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2019 COMPETITIVENESS REPORT

Focus on entrepreneurship



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

Observatoire de la compétitivité

2019 COMPETITIVENESS REPORT

Focus on entrepreneurship

The "Perspectives de Politique Économique" series includes reports, studies, research results or summaries of conferences commanded by or carried out by employees of the Ministry of the Economy or by experts of associated institutions.

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2019 Competitiveness Report

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Introduction

The European economy is currently experiencing its seventh consecutive year of growth and it is forecast to continue growing in 2020 and 2021, against a difficult global backdrop. However, the external environment has become much less favourable and there are great uncertainties, such as global trade tensions and significant international political uncertainties. Although the situation varies considerably between Member States, these factors are not to be ignored as investors' concerns are reflected in the markets in real time, thus weakening the growth forecast.

In Luxembourg, although the negative risks have also risen, a considerable number of short-term indicators and medium-term predictions remain positive compared to other countries. Luxembourg's GDP stood at +3.1% in 2018. Forecast predicts that GDP will grow by 2.4% in 2019 and 2020, and that domestic employment rates will grow by 3% in those two years. Luxembourg has mitigated risks and our economy is benefiting from a relatively serene short and medium-term environment.

This report by the Observatoire de la compétitivité (ODC) provides feed for discussions annually around the structural development of our country. I have come to a number of conclusions concerning this 2019 edition.

According to the results of the composite indicator calculated by the ODC based on the national scoreboard, Luxembourg comes in 8th position in the EU ranking and is therefore in the leading group of countries. Luxembourg still faces a series of challenges in order to strengthen the resilience of its economy though, including boosting the productivity of firms, improving investments, sustainable development and fighting inequality. Our country is in a solid position to face these challenges, but it is time to push ourselves into the next level. The priorities of the economic policies of the past years remain the same today, and efforts will have to be intensified within the framework of our National Reform Programme while implementing responsible budgetary policies.



In the same mindset, in its economic survey for 2019 – of which a short summary has been included in this report – the OECD has highlighted the fact that the firm productivity remains a key factor in the Luxembourgish economy. The increase in productivity must be viewed as a driver for economic growth in Luxembourg. In order to move forward with high-quality development, the focus will have to be on a strategy that aims to maximise the gains achieved in productivity. The concept at the very core of this debate is digitalisation. Indeed, our companies are directly affected by this trend. How can one best conceive and link business and production processes? Which channels should be used to communicate with employees and clients? Which technologies should be applied, and at which stages of the value chain? These are all questions that companies need answers to in an environment that is in full transition, and the Ministry of the Economy supports them.

Finally, the results of the Global Entrepreneurship Monitor survey also aroused my interest, as they provide impetus for my own future political initiatives. The GEM report revealed that more than half of those questioned perceive Luxembourg as offering a favourable business environment for starting a business. On the other hand, fear of failure prevents half of those people from doing so. As the Minister for Small and Medium-Sized Enterprises, I feel it is important to deal with this anguish so that in the long term, entrepreneurship rates may grow in Luxembourg.

Lex Delles

Minister for Small and Medium-Sized Enterprises

Summary

Chapter 2

The debate on territorial competitiveness is regularly revived at the time of publication of benchmarks and international rankings. The most closely monitored annual reports include those issued by the World Economic Forum, the International Institute for Management Development (IMD), the Heritage Foundation and the European Commission. In these four major reports Luxembourg is ranked between 5th and 8th in the EU in 2019. A strong correlation may also be observed between these four international rankings and the national system of indicators among the Member States of the European Union (see Chapter 3). In addition to these major benchmarks released annually, a multitude of others are also published regularly or occasionally. Although the final ranking often constitutes the most widely publicised element, these analyses tell a more complex story, which belies the simplicity of the ranking. We must not lose sight of the limitations of such an exercise, such as the relativity of the rankings, the quality of the sources, the 'one size fits all' approach, etc. Despite the numerous reservations one may have in the face of territorial benchmarking, these reports deserve to be monitored, because they represent powerful communication tools.

Chapter 3

Chapter 3 is dedicated to the **national competitiveness scoreboard**, which constitutes a central component of competitiveness analysis. Indeed, in 2003, the Tripartite Coordinating Committee of Luxembourg recognised the need for a table of indicators to take account of the national specificities, so as to gain a better understanding of the competitiveness of the country, which is not possible through the simple use of international benchmarks. This scoreboard, which was drawn up by Prof. Fontagné at that time, was revised by the Economic and Social Council in 2016. The present Report contains now the first annual update of this new national system of competitiveness indicators.

The updated results show that Luxembourg's performances are generally mixed in all three aspects. More precisely, the result for the economic dimension revealed a mixed performance. For many indicators, Luxembourg's results are close to the EU's average. However, the analysis of Luxembourg's performance in the social dimension clearly points to positive developments. Often, Luxembourg ranks among the top countries for the social indicators. As to the environmental dimension, the country's performance is stable. Following a detailed analysis of the scoreboard indicators, the ODC calculated its traditional composite indicator based on all 68 indicators. Overall, Luxembourg ranks among the best-performing countries, in 4th place. For the dimension-based rankings, Luxembourg is among the high-performance countries for the economic and environment dimensions, i.e. in 11th and 12th place respectively, whereas for the social aspect, Luxembourg ranks 3rd.

Chapter 4

The Europe 2020 strategy constitutes a central element of the EU response to the economic crisis, now a decade old. Overcoming the crisis was considered a shift towards a social, greener and more intelligent market economy. Five broad objectives were confirmed at European Union level with regards to promoting employment, improving the conditions for innovation and R&D, fulfilling the objectives relating to climate change and energy issues while improving levels of education and encouraging social inclusion. Each Member State later fixed its own national targets. For some of the targets established by Luxembourg (2010), the indicators have evolved in the right direction, while for others, the situation is less favourable. In its recent monitoring report on the Europe 2020 indicators (released in October 2019), Eurostat came to the following conclusions: Luxembourg has steadily improved towards reaching its school drop-out rate target; the country has one of the highest rates of post-secondary graduates in the EU but has yet to make progress to reach its highly ambitious national target; the country is coming closer to its employment rate target but has not quite reached it yet; it spends less than the EU average on R&D and is moving away from its national target; the risk of poverty and social exclusion has been rising over the years, widening the gap between reality and its national target; the country has one of the lowest rates for renewable energy in the EU and has not achieved its national target; the reduction of greenhouse gases has not been sufficient to reach the national target; and Luxembourg continues to reach its national primary energy consumption target.

The years preceding the crisis were also characterised by macroeconomic developments creating imbalances between Member States of the EU. The Commission therefore developed a macroeconomic imbalance procedure. The Commission publishes an annual scoreboard analysing each Member State in relation to certain alert thresholds. Since 2015, the procedure has consisted of 14 main indicators. In the most recent edition (November 2018), the Commission noted that Luxembourg faced no imbalances, although the country did exceed some thresholds. For this report, data have been updated in July 2019. We may note that Luxembourg exceeds two thresholds: the consolidated private sector debt and the variation in the unit labour cost (ULC). However, the private debt indicator for Luxembourg must be interpreted with care, since most of the debt is contracted by non-financial companies. Nonetheless, many businesses choose to be financed through Luxembourg not because of any direct need, but for the benefit of other associated entities located abroad (e.g. intra-group loans). The Commission considers that the reason the country surpasses the threshold so obviously is therefore related to the structure of the country, and thus constitutes no risk at this stage.

Chapter 5

In addition to the benchmarks and international rankings mentioned in Chapter 2, one must also mention the "Ease of Doing Business" report, issued annually by the World Bank. This report contains an analysis of the business environment and related regulations to determine the ease for an entrepreneur to start and run a business. As with all other benchmarks and rankings, this report is important for Luxembourg's image, especially in terms of the attractiveness of the country for national and international entrepreneurs. It includes ten categories assessing the various aspects and stages of a business' life cycle.

In the overall ranking of the report published in 2018, Luxembourg ranked 66th out of 190 countries with a score of 69/100. The "Starting a business" category played a significant role here because it refers to assessments of the applicable regulations and requirements to which entrepreneurs are subject at the beginning of their undertaking. Here, Luxembourg ranked 73rd out of 190 countries. The country's results for this benchmark are not aligned with most other international studies, in which Luxembourg usually performs better (see Chapter 2). A critical analysis of Luxembourg's position in the "Ease of Doing Business 2019" was therefore deemed necessary. As a result, certain conclusions could indeed be drawn by the report, but their significance must not be overestimated. For example, to a certain extent, the "one-size-fits-all" methodology applied makes the usefulness of this analysis questionable for a widely open and small service-based economy such as Luxembourg's. Moreover, it is important not to forget that this report only provides a partial overview of the business environment, because it only considers the regulatory environment. Indeed, if the overall result truly reflected the economy's situation, then public statistics would confirm that Luxembourg's business environment is less beneficial than that of most other EU countries – which is not the case. The correlations between the global composite EODB index and various Eurostat indicators are weak, such as the survival rate or the number of enterprises per 10,000 inhabitants, for example. It is therefore impossible to say that Luxembourg's result truly reflects its economic situation. There are other unconsidered aspects that could also play a significant role, such as infrastructures, market characteristics, the political and macroeconomic situation, etc. The holistic title "Doing Business" could therefore be misleading because the report does not consider all the factors allowing businesses to prosper.

Chapter 6

In order to reduce Luxembourg's high level of dependence on its financial sector (27% of GDP), the government is currently actively promoting the development of new priority sectors within a context of a sectoral multi-specialisation strategy. Since 2014, the ODC carries out an annual assessment of the economic impact of the five new priority sectors, including health technologies and space technologies. This work has allowed the analysis of the economic growth and jobs created in these sectors. As a result, it was possible to update the indicators measuring the economic impact of the sector of space technologies. Moreover, a new approach has been put in place to create an in-depth mapping of the companies active in the health technologies sector and of the activities performed on our territory. Indeed, until now, specific NACE codes for private enterprise activities were used to identify companies active in the health technologies sector, using STATEC's business directory ("Répertoire des entreprises"), with a particular focus on diagnostics and biotechnologies activities. This targeted process could only partially reflect the real developments in the sector. In order to obtain a broader overview of the sector, a new approach was defined in 2018 in collaboration with Luxinnovation to improve the identification of the active businesses, analyse the evolution of the sector and define adequate policies for its development. This chapter explains this approach and presents the main results of the new analysis.

Chapter 7

The Secretary-General of the **OECD**, Ángel Gurría, presented the **"Economic Survey of Luxembourg 2019"** on 10 July. This document is one of the outcomes of the work of the Economic and Development Review Committee (EDRC). Every peer survey analyses the state of the Luxembourgish economy and delves into one subject in particular. In the 2019 edition, the OECD decided to focus on housing. The present chapter summarises the main conclusions of the survey.

Chapter 8

The present chapter provides a summary of the **studies undertaken by STATEC Research ASBL** this year. Their work aims to provide an overview of the social and economic reality of the country, with particular focus on relevant economic facts such as entrepreneurship, the impact of certain features of the population structure and quality of life in the country.

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1 The Observatoire de la compétitivité

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1.1 The Observatoire de la compétitivité: Role and missions

The role of the Observatoire de la compétitivité is to assist the Government and the social partners in providing guidelines and formulating policies that promote and/or are suited to the concept of long-term competitiveness, which is the source of growth and well-being.

As such, it is a tool for documenting, observing and analysing evolution in the country's competitive position. It is a monitoring unit, responsible for leading a constructive debate between the social partners.

The main tasks of the Observatoire de la compétitivité are as follows:

- Collect, analyse and compare existing data on the national, regional and international levels that relate to economic competitiveness;
- Accurately target the dissemination of selected and processed information, which is useful for strategic decision-making;
- Undertake or commission studies and research on competitiveness, its factors, etc.;
- Contribute to the works and to the analyses of international organizations dealing with competitiveness (EU Council, OECD, etc.);
- Coordinate the work and the drafting of the Luxembourg's National Reform Programme (NRP) within the framework of the European Strategy for Growth and Jobs (Europe 2020 strategy);
- Contribute to the work of the National Productivity Board, the secretariat of which is provided by officials assigned to the Observatoire de la compétitivité.

1.2 From the Lisbon strategy to the Europe 2020 strategy

Within the Government, the Minister of the Economy is responsible for coordinating the implementation of the European strategy for growth and jobs on the national level. The Observatoire de la compétitivité was commissioned in the autumn of 2005 to prepare the National Plan for Innovation and Full employment, which was submitted to the European Commission within the framework of the Lisbon strategy. In order to optimize government coordination, to ensure consultation procedures and to guarantee assimilation of reforms nationally, an ad hoc structure was set up at the inter-ministerial level in 2005, whose structure is coordinated by the Observatoire de la compétitivité. This network brings together Lisbon strategy coordinators within each of the relevant ministerial departments and administrations concerned. The Government then submitted annual implementation reports to the Commission, until the Lisbon strategy expired in 2010.

At the end of 2009, the European Commission began the works to define a strategy for the next decade: the Europe 2020 strategy¹. Based on European Commission proposals, the June 2010 European Council decided upon the development of this new strategy, the governance of which will take place at three integrated levels:

- A level of macroeconomic monitoring to focus on macroeconomic and structural policies;
- ▼ A thematic coordination level, covering the five major European objectives and their national implementation;
- A simultaneous monitoring level, taking place within the framework of the Stability and Growth Pact (SGP).

In November 2010 each Member State had to submit to the European Commission a first draft of the National Reform Programme (NRP). developed in the framework of the Europe 2020 strategy. In November 2010 Luxembourg submitted its interim NRP draft to the Commission, and the Government finally decided on the finalized NRP for Luxembourg in April 2011 which was then submitted to the European Commission, along with the SGP. The ninth update of Luxembourg's finalized NRP was sent to the European Commission in April 2019, along with the SGP 2019-2023². Based on the NRP and the SGP, the Council issued new country-specific recommendations for Luxembourg, for consideration during the national discussions to be conducted about the 2020 draft budget.

> For additional details: https://ec.europa.eu/info/ strategy/european-semester_ en

For additional details: http://www.mf.public.lu

1.3 STATEC Research ASBL

Since January 2018, the research is conducted within the framework of a collaboration agreement with STATEC, the Observatoire de la compétitivité and STATEC Research ASBL. The Observatoire de la compétitivité and STATEC co-finance the research programme carried out by STATEC Research ASBL via budget articles 05.0.41.010 and 05.1.41.010 respectively.

STATEC Research is taking over the research activity of STATEC and the Observatoire de la compétitivité organised since 2011 within ANEC GIE. More specifically, it focuses on the current pillars of research, that is, growth and productivity, innovation and entrepreneurship, business performance, and well-being. STATEC Research (asbl) received the approval to act as a research body on 15.11.2016 from the Ministry for Higher Education and Research. The working programme aims to pursue the activities undertaken in greater depth so as to meet the objectives of the primary mission of STATEC Research, i.e. make use of the statistical data available from STATEC, within the framework of applied research work. The researchers recruited work mainly on microdata from businesses at the STATEC facilities, so as to ensure the confidentiality of these sensitive data. The research unit consists of a team of economists and econometricians specialising in the fields of innovation, productivity and well-being. Eight Ph.D.-level researchers and one research assistant are currently working under the aegis of STATEC Research. The facility regularly hosts students working on their Master's Degree or Ph.D. theses, as well as other visiting researchers. The papers are supervised by the Scientific Committee, as provided for under the 2011 STATEC framework law.

1.4 Events and publications in 2018-2019

The Observatoire de la compétitivité aims to inform both the economic agents and the general public on competitiveness issues. To achieve his, multiple communication channels are used, such as organising public events (seminars, conferences, etc.) and publishing analytical documents on competitiveness. All information concerning events organized by the Observatoire de la compétitivité and its publications can be downloaded.

1.4.1 Seminars and conferences

The communication strategy of the Observatoire de la compétitivité is consistent with its "competitiveness monitoring" mission and is in particular useful for initiating public debate on the major axes that define the competitiveness of the Luxembourg economy and the Europe 2020 strategy. The organization of public events is a part of this mission.

Economy Day³

The Ministry for the Economy, the Chamber of Commerce and Fedil, in collaboration with pwc, organised the Economy Day entitled "*Protectionism*, *nationalism*, *global trade tensions on the rise – Turbulent waters and potential scenarios*" on 28 February 2019.

Presentation of the OECD's "Economic Survey of Luxembourg 2019"⁴

On 10 July 2019, Ángel Gurría, the Secretary-General of the OECD, presented the new edition of the economic survey in Luxembourg, in the presence of Mr Pierre Gramegna, Minister of Finance, and Ms Sam Tanson, Minister of Housing. The main aspects of the study are summarised in Chapter 7 of the present Report.

1.4.2 Perspectives de Politique économique

Through the publication *"Perspectives de Politique économique"*, the Observatoire de la compétitivité disseminates the findings of studies and/or commissioned research from academics or consultants, as well as papers written by members of the Observatoire de la compétitivité. This publication is also intended to publicize the reports of lectures, seminars or conferences that the Ministry of the Economy organizes on issues of economic policy. Finally, its goal is also to clarify the possible policy options, to assess the effectiveness of certain measures, and so to foster the public debate on economic policy.

1.4.3 The Observatoire de la compétitivité website

The Observatoire de la compétitivité has a website that gathers all the information and publications regarding the competitiveness of the national economy: https://odc.gouvernement.lu. In particular this site provides information on Luxembourg's competitiveness in international publications. It acts as a communication platform for all those involved in the implementation of the Europe 2020 strategy in Luxembourg and enables to make the national competitiveness scoreboard data available. The website announces upcoming events and publications. Documents relating to conferences and seminars, as well as the publications, can be downloaded for free from this site.

- For additional details: http://www.jecolux.lu/events/ economyday/index.html
- For additional details: https://odc.gouvernement.lu/fr/ actualites/mes-actualites/2019/ ocde-economic-survey.html

An overview of the 2019 **Competitiveness Report**

Chapter 2 presents the performance of Luxembourg according to major international composite indicators (IMD, WEF, etc.) and also looks at various rankings less known by the general public.

Chapter 3 analyses how Luxembourg's competitiveness has developed over the course of the past year in comparison with other EU Member States based on the national Competitiveness Scoreboard indicators. This scoreboard was initially introduced at the request of the Tripartite Coordination Committee in 2003 to provide a clearer overview of the specific information pertaining to Luxembourg. It has since been revised by the Economic and Social Council which unanimously adopted an opinion in 2016 on the national indicator system, which constitutes from 2017 on the new updated and restructured scoreboard.

Chapter 4 aims to present the priorities as well as the European and national objectives of the Europe 2020 strategy in the context of the European Semester and makes an intermediate appraisal of Luxembourg's position for the indicators in the macroeconomic surveillance scoreboard, before the publication of the new edition by the end of 2019 by the European Commission.

Chapter 5 provides a critical analysis of the performance attributed to Luxembourg in the World Bank's "Ease of Doing business 2019" report.

Chapter 6 aims to provide an overview of the status guo in the sectors of healthcare technologies and space in Luxembourg. These two sectors are among the government's priority sectors within the framework of its multi-sectoral specialisation strategy, in view of a greater diversification of the economy.

Chapter 7 summarises the main conclusions of the "Economic Survey of Luxembourg 2019", presented by the Secretary-General of the OECD, Ángel Gurría, in Luxembourg in July. This document is one of the outcomes of the work of the Economic and Development Review Committee (EDRC). Every peer survey analyses the state of the Luxembourgish economy and delves into one subject in particular. In the 2019 edition, the OECD decided to focus on the issue of housing.

Finally, Chapter 8 briefly presents the studies undertaken by STATEC Research ASBL this year. The work performed by the institute aims to provide an overview of the social and economic reality of the country, with particular focus on relevant economic facts such as entrepreneurship, the impact of certain features of the population structure and guality of life

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2 Benchmarks and comparative competitiveness analysis

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2.1 Introduction

The debate on "territorial competitiveness" is regularly reopened in Luxembourg when international benchmarks and territory rankings are published. Composite indices are increasingly used to make international comparisons as they draw together multiple sets of information under a single numerical value¹. These indices sum up a variety of characteristics and provide an approximate summary of complex issues such as competitiveness, attractiveness. At the same time, although omnipresent, the concept provides no clue as to its precise meaning.

This chapter seeks on one hand to provide an overview of a raft of international benchmarks which have been published since the last edition of this Report. On the other hand, its aim is above all to analyse Luxembourg's position in those benchmarks and rankings².

2.2 Luxembourg's rankings

In the debate about the determinant factors of regional competitiveness, the best-known annual benchmarks and rankings are those of the World Economic Forum (WEF), the International Institute for Management Development (IMD), the Heritage Foundation and the European Commission. In addition to these four rankings, there are a multitude of other ones, some of which we will look at in this chapter.

2.2.1 WEF, IMD, Heritage Foundation and European Commission

a. Growth Competitiveness Index³

In mid-October, the World Economic Forum (WEF) published a new edition of its annual study of competitiveness in 141 countries across the world: the *Global Competitiveness Report*. 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 the reason why the WEF is using a new methodology since last year edition (2018), designed to understand the dynamics of the world economy in these times of the fourth industrial revolution. In fact, according to the authors of the report, a large proportion of the factors which will have the greatest impact on competitiveness in the future have never been at the centre of major political decisions in the past. These include the creation of new ideas, entrepreneurial culture, openness and agility.

- For more information on composite indicators, see the European Commission's Joint Research Centre website: http://composite-indicators.jrc. ec.europa.eu/
- A list of more benchmarks may also be found on the website of the Observatoire de la compétitivité: https://odc.gouvernement.lu/ fr/statistiques/benchmarksinternationaux.html
- ³ For additional details: https://www.weforum.org/ reports/global-competitiveness-report-2019-searchingfor-the-win-win-policy-space

The Global Competitiveness Index (GCI) evaluates the set of factors determining the level of productivity of an economy – considered as the most decisive factor in long-term growth. The framework is built around 12 main equally-weighted factors of productivity. These pillars are the following: institutions, infrastructure, ability to integrate technology, macroeconomic stability, health, education and skills, property market, labour market, financial system, size of the market, dynamism of businesses and innovation. They include 103 individual indicators in all, based on a combination of statistical data (70%) and information derived from an annual opinion poll of economic decision-makers and business owners, carried out in collaboration with a network of partner institutes, including the Chamber of Commerce for Luxembourg (30%). Each indicator, on a scale from 0 (poor performance) to 100 (best performance), indicates the ranking of an economy compared to the ideal situation.

The 2019 world ranking was headed by Singapore (84.8), the United States (83.7) and Hong Kong (83.1). Luxembourg stood in 18th place worldwide (77.0). The Netherlands ranked 4th (82.4), while Germany was 7th (81.8), France 15th (78.8) and Belgium 22nd (76.4).

The ranking of the Member States of the EU was headed by the Netherlands, Germany and Sweden (81.2), while Luxembourg stood in 8th place within the EU.

Table 1 Excerpts from WEF ranking, 2019						
			Dif	f. 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: WEF	Source: WEF					

Luxembourg ranks as follows in 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)
- Labour market: 11th (68)
- Labour market: 12th (74)
- ▼ Financial system: 10th (87)
- ◄ Market size: 77th (50)
- Business dynamism: 42nd (66)
- ◄ Innovation capability: 19th (68)



b. Global Competitiveness Index⁴

The Swiss Institute IMD published in 2019 the 31st version of its annual report on competitiveness, the *World Competitiveness Yearbook*. This report is published yearly since 1989. In this new edition, 63 countries are analysed through 235 criteria. These criteria are both quantitative and qualitative (survey of business leaders), split into four sub-categories: economic performance, government efficiency, business environment and infrastructure.

The 2019 world ranking is headed by Singapore, Hong Kong and the United States. Luxembourg stands in 12th place worldwide. The Netherlands ranks 6th, Germany 17th, Belgium 27th and France 31st.

Within the European Union (EU), the ranking is headed by the Netherlands, followed by Ireland and Denmark. Luxembourg came 5th in the EU.

Table 2 Excerpts from IMD ranking, 2019						
2019	Country	2018		Change		
1	Singapore	3	+2	\uparrow		
2	Hong Kong SAR	2	-	-		
3	USA	1	-2	\checkmark		
4	Switzerland	5	+1	\uparrow		
5	UAE	7	+2	\uparrow		
6	Netherlands	4	-2	\checkmark		
7	Ireland	12	+5	\uparrow		
8	Denmark	6	-2	\downarrow		
9	Sweden	9	-	-		
10	Qatar	14	+4	\uparrow		
11	Norway	8	-3	\checkmark		
12	Luxembourg	11	-1	\checkmark		
13	Canada	10	-3	\checkmark		
14	China	13	-1	\checkmark		
15	Finland	16	+1	\uparrow		
16	Taiwan, China	17	+1	\uparrow		
17	Germany	15	-2	\checkmark		
18	Australia	19	+1	\uparrow		
19	Austria	18	-1	\downarrow		
20	Iceland	24	+4	\uparrow		
21	New Zealand	23	+2	\uparrow		
22	Malaysia	22	-	-		
23	United Kingdom	20	-3	\downarrow		
24	Israel	21	-3	\downarrow		
25	Thailand	30	+5	\uparrow		
26	Saudi Arabia	39	+13	\uparrow		
27	Belgium	26	-1	\downarrow		
28	Korea, Rep.	27	-1	\downarrow		
29	Lithuania	32	+3	\uparrow		
30	Japan	25	-5	\downarrow		
Source: IMD						

For additional details: http://www.imd.org/wcc/ Luxembourg is ranked as follows under the four sub-categories of the global ranking:

- For the "economic performance" category, Luxembourg places 4th, with strong results in international trade (5th) and international investment (2nd), but lower results in employment (15th), domestic economy (20th) and prices (44th);
- For the "government efficiency" category, Luxembourg places 10th, finishing 6th for public finances, 42nd for tax policy, 10th for overall institutional framework, 13th for business legislation and 5th societal framework;
- For the "business environment" pillar Luxembourg placed 12th, with strong results for finance (5th) and productivity (11th), but lower results for attitudes and values (19th), labour market (22nd) or management practices (23rd);
- The "infrastructure" category is the area where Luxembourg records its poorest results, placing 25th. For example, Luxembourg finishes 13th for basic infrastructure, 37th for technological infrastructure, 27th for scientific infrastructure, 19th for environment and health, and 18th for education.

c. Index of Economic Freedom⁵

Early 2019 the American Heritage Foundation published the 25th edition of its annual study *Index of Economic Freedom* (IEF), launched in 1995. Economic freedom, which is analysed in 186 countries around the world, is defined as the absence of any government coercion or constraint on production, supply or consumption of goods and services beyond the extent necessary to protect and maintain the liberty of citizens. Economic freedom is supposed to favour productivity and economic growth by supporting entrepreneurship and creation of value added. The more an economy is estimated to be free (composite index close to 100), the better a country ranks in the study. Economic freedom is measured through indicators spread among four categories, which are split into twelve equally-weighted sub-categories:

- Rule of law: property rights, judicial effectiveness, government integrity;
- ▼ Government size: tax burden, government spending, fiscal health;
- Regulatory efficiency: business freedom, labor freedom, monetary freedom;
- Market openness: trade freedom, investment freedom, financial freedom.

For additional details: http://www.heritage.org/index/

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The 2019 world ranking is headed by Hong Kong (90.2/100), followed by Singapore (89.4) and New Zealand (84.4). Luxembourg stands in 17th place worldwide (75.9) and forms part of the countries considered to be "mostly free". The Netherlands rank in 13th place (76.8), Germany 24th (73.5), Belgium 48th (67.3) and France 71st (63.8) in this worldwide ranking.

Within the EU, Luxembourg came 6th, after Ireland (80.5), the United Kingdom (78.9), the Netherlands, Denmark (76.7) and Estonia (76.6).

Тор	Top 25 of the ranking, 2019															
World Rank	Regional Rank	Country	Overall Score	Change from 2018	Property Rights	Judicial Effectiveness	Government Integrity	Tax Burden	Government Spending	Fiscal Health	Business Freedom	Labor Freedom	Monetary Freedom	Trade Freedom	Investment Freedom	Financial Freedom
1	1	Hong Kong	90.2	0.0	93.3	75.3	83.8	93.1	90.3	100.0	96.4	89.2	86.4	95.0	90.0	90.0
2	2	Singapore	89.4	0.6	97.4	92.4	95.1	90.4	90.7	80.0	90.8	91.0	85.3	94.8	85.0	80.0
3	3	New Zealand	84.4	0.2	95.0	83.5	96.7	71.0	50.4	98.6	91.0	86.7	87.5	92.4	80.0	80.0
4	1	Switzerland	81.9	0.2	85.3	82.0	88.0	70.5	64.8	96.3	75.4	72.5	85.2	87.4	85.0	90.0
5	4	Australia	80.9	0.0	79.1	86.5	79.9	62.8	60.1	86.2	88.3	84.1	86.6	87.6	80.0	90.0
6	2	Ireland	80.5	0.1	85.8	68.4	78.0	76.3	77.4	89.0	83.1	75.3	87.0	86.0	90.0	70.0
7	3	United Kingdom	78.9	0.9	92.3	85.9	83.8	64.7	48.2	68.6	92.9	73.5	81.2	86.0	90.0	80.0
8	1	Canada	77.7	0.0	87.0	69.4	84.6	76.8	51.3	83.1	81.9	73.7	77.2	86.8	80.0	80.0
9	1	United Arab Emirates	77.6	0.0	81.8	87.1	78.8	99.2	68.8	88.9	79.9	81.1	80.9	84.4	40.0	60.0
10	5	Taiwan	77.3	0.7	85.4	70.1	69.2	75.0	90.6	91.6	93.2	60.9	84.4	87.0	60.0	60.0
11	4	Iceland	77.1	0.1	87.4	63.8	83.8	72.7	44.0	96.7	88.4	64.1	81.7	87.0	85.0	70.0
12	2	United States	76.8	1.1	79.3	78.6	77.4	75.1	57.1	53.1	83.8	89.4	76.6	86.6	85.0	80.0
13	5	Netherlands	76.8	0.6	88.0	74.7	89.1	51.6	42.9	93.3	81.4	60.3	84.0	86.0	90.0	80.0
14	6	Denmark	76.7	0.1	86.2	77.8	85.8	42.0	14.4	96.7	90.7	86.4	84.1	86.0	90.0	80.0
15	7	Estonia	76.6	-2.2	81.5	76.0	73.1	79.9	51.1	99.8	75.3	57.2	79.6	86.0	90.0	70.0
16	8	Georgia	75.9	-0.3	65.9	54.6	58.5	87.1	73.6	93.9	85.8	76.6	76.0	88.6	80.0	70.0
17	9	Luxembourg	75.9	-0.5	83.0	72.4	85.8	65.4	46.6	98.9	68.8	45.9	82.6	86.0	95.0	80.0
18	3	Chile	75.4	0.2	68.7	56.3	62.3	77.3	81.0	89.0	76.6	65.0	84.5	88.8	85.0	70.0
19	10	Sweden	75.2	-1.1	89.5	84.0	88.0	43.2	26.7	96.6	88.0	53.9	82.0	86.0	85.0	80.0
20	11	Finland	74.9	0.8	89.6	81.2	92.5	66.8	7.2	86.4	89.4	50.3	84.8	86.0	85.0	80.0
21	12	Lithuania	74.2	-1.1	73.6	61.2	47.8	86.4	65.1	97.3	75.2	63.6	84.6	86.0	80.0	70.0
22	6	Malaysia	74.0	-0.5	84.1	68.2	55.4	85.6	83.2	82.4	83.9	74.4	78.6	82.0	60.0	50.0
23	13	Czech Republic	73.7	-0.5	74.8	47.6	52.1	82.6	52.1	97.6	72.4	78.1	81.5	86.0	80.0	80.0
24	14	Germany	73.5	-0.7	79.9	75.4	81.3	60.8	42.3	91.8	83.3	52.8	77.9	86.0	80.0	70.0
25	1	Mauritius	73.0	-2.1	69.5	62.1	40.3	92.1	80.3	73.6	79.8	60.8	79.4	88.4	80.0	70.0
C	The Haritana Foundation															

Table 3

Source: The Heritage Foundation

The report reveals Luxembourg's strong results in the domains of rule of law, tax burden, market openness and monetary stability. The country's scores for labour freedom and government spending among other ones give more cause for concern. Luxembourg records the following results in the twelve sub-categories:

- Rule of law: property rights (83.0), judicial effectiveness (72.4), government integrity (85.8);
- Government size: tax burden (65.4), government spending (46.6), fiscal health (98.9);
- Regulatory efficiency: business freedom (68.8), labor freedom (45.9), monetary freedom (82.6);
- Market openness: trade freedom (86.0), investment freedom (95.0), financial freedom (80.0).

In conclusion, the authors of the study make the following observation with regard to Luxembourg: "Luxembourg's economic freedom score is 75.9, making its economy the 17th freest in the 2019 Index. Its overall score has decreased by 0.5 point, with declines in judicial effectiveness and monetary freedom overwhelming an improvement in government integrity. Luxembourg is ranked 9th among 44 countries in the Europe region, and its overall score is above the regional and world averages. Luxembourg is one of the world's wealthiest countries. It has one of the eurozone's highest current-account surpluses as a share of GDP, maintains a healthy budgetary position, and has the region's lowest level of public debt. Economic competitiveness is sustained by the solid institutional foundations of an open-market system. The judiciary, independent and free of corruption, protects property rights and upholds the rule of law. High levels of regulatory transparency and efficiency encourage entrepreneurial activity. The government is seeking to enhance the country's status as an international financial center in 2019."

d. European innovation scoreboard⁶

Each year, the European Commission publishes an evaluation of the results of the Member States of the EU relating to innovation, measured against those in international competition. These data assist the Member States and the EU as a whole to evaluate the areas in which they should concentrate their efforts.

The European Commission published the 18th edition of its annual *European Innovation Scoreboard* (EIS), the first version of which was initially issued in 2001. This scoreboard enables the relative innovation performance of the different countries to be measured and compared and provides an analysis of the strengths and weaknesses of national research and innovation systems.

For additional details: http://ec.europa.eu/growth/ industry/innovation/facts-Charts/scoreboards/index_en. htm The measurement framework includes in total 27 indicators separated into 4 major types of indicators and 10 areas:

- "Tools" covers the main drivers of innovation external to companies: human resources, attractive research systems, innovation-friendly environment;
- "Investments" covers private and public investments in R&D: finance and support, firm investments;
- "Innovation activities" includes the efforts made to innovate within companies: innovators, linkages and intellectual assets;
- "Impacts" captures the effects of companies' innovation activities: employment impacts and sales impacts.

On the basis of the average innovation results, calculated using a composite indicator entitled *Summary Innovation Index* (SII) and ranging from 0 (poorest performance) to 1 (best performance), countries are placed into four different performance groups:

- Innovation leaders, whose results in terms of innovation are well above the EU average (score at least 20% above the EU average);
- Strong innovators, whose results are above or close to the EU average (score of between 90% and 120% of EU average);
- Moderate innovators, whose results are below the EU average (score of between 50% and 90% of the EU average);
- Modest innovators, whose results are well below the EU average (score at least 50% below of the EU average.

The new EU ranking is headed by Sweden (average score 0.713 out of 1), followed by Finland (0.704) and Denmark (0.680). With an index of 0.623, Luxembourg appeared as last year in the top group – comprised of innovation leaders – standing in 5th place in this new version of the scoreboard.



Coloured columns show Member States' performance in 2018, using the most recent data for 27 indicators, relative to that of the EU in 2011. Grey columns show Member States' performance in 2011 relative to that of the EU in 2011. For all years, the same measurement methodology has been used. The dashed lines show the threshold values between the performance groups in 2018, comparing Member States' performance in 2017 relative to that of the EU in 2018. Source: European Commission

Finally, as regards the ten dimensions of innovation, Luxembourg ranks as follows in the indices compared to the 2018 EU average (base 100):

- "Tools": human resources (127.5); attractive research systems (192.7); innovation-friendly environment (134.6);
- "Investments": finance and support (116.8); firm investments (65.3);
- "Innovation activities": innovators (140.4); linkages (67.9); intellectual assets (157.6);
- ▼ "Impacts": employment impacts (134.5); sales impacts (81.2).

In conclusion, the European Commission makes the following observation with regard to Luxembourg: "Attractive research systems, Intellectual assets and Innovators are the strongest innovation dimensions. Luxembourg scores particularly well on Foreign doctorate students, Trademark applications, and International scientific co-publications. Firm investments, Linkages and Sales impacts are the weakest innovation dimensions. Overall, Luxembourg's lowest indicator scores comprise Sales of new-to-market and new-to-firm product innovations, Private co-funding of public R&D expenditures, and Non-R&D innovation expenditures."

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Table 4 Performance of Luxembourg					
Luxembourg	Relative to EU 2018 in	Performance relative to EU 2011 in			
	2018	2011	2018		
SUMMARY INNOVATION INDEX	118.7	123.2	129.2		
Human resources	127.5	141.4	155.8		
New doctorate graduates	55.1	46.2	80.0		
Population with tertiary education	180.0	197.8	214.9		
Lifelong learning	164.3	176.0	167.7		
Attractive research systems	192.7	179.1	217.0		
International scientific co-publications	237.9	221.2	346.1		
Most cited publications	124.9	111.5	136.8		
Foreign doctorate students	268.8	257.1	257.1		
Innovation-friendly environment	134.6	202.6	212.7		
Broadband penetration	150.0	144.4	300.0		
Opportunity-driven entrepreneurship	118.3	242.2	153.2		
Finance and support	116.8	120.6	127.7		
R&D expenditure in the public sector	79.8	60.8	73.9		
Venture capital expenditures	148.2	191.6	191.6		
Firm investments	65.3	65.3	77.9		
R&D expenditure in the business sector	49.1	57.9	56.2		
Non-R&D innovation expenditures	25.4	34.6	29.7		
Enterprises providing ICT training	121.1	106.7	153.3		
Innovators	140.4	133.3	127.5		
SMEs product/process innovations	122.7	123.2	119.1		
SMEs marketing/organisational innovations	165.3	144.2	141.1		
SMEs innovating in-house	135.8	132.6	122.3		
Linkages	67.9	69.7	70.5		
Innovative SMEs collaborating with others	81.0	11.7	86.4		
Public-private co-publications	129.0	88.9	151.4		
Private co-funding of public R&D exp.	25.1	30.7	24.1		
Intellectual assets	157.6	152.9	153.3		
PCT patent applications	63.4	45.4	57.6		
Trademark applications	241.4	269.0	269.0		
Design applications	170.9	168.9	157.6		
Employment impacts	134.5	123.7	140.5		
Employment in knowledge-intensive activities	191.8	220.5	209.0		
Employment fast-growing enterprises	89.9	53.7	91.0		
Sales impacts	81.2	98.7	83.6		
Medium and high tech product exports	68.6	88.1	74.0		
Knowledge-intensive services exports	147.2	146.1	151.8		
Sales of new-to-market/firm innovations	17.1	56.6	16.6		

The colours show normalised performance in 2018 relative to that of the EU in 2018: dark green: above 120%; light green: between 90% and 120%; yellow: between 50% and 90%; orange: below 50%. Normalised performance uses the data after a possible imputation of missing data and transformation of the data. Source: European Commission

e. Ranking comparison and correlation analysis

The table below shows an extract of the rankings of the four major annual composite indicators that had been reviewed above, in which Luxembourg is appearing⁷.

Ta To	Table 5 Top 25 of the four major rankings (reports published in 2019)							
	N°	World Economic Forum	conomic IMD Heritage Foundation		European Commission			
		GCI	GCI	Economic Freedom	SII			
+	1	Singapore	Singapore	Hong Kong	Sweden			
	2	United States	Hong Kong	Singapore	Finland			
	3	Hong Kong	United States	New Zealand	Denmark			
	4	Netherlands	Switzerland	Switzerland	Netherlands			
	5	Switzerland	United Arab Emirates	Australia	Luxembourg			
	6	Japan	Netherlands	Ireland	United Kingdom			
	7	Germany	Ireland	United Kingdom	Germany			
	8	Sweden	Denmark	Canada	Belgium			
	9	United Kingdom	Sweden	United Arab Emirates	Austria			
	10	Denmark	Qatar	Taiwan	Ireland			
	11	Finland	Norway	Iceland	France			
	12	Taiwan	Luxembourg	United States	Estonia			
	13	Korea	Canada	Netherlands	Portugal			
	14	Canada	China	Denmark	Czech republic			
	15	France	Finland	Estonia	Slovenia			
	16	Australia	Taiwan	Georgia	Cyprus			
	17	Norway	Germany	Luxembourg	Malta			
	18	Luxembourg	Australia	Chile	Italy			
	19	New Zealand	Austria	Sweden	Spain			
	20	Israel	Iceland	Finland	Greece			
	21	Austria	New Zealand	Lithuania	Lithuania			
	22	Belgium	Malaysia	Malaysia	Slovenia			
	23	Spain	United Kingdom	Czech republic	Hungary			
	24	Ireland	Israel	Germany	Latvia			
-	25	United Arab Emirates	Thailand	Mauritius	Poland			

Note: Luxembourg's neighbouring countries (Germany, Belgium, France), and the Netherlands as a Member State of the Benelux, are highlighted in green when their ranking is better than Luxembourg's and otherwise in orange.

We can observe that Luxembourg places between 5th (IMD) and 8th (WEF) position in the list of EU countries. Luxembourg places also in this range (8th) in the ranking produced by the Observatoire de la compétitivité, based on the national competitiveness scoreboard⁸.

- ⁷ Annual changes in country rankings should be consulted with a certain caution, because over the years methodological changes in the calculation of the index may have occurred without a recalculation of the ranks for all the years.
- Please refer to Chapter 3 of this Report for more information on the ODC ranking.



Notes: The time axis refers to the report's year of publication. Time series should be consulted with caution, because methodological changes might have occurred without the ranks for all prior years being recalculated.

For the WEF ranking, a new methodology was introduced in 2018 and a recalculation for the preceding years can only be performed for the year 2017.

In general, it is useful to analyse the correlation between these major benchmarks. Kendall's coefficient is suitable for this type of analysis as it measures the degree of agreement. This correlation has been calculated on the basis of the EU countries⁹. The coefficient takes a value between 0 (no relation) and 1 (a perfect agreement between rankings and judges). In each of the previous years' Competitiveness Reports, there has been a strong correlation between the rankings. On the basis of the four annual rankings previously described and the national scoreboard that is annually published by the Observatoire de la compétitivité, the Kendall's coefficient equates to 0.79 in 2019 and there is, as in previous years, a strong correlation between the different EU rankings.

> ⁹ EU excluding Malta. The list of countries used for making this calculation has changed over the years. Since the publication of the 2011 Report, only EU Member States are taken into account. Since the 2014 edition, Croatia has been added as new EU Member State. Since 2017 Cyprus could be added in the calculation.

Table 6
Adjustment of the EU rankings, 20

Adjustment of the EU rankings, 2019								
Country	WEF	IMD	HF	EC	ODC			
Germany	2	7	11	7	11			
Austria	9	8	12	9	6			
Belgium	10	10	18	8	16			
Bulgaria	24	23	14	26	27			
Cyprus	22	20	16	16	24			
Croatia	27	27	26	25	18			
Denmark	5	3	4	3	9			
Spain	11	15	19	18	23			
Estonia	14	14	5	12	10			
Finland	6	6	8	2	7			
France	7	12	24	11	13			
Greece	26	26	27	19	26			
Hungary	23	22	22	22	15			
Ireland	12	2	1	10	2			
Italy	13	21	25	17	22			
Latvia	20	19	13	23	19			
Lithuania	19	11	9	20	14			
Luxembourg	8	5	6	5	8			
Netherlands	1	1	3	4	3			
Poland	18	17	17	24	20			
Portugal	16	18	21	13	21			
Slovak republic	21	25	23	21	17			
Czech republic	15	13	10	14	4			
Romania	25	24	15	27	25			
United Kingdom	4	9	2	6	12			
Slovenia	17	16	20	15	1			
Sweden	3	4	7	1	5			

Note: Excluding Malta Source: Observatoire de la compétitivité

2.2.2 Other international benchmarks

Besides the four composite indicators and rankings analysed in the previous section, a multitude of other ones can be found. Some of these will be considered below.

a. Financial sector attractiveness and competitiveness indicators

a.1 Global Financial Centres Index¹⁰

In September 2019, the Z/Yen consultancy bureau published the latest edition of the bi-annual competitiveness index of financial centres around the world, the *Global financial centres index* (GFCI). This composite indicator, which analyses about 100 financial centres, was first issued in 2007.

In a world that is becoming increasingly globalised and interdependent through information and communication technologies (ICT), financial centres are facing a greater competition than other sectors. In fact, financial services are at the heart of the global economy, acting as facilitators of international trade and foreign investments.

The GFCI study is based on two types of sources to assess the competitiveness of financial centres (scale from 1 to 1,000). The study uses on the one hand 134 quantitative determinants and on the other hand a barometer of appreciation produced from online surveys among professionals of the sector. As defined in this study, competitiveness consists of five categories of indicators:

- Business environment (political stability, regulation, etc.);
- Human resources (training, flexibility, etc.);
- ▼ Infrastructure (cost and availability of offices, ICT, transports, etc.);
- Development of the financial sector (volumes, capital availability, etc.);
- Reputation (perception of cities as desirable places to live, degree of innovation, etc.).

In this new edition, New York (790/1000), London (773) and Hong Kong (771) occupy the top three places worldwide, whereas Luxembourg ranks 25th (708).

 For additional details: https://www.zyen.com/ publications/public-reports/ global-financial-centres-index-26/

Table 7 Top 25 of the ranking		
Centre		GFCI 26
	Rank	Rating
New York	1	790
London	2	773
Hong Kong	3	771
Singapore	4	762
Shanghai	5	761
Tokyo	6	757
Beijing	7	748
Dubai	8	740
Shenzhen	9	739
Sydney	10	738
Toronto	11	737
San Francisco	12	736
Los Angeles	13	735
Zurich	14	734
Frankfurt	15	733
Chicago	16	732
Paris	17	728
Boston	18	727
Melbourne	19	720
Montreal	20	716
Casablanca	21	714
Tel Aviv	22	713
Guangzhou	23	711
Vancouver	24	710
Luxembourg	24	708
Source 7/Yen		

In the EU, Luxembourg comes 4th after London, Frankfurt (15th; 733) and Paris (17th; 728). In the euro area, Luxembourg thus ranks 3rd after Frankfurt and Paris.

Luxembourg ranks among the best-performing territories in the "Human resources" category, where it comes 11th in the world and 2nd in the EU, following London.

b. Innovation and technology indicators

b.1 Global innovation index¹¹

In 2019 Cornell University, INSEAD and the World Intellectual Property Organisation (WIPO) published the 12th edition of the *Global Innovation Index* (GII). The GII composite index has been published every year since 2007 and 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 report contains a ranking of countries' innovation capacities and performance. Given the vital role that innovation plays in economic growth and prosperity, the GII composite index features indicators which go beyond those traditionally used, such as R&D expenditure. This new edition assesses 129 countries and is based on 80 indicators.

The GII composite index is based on two sub-indices:

- The "Resources invested in innovation" sub-index ("Inputs") evaluates national economic measures in favour of innovative business activities on the basis of five pillars: 1) institutions, 2) human capital and research, 3) infrastructure, 4) market sophistication, 5) business sophistication;
- "Outputs" sub-index assesses tangible evidence of innovation on the basis of two pillars: 6) knowledge and technology outputs, 7) creativity.

The GII index is calculated on the basis of the simple average of these two sub-indices, with scores ranging from 0 (poor) to 100 (excellent).

The 2019 worldwide ranking is headed by Switzerland (score of 67.24/100), followed by Sweden (63.65) and the United States (61.73). Luxembourg ranks 18th worldwide (53.47). The Netherlands rank 4th (61.44), Germany 9th (58.19), France 16th (54.25) and Belgium 23rd (50.18). Within the EU-28, Luxembourg stands in 9th place.

¹¹ For additional details: https://www.wipo.int/global_ innovation_index/en/2019/

Table 8 Top 30 of the ranking

1								
Country/Economy	Score (0-100)	Rank	Income	Rank	Region	Rank	Median 33.86	
Switzerland	67.24	1	HI	1	EUR	1		
Sweden	63.65	2	HI	2	EUR	2		
United States of America	61.73	3	HI	3	NAC	1		
Netherlands	61.44	4	HI	4	EUR	3		
United Kingdom	61.30	5	HI	5	EUR	4		
Finland	59.83	6	HI	6	EUR	5		
Denmark	58.44	7	HI	7	EUR	6		
Singapore	58.37	8	HI	8	SEA0	1		
Germany	58.19	9	HI	9	EUR	7		
Israel	57.43	10	HI	10	NAWA	1		
Republic of Korea	56.55	11	HI	11	SEA0	2		
Ireland	56.10	12	HI	12	EUR	8		
Hong Kong, China	55.54	13	HI	13	SEA0	3		
China	54.82	14	UM	1	SEA0	4		
Japan	54.68	15	HI	14	SEA0	5		
France	54.25	16	HI	15	EUR	9		
Canada	53.88	17	HI	16	NAC	2		
Luxembourg	53.47	18	HI	17	EUR	10		
Norway	51.87	19	HI	18	EUR	11		
Iceland	51.53	20	HI	19	EUR	12		
Austria	50.94	21	HI	20	EUR	13		
Australia	50.34	22	HI	21	SEA0	6		
Belgium	50.18	23	HI	22	EUR	14		
Estonia	49.97	24	HI	23	EUR	15		
New Zealand	49.55	25	HI	24	SEA0	7		
Czech Republic	49.43	26	HI	25	EUR	16		
Malta	49.01	27	HI	26	EUR	17		
Cyprus	48.34	28	HI	27	NAWA	2		
Spain	47.85	29	HI	28	EUR	18		
Italy	46.30	30	HI	29	EUR	19		
Source: CORNELL /INSEAD/W	IPO							

Luxembourg scores as follows for the two sub-indices:

- With a score of 57.73, Luxembourg ranks 23rd overall (11th in the EU) for the Inputs category (institutions: 24th place overall, human capital and research: 38th, infrastructure: 25th, market sophistication: 68th, business sophistication: 8th);
- With a score of 49.20, Luxembourg ranks 11th overall (7th in the EU) for the Outputs category (knowledge and technology outputs: 18th, creativity: 2nd).

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The authors note the following regarding Luxembourg: "Luxembourg, in turn, aims to develop its innovation leadership through its strong infrastructure, its location in the heart of Europe, its strong services economy, and its talent base. Luxembourg's efforts are focused on five key areas: infrastructure, skills, government, ecosystem, and policy. Luxembourg aims to invest around 2.5% of its GDP in research in 2020. New financing programs will be launched to foster digital high-tech start-ups. In May 2019, Luxembourg presented its national AI strategy and is rolling out its data-driven innovation strategy with focus on seven specific sectors: ICT, manufacturing industry, eco technologies, health technology, space, logistics, and financial services. Examples of innovative initiatives are the rollout of fiber optic cable to homes, 5th generation networks, and its National CyberSecurity Strategy. Other areas of policy focus include increasing investments and strides in highperformance computing, creating a national strategy for AI, boosting the commercial adoption of block chain, fostering digital skills, and developing further the local space industry. Luxembourg also prioritizes the exploitation of public sector information and open data to spur innovation. In the area of talent, Luxembourg has simplified residence permits for highly qualified workers."

b.2 Digital economy and society index¹²

In 2019 the European Commission has published a new annual edition of its *Digital Economy & Society Index* (DESI), which was first published in 2015. The DESI is a composite index which assesses the progress made by EU countries towards having a digital economy and society and enables EU M States to identify the areas that require priority investments.

The DESI scores range from 0 (worst performance) to 1 (best performance). The index is made up of 30 indicators separated into five interlinked categories:

- Connectivity (fixed broadband, mobile broadband, connection speed and affordability) – 25% weighting;
- Human capital (advanced and basic digital skills) 25% weighting;
- Use of internet (content, communication and transactions) 15% weighting;
- Integration of digital technology (business digitisation, e-commerce)
 20% weighting;
- ▼ Digital public services (e-government, e-health) 15% weighting.

Finland (score of 69.9), Sweden (69.5) and the Netherlands (68.9) occupy the top three positions in the ranking. Luxembourg stands in 6th place (61.8), Belgium 9th (59.4), Germany 12th (54.4) and France 15th (51.0).

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


Luxembourg scores as follows in the 5 dimensions:

- Connectivity (2nd / 73.3): Luxembourg is particularly competitive as regards the adoption of high-speed fixed and mobile broadband;
- Human capital (3rd / 69.9): Luxembourg has a high level of digital skills;
- Use of internet (6th / 62.4): use of the Internet by private citizens is above the EU average;
- Integration of digital technologies (17th / 38.7): the level of integration of digital technologies by businesses in Luxembourg is below the EU average;
- Digital public services (17th / 59.3): Luxembourg is also below the EU average for digital public services.



In conclusion, the authors make the following observation with regard to Luxembourg: "(...) Luxembourg performs best in Connectivity, in which it now ranks second among EU countries. Integration of digital technology and Digital public services continue to be the country's weakest points in the DESI, both scores being below the EU average, but the progress rates over the last two years indicate that the country is actively addressing both areas. The country ranks well in all indicators of the Connectivity dimension, with wide availability of fast and ultrafast fixed and mobile broadband networks, and increasing take-up levels for fast and ultrafast broadband. The country ranks third in Human capital, with a slight improvement in its score compared to last year. The percentage of individuals with at least basic digital and software skills was well above EU average in 2017 (ranked first), while the share of ICT specialist as a percentage of total employment has increased to 5% and is well above the EU average of 3.7%. The country ranks 6th on the Use of internet services. In Integration of digital technology, Luxembourg remains below the EU average but it is narrowing the gap and now ranks 17th. The country performs well in the share of enterprises analysis big data and there has been notable progress in the share of SMEs selling online, though this remains substantially below the EU average. Digital public services have continued to improve, but the score remains several points below the EU average. Medical data exchange and e-prescriptions indicators show a performance well below the EU average."

b.3 Digital competitiveness ranking¹³

At the end of September, the Swiss IMD institute published the third edition of its annual report on digital competitiveness, the *Digital competitiveness ranking* (DCR). 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 its latest edition, 63 countries were analysed according to 51 criteria. These include both quantitative and qualitative criteria, distributed into 3 categories and 9 sub-categories:

- The "Knowledge" category concerns the know-how necessary to discover, understand and build new technologies: talents, education and training, as well as scientific concentration;
- The "Technology" category concerns the overall context that enables the development of digital technologies: regulatory frameworks, capital and technological framework;
- The "Future readiness" category concerns the level of preparedness of an economy to exploit digital transformation: adaptive attitudes, business agility and IT integration.

The general DCR 2019 ranking is led by the United States (100/100), followed by Singapore (99.373) and Sweden (96.070). Luxembourg comes 21st in the world (84.368). The Netherlands rank 6th (94.261), Germany 17th (86.216), France 24th (82.522) and Belgium 25th (82.491).

In the European Union (EU), Sweden is in the lead, trailed by Denmark (95.225) and the Netherlands. Luxembourg comes 9th in the EU.

¹³ For additional details: https://www.imd.org/wcc/ world-competitiveness-centerrankings/world-digital-competitiveness-rankings-2019/

Table 9 DCR rankings										
2019	Country	2018	Cha	nge		2019 Country		2018	Cha	nge
1	USA	1	-	-		33	Poland	36	+3	\uparrow
2	Singapore	2	-	-		34	Portugal	32	-2	\downarrow
3	Sweden	3	-	-		35	Kazakhstan	38	+3	\uparrow
4	Denmark	4	-	-		36	Latvia	35	-1	\downarrow
5	Switzerland	5	-	-		37	Czech Republic	33	-4	\downarrow
6	Netherlands	9	+3	\uparrow		38	Russia	40	+2	\uparrow
7	Finland	7	-	-		39	Saudi Arabia	42	+3	\uparrow
8	Hong Kong SAR	11	+3	\uparrow		40	Thailand	39	-1	\downarrow
9	Norway	6	-3	\downarrow		41	Italy	41	-	-
10	Korea Rep.	14	+4	\uparrow		42	Chile	37	-5	\downarrow
11	Canada	8	-3	\downarrow		43	Hungary	46	+3	\uparrow
12	UAE	17	+5	\uparrow		44	India	48	+4	\uparrow
13	Taiwan, China	16	+3	\uparrow		45	Bulgaria	43	-2	\downarrow
14	Australia	13	-1	\downarrow		46	Romania	47	+1	\uparrow
15	United Kingdom	10	-5	\downarrow		47	Slovak Republic	50	+3	\uparrow
16	Israel	12	-4	\downarrow		48	South Africa	49	+1	\uparrow
17	Germany	18	+1	\uparrow		49	Mexico	51	+2	\uparrow
18	New Zealand	19	+1	\uparrow		50	Jordan	45	-5	\downarrow
19	Ireland	20	+1	\uparrow		51	Croatia	44	-7	\downarrow
20	Austria	15	-5	\downarrow		52	Turkey	52	-	-
21	Luxembourg	24	+3	\uparrow		53	Greece	53	-	-
22	China	30	+8	\uparrow		54	Cyprus	54	-	-
23	Japan	22	-1	\downarrow		55	Philippines	56	+1	\uparrow
24	France	26	+2	\uparrow		56	Indonesia	62	+6	\uparrow
25	Belgium	23	-2	\downarrow		57	Brazil	57	-	-
26	Malaysia	27	+1	\uparrow		58	Colombia	59	+1	\uparrow
27	Iceland	21	-6	\downarrow		59	Argentina	55	-4	\downarrow
28	Spain	31	+3	\uparrow		60	Ukraine	58	-2	\downarrow
29	Estonia	25	-4	\downarrow		61	Peru	60	-1	\downarrow
30	Lithuania	29	-1	\downarrow		62	Mongolia	61	-1	\downarrow
31	Qatar	28	-3	\downarrow		63	Venezuela	63	-	-
32	Slovenia	34	+2	\uparrow						
C										

As to the three categories in the overall ranking, Luxembourg scores as follows:

- "Knowledge": Luxembourg comes 34th in the world (for talents, 31st; education and training, 24th; and scientific concentration, 42nd);
- "Technology": Luxembourg comes in 12th place in the world (for the regulatory framework, 4th; capital, 9th; and technological framework, 34th);
- "Future readiness": Luxembourg ranks 17th in the world (for adaptive attitudes, 22nd; business agility, 20th; IT integration, 6th).

c. Globalisation and openness indicators

c.1 Index of Globalization¹⁴

At the end of 2018 the Federal Institute of Technology in Zurich (ETH) published the new annual edition of its composite globalisation index, known as the KOF. This new version is based mainly on 2016 data. It assesses the level of globalisation of about 200 countries around the world, through 42 variables split into 3 sub-categories:

- Economic globalisation: it includes the strength of the international trade and financial flows and the effect of any restrictions on these flows;
- Social globalisation: it is measured based on three segments, namely personal international contacts, international information flows and cultural proximity to major global trends;
- Political globalisation: it is assessed based on the number of embassies, the number of UN peacekeeping missions, the number of international non-governmental organisations and the number of bilateral and multilateral agreements, etc.

The distinction is also made between "de facto" globalisation (measurement of flow and activities) and "de jure" globalisation (public policies with an impact on flow). The KOF index measures globalisation on a scale of 1 (less globalised) to 100 (most globalised).

Generally speaking, Switzerland is he most highly globalised country in the world (91.17/100), followed by the Netherlands (90.97) and Belgium (90.50). Luxembourg ranks 17th worldwide with an overall score of 83.73. Luxembourg is considered as less globalised than its neighbours. Germany ranks 8th (88.17) and France 9th (87.20).



For additional details: https://www.kof.ethz.ch/en/ forecasts-and-indicators/ indicators/kof-globalisationindex.html Heading the economic globalisation ranking were Singapore (93.64), the Netherlands (89.01) and Belgium (88.56). Luxembourg ranks 4th worldwide (88.34). Luxembourg ranks 12th (85.57) for "de facto" economic globalisation and 1st for "de jure" economic globalisation (91.78).

Luxembourg (92.11) leads the ranking for social globalisation, followed by Norway (91.12) and Monaco (90.90). Luxembourg stands 4th worldwide (91.77) for "de facto" social globalisation and also 4th for "de jure" social globalisation (92.45).

With regards to political globalisation, Italy ranks 1st (98.25), France 2nd (98.16) and Germany 3rd (97.56). Luxembourg stands 86th worldwide (71.17). Luxembourg ranks 132nd (46.93) for "de facto" political globalisation and 18th for "de jure" political globalisation (95.41).

d. Quality of life and cost of living indicators

d.1 Quality of living survey¹⁵

The consultancy firm MERCER published the 21st edition of its annual study on the quality of living for expatriates through their host cities around the world: the *Quality of living survey*. This survey is conducted to help multinational companies and governments to establish the amount of compensation for their staff abroad. In this edition, 231 cities were analysed. The survey is based on factors that expatriates consider as having a major impact on their quality of life abroad. Indicators used to assess the level of quality of living are grouped into ten categories: political and social environment, economic environment, sociocultural environment, health system, education system, public services and transport, leisure, consumer products, housing, and finally, the natural environment. The data for this edition were collected between September and November 2018.

Vienna (1st), Zurich (2nd), Vancouver/Munich/Auckland (3rd) are ranked as the best cities in the world in terms of quality of living for expats. Luxembourg comes 18th in the global ranking. Luxembourg comes 8th at EU level. Vienna, Munich and Düsseldorf (6th) are the top three EU cities. Luxembourg outscores several neighbouring cities, including Brussels (28th) and Paris (39th). but is beaten by Francfort (7th) and Amsterdam (11th). Dublin places 33rd London 41st.

> ¹⁵ For additional details: https://www.mercer.com/ newsroom/2019-quality-ofliving-survey.html

Table 10 Top 20 of the ranking						
Rank	City	Country				
1	Vienna	Austria				
2	Zürich	Switzerland				
3	Vancouver	Canada				
4	Munich	Germany				
5	Auckland	New Zealand				
6	Düsseldorf	Germany				
7	Frankfurt	Germany				
8	Copenhagen	Denmark				
9	Geneva	Switzerland				
10	Basel	Switzerland				
11	Sydney	Austria				
12	Amterdam	Netherlands				
13	Berlin	Germany				
14	Bern	Switzerland				
15	Wellington	New Zealand				
16	Toronto	Canada				
17	Melbourne	Australia				
18	Luxembourg	Luxembourg				
19	Ottawa	Canada				
20	Hamburg	Germany				
с н						

Source: Mercer

This new edition also contains a ranking concerning personal safety, analysing the internal stability of towns: crime rates, law enforcement, limitations to personal freedom, international relations and freedom of the press. Luxembourg comes top in the world in this second ranking for personal safety, followed by Helsinki, Basel, Bern and Zurich coming second.

d.2 Global liveability ranking¹⁶

ECA International, a provider of solutions and information for professionals in the international human resources sector, published in 2019 the latest edition of its *Global Liveability Ranking 2019* on the most liveable cities in the world for European expatriates.

Using ratings provided by expats as well as other indicators, this survey assesses several factors to generate an estimate of quality of life in 480 cities around the world. Cities are rated on several criteria including weather conditions, availability of healthcare, accommodation, social networks and free time activities, infrastructures, personal safety, political tension, air quality, etc. These data are mainly used by human resources professionals to calculate living costs allowances for expats.

The 2019 global ranking for European expats is led by Copenhagen, Bern and The Hague. The City of Luxembourg is in 9th position worldwide, with Göteborg and Dublin.

> ¹⁶ For additional details: https://www.eca-international. com/news/february-2019/ dublin-enters-the-top-tenmost-liveable-cities-for

Table 11 Top 20 of the ranking		
Location	2019 ranking	2018 ranking
Copenhagen, Denmark	1	=1
Bern, Switzerland	1	=1
The Hague, Netherlands	3	3
Geneva, Switzerland	3	=4
Stavanger, Norway	5	=4
Amsterdam, Netherlands	6	=6
Eindhoven, Netherlands	6	=6
Basel, Switzerland	6	=6
Luxembourg City, Luxembourg	9	=9
Gothenburg, Sweden	9	=9
Dublin, Irish Republic	9	=11
Aarhus, Denmark	12	=11
Rotterdam, Netherlands	12	=11
Zurich, Switzerland	14	14
Bonn, Germany	15	=15
Munich, Germany	15	=15
Vienna, Austria	17	=17
Hamburg, Germany	17	=17
Stockholm, Sweden	19	=19
Edinburgh, United Kingdom	19	=19
Source: ECA		

d.3 Expat insider¹⁷

InterNations, a worldwide expatriate network, published in 2019 the 6th edition of its annual report on host countries for expatriates. The report is based on a (qualitative) survey of about 20,000 expatriates. They scored different aspects of expatriate life in their host country: quality of life, easy insertion, work, family life, financial situation and cost of living abroad. The authors rank the best destinations for expatriates across the world on the basis of the responses submitted.

The 2019 general ranking of the best destinations for expatriates is headed by Taiwan, Taiwan, Vietnam and Portugal. Luxembourg stands 12th worldwide. The Netherlands rank 24th, Belgium 28th, Germany 33rd and France 42nd. As an example, Ireland ranks 43rd, Switzerland 38th and the United Kingdom 58th. Within the EU, Luxembourg therefore stands in 5th place, after Portugal, Spain (5th) the Czech Republic (10th) and Bulgaria (11th).

> ¹⁷ For additional details: https://www.internations.org/ expat-insider/

Chart 7 2019 Expat insider ranking									
The	Top Expat Des	tina	tions 2019						
Тор	10								
1	Taiwan	3	Portugal	5	Spain	7	Bahrain	9	Malaysia
2	Vietman	4	Mexico	6	Singapore	8	Ecuador	10	Czechia
Bot	tom 10								
64	Kuwait	62	Nigeria	60	Turkey	58	UK	56	Russia
63	Italy	61	Brazil	59	India	57	Greece	55	South Korea
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		
Sou	rce: InterNatio	ns							

Luxembourg scores as follows in the 5 sub-categories on which the overall ranking is based:

- Quality of life: Luxembourg comes 12th. The Netherlands (17th), France (18th), Germany (22th) and Belgium (40th) are further down the list. For the sub-indicators in this category, Luxembourg comes 52nd for Leisure Options, 25th for Personal happiness, 17th for Travel & Transport, 12th for Health & Well-being, 4th for Safety & Security and 15th for Online digital life;
- Ease of settling in: Luxembourg comes 32nd, ahead of Belgium (39th), the Netherlands (43rd), France (52th) and Germany (60h). For the sub-indicators in this category, Luxembourg comes 27th for Feeling Welcome, 34th for Friendliness, 44th for Making Friends and 12th for Language;
- Working Abroad: Luxembourg comes 3rd, ahead of Germany (4th), the Netherlands (5th), Belgium (24th) and France (42th). For the sub-indicators in this category, Luxembourg comes 8th for Job & Career, 31st for Work-Life Balance, and 1st for Job Security;

- Family Life: Luxembourg comes 19th and is outperformed by Belgium (3rd), the Netherlands (11th), Germany (14th) and France (17th) are behind Luxembourg. For the sub-indicators in this category, Luxembourg comes 24th for Availability of Childcare and Education, 18th for Costs of Childcare and Education, 11th for Quality of Education and 9th for Family Well-being;
- Personal Finance and Cost of Living: Luxembourg comes 24th for perceived personal finance, outstripping Belgium (26th), Germany (31st), the Netherlands (36th) and France (44th). Luxembourg comes 59th for cost of living and is beaten by Germany (27th), France (36th), the Netherlands (43rd), Belgium (40th) and the Netherlands (42nd).

d.4 Cost of living¹⁸

MERCER published the 25th edition of its annual Cost of living survey for expatriates across the world. The survey measures the cost of living in 209 cities on five different continents and uses 200 products and services to estimate the cost of living (housing, transport, food, clothing, leisure, etc.). Among other things, human resources professionals use these data to calculate allowances for expatriates.

Hong Kong, Tokyo and Singapore have the highest living costs for expats in the world. Luxembourg is ranked 84th worldwide. Other European cities rank as follows: Zurich (5th), Geneva (13th), London (23rd), Dublin (43rd), Paris (47th), Amsterdam (58th), Frankfurt (74th), Brussels (77th) and Düsseldorf (92nd).

Table 12 Excerpts of 2019 Cost of living ranking						
Rank	City	Country				
70	Montevideo	Uruguay				
70	Morristown	United States				
72	Dakar	Senegal				
72	San Juan	Puerto Rico				
74	Frankfurt	Germany				
75	St. Petersburg	Russia				
75	Amman	Jordan				
77	Brussels	Belgium				
78	Minneapolis	United States				
79	Melbourne	Australia				
79	Santiago	Chile				
81	Berlin	Germany				
82	Madrid	Spain				
83	Port of Spain	Trinidad & Tobago				
84	Luxembourg	Luxembourg				
85	Abuja	Nigeria				
86	São Paulo	Brazil				
87	Perth	Australia				
88	Conakry	Guinea				
Source: Mercer						

¹⁸ For additional details: https://www.mercer.com/ newsroom/mercers-25th-annual-cost-of-living-surveyfinds-cities-in-asia-most-expensive-locations-for-employees-working-abroad.html

e. Human resources

e.1 Global talent competitiveness index¹⁹

In a globalised world, human capital is a key factor for territorial competitiveness. Countries are competing in developing this human capital, but also in attracting and retaining it on the national territory. In this context, the business school INSEAD published in 2019 with the Adecco Group and Tata communications the 6th edition of the *Global Talent Competitiveness Index* (GTCI), first issued in 2013.

In order to compare the performance of 125 countries around the world, the report uses a composite index based on an input-output model, which allows evaluating:

- The measures, policies and resources implemented to develop human capital (inputs), based on four sub-categories: enable, attract, grow and retain talents;
- The performance of the measures implemented (outputs), based on two categories of competence: mid-level/technical skills of labour force (LV skills) and high-level skills needed for innovation and entrepreneurship (GK skills).

The GTCI global composite index, calculated through a simple average of these six categories, is made up of 68 indicators. It uses a score between 0 (worst performance) and 100 (best performance).

The GTCI global ranking is led by Switzerland (81.82), followed by Singapore (77.27) and the United States (76.64). Luxembourg places 10th in the overall ranking (71.18). The Netherlands are in 8th place (73.02), Germany 14th (70.72), Belgium 17th (68.48) and France 21st (61.82). Luxembourg is the 6th EU country after Denmark (73.85), Finland (73.78), Sweden (73.53), the Netherlands and the United Kingdom (71.44).

⁹ For additional details: https://gtcistudy.com/#

Table 13 Top 20 of the ranking							
Country	Score	Overall rank	Income group				
Switzerland	81.82	1	High income				
Singapore	77.27	2	High income				
United States of America	76.64	3	High income				
Norway	74.67	4	High income				
Denmark	73.85	5	High income				
Finland	73.78	6	High income				
Sweden	73.53	7	High income				
Netherlands	73.02	8	High income				
United Kingdom	71.44	9	High income				
Luxembourg	71.18	10	High income				
New Zealand	71.12	11	High income				
Australia	71.08	12	High income				
Iceland	71.03	13	High income				
Germany	70.72	14	High income				
Canada	70.43	15	High income				
Ireland	70.15	16	High income				
Belgium	68.48	17	High income				
Austria	68.31	18	High income				
United Arab Emirates	65.90	19	High income				
Israel	63.26	20	High income				

In the inputs sub-category, Luxembourg comes 17th worldwide for Enable (77.96), 2nd for Attract (85.05), 19th for Grow (60.66) and 8th for Retain (84.94). In the outputs sub-category, Luxembourg comes 26th (59.61) for mid-level/technical skills (LV skills) and 9th (58.88) for high-level skills (GK skills).

The authors of the report make the following observation with regard to Luxembourg: "Luxembourg (10th) owes a great part of its position in the top 10 of the GTCI to its excellent performance in Attract (2nd), which itself is the result of combining strong External Openness (3rd) with good Internal Openness (8th). As a small country that has built an international reputation as a centre of finance and industry, Luxembourg also excels at retaining its domestic talent (8th in this pillar). It also has a competitive pool of Global Knowledge Skills (9th) that rests on it being a highly innovative and entrepreneurial country. There are many areas that need improvement, however – notably strengthening Formal Education (55th) in the Grow pillar and ensuring the Employability (32nd, in Vocational and Technical Skills) of domestic talent in the private sector."

Table 14 Top 20 of the ranking per sub-category

Country	GTCI Ranking	Enable	Attract	Grow	Retain	VT Skills	GK Skills
				Countries	above the med	ian in the over	all GTCI score
Switzerland	1	2	5	2	1	1	4
Singapore	2	1	1	11	26	7	1
United States	3	4	14	1	13	2	3
Norway	4	7	13	5	2	5	13
Denmark	5	3	17	6	4	10	7
Finland	6	14	15	4	5	4	15
Sweden	7	10	10	7	6	11	10
Netherlands	8	13	16	3	7	6	17
United Kingdom	9	9	9	9	11	27	5
Luxembourg	10	17	2	19	8	26	9
New Zealand	11	5	4	14	15	20	16
Australia	12	19	8	10	12	21	8
Iceland	13	18	18	16	9	12	2
Germany	14	8	20	13	10	3	23
Canada	15	11	7	12	18	19	12
Ireland	16	16	11	15	16	13	11
Belgium	17	21	19	8	14	15	18
Austria	18	15	21	17	3	9	25
United Arab Emirates	19	12	3	22	24	8	49
Israel	20	22	49	21	19	17	6
Source: INSEAD							

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 talents: the Global Cities Talent Competitiveness Index (GCTCI). This index is based on a limited list of 16 variables, divided into five sub-categories. This second benchmark compares and ranks 114 cities around the world. The four first sub-categories rather closely reflect the methodology utilised on the level of the countries. The fifth sub-category constitutes the principal change compared to the methodology applied to countries: it analyses the level of internationalisation of cities based on their share of the population and workforce with a tertiary education, the presence of international airports and the presence of intergovernmental organisations. The GCTCI ranking for cities was headed by Washington (69.2), followed by Copenhagen (68.0) and Oslo (66.1). Luxembourg stands 38th worldwide and 17th within the EU (52.2).

Table 15 City ran	king	
Rank	City	Overall score
1	Washington DC (United States)	69.2
2	Copenhagen (Denmark)	68.0
3	Oslo (Norway)	66.1
4	Vienna (Austria)	65.7
5	Zurich (Zwitzerland)	65.5
6	Boston (United States)	65.4
7	Helsinki (Finland)	65.0
8	New York (United States)	64.6
9	Paris (France)	63.5
10	Seoul (Korea, Rep.)	62.7
11	Stockholm (Sweden)	62.6
12	San Francisco (United States)	62.5
13	Seattle (United States)	62.1
14	London (United Kingdom)	62.1
15	Taipei (Chinese Taipei)	60.5
16	Geneva (Switzerland)	59.1
17	Singapore (Singapore)	58.7
18	Brussels (Belgium)	58.5
19	Tokyo (Japan)	58.4
20	Munich (Germany)	58.3
21	Amsterdam (Netherlands)	58.1
22	Los Angeles (United States)	57.8
23	Madrid (Spain)	56.9
24	Montreal (Canada)	56.7
25	Prague (Czech Republic)	55.7
26	Sydney (Australia)	55.6
27	Hong Kong (SAR, China)	55.2
28	Rotterdam-The Hague (Netherlands)	55.0
29	Ottawa (Canada)	54.4
30	Melbourne (Australia)	54.4
31	Chicago (United States)	54.2
32	Berlin (Germany)	54.1
33	Toronto (Canada)	53.9
34	Gothenburg (Sweden)	53.2
35	Dublin (Ireland)	52.7
36	Dallas (United States)	52.5
37	Bratislava (Slovakia)	52.3
38	Luxembourg (Luxembourg)	52.2
39	Frankfurt (Germany)	52.1
40	Eindhoven (Netherlands)	50.9
Source:	INSEAD	

e.2 World talent report²⁰

At the end of 2018, the Swiss IMD institute published the 5th edition of its *World Talent Report*. The authors have analysed how 63 countries around the world are developing, attracting and retaining 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 improve competitiveness and achieve sustainable long-term growth in a dynamic environment, in which artificial intelligence, robotics and new technologies continually re-define the challenges faced by public authorities, businesses and society.

The report uses 30 indicators, both quantitative and qualitative, which are split into three sub-categories:

- Investment in and development of home-grown talent (expenditure on education, quality of national education, apprenticeships, employee training etc.);
- Appeal to the overseas talent pool (quality of life, cost of living, brain drain etc.);
- Availability of skills and competencies (labour force growth, skills, student mobility, PISA test results etc.).

This information is then used to calculate a composite index that reflects the quality of the talent pool in a country (values between 0 and 100).

2018 ranking is headed by Switzerland (100/100), followed by Denmark (91.97) and Norway (86.37). Luxembourg ranks 9th worldwide (81.63) The Netherlands rank 5th (85.25), Germany 10th (81.11), Belgium 11th (80.54) and France 25th (70.85).

Within the European Union (EU), the ranking is headed by Denmark, Austria (86.10) and the Netherlands. Luxembourg stands in 6th place within the EU.

 For additional details: https://www.imd.org/wcc/ world-competitiveness-centerrankings/talent-rankings-2018/

Table Top 30	16) of the ranking							
			Factor Ranks 2					s 2018
Overall Rank 2018		One Year	Change		Overall Score 2018	Investment & Development	Appeal	Readiness
1	Switzerland		-		100.00	4	1	1
2	Denmark		-		91.97	1	7	8
3	Norway	+	4		86.37	3	12	10
4	Austria		-		86.10	2	13	18
5	Netherlands	+	1		85.25	15	10	3
6	Canada	+	5		84.50	19	3	5
7	Finland	-	2		83.00	6	21	7
8	Sweden	+	1		82.45	9	9	15
9	Luxembourg	+	1		81.63	18	4	11
10	Germany	-	2		81.11	10	6	21
11	Belgium	-	8		80.54	8	16	14
12	USA	+	4		79.22	28	2	23
13	Singapore		-		78.66	34	15	2
14	Australia	+	5		78.57	26	19	6
15	Cyprus	+	2		77.34	5	27	26
16	Iceland	+	2		77.21	12	20	19
17	Portugal	+	7		76.76	7	29	22
18	Hong Kong SAR	-	6		76.62	31	14	9
19	Israel	+	1		75.86	14	23	16
20	New Zealand	-	5		74.12	32	17	13
21	Ireland	-	7		73.93	42	11	12
22	Malaysia	+	6		72.77	17	26	24
23	United Kingdom	-	2		72.63	37	18	17
24	Qatar	-	2		71.99	44	8	20
25	France	+	2		70.85	21	22	28
26	UAE	-	1		70.38	59	5	4
27	Taiwan	-	4		68.28	25	32	27
28	Estonia	+	1		67.92	16	33	31
29	Japan	+	2		64.95	23	28	41
30	Slovenia	+	7		64.69	27	42	29

Source: IMD

Luxembourg performs as follows in the three sub-categories:

- Investment in and development of home-grown talent: Luxembourg ranks 18th worldwide, and 13th in the EU (score of 66.81/100);
- Appeal to the overseas talent pool: Luxembourg ranks 4th worldwide and 1st within the EU (78.68);
- Availability of skills and competencies: Luxembourg ranks 11th worldwide and 4th within the EU (74.20).

f. Miscellaneous indicators

A multitude of other factors play a role in the debate regarding competitiveness and territorial attractiveness: functioning and governance of public authorities, business environment, etc. There are regular publications on benchmarks focusing on a multitude of these topics, some of which are reviewed below.

f.1 Corruption perceptions index²¹

The institutional and regulatory framework within which economic activities take place, impacts on the way resources are distributed, investment decisions are orientated, and creativity and innovation are stimulated. Corruption weakens a country and harms the stability and security of the decisions economic agents make.

The non-governmental organization Transparency International published early 2019 an updated version of its composite index on the perception of corruption in the public sector, which is built on private and public sector experts' assessments: the *Corruption Perceptions Index* (CPI). The latest version of this survey analyses 180 countries.

The CPI, based on data from several sources which report on corruption perception (corruption perception polls and ratings compiled by various renowned institutions), ranges from 100 (lowest level of perceived corruption) to 0 (highest level of perceived corruption). Although no country is free of corruption, the countries at the top of the range often share the following features: a transparent government, freedom of the press, protection of civil liberties and independent legal systems.

In this new edition, Denmark (88) showed the best results worldwide, followed closely by New Zealand (87). Luxembourg ranks 9th worldwide, along with Canada (81). The Netherlands rank 8th (82), Germany 11th (80), Belgium 17th (75) and France 21st (72) worldwide. As for the EU, Luxembourg ranks 5th, after Denmark, Finland (85), Sweden (85) and the Netherlands.

¹ For additional details: https://www.transparency.org/ cpi2018

Table 17 CPI ranking		
Score	Country/Territory	Rank
88	Denmark	1
87	New Zealand	2
85	Finland	3
85	Singapore	3
85	Sweden	3
85	Switzerland	3
84	Norway	7
82	Netherlands	8
81	Canada	9
81	Luxembourg	9
80	Germany	11
80	United Kingdom	11
77	Australia	13
76	Austria	14
76	Hong Kong	14
76	Iceland	14
75	Belgium	17
73	Estonia	18
73	Ireland	18
73	Japan	18
72	France	21
71	United States	22
70	United Arab Emirates	23
70	Uruguay	23
68	Barbados	25
68	Bhutan	25
Source: Tran	isparency International	

f.2 Global resilience index²²

FM Global, one of the world's largest commercial and industrial property insurance companies, published a new 2019 edition of its annual report analysing through a composite index the territorial resistance in the event of a disruption in the business supply chain: the *Global Resilience Index*. This composite index thus constitutes a decision-making support tool for economic decision-makers to locate or expand their activities, select or evaluate suppliers, assess supply chains or identify vulnerable clients.

The increased resistance of a territory allows businesses located there to protect themselves more effectively against a potential disturbance of their supply chain, as well as to bounce back more rapidly in such an event. This is particularly important for multinational corporations engaged in cross-border trade, since they face a multitude of risks: geopolitical tension, raw material price volatility, natural hazards, etc.

> For additional details: https://newsroom.fmglobal. com/releases/fm-global-unveils-updated-country-rankings-in-the-2019-fm-globalresilience-index

This new edition analyses 130 countries and territories by means of twelve qualitative and quantitative criteria, divided into three subcategories:

- Economy (productivity, political risk, oil intensity of the economy, urbanisation rate);
- Risk quality (exposure to natural hazards, potential risk management improvement rate, fire risk management, cyber risks);
- Supply chain (control of corruption, quality of infrastructure, corporate governance, supply chain visibility).

These sub-categories and criteria are evaluated on a scale from 0 (territory with the poorest performance) to 100 (territory with the best performance).

The worldwide ranking is headed by Norway (score of 100 out of 100) which is considered the most resilient country (comparative basis), followed by Denmark (97.2) and Switzerland (97.0).

Luxembourg ranks 7th worldwide (94.0). Germany ranks 4th (96.6), France 14th (90.1), the Netherlands 15th (89.1) and Belgium 19th (86.8).

Table 18 Luxembourg and its neighbouring countries in the ranking, 2019									
	Luxembourg	Belgium	Netherlands	Germany	France				
Overall	7	19	15	4	14				
Economic +	2	44	24	11	28				
Risk Quality +	18	8	17	3	9				
Supply Chain +	23	20	8	12	17				

Fourth Quartile Third Quartile Second Quartile First Quartile Data displayed are index rankings (out of 130) Source: FM Global

As regards the three sub-categories making up the general composite index most particularly, Luxembourg ranks as follows:

- Economy: Luxembourg ranks 2nd worldwide (91.3): productivity (84.8), political risk (93.6), oil intensity of the economy (64.9), urbanisation rate (84.6);
- Risk quality: Luxembourg ranks 18th worldwide (79.9): exposure to natural hazards (95.3), potential risk management improvement in the event of natural hazards (62), fire risk management (72.5), cyber risk (50.3);
- Supply chain: Luxembourg ranks 23rd worldwide (78.8): control of corruption (93.0), quality of infrastructure (83.6), corporate governance (64.6), supply chain visibility (69.7).

f.3 fDi Global cities of the future²³

fDi Intelligence, a branch of the Financial Times group, published a new edition of its study measuring the attractiveness of towns for foreign investors. It is measured by means of incoming foreign investments, economic development and growth potential. The 2018/2019 edition includes a total of 129 locations. The indicators used to measure their level of attractiveness are distributed into five main categories: economic potential, human resources and lifestyle, costs, connectivity and business friendliness. A sixth category concerns foreign investment promotion policies. Based on their performance, the towns are then assessed according to a scale from 1 (minimum) to 10 (maximum).

There are several ranking categories depending on the size of the towns assessed. A distinction is made between so-called "megacities" (e.g. London, New York, etc.), "major cities" (e.g. Singapore, Amsterdam, etc.), "large cities" (e.g. Dublin, Frankfurt, etc.) and "mid-sized and small cities" (e.g. Zurich, Geneva, Luxembourg, etc.).

Luxembourg belongs to the latter category, i.e., "mid-sized and small cities". Following Zurich and Belfast, Luxembourg comes 3rd in the world in the overall ranking. In the various sub-categories of the overall ranking, Luxembourg's performance is as follows:

- Economic potential: 1st;
- Human resources and lifestyle: 7th;
- Costs: 9th;
- Connectivity: 6th;
- Business friendliness: 7th.

²³ For additional details: https://www.fdiintelligence. com/Locations/Asia-Pacific/ Singapore/fDi-Global-Citiesof-the-Future-2018-19-thewinners?ct=true?utm_ campaign=Jan+2019+enews+1&utm_ source=emailCampaign&utm_ medium=email&utm_content

Table 19

Top 10 Overall

Rank	City	Country
1	Zürich	Switzerland
2	Belfast	United Kingdom
3	Luxembourg	Luxembourg
4	Geneva	Switzerland
5	Edinburgh	United Kingdom
6	Aberdeen	United Kingdom
7	Vilnius	Lithuania
8	Silao	Mexico
9	Manama	Bahrain
10	San José	Costa Rica

Top 10 Economic potential											
Rank	City	Country									
1	Luxembourg	Luxembourg									
2	Zürich	Switzerland									
3	Geneva	Switzerland									
4	Silao	Mexico									
5	Belfast	United Kingdom									
6	Edinburgh	United Kingdom									
7	Aberdeen	United Kingdom									
8	Manama	Bahrain									
9	Vilnius	Lithuania									
10	San José	Costa Rica									
Top 10 C	Top 10 Cost effecctiveness										

Top 10 Human capital and lifestyle

Rank	City	Country								
1	Zürich	Switzerland								
2	Geneva	Switzerland								
3	Belfast	United Kingdom								
4	Aberdeen	United Kingdom								
5	Edinburgh	United Kingdom								
6	San José	Costa Rica								
7	Luxembourg	Luxembourg								
8	Manama	Bahrain								
9	Vilnius	Lithuania								
10	Silao	Mexico								
Top 10 Connectivity										
Rank	City	Country								
1		o								
1	Zürich	Switzerland								

United Kingdom

United Kingdom

United Kingdom

Luxembourg

South Africa

Lithuania

Bahrain

Mexico

Top 10 Cost effecctiveness										
Rank	City	Country								
1	Durban	South Africa								
2	Vilnius	Lithuania								
3	Manama	Bahrain								
4	Silao	Mexico								
5	San José	Costa Rica								
6	Belfast	United Kingdom								
7	Aberdeen	United Kingdom								
8	Edinburgh	United Kingdom								
9	Luxembourg	Luxembourg								
10	Geneva	Switzerland								
Top 10 Business friendliness										

Rank City

1	Belfast	United Kingdom
2	Aberdeen	United Kingdom
3	Edinburgh	United Kingdom
4	Zürich	Switzerland
5	Geneva	Switzerland
6	Vilnius	Lithuania
7	Luxembourg	Luxembourg
8	Silao	Mexico
9	San José	Costa Rica
10	Manama	Bahrain

Country

Silao Source: fDi Intelligence

Edinburgh

Aberdeen

Luxembourg

Belfast

Vilnius

Manama

Durban

3

4

5

6

7

8

9

2.3 Conclusions

Many benchmarks and rankings covering various facets of competitiveness and territorial attractiveness, with their determinant factors, are published annually. These include: the business environment, innovation, ICT, human resources, quality and cost of living, etc.

Rankings themselves are undoubtedly the most mediatized elements by far. However, those reports tell a more complex story which belies the apparent simplicity of the ranking. When analysing those benchmarks, one should therefore not lose sight of the intrinsic limitations of such an exercise.

- A rise or fall in the rankings does not mean that the performance of Luxembourg has improved or deteriorated. Such a development may also stem from the fact that other territories have experienced the effects of a shock more or less severely than Luxembourg. It is essential to take this relativity into account in international comparisons.
- 2. It is worth noting that there is a time lag between the time of publication of the rankings and many statistics used therein. Benchmarks analysed in this edition of the Report still often use statistics and indicators dating back to 2016, 2017 and 2018. Therefore, these rankings should not be considered as short-term predicting tools.
- 3. Many rankings assume methodological differences. While for example the WEF attempts to measure the ability of countries to achieve sustainable economic growth, the IMD analyses the ability of countries to create and maintain a supporting environment for company competitiveness, as wealth creation is supposed to happen at the level of companies that operate within a national environment which either facilitates or hampers their competitiveness. Luxembourg's positions therefore can vary from one ranking to another, even if they try to measure "territorial competitiveness".
- 4. The different rankings are criticized over suffering from methodological weaknesses, especially in three areas: the quality of sources (primary and secondary data), the core indicators used and the method for calculating the composite index (formulas, weights, etc.). For example, some "one size fits all" indicators used in the same way for all territories analysed, often prove to be inadequate to the specificities of Luxembourg, which is a very small economy that is widely open.

The best-known example is the "GDP per capita"²⁴ which, by its statistical construction, does not take into account the large flow of incoming cross-border workers in Luxembourg. Thus, this indicator strongly overestimates the country performance. The indicator concerning the number of Luxembourg students in higher education or associated is another typical example for which one should put Luxembourg's bad results into perspective. For instance, the science and technology graduates "STEM" indicator²⁵, which is frequently used in this kind of analysis, ignores the fact that a majority of Luxembourg students are studying abroad. Hence it considerably underestimates Luxembourg's performance.

- "(...) in some regions the GDP per capita figures can be significantly influenced by commuter flows. Net commuter inflows in these regions push up production to a level that could not be achieved by the resident active population on its own. There is a corresponding effect in regions with commuter outflows. In Luxembourg, nearly 45% of the labour force in Luxembourg is currently border-workers. For additional details: http://ec.europa.eu/eurostat/ documents/2995521/8700651/1-28022018-BP-EN/15f5fd90ce8b-4927-9a3b-07dc255dc42a
- 25 "In 2014, the number of science and technology graduates ranged from about 24.7 per 1,000 inhabitants in Ireland to 9.2 ner 1.000 inhabitants in Cyprus and 3.5 per 1,000 inhabitants in Luxembourg. The very low ratio of science graduates in Luxembourg and Cyprus might be explained to a large extent by the number of students who pursue their studies abroad. , Since some of the graduates reported by a country may be foreigners who return home following their studies, this pushes up the ratio in the country where they studied and pulls down the ratio for their country of origin."

For additional details: http://ec.europa.eu/eurostat/ statistics-explained/index.php/ Europe_2020_indicators_-_R%26D_and_innovation

- 5. The detail of which countries are analysed has an impact on comparability. For example, the WEF compares 141 countries, the IMD only 63 and the Heritage Foundation 186. This affects the relative position of countries in the rankings. For example, a decision could be made to only compare the EU M States. Luxembourg would then climb from the 18th world position to the 8th position (WEF), from the 12th to the 5th position (IMD) and from the 17th to the 6th position (Heritage Foundation).
- 6. There are countries or groups of countries in these rankings for which the performance is often close, i.e. whose numerical values of the calculated composite indices are very close to each other. The mere country rankings can usually not show this situation. All things being equal, a slight increase (or decrease) in the value of the composite index could therefore lead to a significant rise (or fall) in the rankings. The ranking of a territory should therefore not be looked at separately from the value of its composite index. In fact, significant differences in the rankings of countries may be related to small differences in the index.

Considering the above remarks, what should one think of these rankings? Even if they trigger numerous concerns, these reports provide a useful performance calibration tool worthy to monitor. On one hand, these benchmarks summarize complex issues down to one single value, being thus extremely efficient communication tools that favour political debate and allow authorities to evaluate their policies by comparing them to best practice. On the other hand, due to press coverage, these benchmarks also have a significant impact on the brand image of a territory and can influence the investors' perception (nation branding perspective).

Consequently, it is important to avoid caving into the syndrome of ranking for the sake of ranking. The indications provided in a ranking are often of a character too general to be used and should help to focalize attention and lead to a more rigorous analysis. There is, indeed, no unique recipe. Different policies may be compared, but each country needs to adapt them to its own socio-economic environment. The strategies implemented succeed when economic imperatives and social cohesion are in perfect balance.

To this end, in 2003 the Tripartite Coordination Committee in Luxembourg had identified the need for an enlarged indicator scoreboard, that would take better into account the specificities of the country in order to gain a better insight into the national competitiveness. The Committee entrusted Professor Fontagné (University Paris I - Sorbonne) the task of elaborating proposals in this regard (November 2004)²⁶. The Observatoire de la compétitivité updated this national scoreboard till 2016. In July 2016, the Economic and Social Council (ESC)²⁷ unanimously adopted an opinion on a national indicators list for the new, updated and reorganized scoreboard. The results of this new national system of indicators were presented for the first time in the 2017 Report. A second annual update has been carried out in this 2019 Report²⁸.

- ²⁶ FONTAGNÉ L., Compétitivité du Luxembourg : une paille dans l'acier, Rapport pour le Ministère de l'Économie et du Commerce extérieur, Luxembourg, November 2004, pp.102-120 For additional details: https://gouvernement.lu/ dam-assets/fr/publications/ rapport-etude-analyse/ minist-economie/observatoirede-la-competitivite/perspectives-politique-economique/ perspectives-politiqueeconomique-03/ppe-003.pdf
- ²⁷ CES, Le système d'indicateurs national, Avis, 8 July 2016 For additional details: http://www.ces.public.lu/ content/dam/ces/fr/ actualites/2016/07/2016-indicateurs.pdf
- ²⁸ See Chapter 3 in this Competitiveness Report.

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3 National competitiveness scoreboard

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3.1 Competitiveness scoreboard

3.1.1 Introduction

The major revision of the Competitiveness scoreboard was carried out in 2016 with the social partners at the ESC. The indicators that have been selected since then provide relevant information of high statistical quality. The national scoreboard takes into account the multitude of scoreboards, specifically Europe 2020 indicators, EU Macroeconomic Imbalance Procedure (MIP) indicators, PIBien-être and sustainable development indicators at national level. As a result, the Competitiveness Scoreboard provides a good overview of the economic, social and environmental situation in Luxembourg.



The definition of competitiveness is still the one used by the Tripartite Coordination Committee and used by the ESC. Furthermore, the ESC sets the following objectives for the government: "[...] the main role of the State is to contribute to achieving and upholding of a high, sustainable quality of life for the country's population"¹. According to the ESC competitiveness is a means to achieve these objectives. According to a current definition, a country is internationally competitive if concurrently "its productivity increases at a rate which is similar to or higher than that of its major trading partners with a comparable level of development; it maintains external equilibrium in the context of an open free-market economy; and it realises a high level of employment"². Broadly speaking, the ESC defines competitiveness as "a nation's ability to sustainably improve the quality of life of its inhabitants and ensure a high level of employment and social cohesion whilst also preserving the environment".

- http://www.ces.public.lu/ content/dam/ces/fr/avis/ politique-generale/2001-roleetat.pdf
- http://ec.europa.eu/economy_ finance/publications/pages/ publication8051_fr.pdf

As regards the structure of the scoreboard, the ESC called for a clear structure of indicators and a balance between the different aspects of sustainable development in the new indicator system. The new system of indicators is not set in stone and may be adapted over time if necessary. It is designed to be used as the main reference tool for the social dialogue and to foster public debate. Furthermore, it should assist in shedding light on areas where Luxembourg's performance is unsatisfactory. The general diagnostics established by the new system of indicators may be followed up by a road map of actions with precise, quantifiable and measurable objectives drawn up in cooperation with all social partners. This has not yet been 100% guaranteed, hence why the ODC and the ESC have met several times to discuss novelties. Pertinent indicators are still missing to measure the circular economy, for instance, mainly under the environment dimension. On the European level, efforts have been undertaken to strengthen the statistical framework for the environment. Little by little, the "Indicators" task force will assess the new indicators and integrate them into the national scoreboard.

The ESC has also decided to highlight a limited number of "meta" indicators for each dimension. These are considered the most significant indicators in each of the respective dimensions and should ensure that Luxembourg can be compared with the rest of Europe. The other indicators focus on the specific features of Luxembourg and, although considered secondary, are nevertheless useful in terms of providing more detailed information should the need arise. An indicative, nonexhaustive list of relevant secondary indicators has been drawn up. However, those indicators should not be considered as an integral part of the new system of indicators.

The indicators which were retained for the new system of national indicators had to fulfil several criteria, notably:

- Ensure spatial and temporal comparability with EU-level indicators;
- Ensure that the relevance, statistical quality and frequency of indicator publication is sufficient to enrich future political and societal debates:
- ▼ Take into account the Europe 2020 and MIP indicators;
- Eliminate obsolete and inactive indicators as well as duplication.

3.1.2 Methodology

The method of comparison does not vary from the method used in the previous iteration of the scoreboard. First, Luxembourg's position compared to the European average is highlighted.

If Luxembourg's performance is at least 20% better than the EU average, then the indicator is classified as "green" (favourable position).

If Luxembourg's performance is between +20% and -20% in relation to the EU average, then the indicator is classified as "orange" (neutral position).

If Luxembourg's performance is more than 20% lower than the EU average, then the indicator is classified as "red" (unfavourable position).

This rating is a purely visual tool to quickly see 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 previous years. The arrows will indicate in which direction each indicator has recently changed (improvement or deterioration).

- ↑ If Luxembourg's performance has improved since the last edition of the Scoreboard, an arrow pointing upward will signal the indicator in question.
- → If Luxembourg's performance has remained stable since the last edition of the Scoreboard, a horizontal arrow will signal the indicator in question.
- ↓ If Luxembourg's performance has deteriorated since the last edition of the Scoreboard, an arrow pointing downward will signal the indicator in question.

Apart from the comparison with the European average, Luxembourg is also compared to the best and worst countries from the EU.

3.1.3 Economic dimension

Table 1

Data for the economic dimension

		Year	Trend	З		Position		Position		EU Average	DE	BE	FR	First	Last
A1	Public debt (% of GDP)	2018	\uparrow	21.40	2	/	28	80.00	60.90	102.00	98.40	Estonia: 8.40	Greece: 181.10		
A2	Government balance (% of GDP)	2018	\uparrow	2.40	1	/	28	-0.60	1.70	-0.70	-2.50	Luxembourg: 2.40	Cyprus: -4.80		
A3	Current account balance, % of GDP (average over 3 years) ⁽¹⁾	2018	\uparrow	5.00	20	/	28	3.96	7.90	1.70	2.60	Portugal: 1.10	Netherlands: 8.90		
A4	Market share of world exports (% change over 5 years)	2018	\downarrow	10.68	10	/	28	10.17	3.11	-1.46	-0.16	Ireland: 77.37	Sweden: -6.32		
A5	Net international investment position (% of GDP)	2018	\uparrow	61.00	4	/	28	-26.66	61.20	42.20	-16.40	Netherlands: 70.70	Ireland: -167.90		
A6	Real effective exchange rate (42 trade partners, % change over 3 years)	2018	\downarrow	3.30	14	/	28	2.99	5.30	6.90	4.50	United Kingdom: -13.00	Czech Republic: 11.00		
A7	Real GDP growth (%; average over 3 years)	2018	\downarrow	3.17	13	/	27	2.20	2.07	1.53	1.70	Ireland: 6.67	Greece: 1.07		
A8	Inflation rate (%) ^[2]	2018	\checkmark	1.50	11	/	28	1.90	1.90	2.30	2.10	Germany: 1.90	Romania: 4.10		
A9	Time required to set up a company (days)	2018	\rightarrow	16.50	21	/	28	11.66	8.00	4.00	3.50	Denmark: 3.50	Poland: 37.00		
A10	Long-term government bond yields (%)	2018	\downarrow	0.56	4	/	27	1.38	0.40	0.79	0.78	Lithuania: 0.31	Romania: 4.69		
A11	Regulatory capital for risk-weighted assets (%)	2018	\downarrow	25.00	3	/	27	19.82	18.90	18.76	18.74	Estonia: 28.51	Portugal: 15.15		
A12	Availability of financial resources for entrepreneurs (score from 1 to 5)	2018	\downarrow	2.44	15	/	18	2.86	2.84		2.84	Netherlands: 3.54	Cyprus: 2.30		
A13	Employment rate of population aged 20-64 (%)	2018	\uparrow	72.10	21	/	28	73.20	79.90	69.70	71.80	Sweden: 82.60	Greece: 59.50		
A14	Unemployment rate (%)	2018	\uparrow	5.50	14	/	28	6.80	3.40	6.00	9.10	Czech Republic: 2.20	Greece: 19.30		
A15	Average annual level of variation in total factor productivity in the economy overall (%)	2018	\uparrow	-0.58	27	/	28	0.62	0.22	-0.02	0.40	Ireland: 4.32	Denmark: -0.61		
A16	Real labour productivity per hour worked (%; average growth rate over 3 years)	2018	\downarrow	-0.03	27	/	28	0.90	1.00	0.10	1.37	Romania: 4.73	Greece: -0.37		
A17	Nominal unit labour costs (% change over 3 years)	2018	\downarrow	7.90	19	/	28	0.60	5.60	3.50	2.40	Ireland: -2.80	Romania: 33.60		
A18	Corporate tax rates (%)	2018	\uparrow	26.00	21	/	28	21.90	30.20	29.60	34.40	Bulgaria: 10.00	Malta: 35.00		
A19	Profitability of non-financial companies (%)	2016	\uparrow	6.70	28	/	28	10.83	9.90	9.70	6.80	Ireland: 0.40	Luxembourg: 6.70		
A20	GDP/hour worked (US=100)	2018	\downarrow	128.30	1	/	28	71.57	96.27	100.38	93.74	Luxembourg: 128.00	Bulgaria: 38.00		
A21	Gross domestic R&D expenditure (% of GDP)	2017	\downarrow	1.26	16	/	28	2.06	3.02	2.58	2.19	Sweden: 3.40	Romania: 0.50		
A22	Share of jobs in medium-high and high-tech manufacturing sectors (% of total jobs)	2018	\rightarrow	0.60	28	/	28	5.80	9.90	4.80	4.20	Czech Republic: 11.30	Luxembourg: 0.60		
A23	Entrepreneurial intentions (%)	2018	\uparrow	14.70	6	/	17	11.16	5.85		18.60	Croatia: 18.62	Bulgaria: 3.91		
A24	Skillset of graduates (average score; 1 to 7)	2018	\uparrow	5.01	9	/	28	4.51	5.31	5.05	4.65	Netherlands: 5.50	Romania: 3.27		
A25	Life-long learning as a % of the population aged 25-64	2018	\uparrow	18.00	7	/	28	11.10	8.20	8.50	18.60	Sweden: 29.20	Romania: 0.90		

(1) 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). ^[2] Countries are ranked against the benchmark of the EU average inflation rate.

Despite some indicators in red (8 indicators), Luxembourg is in the leading group for a large number of economic indicators. Seven of the 25 indicators are orange, indicating that Luxembourg scores close to the EU average for these particular indicators. The number of green indicators decreased from 11 to 10 between 2017 and 2018. The number of red indicators decreased from ten to eight in 2018 a in favour of the number of indicators in orange, which now stands at 7. For twelve of the 25 indicators, Luxembourg's performance improved in 2018 compared to 2017. Eleven of the twenty-five indicators show poorer performance in 2018 than in 2017.



3.1.3.1 Detailed description of the economic dimension indicators

Luxembourg had a gross public debt (A1) of 21.4% in 2018 and a government balance (A2) of 2.4% in 2018. Only 14 EU Member States posted figures lower than the reference value set by EU rules (60% of GDP). Apart from Cyprus (-4.8%), all Member States meet from now on the threshold limit set for the government balance (-3% of GDP). Thirteen Member States registered a government balance surplus in 2018: Luxembourg, Bulgaria, Malta, Germany, the Netherlands, Greece, Croatia, the Czech Republic, Sweden, Lithuania, Slovenia, Denmark and Austria. The main challenge facing European governments is ensuring the repayment of public debt while managing public spending in a manner which favours economic growth. The 2008 and subsequent years economic and financial crisis has seen many European governments face major challenges. Ten-year government bond yields (A10) are a marker of the confidence that the financial markets have in these countries' ability to implement healthy financial policies and thus to repay invested capital. In 2018, the rate in Lithuania was the lowest of the European Union with 0.31%, ranking as in 2017 ahead of Germany (0.4%). In Luxembourg, the rate only marginally increased between 2017 and 2018, going from 0.54% to 0.56%. It remains in the top tier with Denmark and the Netherlands. In 2016 Luxembourg's rate was the lowest, with 0.25%.

The competitiveness and trade situation in a country compared with its main trade partners measured by the current account balance (A3) indicates that in 2018 the average over 3 years in Luxembourg's current account balance was +5% of GDP. Consequently, Luxembourg respected the two thresholds (+6% and -4%) set by the European Commission as part of the macroeconomic imbalance procedure. No country was below the lower limit of -4% in 2018 whilst the Netherlands, Cyprus, Germany and Denmark reported higher results than the upper limit of +6%. The current account balance forms part of the indicators in the MIP. in which it has been stated that a country is potentially at risk if its current account balance presents a deficit over -4% of GDP (lower threshold) or an excess of over +6% of PIB (upper threshold). It is therefore difficult rank countries as the issue is whether it is more problematic to exceed the upper or lower threshold. The ESC finally approved the OCD's proposal to rank countries according to their current account balance's position in relation to the average of the two thresholds (the objective being a current account balance of approximately +1% of GDP). In this scenario, Luxembourg came 20th out of the 28 Member States.

The percentage change over 5 years in Luxembourg's market share of world exports (A4) stood at +10.68% in 2018. Compared to 2017, this rate has decreased in Luxembourg, which nevertheless ranks 10th among the 28 Member States. This indicator, which is also part of the MIP and its system of indicators, factors in structural competitiveness losses which may accumulate. A country may lose export market share not only if its exports are reduced but also if its exports do not grow at the same rate as world exports, which could see the country's global position regress.

The net international investment position as a % of GDP [**A5**] denotes whether a country's stock of foreign assets is worth more or less than the stock of domestic assets owned by foreign investors. This determines whether a country is in credit or in debt vis-à-vis the rest of the world. This indicator is part of the MIP. Luxembourg's score in 2018 was 61%, with the country ranking 4th out of the 28 EU Member States.

The percentage change in the real effective exchange rate over 3 years (**A6**) serves to measure price competitiveness and cost competitiveness by providing a macroeconomic comparison of domestic and foreign prices in a common currency using a price or cost indicator to account for inflation. The MIP states that a country is potentially at risk if this indicator is over +5% or under -5%. Luxembourg had a rate of 3.3% in 2018 and was in most years within this range, which is considered not posing a risk of imbalance.

In 2018, the average real GDP growth rate over three years (**A7**) in Luxembourg was +3.17%. Luxembourg's position dropped by 6 places in the country ranking compared to 2017. Ireland's performance is the best for this indicator, with a rate of 6.67%. Since 2011, the progression of the inflation rate (**A8**) has continued to slow down in Luxembourg, reaching +0.3% in 2016. In 2017, the inflation rate began rising again, reaching 1.9% the following year in the euro area. Luxembourg's inflation rate was 1.5% in 2018, measured by the NICP. Incidentally, the inflation rate is also problematic in terms of interpretation. This indicator has not been included in the MIP scoreboard. Neither negative inflation rates nor positive inflation rates are desirable. After consulting the ESC, the ODC decided to use the EU average as a benchmark and the countries are ranked according to the difference between their respective national inflation rates and the EU average.

The number of days required to set up a company (A9) is one of the indicators used by the World Bank in its "Doing Business" report, which measures corporate legislation and its effective application. Luxembourg's performance is rather mediocre in comparison to the other Member States of the European Union as an average of 16.5 days are required to obtain all the paperwork necessary to set up a company. Since 2010, Luxembourg's score for this indicator has remained unchanged. In Denmark and in France, the process of setting up a company requires an average of just 3.5 days. The recent creation (in 2017) in Luxembourg of the "simplified limited liability company" status ("SARL simplifiée") should contribute over time to an improvement in this domain. However, due to the methodology used by the World Bank³, such an effective improvement might not be reflected in forthcoming editions of the "Doing Business" report. It should also be noted that the value is guestionable and should be 13 days in 2018⁴. "Doing Business" indicators are discussed in more detail in chapter 5 of this report.

With a view to ensuring the stability and robustness of the banking system, the banking regulator introduced bank solvency requirements. The regulatory capital for risk-weighted assets indicator (A11) pertains to capital requirements for banks in relation to their credit risk. Each asset is assigned a weighted risk to ensure the bank is not exposed to a higher level of risk than it can bear. The ratio in Luxembourg was 25% in 2018. The highest score was posted by Estonia (28.51%) with Portugal chalking up the lowest score (15.15%) in 2018. Whilst on the one hand, a stable banking system has a significant impact on a country's competitiveness, it also means that banks which adhere to this ratio only offer low-risk loans, which does not make it easy for start-ups and SMEs to access credit. Indicator A12, which pertains to the availability of financial resources for small and medium-sized enterprises, was taken from the Global Entrepreneurship Monitor (GEM). Luxembourg scored below the EU average with 2.44% and placed 15h out of 18 countries. Entrepreneurial intent (A23) is also covered by the GEM study. For this indicator, Luxembourg ranks better than the European average with a rate of 14.7% in 2018. France led the standings with 18.6%.

With a rate of 72.1%, Luxembourg ranked in the EU average for the indicator referring to the employment rate among 20 to 64-year-olds (A13). In 2018, Sweden posted the highest score with 82.6%. The unemployment rate (A14) in Luxembourg in 2018 was 5.5%. France's unemployment rate was 9.1% in 2018, an increase on the 2008 figure of 7.4% whilst Germany posted a rate of 3.4% in 2018, a reduction on the 2005 unemployment rate of 11.2%.

- ³ Information on the World Bank's methodology: https://www.doingbusiness. org/en/methodology/ starting-a-business
- ⁴ Data from the Directorate General for Small and Medium-Sized Enterprises of the Ministry of the Economy for the year 2018. This period consists of 12 days for processing and one day to deliver the authorisation by post. For more details, see the chapter on "Doing Business 2019" report.

Over the last 2 years, Luxembourg has performed badly in indicator categories relating to price and cost competitiveness. Luxembourg was amongst the laggard countries in the European Union for average annual level of variation in total factor productivity in the economy overall (A15), real labour productivity per hour worked (A16), nominal unit labour costs (A17). Luxembourg brings up the rear of the EU standings⁵ as well for nominal corporate tax rates (A18) and profitability of non-financial companies (A19), with a rate of 26% (2018) and 6.7% (2016) respectively.

In Luxembourg, there is a very low level of gross domestic R&D expenditure (**A21**): 1.26% of GDP in 2018. Sweden had the highest rate among EU countries at 3.4%.

The share of jobs in the medium-high and high technology manufacturing sectors (**A22**) totalled only 0.6% in 2018, which was the worst performance in the EU-28. The medium-high and high-technology sectors are defined as sectors requiring relatively high levels of R&D. These include activities such as aeronautic and spatial construction, the pharmaceutical industry, the manufacture of office machinery and IT equipment, electronics and communication, and scientific instruments for high technology. According to the World Economic Forum (WEF), Luxembourg has a service-based economic structure, and may obtain its innovation from sources other than R&D⁶.

In the WEF report, one of the indicators used to measure the quality of the national education system (A24) derived from the response given to the following question which was asked as part of the annual survey of economic decision-makers: "How well does the education system in your country meet the needs of a competitive economy?". However, in the 2018 edition, this question is no longer included. For this reason, this indicator has been replaced by the following questions: "In your country, to what extent do graduating students from secondary education possess the skills needed by businesses?" and "In your country, to what extent do graduating students from secondary education possess the skills needed by businesses?" and "In your country, to what extent do graduating students from university possess the skills needed by businesses?"⁷⁷. Luxembourg placed 9th amongst the 28 EU Member States with a score of 5.01 out of 7 (maximum score = 7), gaining one position compared to 2017. The Netherlands led the way in 2018 with a score of 5.5.

Life-long learning among the population aged 25-64 **(A25)** is of great importance for both the employability of employees and the competitiveness of companies. The Nordic countries, i.e. Sweden, Denmark, Finland, had the highest scores for life-long learning (29.2%, 23.5% and 28.5% respectively in 2018) whilst Luxembourg posted a score of 18% in 2018, which is improving compared to 2017.

- ⁵ http://www.statistiques.public. lu/fr/publications/series/ bulletin-statec/2018/03-18-Taux-EBE/index.html
- World Economic Forum

 "Global Competitiveness Report (GCR)" 2014-2015
- The score is the average of the two questions. It is the result of the WEF's GCI Report 2018.

3.1.3.2 Data availability in the economic dimension

Table 2 Incomplete data in the economic dimension														
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Economic dimension	21.3%	19.6%	18.6%	9.3%	8.7%	7.7%	7.1%	5.6%	16.1%	5.4%	6.1%	5.9%	3.9%	11.4%

Most of the economic dimension data is readily available and is based on well-established indicators. However, some indicators have only been developed recently, such as Regulatory capital for risk-weighted assets (A11) (from 2008) and Skillset of graduates (A24) (from 2017). Indicators concerning the Availability of financial resources for entrepreneurs (A12) and Entrepreneurial intentions (A23) can be traced back to the Global Entrepreneurship Monitor (GEM) study. In 2018, the GEM database contains information from only 17 out of 28 countries. Luxembourg has only participated in the study since 2013 while countries such as the United Kingdom, the Netherlands and Spain have participated in the study every year since 2005.

17 of the 25 indicators displayed were provided by Eurostat, which drew up a European Statistics Code of Practice setting a standard for the development, production and dissemination of European statistics. The sources of the other 8 indicators are the World Bank, the Global Entrepreneurship Monitoring (GEM) study, AMECO database of the European Commission, the World Economic Forum (WEF) and the International Monetary Fund (IMF). Of the 25 indicators which make up the economic dimension, 8 indicators (A1, A3, A4, A5, A6, A14, A17 and A21) are used by the European Commission in the Macroeconomic Imbalance Procedure.

14 of the indicators already featured in the former version of the scoreboard, although 4 of these have been slightly adapted to better suit the new system of indicators: the real effective exchange rate (A6) now takes account of 42 trade partners as supposed to 37 (alignment with the MIP scoreboard) whilst real GDP growth rate (A7) and real unit labour costs (A17) are highly volatile indicators which the ESC decided to measure over a 3-year period. Furthermore, the employment rate (A13) covers the population aged 20-64 (Europe 2020 strategy indicator) as opposed to using a 15-64 age range (former Lisbon strategy indicator).

3.1.4 Social dimension

Table 3

		Year	Trend	E		Position		EU Average	B	BE	Ŗ	First	Last
B1	Long-term unemployment rate (%)	2018	\uparrow	1.40	8	/	28	2.90	1.40	2.90	3.80	Czech Republic: 0.70	Greece: 13.60
B2	Risk of in-work poverty (%)	2018	\uparrow	13.50	24	/	25	9.20	9.00	5.20	7.10	Finland: 3.10	Romania: 15.00
В3	Proportion of employees with fixed-term contracts (%)	2018	\downarrow	8.50	15	/	28	11.20	9.80	8.50	13.70	Romania: 0.80	Spain: 22.30
Β4	Young people not in employment, education or training (NEET) (%)	2018	\uparrow	5.30	2	/	28	10.50	5.90	9.20	11.10	Netherlands: 4.20	Italy: 19.20
В5	Involuntary part-time work (%)	2018	\uparrow	12.80	9	/	28	25.60	10.40	6.90	42.40	Estonia: 6.00	Greece: 70.40
B6	Employees with involuntary long hours	2015		35.00	24	/	28	30.00	30.00	28.00	32.00	Lithuania: 16.00	Sweden: 52.00
В7	Change in employment rate compared to the previous year (%)	2018	\uparrow	3.70	3	/	28	1.30	1.40	1.30	1.00	Malta: 5.30	Bulgaria: -0.10
B8	Individuals having prematurely left education and training	2018	\uparrow	6.30	8	/	28	10.60	10.30	8.60	8.90	Croatia: 3.30	Spain: 17.90
B9	Level of higher education amongst 30 to 34-year-olds	2018	\uparrow	56.20	4	/	28	40.70	34.90	47.60	46.20	Lithuania: 57.60	Romania: 24.60
B10	School year repetition rate (%)	2015	\uparrow	30.90	25	/	28	12.00	18.10	34.00	22.10	Croatia: 1.60	Belgium: 34.00
B11	Median income (% change from previous year)	2018	\uparrow	11.63	4	/	25	2.76	3.62	4.21	1.18	Romania: 19.77	Bulgaria: 0.00
B12	Median income expressed in purchasing power standard	2018	\uparrow	31,995.00	1	/	25	17,068.00	21,830.00	21,430.00	20,300.00	Luxembourg: 31,995.00	Romania: 6,241.00
B13	Gender wage gap (%)	2017	\uparrow	5.00	2	/	26	16.00	21.00	6.00	15.40	Romania: 3.50	Estonia: 25.60
B14	Wage changes (%) in the economy (real ULC), over 3 years	2018	\downarrow	1.04	10	/	28	0.07	0.39	-0.30	0.10	Romania: 5.58	Finland: -1.76
B15	Household debt (consolidated) (%)	2018	\rightarrow	66.10	23	/	28	60.80	53.10	60.90	59.20	Romania: 15.90	Denmark: 125.40
B16	Net wealth per household (in EUR k)	2016	\uparrow	768.40	1	/	20	208.26	214.30	330.30	243.10	Luxembourg: 768.40	Latvia: 40.00
B17	At-risk-of-poverty rate after social transfers (%)	2018	\uparrow	18.30	16	/	25	16.90	16.00	16.40	13.40	Czech Republic: 9.60	Romania: 23.50
B18	Serious material deprivation rate (%)	2018	\downarrow	1.30	1	/	26	5.80	3.10	4.90	4.70	Luxembourg: 1.30	Bulgaria: 20.90
B19	Gini index of income inequality (0 to 100)	2018	\downarrow	33.20	19	/	25	30.14	31.10	25.60	28.50	Slovenia: 23.40	Bulgaria: 39.60
B20	Effectiveness of social transfers (difference between the at-risk-of-poverty rate before and after social transfers) in percentage points	2018	\downarrow	27.70	8	1	25	26.70	26.00	25.80	32.30	Hungary: 33.30	Latvia: 15.80
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B21	Individuals living in over-crowded accommoda- tion (% of the total population)	2018	\downarrow	8.40	9	/	24	15.30	7.40	5.90	8.20	Cyprus: 2.50	Romania: 46.30
B22	Housing cost burden over 25% of disposable household income (owners and tenants) (%)	2018	\uparrow	21.45	9	/	25	28.74	38.99	24.21	19.56	Malta: 11.72	Greece: 74.55
B23	Delinquency, violence or vandalism in the surrounding area (%)	2018	\uparrow	11.30	14	/	25	11.90	13.30	12.30	14.90	Croatia: 2.60	Bulgaria: 21.80
B24	Healthy life expectancy (years)	2017	\downarrow	59.10	18	/	28	63.75	65.90	63.80	63.70	Malta: 72.75	Latvia: 51.40
B25	Persons living in households with low work intensity (as a % of the population under the age of 60)	2018	\uparrow	8.30	13	/	25	9.00	8.10	12.10	8.00	Czech Republic: 4.50	Greece: 14.60

The social dimension seeks notably to ascertain developments in the standard of living, quality of life, well-being and social cohesion in Luxembourg. The indicators in this dimension primarily cover the labour market, education, income, assets and private indebtedness, social inequality and living conditions.

In 2018, 15 of the 25 indicators are green, which means that Luxembourg's performance in these areas was at least 20% above the EU average. Eight indicators are displayed in orange whilst two are red. There were fewer colour changes in the social dimension than in the economic dimension given that the social dimension is more structural than cyclical in nature. As far as upward and downward trends are concerned, it is interesting to note that Luxembourg's score deteriorated compared to previous year's performance for 7 of the 25 indicators. It has improved for 16 indicators.



3.1.4.1 Detailed description of the social dimension indicators

In Luxembourg, the rate of long-term unemployment (**B1**), which mainly affects jobseekers with low levels of qualifications, was 1.4% in 2018 and reached again the level of 2011. Indeed, this rate is relatively low when compared to the average but has nevertheless risen steadily between 2011 and 2017.

Involuntary part-time work **(B5)** oscillates depending on the unemployment rate, which indicates that individuals are obliged to work part-time rather than being allowed to work full-time during economic slumps. In Luxembourg, the involuntary part-time rate was 12.8% in 2018. Greece posted a score of 70.4% in 2018 whilst Estonia recorded the lowest rate, i.e. 6% in 2018.

Luxembourg ranked 3rd for the change in employment rate (**B7**) indicator. In 2018, the employment rate increased by 3.7% compared to the previous year. Only Malta and Cyprus were able to outdo Luxembourg, posting a 5.3% growth in its employment rate in 2018. Bulgaria is the only country where employment has decreased by 0.1% in 2018.

In 2018, the share of workers with fixed-term contracts **(B3)** was 11.2% in the EU-28. In France, 13.7% of workers had fixed-term contracts whilst 9.8% of their German counterparts found themselves in the same position. In Luxembourg and in Belgium, the rate was 8.5% in 2018. In the other EU Member States, the proportion of employees with a fixed-term contract ranged from 22.3% in Spain to a mere 0.8% in Romania. The considerable variations between Member States are due to labour supply and demand, company growth forecasts and procedures set out in labour law pertaining to recruitment and dismissal of staff.

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Luxembourg's performance in the indicators assessing household income was mixed. The median income after social transfers (**B12**) was the highest in the EU (EUR 31,995 in purchasing power standard) and rose by 11.63% over a 12-month period (**B11**), but Luxembourg ranked 24th for the risk of in-work poverty (**B2**) indicator with a score of 13.5%. This rate even decreased between 2017 and 2018. The risk of in-work poverty indicator measures the proportion of people who are working but have an available income that is lower than the at-risk-of-poverty threshold, which is fixed at 60% of the median national available income (after social transfers).

The Gini index (**B19**) measures income inequality. A score of 0 would mean that the whole population has the same revenue (perfect equality) whereas a score of 100 refers to a situation where a single individual earns the entirety of the income whilst everyone else has an income of 0 (total inequality). In 2018, Luxembourg's Gini coefficient was 33.2, close to the European average. Slovakia posted the lowest Gini coefficient (23.4) whilst the largest income disparity in the European Union is to be found in Bulgaria (39.6).

The percentage change in real ULC over 3 years (**B14**) deteriorated slightly compared to the previous year (1.04% change in 2018 compared to 2017). This indicator compares real labour costs and productivity expressed in volume. It presupposes "price setter" behaviour and is identical to the wage share of GDP.

The at-risk-of-poverty after social transfers **(B17)** score was worse than that of the previous year with Luxembourg's figure for 2018 being 18.3%. Between 2013 and 2014, Luxembourg's at-risk-of-poverty rate rose by 0.5 percentage points (pp) before falling 1.1 pp in 2015 to 15.3%. Between 2005 and 2018, the at-risk-of-poverty rate remained relatively stable in the EU 28, increasing slightly from 15.4% to 16.9%.

In the EU-SILC survey, the rate of material deprivation (**B18**) indicator refers to the inability to procure certain goods and services which most individuals deem to be necessary for an acceptable standard of living. A distinction is therefore made between individuals who are unable to procure certain goods and services and those who don't have them for other reasons such as not wanting them or not deeming them necessary. Luxembourg ranked 1st with a rate of 1.3% in 2018.

The indicator "Persons living in households with low work intensity" (**B25**) is new in the Competitiveness scoreboard. To compare this indicator with other European Union countries, the unit "percentage of the population under the age of 60 years" should be used instead of "in thousands of people". While taking into account the break in series in 2016, Luxembourg posted a rate of 8.3% in 2018. The EU average is 9% in 2018.

In 2018, 15.3% of the EU population lived in overcrowded accommodation (**B21**). The highest rates of overcrowding amongst the EU Member States were in Romania (46.3%) and Poland (39.2%), whilst Cyprus (2.5%), Belgium (5.9%), the Netherlands (4.1%), Ireland (2.8%) and Malta (3.4%) had the lowest rates of overcrowding. The rate of overcrowding in Luxembourg in 2018 was 8.4%, deteriorating compared to 2017.

In 2018, 21.45% of the Luxembourg population faced housing cost burden over 25% of disposable household income (owners and tenants) (**B22**). In the 2005-2015 period, the rate remained relatively stable in Luxembourg, while this rate decreased in the EU 28, from 37.1% in 2005 to 21.45% in 2018. Some countries, such as Bulgaria, Croatia and Hungary, were able to drastically reduce their scores over the same period. However, the rate in Greece increased from 39.4% in 2007 to 74.55% in 2018.

Household debt (**B15**) refers to liabilities incurred by households. Private sector debt is calculated based on credit. These data are presented in consolidated terms; hence they exclude transactions between units in the same sector. The indicator for Luxembourg is red, with a rate of 66.10% in 2018.

Net household wealth (**B16**) measures the difference between real and financial assets on the one hand and liabilities such as loans and mortgages on the other. Luxembourg topped the EU rankings with a net wealth of EUR 768,400 in 2016.

Whilst the proportion of young people not in employment, education or training (NEETs) (**B4**) remained reasonably stable in the EU between 2005 and 2017, there have been significant changes in some Member States over the last decade. The greatest reductions in the NEET percentage were recorded in Bulgaria (-9.8 pp), the Czech Republic (-7.3 pp), Germany (-4.6 pp), Sweden (-4.3 pp), Cyprus (-3.4 pp), Slovakia (-3.7 pp), Poland (-4 pp) and Malta (-3.9 pp). However, the NEET rate increased significantly in Italy (+3 pp), the United Kingdom (+1.9 pp) and Finland (+1.6 pp) over the same period. Luxembourg reached a rate of 5.3% in 2018 and improved compared to 2017.

Individuals having prematurely left education or training **(B8)** is an education indicator which provides key information for the Europe 2020 strategy objectives. Luxembourg's figure for 2018 was 6.3%. It should be noted that these data are taken from the EU Labour Force Survey (LFS) and that this indicator is not a full reflection of the situation in Luxembourg due to the limited sampling carried out in Luxembourg for the LFS.

In 2018, the percentage of the population aged 30-34 with a higher education qualification (**B9**) was 56.9% in Luxembourg, with the country ranking 4th amongst the 28 EU Member States. Lithuania, Cyprus and Ireland were the only countries to perform better than Luxembourg, posting a score of 57.68%, 57.1% and 56.3% respectively. The lowest rate in 2018 was in Romania (24.6%).

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The school year repetition rate (**B10**) is one of the two indicators classified in red for Luxembourg, which posted a score of 30.9% in 2015. The lowest rate was in Croatia (1.6% in 2015).

The indicator labelled "Delinguency, violence or vandalism in the surrounding area" (B23) measures a population's sense of insecurity and is taken from the EU-SILC study on well-being and contains variables on satisfaction in a range of specific areas. Luxembourg posted a score of 11.3% for this indicator in 2018. In Bulgaria this feeling of insecurity is the highest among the European Union countries with a rate of 21.8%. The lowest rate is observed in Croatia (2.6%) in 2018.

Healthy life expectancy (B24) stood at 59.1 years in 2017, earning Luxembourg 18th place in the EU-28 rankings. This indicator measures the number of years that a person of a specific age should be able to live without moderate or severe health problems. This indicator is also known as "disability-free life expectancy". Therefore, this is a composite indicator which combines mortality and health data.

Luxembourg ranked 2nd for the gender pay gap (**B13**) indicator. The gap was 5.5% in Luxembourg whilst the EU average was 16% in 2017. It should be noted that the data only span industry, construction and services and do not cover public administration, defence or mandatory social security.

3.1.4.2 Data availability in the social dimension

Of the 25 indicators, 21 are calculated by Eurostat. The data for indicator B6 (Employees with involuntary long hours) were gathered by Eurofound (European Foundation for the Improvement of Living and Working Conditions) as part of a study. The School year repetition rate (B10) data came from the OECD database and the real unit labour cost (B14) information was provided by AMECO. The household wealth (B16) information was provided by the ECB. Of the 25 indicators in the social dimension, 5 (B1, B4, B7, B17 and B18) are used by the European Commission as part of the MIP.

Nine of the 25 indicators featured in the former version of the scoreboard. However, two indicators, namely NEETs (B4) and involuntary part-time work (**B5**), have been adapted slightly. Indicator B5 only covers involuntary part-time work whilst indicator B4 only takes account of young people not in employment, education or training (the former indicator grouped together all unemployed young people).

Table 4 Incomplete d	ata in the	social d	imensio	ı										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Social dimension	24.4%	21.1%	14.7%	14.7%	11.1%	13.1%	13.0%	8.7%	10.3%	12.0%	4.4%	9.4%	12.3%	24.3%

Data are generally made available only with a certain time lag, which explains why there is a data incompleteness figure of 24.3% for 2018.

Data for indicator **B6** (employees with involuntary long hours) were only available for 2015 and thus do not adhere to the ESC criteria, especially those aiming to ensure temporal comparability.

Data on the school year repetition rate (**B10**) are published as part of the OECD's PISA study and were only available for three calendar years (2009, 2012, 2015).

The data for indicator **B22** (housing cost burden over 25% of disposable household income) factors in the percentage of homeowners/tenants in each Member State and the housing costs for each household. The calculation was performed by the ODC using data published by Eurostat.

3.1.5 Environment dimension

Table 5 Data for the environment dimension

		L	σ	2		_		_ e	ш	ш	œ	÷	t
		Yea	Tren	-		Positio		El Averag	ā	œ	ш	Firs	Las
C1	Energy intensity (energy consump- tion per GDP unit) (kilograms of oil equivalents per EUR)	2016	\uparrow	86.69	4	1	28	118.47	111.03	147.26	117.17	Ireland: 61.64	Bulgaria: 422.60
C2	Share of crude oil and petroleum products in total household energy consumption (%)	2016	\uparrow	33.80	26	/	28	11.60	20.60	29.20	14.40	Sweden: 0.30	Ireland: 38.10
С3	Resource productivity (EUR (PPS) per kilogram)	2018	\uparrow	3.30	3	/	10	2.35				Netherlands: 4.01	Finland: 0.97
C4	Domestic raw material consump- tion (RMC) (in tonnes per head)	2018	\downarrow	24.08	23	/	28	13.84	15.80	14.01	11.76	Italy: 8.33	Finland: 35.04
C5	Renewable energy share (% of national 2020 target)	2017	\uparrow	58.00	27	1	28	87.63	85.84	69.68	70.87	Croatia: 136.38	Nether- lands: 47.17
C6	Greenhouse gas emission intensity (index 100 in 2000)	2017	\uparrow	91.50	22	/	28	86.60	93.50	82.40	83.10	Malta: 62.20	Bulgaria: 107.90
C7	Waste production per head (kilograms per person)	2016	\downarrow	17,405.00	26	/	28	4,968.00	4,858.00	5,573.00	4,848.00	Croatia: 1,265.00	Finland: 22,359.00
C8	Municipal waste recycling rate (%)	2017	\uparrow	48.30	6	/	27	46.40	67.60	53.70	42.90	Germany: 67.60	Malta: 6.40
C9	E-waste recycling rate (%)	2016	\uparrow	45.60	11	/	28	41.20	39.00	34.00	37.10	Bulgaria: 105.20	Malta: 6.20
C10	Exposure to air pollution by fine particles (< 2,5 μm)	2017	\uparrow	11.20	7	/	25	14.10	12.70	12.90	12.00	Finland: 4.90	Bulgaria: 23.80
C11	Exposure to air pollution by fine particles (< 10 μm)	2017	\uparrow	20.30	13	/	26	21.60	17.50	20.40	19.10	Finland: 10.00	Bulgaria: 37.30
C12	Biochemical oxygen demand in rivers (mg O2/l)	2015	\rightarrow	1.88	9	/	17	2.02		2.91	1.28	Ireland: 1.21	Romania: 3.35
C13	Total expenditure on environmental protection (% of GDP)	2017	\uparrow	1.00	3	/	28	0.80	0.60	0.90	0.90	Netherlands: 1.40	Finland: 0.20
C14	Land protected (%)	2018	\rightarrow	27.00	6	/	28	18.00	15.00	13.00	13.00	Slovenia: 38.00	Denmark: 8.00
C15	Ecoinnovation Index (EU index 100)	2018	\downarrow	138.00	1	/	28	100.00	137.00	83.00	112.00	Luxembourg: 138.00	Cyprus: 45.00
C16	Greening (% of GDP)	2016	\uparrow	5.20	13	/	24	5.39	5.80	3.99	4.00	Finland: 19.62	Ireland: 2.30
C17	Number of green jobs (% of total jobs)	2016	\uparrow	2.68	8	/	24	1.92	1.16	1.01	1.65	Finland: 5.34	Belgium: 1.01
C18	Non-energetic material productivity (EUR per kilogram)	2018	\uparrow	4.38	4	/	28	2.86	3.55	3.28	3.23	Netherlands: 6.32	Romania: 1.04
C19	Circular economy					/							

A country's development which is fostered at the expense of the environment is not only untenable 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.

Luxembourg's performance is more mixed for this dimension than it was for the other two dimensions, with 4 of the 18 indicators being red in colour, whilst the number of green indicators increased from 7 in 2011 to 8 in 2018. According to the last available data, Luxembourg was able to improve its performance in 13 indicators pertaining to the environment.



3.1.5.1 Detailed description of the environment dimension indicators

As part of the Europe 2020 strategy, the European Council set the following European objective: "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 intensity of greenhouse gas emissions (**C6**) is the ratio between greenhouse gas emissions linked to energy production (carbon dioxide, methane, nitrogen oxide) and gross domestic energy consumption. This index (year 2000=100) shows that several Member States have been able to reduce their GHG emissions since 2000. However, this index does not provide any information on the initial level of consumption. Luxembourg ranked in the EU average with an index of 91.5 in 2017.

When it comes to the share of renewable energy in gross domestic energy consumption (achieved % of the national 2020 target) (**C5**), many countries had already reached their 2020 targets by 2015: Bulgaria, the Czech Republic, Denmark, Estonia, Croatia, Italy, Lithuania, Hungary, Romania, Finland and Sweden. In 2017, Luxembourg achieved 58% of it's the national 2020 target but remains on-track to meet its target.

Energy intensity refers to energy consumption per unit of GDP (**C1**). For this indicator, Luxembourg (86.69) stood alongside Denmark (65.63), Ireland (61.64), Italy (98.12) and Malta (79.34) as the countries with the lowest energy intensity in 2016. The highest energy intensity score was recorded in Bulgaria (422.56).

Indicator **C2** refers to the share of crude oil and petroleum products in the total energy consumption of the residential sector. In Luxembourg, the figure was 33.8% in 2016, thus placing the country 26th among the 28 EU Member States.

To calculate the productivity of resources (**C3**) indicator, GDP is divided by the domestic consumption of raw materials. Luxembourg scored 3.30 in 2018 and topped the rankings (3rd position) together with the Netherlands (4.01) and the United Kingdom (3.76).

Domestic consumption of raw materials (**C4**) in Luxembourg equated to 24.08 tons per head. The top-performing EU Member State was Italy with 8.33 tons per head. This indicator takes account of raw materials imported into national economies. It also covers all imported solids, liquids and gases, except for water and air. Over the last few years, the indicator levels have remained stable for most countries.

Luxembourg performed relatively poorly in terms of waste produced per head (**C7**). In 2016, Luxembourg produced around 17.4 tons of waste per head of the population. Other countries, such as Sweden, Estonia and Bulgaria, produce even more waste. Croatia (1,265 kg per head) produces the least waste in the EU. As regards the recycling of municipal waste (**C8**), Luxembourg managed a rate of 48.3% in 2017 but still trailed Germany, which achieved a recycling rate of 67.6% in 2017. Luxembourg (45.60%) performed slightly better than the EU average 41.2% in 2016) in terms of e-waste recycling (**C9**). Posting a score of 105.2%, Bulgaria earned the top spot in the EU rankings in 2016.

For the Exposure to air pollution by fine particles (< 2,5 µm) indicator (C10), Luxembourg registered a score of 11.20 in 2017. The indicator score is twice as high as in Bulgaria than in Luxembourg. Luxembourg's performances for air quality and satisfaction with air quality (C11) and water quality (C12) were average. Ireland recorded the best water quality and satisfaction with water quality score in 2015. The air quality indicator saw Finland perform the best in 2015, scoring 10%. Luxembourg's total expenditure on environmental protection (C13) is amongst the highest in the European Union with a score of 1% of GDP in 2017. Only Malta and the Netherlands posted a higher score.

Concerning protected land (**C14**), Luxembourg placed in 6th position in the EU rankings in 2018, with a rate of 27%, behind Slovenia, Croatia, Bulgaria, Slovakia and Cyprus.

The Eco-Innovation Observatory (EIO) defines eco-innovation as an innovation that reduces both the use of natural resources and the emission of harmful substances throughout the whole life cycle. The Ecoinnovation index (C15) and the corresponding scoreboard seek to cover the different aspects of eco-innovation through 16 indicators which span five thematic areas⁸: (1) measuring the financial and human resources earmarked for starting eco-innovation activities, (2) illustrate the extent to which companies in a given country are active in the field of eco-innovation, (3) quantify the efficiency of eco-innovation activities in patents, academic publications and the media, (4) measure efficiency whilst framing eco-innovation in the context of the efficient use of a country's resources (i.e. energy, water) and the efficiency and intensity of GHG emissions, (5) quantify the socioeconomic benefits illustrating the level at which eco-innovation can generate positive social (employment) and economic (turnover, exports) outcomes. In 2018, Luxembourg ranked 1st among the 28 Member States with an index of 138.

> Source: https://ec.europa.eu/ environment/ecoap/scoreboard en

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Combating climate change and using natural resources in an efficient way are not only necessary for ensuring sustainable development but also provide new opportunities for the economy. Green activities (C16) accounted for 5.2% of Luxembourg's GDP in 2016. Finland posted a score of 19.62% in 2016. This not only enables new sectors of the environmental economy to emerge but also green jobs to be created. The number of green jobs as a percentage of total jobs (C17) refers to jobs created by commitments to protect the environment and natural resources. The figure for Luxembourg was 2.68% in 2016. Finland and Estonia were leading countries, posting scores of 5.34% and 4.82% in 2015. It should be borne in mind that many countries do not have any available data on green jobs.

3.1.5.2 Data availability in the environment dimension

Table 6 Incomplete data	in the er	vironme	ent dime	nsion										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Environment dimension	42.9%	31.8%	35.9%	29.9%	28.9%	17.1%	16.7%	10.5%	15.2%	4.7%	9.8%	7.5%	33.6%	71.8%

In the environment dimension, 71.8% of the data are not available for 2018. Other indicators have only existed for a few years or are in the process of being adapted. Worthy of mention is the fact that the UN adopted 17 sustainable development goals in September 2015 with new indicators to measure achieved progress. These indicators could also serve as a source of inspiration for indicators to be adapted in the future. The circular economy (indicator **C19**) is a very complex issue. There is a European definition of the term but standards and indicators to measure it are yet to be established.

3.2 Annex: Secondary indicators

The ESC drew up an indicative, non-exhaustive list of relevant secondary indicators in its opinion paper on the national system of indicators. These indicators are not integrated into the composite indicator calculations, to avoid overloading the key element of the system of indicators. Nonetheless, the secondary indicators are pertinent and are therefore presented here for indicative purposes. They provide more information on specific areas and can help provide a more targeted analysis where needed. As such, they provide a fuller overview of the three economic, social and environment dimensions.

It must be noted however that, at this stage, there are several problems related to the availability of data for these secondary indicators. For some, no data was available at all, while for others the information is only available for Luxembourg. The corresponding fields in the tables are left blank where this is the case but will be filled in as soon as the relevant data becomes available.

3.2.1 Economic dimension (secondary indicators)

Table Seco	e 7 Indary indicators for the economic dir	nensio	n										
		Year	Trend	E		Position		EU Average	DE	BE	FR	First	Last
D1	Net external debt (as a % of GDP)	2018	\uparrow	4.70	22	/	28	1.68	7.30	-1.30	-0.60	Cyprus: -7.0	Greece: 181.10
D2	Terms of trade per item (% variation over 5 years)	2018	\uparrow	-0.20	23	/	28	2.42	3.50	-0.70	2.80	Bulgaria: 6.3	Cyprus: -4.80
D3	Real effective exchange rate for the euro area (% variation over 3 years)	2018	\uparrow	0.40	8	/	28	-0.88	0.40	2.80	-0.10	Czech Republic: 7.6	Netherlands: 8.90
D4	Direct Investment in the reporting economy (stocks, in % of GDP)	2018	\downarrow	7,544.90	1	/	28	453.12	43.60	175.30	45.80	Luxembourg: 7 544.9	Sweden: -6.32
D5	Direct investment in reporting economy (flows, in % of GDP)	2018	\downarrow	-743.50	28	/	28	-26.38	2.60	-12.30	2.20	Malta: 33.0	Ireland: -167.90
D6	Net trade balance for energy products as a % of GDP	2018	\downarrow	-3.30	20	/	28	-2.69	-2.00	-3.60	-1.90	Denmark: -0.2	Czech Republic: 11.00
D7	Share of OECD exports market (% variation over 5 years)	2018	\checkmark	8.05	9	/	28	7.27	1.14	0.63	-2.08	Ireland: 73.97	Greece: 1.07
D8	Export market share (% variation over 5 years)	2018	\downarrow	10.38	9	/	28	9.59	3.32	2.80	0.04	Ireland: 77.72	Romania: 4.10
D9	Rate of growth in liabilities for the entire financial sector (% variation over 5 years)	2018	\downarrow	1.20	17	/	25	3.73	3.73	0.10		Czech Republic: 15.53	Poland: 37.00
D10	10-year bond returns (%)	2018	\downarrow	0.56	4	/	27	1.38	0.40	0.79	0.78	Lithuania: 0.31	Romania: 4.69
D11	Number of days needed to acquire a building permit	2017	\rightarrow	157.00	14	/	28	175.07	126.00	212.00	183.00	Denmark: 64	Cyprus: 507
D12	Regulation quality index	2016	\uparrow	1.72	7	/	28	1.17	1.82	1.34	1.07	Netherlands: 1.98	Greece: 0.15
D13	Administration efficiency index	2016	\downarrow	1.69	6	/	28	1.11	1.74	1.33	1.41	Denmark: 1.89	Romania: -0.17
D14	Flexibility of wage determination	2018	\uparrow	5.14	11	/	28	4.78	4.72	4.51	5.04	Estonia: 6.16	Austria: 2.4
D15	Hiring and firing practice	2018	\downarrow	3.95	19	/	28	3.72	4.81	3.25	2.73	Croatia: 2.55	United Kingdom: 5.14
D16	Price of electricity - Industrial users (euro/kWh)	2019	\checkmark	0.09	6	/	25	0.11		0.11	0.10	Denmark: 0.07	Cyprus: 0.16
D17	Price of gas - industrial users (euro/GJ)	2019	\checkmark	9.17	21	/	23	8.22		6.09	8.52	Belgium: 6.09	Finland: 13.03
D18	Broadband Internet access rates (USD/MB)	2014	\uparrow	6.56	8	/	20	24.02	25.58	1.73	6.29	Belgium: 1.73	Poland: 188.8
D19	Venture capital investment (% PIB)	2018	\downarrow	0.32	1	/	28	0.15	0.09	0.13	0.21	Luxembourg: 0.32	Malta: 0.0
D20	R&D expenditure in the business sector (% PIB)	2017	\downarrow	0.68	15	/	28	1.36	2.09	1.76	1.42	Sweden: 2.42	Latvia: 0.14
D21	Non-R&D innovation expenditure as % of turnover	2016	\uparrow	0.23	26	/	28	0.86	1.33	0.49	0.51	Lithuania: 2.0	Romania: 0.12
D22	SMEs innovating inhouse as % SMEs	2016	\uparrow	35.12	9	/	28	28.06	36.80	39.77	33.78	Portugal: 51.19	Romania: 4.25
D23	Innovative SMEs collaborating with others as % SMEs	2016	\uparrow	9.82	16	/	28	11.85	8.55	22.12	13.38	United Kingdom: 30.56	Romania: 1.71
D24	Public-private co-publications per million population	2018	\downarrow	104.65	10	/	28	81.71	137.28	120.01	64.31	Denmark: 267.59	Lithuania: 16.38
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Table Cont	97 inued												
D25	Patents applications per billion GDP	2016	\uparrow	2.23	10	/	28	3.53	6.27	3.46	3.75	Sweden: 9.57	Romania: 0.23
D26	Patents applications in health and environment per billion GDP	2012		0.68	10	/	28	1.01	1.47	0.77	0.92	Denmark: 2.05	Romania: 0.04
D27	USPTO issued patents per million inhabitants	2015	\uparrow	90.59	11	/	28	86.79	203.81	100.64	98.85	Sweden: 270.12	Latvia: 2.01
D28	Patents applications per million inhabitants	2017	\downarrow	93.94	9	/	28	106.84	228.81	145.83	141.85	Sweden: 283.46	Bulgaria: 4.13
D29	SMEs introducing product or process innovation as % of SMEs	2016	\uparrow	40.35	10	/	28	34.34	41.05	47.32	37.99	Portugal: 56.03	Romania: 4.63
D30	SMEs introducing marketing or organisational innovation as % of SMEs	2016	\downarrow	52.04	1	/	28	35.63	45.58	45.09	45.24	Luxembourg: 52.04	Romania: 7.35
D31	Employment in fast-growing firms of innovative sectors	2016	\uparrow	4.74	17	/	28	5.19	4.77	2.77	4.16	Hungary: 8.55	Cyprus: 1.84
D32	Financing for entrepreneurs the availability of financial resources	2018	\downarrow	2.44	15	/	18	2.86	2.84		2.84	Netherlands: 3.54	Cyprus: 2.3
D33	Taxes and bureaucracy - The extent to which public policies support entrepreneurship	2018	\downarrow	3.20	2	/	18	2.43	2.63		3.20	Netherlands: 3.26	Croatia: 1.34
D34	Basic-school entrepreneurial education and training	2018	\uparrow	2.38	4	/	18	1.99	1.84		1.73	Netherlands: 3.24	Croatia: 1.52
D35	Post-school entrepreneurial education and training	2018	\uparrow	3.31	3	/	18	2.86	2.73		3.38	Netherlands: 3.72	Croatia: 2.27
D36	Perceived capabilities for entrepreneurship	2018	\uparrow	43.91	12	/	17	44.43	38.31		37.46	Slovakia: 53.29	Italy: 29.77
D37	Entrepreneurship as a good career choice	2018	\uparrow	48.81	16	/	17	59.81	49.60		58.21	Poland: 85.86	Slovakia: 46.89
D38	Cultural and social norms	2018	\uparrow	2.89	7	/	18	2.63	2.65		2.85	Netherlands: 3.71	Croatia: 1.72
D39	PISA math and sciences scores	2015	\downarrow	486.00	17	/	22	495.23	506.00	507.00	493.00	Estonia: 520	Greece: 454
D40	New doctorate graduates per 1000 population aged 25-54	2017	\rightarrow	1.24	21	/	28	2.09	2.68	1.98	1.71	Denmark: 3.17	Malta: 0.53
D41	International scientific co-publi- cations per million population	2018	\uparrow	2,451.81	3	/	28	1,070.39	995.13	1,834.70	913.96	Denmark: 2929.33	Romania: 256.88
D42	Scientific publications among the top 10% most cited worldwide	2016	\downarrow	13.93	4	/	28	11.46	11.83	13.10	10.09	Denmark: 15.77	Bulgaria: 2.68
D43	Foreign doctorate students as a % of all doctorate students	2017	\downarrow	80.81	1	/	28	20.31	9.68	20.60	39.54	Luxembourg: 80.81	Greece: 1.39

3.2.2 Social dimension (secondary indicators)

Table Seco	e 8 Indary indicators for the social dimension	on											
		Year	Trend	E		Position		EU Average	DE	BE	FR	First	Last
E1	Share of low-wage workers as a % of the overall workforce	2014	\uparrow	11.94	7	/	28	17.19	22.48	3.79	8.81	Sweden: 2.64	Latvia: 25.46
E2	Participation rate (%)	2018	\uparrow	71.10	22	/	28	73.70	78.60	68.60	71.90	Sweden: 82.9	Italy: 65.6
E3	Quality of Work Index (en %)	2018	\checkmark	54.5	1	/	1	5,450.00					
E4	People living in households with very low labour intensity (%)	2017	\downarrow	6.90	7	/	28	9.50	8.70	13.50	8.10	Slovakia: 5.4	Ireland: 16.2
E5	Fatal accidents in the workplace (%)	2017	\uparrow	2.74	23	/	27	1.84	0.89	1.68		Malta: 0.45	Romania: 4.49
E6	Feeling of job insecurity (%)	2018	\uparrow	1.70	1	/	22	7.52	2.70	3.70	7.60	Luxembourg: 1.7	Greece: 29.8
E7	Workers who report they are satisfied with their work-life balance	2013		7.20	1	/	1	7.20					
E8	Level of studies achieved (% of the population with a university qualification)	2015	\downarrow	39.79	1	/	1	39.79					
E9	Reading skills in 15-year old students (PISA)	2015	\downarrow	481.44	20	/	28	486.00	509.10	498.52	499.31	Finland: 526.42	Bulgaria: 431.72
E10	Knowledge and use of Luxembourgish, French, German and/or English					/							
E11	Civic skills of students	2009		473.00	20	/	22	511.36		514.00		Denmark: 576	Cyprus: 453
E12	Support from social network (%)	2015	\uparrow	87.10	27	/	28	94.10	96.70	92.20	93.10	Czech Republic: 98.1	Italy: 86.8
E13	Participation in social, cultural and sports associations (%)	2015	\uparrow	82.70	5	/	28	67.30	77.20	72.50	80.50	Sweden: 88.1	Romania: 29.6
E14	Time spent volunteering	2015	\downarrow	30.30	8	/	28	22.20	11.40	20.80	23.30	Netherlands: 82.5	Malta: 0.9
E15	Frequency of social contacts (%)	2015	\uparrow	70.70	9	/	28	63.80	66.80	70.00	58.90	Cyprus: 84.3	Poland: 37.3
E16	Number of voters as a % of the voting age population	2018	\rightarrow	91.00	1	/	23	69.65	76.00	89.00	75.00	Luxembourg: 91	Lithuania: 51
E17	Existence of formal consultation procedures during law-making and production of regulations	2018	\uparrow	1.70	18	/	23	2.08	1.80	2.00	2.10	United Kingdom: 3.1	Hungary: 1.2
E18	Participation in political and civic associations (%)	2006		4.70	11	/	25	4.20	6.40		2.70	Denmark: 12.2	Lithuania: 1.9
E19	Trust in institutions	2013		5.47	9	/	28	4.67	5.53	5.23	4.37	Finland: 7.13	Croatia: 3.05
E20	Tax rate for physical persons (%)	2018	\rightarrow	42.00	18	/	28	33.85	45.00	50.00	45.00	Bulgaria: 10	Austria: 55
E21	Real annual growth rate of different income statistics per household	2015	\uparrow	103.00	1	/	1	103.00					
0													

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Table Cont	e 8 inued												
E22	Overall household consumption including non-market services					/							
E23	Population unable to make ends meet (%)	2017	\uparrow	7.50	6	/	28	13.90	4.00	12.40	14.00	Germany: 4	Greece: 37.3
E24	Rooms per person	2018	\downarrow	1.90	3	/	23	1.63	1.80	2.20	1.80	Belgium: 2.2	Poland: 1.1
E25	Number of houses built per year	2013	\uparrow	2,642.00	1	/	1	2,642.00					
E26	Social housing					/							
E27	Time spent on pastimes and personal hobbies	2017	\downarrow	15.15	10	/	22	15.14	15.55	15.77	16.36	France: 16.36	Latvia: 13.83
E28	Relative incidence of parental leave	2015	\downarrow	0.32	1	/	1	0.32					
E29	Feeling of discrimination (nationality) (%)	2014	\uparrow	24.00	1	/	1	24.00					
E30	Feeling of security (%)	2018	\uparrow	75.80	9	/	23	72.00	72.50	70.10	70.50	Slovenia: 86.1	Lithuania: 55.9
E31	Satisfaction with life	2018	\rightarrow	6.90	8	/	23	6.49	7.00	6.90	6.50	Denmark: 7.6	Greece: 5.4
E32	Incidence and seriousness of mental health problems					/							
E33	Suicide rate	2016	\uparrow	9.38	11	/	28	10.33	11.29	17.11	13.21	Cyprus: 3.89	Lithuania: 28.27
E34	Death rate according to cause	2015	\uparrow	459.98	1	/	22	561.00	557.03	537.69		Luxembourg: 459.98	Lithuania: 871.26
E35	Consumption of psychotropic drugs	2014	\uparrow	5.55	1	/	1	5.55					
E36	Adults who report they are in good or very good health (%)	2017	\uparrow	23.20	14	/	28	21.60	18.60	30.60	24.30	Cyprus: 49.8	Latvia: 3.5
E37	Adults who report they have a long-term illness or health problem (%)	2015	\downarrow	23.20	1	/	1	23.20					
E38	Adults who report they are unable to perform their usual activities due to a health problem (%)	2015	\downarrow	25.70	1	/	1	25.70					

3.2.3 Secondary indicators for the environment dimension

Image: Final energy consumption - accountability mechanism2017 \checkmark 90.057/2890.7993.1495.2791.80Lithuania: 76.58PolanF2Final energy consumption - accountability mechanism2016 \rightarrow 4.005/281,107.70216.4036.30147.20Malta: 0.4	nd: 112.69 Germany: 216.4 Estonia: 0
F1Final energy consumption - accountability mechanism2017 \downarrow 90.057/2890.7993.1495.2791.80Lithuania: 76.58PolanF2Final energy consumption - accountability mechanism2016 \rightarrow 4.005/281,107.70216.4036.30147.20Malta: 0.40.4	nd: 112.69 Germany: 216.4 Estonia: 0
F2 Final energy consumption - 2016 \rightarrow 4.00 5 / 28 1,107.70 216.40 36.30 147.20 Malta: 0 0.4	Germany: 216.4 Estonia: 0
	Estonia: O
F3A Share of renewable energy - solar panels (%) 2016 \$\screwed{4}\$ 6.88 8 / 28 4.29 8.30 8.66 2.94 Malta: 61.02	
F3B Share of renewable energy - hydroelectric (%) 2016 ↑ 7.92 15 / 28 14.29 4.47 1.04 21.61 Austria: 35.06	Cyprus: O
F3C Share of renewable energy - 2016 1 6.96 15 / 28 12.36 17.12 15.25 7.70 Ireland: 54.35	Malta: 0
F3D Share of renewable energy - / /	
F3E Share of renewable energy - thermal (%) 2016 ↓ 1.60 7 / 28 2.05 1.70 0.75 0.42 Cyprus: 55.6	Estonia: 0
F4 Number of subsidies granted /	
F5A Total greenhouse gas emissions 2017 V 5.54 22 / 28 3.73 5.71 4.14 1.90 Latvia: 1.3	Estonia: 11.46
F5B Total greenhouse gas emissions per million inhabitants - non-ETS 2017 \uparrow 14.66 28 / 28 5.03 5.63 6.38 5.31 Malta: Luxe 3.11	embourg: 14.66
F5C Total greenhouse gas emissions per million inhabitants - of which 2017 \uparrow 9.55 28 / 28 1.85 2.04 2.27 2.02 Romania: Luxe 0.92	embourg: 9.55
F5D Total greenhouse gas emissions / /	
Urban population exposure to air pollution (NO _x emissions and concentration)2017 ↑11.207/2514.1012.7012.9012.00Finland: 4.9	Bulgaria: 23.8
F7A NH3/thousand people 2016 V 11.00 24 / 27 7.67 8.08 5.99 9.42 United Kingdom: 4.41	Ireland: 24.55
F7B NH ₃ /GDP 2016 ↑ 0.13 2 / 27 0.28 0.23 0.17 0.30 Sweden: E	Bulgaria: 1.17
F8A NMVOC emissions/ thousand people 2016 ↑ 20.34 24 / 27 14.41 13.09 10.09 14.55 Netherlands: 8.68 D	Denmark: 23.34
F8B NMVOC emissions/GDP 2016 ↑ 0.24 2 / 27 0.53 0.38 0.29 0.46 Netherlands: 0.22 0.22	Bulgaria: 1.95
F9 Environmental morbidity rate (%) 2012 0.13 5 / 28 0.14 0.13 0.13 Denmark: 0.12 F	Romania: 0.18
F10 Noise (%) 2017 V 21.60 24 / 28 17.50 26.10 15.40 16.80 Estonia: 8.2	Germany: 26.1
F11 Dangerous waste generated 2016 V 734.00 26 / 28 197.00 280.00 336.00 165.00 Romania: 32	Estonia: 7,358
Packaging waste per type of waste and waste flow 2017	_ithuania: 74.2

Continuing on next page

lable Cont	e 9 inued												
Com	inded												
F13	Organic crop area by agricultural production methods and crops (%)	2017	\uparrow	4.15	20	/	28	7.03	6.82	6.28	5.99	Austria: 23.37	Malta: 0.35
F14	Number of ISO 14001 and EMAS certifications per 100,000 inhabitants	2017	\uparrow	20.15	17	/	28	19.53	12.33	9.36	9.46	Sweden: 48.31	Poland: 7.6
F15	Number of ISO 9001 certifications per 100,000 inhabitants	2017	\downarrow	35.55	25	/	28	69.48	78.35	27.49	32.64	Italy: 161.16	Belgium: 27.49
F16	Gross fresh water abstractions per capita (cubic metres per inhabitant)	2016	\uparrow	39.91	3	/	20	110.54	72.56		82.68	Romania: 32.13	Greece: 635.63
F17	Built-up areas (%)	2015	\rightarrow	2.60	25	/	28	1.30	2.50	5.50	1.50	Finland: 0.3	Malta: 15.6
F18	Houses in "Wohnvorrangge- meinden"					/							

3.3 Competitiveness composite indicator⁹

The use of a composite indicator makes it possible to summarize the performances of a country for the set of indicators included in all three dimensions, with all the pros and cons that this implies. Often appreciated by the media, appreciating instantaneous compact information, such a composite indicator - and the country rankings which are drawn up as a result - cannot replace a more serious and detailed analysis, looking more specifically at the individual indicators and dimensions. On the contrary, a composite indicator should encourage readers to consult the underlying data¹⁰.

In comparison with the previous editions, it has to be mentioned that some modifications took place in the Competitiveness scoreboard. Consequently, those changes are also integrated in this sub-chapter:

- The indicator for the quality of the educational system (A24) from the WEF's "Global competitiveness index" has been replaced by the "Skillset of graduates" indicator (from the same publication). This change was necessary because the old indicator is no longer included in the 2018 edition of the report;
- The indicator of persons living in households with low work intensity (as a % of the population under the age of 60) (B25) has been integrated into the social dimension, so as to form a trio of indicators permitting the measurement of the fight against poverty and social exclusion within the framework of the Europe 2020 strategy, i.e. along with the indicator for at-risk-of-poverty rate after social transfers (B17) and the indicator for persons suffering from serious material deprivation (B18);
- The "Urban population exposure to air pollution / Emissions NO_x concentration" (C11) has been replaced by the indicator for exposure to air pollution by fine particles (< 2,5 µm). The old indicator no longer seems to be available.

- 9 Data used in this section were updated on: 7/10/2019
- See chapter 2 "Benchmarks and comparative competitiveness analysis".

3.3.1 Overall result

In the ODC's composite indicator calculated based on the new national system of indicators for the year 2018, Luxembourg ranked 8th among the EU-28. At the top of the ranking are Slovenia (1st), Ireland (2nd) and the Netherlands (3rd). Germany is 11th, France 14th and Belgium 17th in the overall ranking.



The countries are split into 4 performance groups, depending on their average results in terms of competitiveness.

The "competitiveness champion" group includes countries whose results in terms of competitiveness are significantly higher than the composite index for the EU in 2018 (performance above 115% of the EU composite index¹¹). This group is composed of Slovenia and Ireland.

The group of "high performance" countries includes those whose results are higher than the composite index of the EU (performance between 100% and 115% of the composite index of the EU). This group includes the Netherlands, the Czech Republic, Sweden, Austria, Finland, Luxembourg, Denmark, Estonia, Germany, the United Kingdom, Malta, France, Lithuania, Hungary, Belgium and Slovakia. The values of Sweden, Austria, Finland and Luxembourg are quite close to each other. Thus, minimal variations in only one of the individual indicators considered in the three dimensions could lead to a slight increase or decrease in the overall composite index, and so be sufficient to modify the overall ranking.

> ¹¹ The EU composite indicator is calculated in the same way as for the country indicators.

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

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



■ > 115% ■ 115% - 100% ■ 100% - 85% ■ < 85%

The rank of 8 countries in the overall ranking did not change between 2017 and 2018. Eight countries saw their rank change from one position, either in the negative or positive direction. Malta, Sweden and Denmark lost -3, -4 and -7 places respectively. Austria, Estonia, Lithuania and Slovenia went up between +3 and +6 places.

As every year, the ODC has also recalculated the general ranking of the new national system of indicators for 2005 to 2018. During this period, the country most often at the top of the ranking is Denmark.

Denmark and Slovenia

Box

Table 10

Denmark experienced a severe drop between 2017 and 2018. The decomposition of the overall classification into three different dimensions reveals that the drop was the product of poorer performance in two dimensions, i.e., the economic and social dimensions. Under the economic dimension, the country dropped by 4 places due to a downgrade in government balance (-7), inflation rate (-8) and the average annual level of variation in total factor productivity in the economy overall (in %) (-3).

Under the social dimension, Denmark lost 7 places, mainly due to the negative trend of some indicators and to the fact that compared to other States, the positions occupied by Denmark are less scattered, finding themselves between the 8th and the 18th place for most indicators.

Since 2016, Slovenia has improved greatly in this ranking. It moved up from the 9th to the 11th place in the overall classification. This is mainly due to good performance in the economic and social dimensions. Slovenia performed better than Luxembourg for 33 individual indicators.

Eco	onomic dimens	sion	S	ocial dimensio	n	Envi	ronment dimer	nsion
Indicator	Rank Slovenia	Rank Luxembourg	Indicator	Rank Slovenia	Rank Luxembourg	Indicator	Rank Slovenia	Rank Luxembourg
Overall	3	11	Overall	2	3	Overall	13	12
A1	17	2	B1	17	8	C1	17	4
A2	9	1	B2	7	27	C2	17	26
A3	22	20	В3	20	15	C3	11	4
A4	6	10	B4	6	2	C4	10	23
A5	13	4	В5	3	9	C5	17	27
A6	6	14	B6	8	24	C6	18	22
Α7	7	13	В7	4	3	C7	8	26
A8	1	11	B8	2	8	C8	2	6
Α9	15	20	В9	15	4	C9	23	10
A10	15	5	B10	2	25	C10	22	7
A11	20	3	B11	12	9	C11	19	13
A12	11	24	B12	16	1	C12	17	9
A13	13	21	B13	6	2	C13	18	3
A14	10	14	B14	15	10	C14	1	6
A15	4	27	B15	6	23	C15	10	1
A16	4	27	B16	18	1	C16	18	11
A17	16	19	B17	6	19	C17	10	8
A18	8	21	B18	10	1	C18	13	4
A19	16	28	B19	2	22	Average	13.94	11.67
A20	15	1	B20	9	8	Median	17	8.5
A21	9	16	B21	14	11			
A22	3	28	B22	20	9			
A23	9	12	B23	10	16			
A24	19	9	B24	27	18			
A25	11	7	B25	3	14			
Average	11.16	14.28	Average	10.32	11.56			
Median	11	14	Median	9	9			

During the period 2005 to 2018, Luxembourg experienced both downward and upward variations. Between 2014 and 2017 the trend is negative, and Luxembourg falls from 2nd to 8th place. In 2018, Luxembourg's position remained unchanged from the previous year.

Some more or less important changes can be seen in the country ranking over the years. When comparing the situation of 2018 to that of 2005, the greatest negative variations occurred in the ranking of Finland (-4), Italy(-4), Cyprus (-4), the United Kingdom (-5) and Denmark (-8). On the other hand, some countries considerably improved their ranking. Examples of this trend are Hungary (+6), the Czech Republic (+6), Slovenia (+7), and Ireland (+7).

Table 11 Overall rankings	from 20	105 to 20	18											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Germany	12	12	11	10	9	7	7	8	7	11	11	10	11	11
Austria	6	5	5	4	2	4	3	1	3	4	8	8	9	6
Belgium	14	14	13	12	11	10	11	11	12	13	15	16	15	17
Bulgaria	28	28	28	28	28	26	27	27	27	27	27	28	27	28
Cyprus	21	18	18	18	20	19	23	25	26	26	26	25	25	25
Croatia	20	21	21	21	21	21	21	21	21	21	21	20	18	19
Denmark	1	1	1	1	4	2	2	2	1	1	2	1	2	9
Spain	23	23	22	23	24	23	25	23	23	23	24	24	24	24
Estonia	13	13	16	16	16	18	15	13	14	15	13	12	13	10
Finland	3	4	3	2	6	5	5	4	4	5	7	6	5	7
France	11	11	12	13	12	12	12	12	10	9	12	13	14	14
Greece	26	26	26	26	25	28	28	28	28	28	28	27	28	27
Hungary	22	22	23	22	19	17	13	19	17	18	17	18	17	16
Ireland	9	10	10	15	15	15	14	16	15	10	1	4	3	2
Italy	19	19	19	19	17	16	18	20	20	20	20	21	21	23
Latvia	17	20	20	25	27	27	22	18	19	19	19	19	20	20
Lithuania	16	17	15	17	22	24	19	14	13	14	18	17	19	15
Luxembourg	5	6	4	5	3	1	1	3	2	2	4	7	8	8
Malta	15	15	17	14	13	13	16	15	16	16	14	14	10	13
Netherlands	4	3	6	3	1	6	4	5	5	6	6	2	4	3
Poland	24	24	24	20	18	20	20	22	22	22	22	22	22	21
Portugal	25	25	25	24	23	22	24	24	24	25	23	23	23	22
Romania	27	27	27	27	26	25	26	26	25	24	25	26	26	26
United Kingdom	7	8	9	9	10	8	9	10	9	12	10	11	12	12
Czech Republic	10	9	8	8	8	11	10	9	8	7	5	5	6	4
Slovakia	18	16	14	11	14	14	17	17	18	17	16	15	16	18
Slovenia	8	7	7	7	7	9	8	7	11	8	9	9	7	1
Sweden	2	2	2	6	5	3	6	6	6	3	3	3	1	5

It is worth noting that the update of the scoreboard also takes regular reviews of statistical data for the former years into account (from 2005 to 2018 for the current edition). The revisions of the national accounts by national statistics institutes in the respective Member States have had an impact on some indicators, in particular on the indicators using GDP in the denominator. In addition, the data for some indicators are published with more or less significant time gaps. This is why the results for 2017 in the composite index, published in the 2018 Report, may differ from the 2017 result of the composite index published in the 2019 edition.

3.3.2 Results for each dimension

Here, the results of the composite indices are explained by section. It is important to decompose the composite index because it can conceal important information concerning the sub-indicators.

Thus, the ODC assessed the performance of the EU Member States along three dimensions: the economic dimension, the social dimension, and the environment dimension, while calculating a composite index for each one, which summarises the underlying information.

3.3.2.1 Results for the economic dimension





■ > 115% ■ 115% - 100% ■ 100% - 85% ■ < 85%

Just as in the general result, the countries are classified into 4 groups, i.e the competitiveness champion group, the group of high-performance countries, the group of moderate performance countries and the group of modest performance countries.

The champions of the economic dimension are Ireland, Sweden, Slovenia, Estonia, the Netherlands, Finland, Germany, Denmark, the Czech Republic and Austria. Amongst others, Luxembourg, Belgium, France and the United Kingdom are in the high-performance group. The moderate performance group includes Portugal and Cyprus, as well as countries from Eastern Europe, such as Slovakia and Romania. The group of modest-performance countries is comprised of Spain, Italy and Greece.

Compared to its neighbouring countries and the Netherlands, Luxembourg ranks in the middle, in 11th place, behind the Netherlands (5th) and Germany (7th), but above Belgium (16th) and France (20th).

In this dimension, and as in the previous year, Ireland and Greece are interesting cases, with much higher and much lower values respectively than those of other countries. Ireland ranks top for five indicators, hence why it is often top of the ranking. These indicators are: the market share of world exports (A4), the real GDP growth (A7), the average annual level of variation in total factor productivity in the economy overall (A15), the nominal unit labour costs (A17) and the profitability of non-financial companies (A19). However, indicator A4 presents an outlier for Ireland. Consequently, it has been corrected, giving Ireland the second highest value. The method applied to process outliers is described in greater detail in the box concerning methodology.

Ireland has evolved greatly since 2010. Indeed, it jumped from rank 18 in 2010 to the top in 2015. Since then, Ireland has remained top of the ranking for the economic dimension. However, it is worth recalling that these results still include the spectacular increase in Irish GDP in 2015 linked to the relocation to Ireland of the activities of several major foreign economic operators.

Greece comes bottom for five indicators. These indicators are: the public debt (A1), the rate of real GDP growth (A7), the employment rate of population aged 20-64 (A13), the unemployment rate (A14) and the real labour productivity per hour worked (A16). In the ranking of the economic aspect, Greece has been in last place since 2010.

Luxembourg comes bottom twice: for the profitability of non-financial companies (A19) and the share of jobs in the medium-high and high technology manufacturing sectors (A22). On the other hand, Luxembourg comes top for the government balance (A2) and the GDP per hour worked indicator (A20).

Luxembourg's progress is rather mixed. The places occupied by the country range from 3rd in 2013 to 12th in 2017.

For the economic dimension, Hungary and Slovenia are the countries that improved the most between 2005 and 2018, gaining 8 places. On the other hand, the countries having dropped the most are the United Kingdom, Cyprus and Denmark, with a drop of 10 and 7 places respectively. Over the past year, Romania is the country that dropped the most (-8) and Lithuania that moved up the most (+9).

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



3.3.2.2 Results for the social dimension

Chart 9



For the social dimension, the champion group includes the Czech Republic, Slovenia, Luxembourg, Malta, Poland, Finland, Ireland, Austria and Lithuania. The group of high-performance countries includes Hungary, Sweden, Belgium, the Netherlands, Estonia, Denmark, Cyprus, Slovakia, Germany, France and the United Kingdom.

The moderate performance group includes Croatia, Latvia Romania and Portugal. The group of modest-performance countries includes Greece, Italy, Spain and Bulgaria.

Luxembourg ranks above its neighbours, Belgium (12th), Germany (18th) and France (19th), as well as above the Netherlands (13th). It comes top for the indicator for median income expressed in purchasing power standard (B12), net wealth per household (B16) and for the indicator for serious material deprivation (B18). It ranks second for the indicator for young people not in employment, education or training (B4) and for that of the gender wage gap (B13).

However, Luxembourg ranks near the bottom for the risk of in-work poverty indicator (B2) and for the school year repetition rate (B10).

Between 2005 and 2016, Luxembourg came top for the social dimension every year. Since 2017, it has ranked 3rd.

Bulgaria comes bottom for the social dimension, more specifically for 5 indicators, i.e., change in employment rate compared to the previous year (B7), median income variation (B11), serious material deprivation (B18), the Gini index of income inequality (B19) and for delinquency, violence or vandalism in the surrounding area (B23).

During the 2005-2018 period, Cyprus dropped the most (-13), followed by Italy and Denmark, each having suffered a drop of 11 places. The countries having gone up the ranking the most are Poland (+19), followed by the Czech Republic and Hungary (+9). Between 2017 and 2018, Hungary (+8) and Poland (+6) are the countries that improved the most. Denmark is the country having gone down the ranking the most (-7).

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

Table 13



3.3.2.3 Results for the environment dimension



No country has a performance better than the EU by 15%. Thus, no country is prominent in the environment dimension.

The group of high-performance countries includes the Netherlands, the United Kingdom, Italy, Denmark, Austria, Spain, France, Croatia, Finland, Germany, Sweden and Luxembourg.

The moderate performance group includes Slovenia, the Czech Republic, Greece, Slovakia, Latvia, Estonia, Portugal, Hungary, Ireland, Lithuania and Belgium.

In the environment dimension, the group of modest-performance countries includes Malta, Poland, Cyprus, Romania and Bulgaria.

Luxembourg (12th) ranks behind the Netherlands (1st), France (7th) and Germany (10th), but ahead of Belgium (23rd).

From the beginning, the Netherlands have come top. In 2018, the country led the ranking three times, i.e. for resource productivity (C3), total expenditure on environmental protection (C13) and for non-energetic material productivity (C18).

Except in 2009 and 2010, Bulgaria has ranked towards the bottom every year for the environment dimension since 2005. For 4 out of 18 indicators, it comes last. The indicators in question are: energy intensity (C1), greenhouse gas emission intensity (C6), and exposure to air pollution by fine particles (< $2,5 \mu m$ and < $10 \mu m$) (C10 and C11).

In terms of renewables (C5), Luxembourg ranks before-last. It is 26th for its share of crude oil and petroleum products in total household energy consumption (C2) and waste production per head (C7). However, Luxembourg comes top for the *Ecoinnovation Index* indicator (C15) and third for the indicator for total expenditure on environmental protection (C13). It comes 4th for energy intensity (C1) and for non-energetic material productivity (C18).

Luxembourg's ranking in the classification for this dimension is rather volatile, ranging between 19th place in 2006 and 7th in 2011. Since 2015, the country has been following a positive trend.

For the 2005-2018 period, Sweden, Estonia and Belgium each lost 9 places. On the other hand, during the same period, Spain, Italy and Greece gained 14, 12 and 9 places respectively. Between 2017 and 2018, Finland is the country that dropped the most (-3) and the Czech Republic is the one that went up the most (+3).

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

3.3.3 Luxembourg's development

In the overall ranking of the composite indicator of 2018 included in this latest edition of the Report, Luxembourg ranks 8th, i.e. in the same place as in 2017. When analysing this result in detail, the performance in the social dimension in 2018 was equal to that of the previous year. In the economic and environment dimensions, Luxembourg gained one and two positions respectively, compared to 2017.

In order to deepen the understanding of these "relative" rankings, it is important to determine how the position changes occurred. Was Luxembourg's performance negative, or did other countries improve more than Luxembourg? It is difficult – if not impossible – to provide a comprehensive answer to that question by taking into account only composite indicators¹². It is important to note that it is fundamental that the core data and individual indicators used be analysed in order to understand the performance of the composite indicator scores for Luxembourg. The choice of indicators requiring a more in-depth analysis is performed according to the differences in ranking between 2018 and 2017.

From a methodological viewpoint, it is important to note that this is a relative classification, which means that Luxembourg's ranking is also dependent on other countries' performance. Even if Luxembourg's performance is good (poor), other countries may have done even better (worse), thus having a negative (positive) impact on Luxembourg's final position. The classification reveals nothing of the absolute performance of a given country. On the contrary, an improved country ranking may be the result of other countries' drop in performance. This is why the ODC recommends that the classification be interpreted and analysed on the basis of data from the scoreboard, i.e. the core individual indicators.

The values of the composite indices are not comparable over time because each year (and each indicator) has its own basis values (maximum, minimum) with which the composite indices are calculated. See Box Methodology.

3.3.3.1 Performance under the economic dimension

Table Econ	omic dimension									
Indicator					Rank		Value			
			Obs	ervation	Differ-	Observation		Differ-		
			i-1	i	ence	i-1	i	ence		
A1	Public debt (% of GDP)	2018	2	2	0	23.00	21.40	-1.60		
A2	Government balance (% of GDP)	2018	4	1	3	1.40	2.40	1.00		
A3	Current account balance, $\%$ of GDP (average over 3 years) $^{\scriptscriptstyle (1)}$	2018	22	20	2	4.10	4.00	-0.10		
A4	Market share of world exports (% change over 5 years)	2018	6	10	-4	21.39	10.68	-10.71		
A5	Net international investment position (% of GDP)	2018	5	4	1	53.30	61.00	7.70		
A6	Real effective exchange rate (42 trade partners, % change over 3 years)	2018	19	14	5	-1.00	3.30	4.30		
A7	Real GDP growth (%; average over 3 years)	2018	8	13	-5	3.57	3.17	-0.40		
A8	Inflation rate [%] ^[2]	2018	1	11	-10	0.00	0.40	0.40		
A9	Time required to set up a company (days)	2018	20	21	-1	16.50	16.50	0.00		
A10	Long-term government bond yields (%)	2018	5	4	1	0.54	0.56	0.02		
A11	Regulatory capital for risk-weighted assets (%)	2018	3	3	0	25.91	25.00	-0.90		
A12	Availability of financial resources for entrepreneurs (score from 1 to 5)	2018	14	15	-1	2.46	2.44	-0.02		
A13	Employment rate of population aged 20-64 (%)	2018	17	21	-4	71.50	72.10	0.60		
A14	Unemployment rate (%)	2018	10	14	-4	5.60	5.50	-0.10		
A15	Average annual level of variation in total factor productivity in the economy overall {%}	2018	28	27	1	-1.69	-0.58	1.11		
A16	Real labour productivity per hour worked (%; average growth rate over 3 years)	2018	25	27	-2	0.57	-0.03	-0.60		
A17	Nominal unit labour costs (% change over 3 years)	2018	16	19	-3	4.00	7.90	3.90		
A18	Corporate tax rates (%)	2018	21	21	0	27.10	26.00	-1.10		
A19	Profitability of non-financial companies (%)	2016	28	28	0	6.50	6.70	0.20		
A20	GDP/hour worked (US=100)	2018	1	1	0	1.31	1.28	-0.03		
A21	Gross domestic R&D expenditure (% of GDP)	2017	13	16	-3	1.30	1.26	-0.04		
A22	Share of jobs in medium-high and high-tech manufacturing sectors (% of total jobs)	2018	28	28	0	0.60	0.60	0.00		
A23	Entrepreneurial intentions (%)	2018	8	6	2	10.98	14.70	3.72		
A24	Skillset of graduates (average score; 1 to 7)	2018	10	9	1	4.77	5.01	0.24		
A25	Life-long learning as a % of the population aged 25-64	2018	6	7	-1	17.20	18.00	0.80		

The comparison of the result of the economic dimension of 2017 and 2018 shows that in 2018, Luxembourg ranked better compared to the Member States of the European Union than in 2017. However, this does not reveal anything about the evolution of the indicator values.

The indicators with the greatest variations between 2017 and 2018 are, among others, A2, A3, A6, A7, A8, A13 and A14 with differences ranging between +5 [A6] and -10 (A8] positions from one year to the next. Changes alone do not indicate whether indicator values have increased, decreased or remained stable.

a) Government balance (% of GDP) (A2)

Between 2017 and 2018, the government balance increased by one percentage point, reaching 2.40% of GDP in 2018. This led Luxembourg to move from the 4th place to the top. All its neighbouring countries have undergone a positive trend in value. France and Germany moved up the classification and Belgium moved down. The Netherlands improved both their position and figures.

b) Current account balance, % of GDP (average over 3 years) (A3)

The current account balance dropped slightly, by 0.1 percentage points. Consequently, Luxembourg moved up 2 places in 2018. The balance and position of Belgium deteriorated, whereas Germany's improved and both France's and the Netherlands' remained quite stable.

c) Real effective exchange rate (42 trade partners, % change over 3 years) (A6)

The real effective exchange rate dropped by 4.3 percentage points between 2017 and 2018. Luxembourg, however, moved up five places, from the 19th to the 14th position, due to weaker results for other EU Member States. Most of their performance levels were negative in both terms of value and position, including Luxembourg's neighbours. The Netherlands, like Luxembourg, moved up the classification even if their rate worsened. They remain above Luxembourg. France, Belgium and Germany find themselves lower down in the classification.

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

The real GDP growth rate dropped from 3.57% in 2017 to 3.17% in 2018. Consequently, Luxembourg ranked 13th, whereas it came 8th in 2017. The Netherlands, with an improvement in the rate between 2017 and 2018, ranked 18th.

The rate for Germany remained stable, while that in Belgium fell slightly. In position, both countries move back one rank. On the other hand, France's rate and position were increasing. However, Luxembourg remained ahead of Germany, Belgium, France and the Netherlands.

e) Inflation rate (%) (A8)

The difference between the Luxembourgish inflation rate and that of the EU widened by 0.4 percentage points. Thus, Luxembourg lost 10 places between 2017 and 2018 and ranked 12th.

Germany remains top, with a rate that did not change compared to the previous year. Both of Luxembourg's other neighbouring countries and the Netherlands came closer to closing the gap between their rates and that of the EU, thus going up the ranking and overtaking Luxembourg.

f) Employment rate of population aged 20-64 (%) (A13)

Luxembourg lost 4 places between 2017 and 2018 and ranked 21st. At the same time, the rate improved very slightly, by 0.6 percentage points. Germany ranks 2nd, the Netherlands 5th, Belgium 18th and France 22nd.
g) Unemployment rate (%) (A14)

The slight decrease in unemployment in Luxembourg compared to the other Member States was insufficient to allow the country to remain at the same rank as before. Thus, Luxembourg lost 4 places between 2017 and 2018. All its neighbouring countries saw their unemployment rates drop more than Luxembourg. Whereas Germany's ranking remains unchanged, the Netherlands' and Belgium's both improved and France's deteriorated.

3.3.3.2 Performance under the social dimension

Table Socia	16 I dimension								
		Year			Rank				
Indic	ator	i	Obse	rvation	Differ-	Obse	ervation	Differ-	
			i-1	i	ence	i-1	i	ence	
B1	Long-term unemployment rate (%)	2018	13	8	5	2.10	1.40	-0.70	
B2	Risk of in-work poverty (%)	2018	27	24	3	13.70	13.50	-0.20	
B3	Proportion of employees with fixed-term contracts (%)	2018	10	15	-5	7.60	8.50	0.90	
Β4	Young people not in employment, education or training (NEET) {%}	2018	2	2	0	5.90	5.30	-0.60	
B5	Involuntary part-time work (%)	2018	9	9	0	13.60	12.80	-0.80	
B6	Employees with involuntary long hours	2015		24	-		35.00	-	
B7	Change in employment rate compared to the previous year (%)	2018	3	3	0	3.40	3.70	0.30	
B8	Individuals having prematurely left education and training	2018	9	8	1	7.30	6.30	-1.00	
B9	Level of higher education amongst 30 to 34-year-olds	2018	4	4	0	52.70	56.20	3.50	
B10	School year repetition rate (%)	2015	26	25	1	34.50	30.90	-3.60	
B11	Median income (% change from previous year)	2018	6	4	2	6.68	11.63	4.95	
B12	Median income expressed in purchasing power standard	2018	1	1	0	29.341	31.995	2,654.00	
B13	Gender wage gap (%)	2017	3	2	1	5.50	5.00	-0.50	
B14	Wage changes (%) in the economy (real ULC), over 3 years	2018	6	10	-4	1.43	1.04	-0.39	
B15	Household debt (consolidated) (%)	2018	22	23	-1	66.10	66.10	0.00	
B16	Net wealth per household (in EUR k)	2016	1	1	0	710.10	768.40	58.30	
B17	At-risk-of-poverty rate after social transfers (%)	2018	19	16	3	18.70	18.30	-0.40	
B18	Serious material deprivation rate (%)	2018	2	1	1	1.20	1.30	0.10	
B19	Gini index of income inequality (0 to 100)	2018	18	19	-1	30.90	33.20	2.30	
B20	Effectiveness of social transfers (difference between the at-risk-of-poverty rate before and after social transfers) in percentage points	2018	8	8	0	28.30	27.70	-0.60	
B21	Individuals living in over-crowded accommodation (% of the total population)	2018	11	9	2	8.30	8.40	0.10	
B22	Housing cost burden over 25% of disposable household income (owners and tenants) [%]	2018	9	9	0	21.63	21.45	-0.18	
B23	Delinquency, violence or vandalism in the surrounding area (%)	2018	18	14	4	12.00	11.30	-0.70	
B24	Healthy life expectancy (years)	2017	17	18	-1	60.15	59.10	-1.05	
B25	Persons living in households with low work intensity (as a % of the population under the age of 60)	2018	7	13	-6	6.90	8.30	1.40	

The comparison of the result of the social dimension of 2017 and 2018 shows that Luxembourg remained in the champion group. However, Luxembourg's rating is lower, which shows that, compared to the Member States of the European Union, Luxembourg's performance deteriorated slightly.

Indicators B1, B3, B14, B17 and B25 show the greatest variations between 2017 and 2018 with differences ranging between -6 (B25) and +5 (B1) positions. Again, changes in position do not indicate whether indicator values have increased, decreased or remained stable.

a) Long-term unemployment rate (%) (B1)

Between 2017 and 2018, the long-term unemployment rate in Luxembourg diminished by 0.7 percentage points. This explains why Luxembourg came 8th in 2018, compared to 13th in 2017.

For Germany, the Netherlands, Belgium and France, the indicator improved. However, not all these countries enjoyed the same progress in terms of ranking. France and Germany lost 3 and 2 places respectively, whereas the Netherlands gained 2 and Belgium gained 1.

b) Proportion of employees with fixed-term contracts (%) (B3)

In Luxembourg, the proportion of salaried workers with fixed-term contracts increased by 0.9 percentage points between 2017 and 2018. In 2018, Luxembourg's position dropped by 5 places compared to 2017.

For the Netherlands, Germany and France, the indicator improved. Belgium deteriorated somewhat with an increase of 0.1 percentage points. On the other hand, the Netherlands, Belgium and Germany remained in the same position, whereas France lost one place compared to 2017.

c) Wage changes (%) in the economy (real ULC), over 3 years (B14)

The indicator for real unit labour costs in the Luxembourgish economy decreased by 0.39 percentage points, and the country lost 4 positions in the ranking.

The indicator values for France, the Netherlands, Germany and Belgium improved. Both Belgium and the Netherlands went up one place. Even if its indicator value improved, France lost 3 positions and Germany remains at the same rank.

d) At-risk-of-poverty rate after social transfers (%) (B17)

The indicator for at-risk of poverty rate after social transfers for Luxembourg decreased by 0.4 percentage points between 2017 and 2018, from 18.7% to 18.3%. Luxembourg gained 3 ranks and was in 16th place in 2018.

The indicator values for the Netherlands, Belgium and France deteriorated. Germany's improved. The evolution of the positions is the opposite, i.e. Germany lost one position and the other 3 improved by 2 (France) and 1 (Belgium and the Netherlands) positions.

e) Persons living in households with low work intensity (B25)

In Luxembourg, the rate of persons living in a very low-work intensity household increased by 1.4 percentage points and the country lost 6 places in the ranking. For Belgium, Germany, France and the Netherlands, the indicator improved. Consequently, Belgium and Germany gained 2 places, France gained 1 and the Netherlands 3.

3.3.3.3 Performance under the environment dimension

Table Envir	17 onment dimension									
		Year			Position	Value				
Indic	ator	i	Obse	rvation	Differ-	Obse	Differ-			
			i-1	i	ence	i-1	i	ence		
C1	Energy intensity (energy consumption per GDP unit) (kilograms of oil equivalents per EUR)	2016	4	4	0	90.29	86.69	-3.60		
C2	Share of crude oil and petroleum products in total household energy consumption (%)	2016	26	26	0	34.60	33.80	-0.80		
C3	Resource productivity (EUR (PPS) per kilogram)	2018	4	3	1	3.25	3.30	0.05		
C4	Domestic raw material consumption (RMC) (in tonnes per head)	2018	23	23	0	23.41	24.08	0.67		
C5	Renewable energy share (% of national 2020 target)	2017	27	27	0	49.45	58.00	8.55		
C6	Greenhouse gas emission intensity (index 100 in 2000)	2017	23	22	1	92.90	91.50	-1.40		
C7	Waste production per head (kilograms per person)	2016	24	26	-2	12.713	17.405	4,692.00		
C8	Municipal waste recycling rate (%)	2017	7	6	1	48.20	48.30	0.10		
C9	E-waste recycling rate (%)	2016	11	11	0	42.50	45.60	3.10		
C10	Exposure to air pollution by fine particles (< 2,5 µm)	2017	14	7	7	13.40	11.20	-2.20		
C11	Exposure to air pollution by fine particles (< 10 μ m)	2017	13	13	0	20.50	20.30	-0.20		
C12	Biochemical oxygen demand in rivers (mg O2/l)	2015	9	9	0	1.88	1.88	0.00		
C13	Total expenditure on environmental protection (% of GDP)	2017	7	3	4	0.80	1.00	0.20		
C14	Land protected (%)	2018	6	6	0	27.00	27.00	0.00		
C15	Ecoinnovation Index (EU index 100)	2018	3	1	2	139.00	138.00	-1.00		
C16	Greening (% of GDP)	2016	15	13	2	4.42	5.20	0.78		
C17	Number of green jobs (% of total jobs)	2016	10	8	2	2.38	2.68	0.30		
C18	Non-energetic material productivity (EUR per kilogram)	2018	4	4	0	4.26	4.38	0.13		

The comparison of the result of the environment dimension shows that most positions are stable.

For indicators C1, C2, C5, C9, C11 and C18, Luxembourg remained stable in the ranking while the indicator improved.

In general, this category has fewer year-to-year changes than the other two dimensions. In addition, the availability of data varies greatly between the indicators (2015 and 2018). However, the indicators are updated regularly, and it is therefore interesting to monitor their evolution.

a) Waste production per head (kilograms per person) (C7)

Waste production per head increased by approximately 4,700 kg per person between 2014 and 2016. Consequently, Luxembourg dropped by 2 places compared to 2014, coming 26th.

The indicator increased for Belgium, Germany and the Netherlands. France's decreased. Belgium's and the Netherlands' positions did not change, but Germany's went down and France's went up.

b) Exposure to air pollution by fine particles (< 2,5 µm) (C10)

Exposure to air pollution by fine particles smaller than $2.5 \,\mu$ m diminished by $2.2 \,\mu$ m/m³. This led to an improvement of 7 places, putting Luxembourg in the 7th position in 2017. Please note that this indicator is rather volatile.

The values for Belgium, Germany and France improved. Belgium and the Netherlands remained in the same positions, whereas Germany went down one place and France went up one.

c) Total expenditure on environmental protection (% of GDP) (C13)

Total expenditure on environmental protection in Luxembourg increased by 0.2 percentage points between 2016 and 2017. In 2017, it represented 1% of GDP. In 2017, Luxembourg came 3rd, going up 4 places compared to the previous year. The figures for the neighbouring countries and the Netherlands did not change. Germany is the only country out of the 4 that went down (-2). The others remain stable.

3.3.4 Methodology

3.3.4.1 Calculation method

The methodology for calculating the composite indicator based on the new national system of indicators remains unchanged compared to previous editions. Please see below for a reminder of the calculation methodology.

Box Methodology

The methodology for calculating the Indicators to be maximised: composite indicator is not different from the one used in the former national scoreboard and we take the recommendations made by the audit into account (2010 Competitiveness Report, Perspectives économiques No. 15).

In order to address the problem of missing values, the "hot-deck imputation" method is used. The idea is to estimate a country's missing values based on the values of a country that shows a similar The inflation indicators and those of the performance for the other indicators in current account balance are not maximthe same dimension.

For some indicators, there are outliers¹³. This means there is a country that has a value significantly higher or lower than all other countries. As these indicators are likely to influence the result too much, extreme values were replaced by the value of the country in second position.

To calculate the composite indicator, the core indicators must be standardised first. This means that if it is an indicator that must be maximised, the country with the highest value scores 1, the one with the lowest value scores 0, and the remaining countries are awarded a score The final composite indicator CI is between 0 and 1. The same method applies if an indicator must be minimised, but the other way around. Each indicator i is transformed by means of the following formula per country j at time t.

$$y_{ij}^t = \frac{x_{ij}^t - min_j x_{ij}^t}{max_j x_{ij}^t - min_j x_{ij}^t}$$

Indicators to be minimised:

$$y_{ij}^t = \frac{x_{ij}^t - max_j x_{ij}^t}{min_j x_{ij}^t - max_j x_{ij}^t}$$

ised or minimised. They are evaluated according to how far removed from a defined value they are: for the inflation indicator, this value is the average of the European Union, and for the indicator for the current account balance, it is the average of -4% and $+6\%^{14}$.

The composite indicator C – also called composite indicator - for an aspect k (k = 1, 2, 3) at time t is calculated through a simple arithmetic mean of the subindicators of this aspect in the new scale:

$$C_{k,j}^{t} = \frac{1}{m_k} \sum_{i=1}^{m_k} y_{ij}^{t}$$

achieved by a simple arithmetic mean of these composite indicators by dimension:

$$CI_j^t = \frac{1}{k} \sum_{i=1}^k C_{k,j}^t$$

- ¹³ Technically, these indicators have been identified by the fact they have a very high skewness and kurtosis (skewness > 2 and kurtosis >7).
- For this indicator, the European Commission has agreed under the MIP that a country is potentially at risk if it has a current account balance with either a deficit higher than -4% of GDP or a surplus of over +6% of GDP.

3.3.4.2 Dealing with outliers

The min-max method (see box Methodology) is usually sensitive to outliers. If these are not processed correctly, they can become unintentional reference points. Moreover, outliers can have a significant impact on the correlation structure and thereby introduce bias into the interpretation of results. While there are numerous suitable methods for detecting outliers, in the context of strengthening composite indicators it seems particularly appropriate to use a combination of skewness and kurtosis. A skewness value of more than 2 with a kurtosis value of more than 7 (in absolute terms) was used to detect problematic indicators which need to be processed before generating the composite indicator. In the 2010 JRC audit, the recommended values for detecting outliers were 1 for skewness and 3.5 for kurtosis; however, the ODC applies a broader range to keep data processing to a minimum.

There were three indicators for 2018 which were considered problematic from this point of view: the market share of world exports (A4), the long-term unemployment rate (B1) and the housing cost burden over 25% of disposable household income (B22). Ireland's value is considered an outlier for the indicator Market share of world exports (A4). Greece is an outlier for two indicators: for the indicator relative to the long-term unemployment rate (B1) and for the housing cost burden over 25% of disposable household income (B22).



In accordance with the advocated methodology, the outliers are replaced by the next best value. For indicator A4, the value for Ireland (77.4%) was replaced by that of Poland (25.8%). For indicators B1 and B22, the values for Greece (13.6% and 74.6%) were replaced by those of Spain (7.7%) and Denmark (6.4% and 42.4%).

3.3.5 Robustness analysis

In their opinion paper on the national system of indicators, the ESC announced that a statistical robustness test should be carried out to assess data availability and reliability. Such a test is vital to ensure the quality of the indicators system and better understand Luxembourg's competitiveness and how this interacts with specific national characteristics. The analyses below were mainly inspired by the European Commission Joint Research Centre (JRC)¹⁵ audit commissioned by the ODC in 2010 pertaining to the former version of the national competitiveness scoreboard¹⁶.

3.3.5.1 The composite indicator stress test

The ODC carried out a stress test on its composite indicator based on the new system of indicators. The test consists in recalculating the overall rankings with one of the 68 indicators excluded from the calculation each time.

The table below reveals that Luxembourg varied between 3rd and 9th place depending on the different scenarios. It is most likely that Luxembourg should be located in 8th position. The table also shows that it is rather unlikely that Luxembourg should be in 3rd or 4th place. The overall results also show that the results for the 5th to 8th places are very close, thus confirming this outcome.

There is a certain level of volatility, but it remains acceptable, and can be considered solid. The table reveals the existence of a cluster of countries (Sweden (5th) to Luxembourg (8th)) that are very close to one another, and for which the exclusion of this indicator could have a severe impact.

Perspectives de politique économique No. 15: The Luxembourg Competitiveness Index: Analysis & Recommendations: https://odc.gouvernement.lu/ fr/publications/rapport-etudeanalyse/perspectives-politique-economique/perspectives-politique-economique-15. html

¹⁵ For more details: http:// composite-indicators.jrc. ec.europa.eu/

Table 18 Stress test																													
Country	Average of alternative scenarios	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Slovenia	1.18	85	13		1																								
Ireland	2.06	15	68	15	3																								
Netherlands	3.47		12	49	34		1	1	3																				
Czech Republic	3.81		6	31	49	9	3	3																					
Sweden	5.88			3	3	38	26	19	9	1																			
Austria	6.41					26	29	24	18	3																			
Finland	6.63		1	1	4	12	22	28	26	4																			
Luxembourg	6.93			1	6	13	16	19	29	15																			
Denmark	8.63					1	1	6	15	76																			
Estonia	10.22										85	7	7																
Germany	11.10										12	72	10	6															
United Kingdom	11.96										1	15	71	13															
Malta	12.76										1	6	12	78	1	1													
France	14.63														51	34	15												
Lithuania	14.63													3	40	49	9												
Hungary	15.74														7	16	72	4											
Belgium	17.34																4	68	18	10									
Slovakia	17.96																	26	53	19	1								
Croatia	18.74																	1	28	66	4								
Latvia	20.01																		1	4	85	9							
Poland	20.91																				9	91							
Portugal	22.04																						96	4					
Italy	22.99																						4	93	3				
Spain	23.99																							3	96	1			
Cyprus	24.99																								1	99			
Romania	26.03																										97	3	
Greece	27.47																										1	50	49
Bulgaria	27.50																										1	47	51

Source: Observatoire de la compétitivité



3.3.5.2 Correlation between the three dimensions and the composite indicator

The Pearson correlations, calculated by ODC, suggest that the dimensions are positively and significantly linked to one another and the overall index.

	Economic dimension	Social dimension	Environment dimension	Composite indicator
Economic dimension	1.00	0.70	0.16	0.85
Social dimension	0.70	1.00	0.08	0.82
Environment dimension	0.16	0.08	1.00	0.54
Composite indicator	0.85	0.82	0.54	1.00

3.3.5.3 Correlation between dimension result and underlying indicators¹⁷

The aim of each indicator under a given dimension is to correlate positively with the overall dimension result. For each dimension, however, there is at least one indicator which is pointing in the wrong direction. If an indicator is maximised, the higher the value of the indicator, the higher the final score of the composite indicator. If an indicator is minimised, the lower the value of the indicator, the lower the final score of the composite indicator. In the opposite cases, the final score of the composite indicator is weaker. This logic is not always respected, however. It is the case when an indicator that must be minimised has a positive correlation with the overall result or, on the contrary, when an indicator that must be maximised has a negative correlation with the overall result.

Moreover, causality – i.e. the fact that the final score of a composite indicator or the score of a dimension results from a good performance in the underlying indicators or vice versa – cannot be determined.

The results for 2018 show that there is only one indicator that points in the wrong direction and is significant ($R^2 \ge 0.05$). This is the Land protected (%) indicator (C14).



¹⁷ Note: the green dot represents Luxembourg's value. Specifically, this means that it is the States with large protected surfaces that obtain bad results for the other indicators here, and that an increase in protected surfaces goes hand-in-hand with a drop in score for the environment dimension.

Tables 19, 20 and 21 Overview of intra-dimension correlations in 2018 (significant or not)								
Econor	nic dimension	Soc	ial dimension	Environment dimensio				
Indicator	Correlation	Indicator	Correlation	Indicator	Correlation			
A3	-0.10	В6	-0.22	C14	-0.31			
A4	-0.01	B24	-0.14	C5	-0.02			
A6	-0.01	B13	-0.08	C7	0.08			
A23	0.01	B15	-0.08	C2	0.11			
A17	0.06	B14	-0.04	C17	0.12			
A15	0.09	В3	0.09	C4	0.19			
A22	0.19	B11	0.09	C9	0.22			
A18	0.19	B10	0.13	C16	0.22			
A9	0.20	B20	0.13	C13	0.28			
A16	0.23	B22	0.24	C6	0.31			
A8	0.24	B16	0.29	C12	0.31			
A7	0.33	B23	0.35	C8	0.48			
A19	0.38	B25	0.36	C1	0.50			
A5	0.38	В9	0.40	C11	0.50			
A2	0.39	B21	0.42	C10	0.52			
A21	0.42	B8	0.44	C18	0.52			
A24	0.46	B7	0.45	С3	0.59			
A20	0.46	B12	0.46	C15	0.76			
A25	0.54	B2	0.56	C4	0.64			
A12	0.58	B17	0.60	C16	0.69			
A11	0.59	B19	0.64					
A1	0.66	B18	0.68					
A10	0.68	B1	0.74					
A14	0.71	B4	0.74					
A13	0.77	B5	0.80					

Note: These tables show the intra-dimension correlations by using standardised values between 0 and 1. All negative correlations show that the indicator in question has an insignificant effect on the composite indicator of the dimension when the correlation is very close to 0, or is incoherent.

4 Luxembourg in the European semester

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This chapter is monitoring Luxembourg's indicators and targets within the framework of the European Union strategy for growth and jobs (Europe 2020 strategy) and the macroeconomic imbalance procedure¹. These two pillars of the European economic governance were implemented by the 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 policies².

This chapter focuses mainly on Luxembourg performances and national targets. Consequently, it doesn't aim to assess indicators and objectives at EU level.

4.1 Thematic coordination of structural policies

4.1.1 Implementation of thematic coordination under the Europe 2020 strategy

The Europe 2020 strategy³, which is a central element of the EU's response to the global economic crisis, has been designed to update and replace the Lisbon strategy⁴ that 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 strategy⁵. 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 which will guide its implementation, as well as provisions to improve monitoring. The European Council agreed on a series of elements⁶. The June European Council⁷ finally completed the development of the new Europe 2020 strategy.

However, the analysis of the situation of Luxembourg in the coordination of budgetary policies (SGP) is not the subject of this section. With regards to the economic policy measures implemented by Luxembourg to achieve the objectives of the Europe 2020 strategy, reference is made to the NRP submitted in April 2019 by the government to the European Commission within the framework of the European Semester.

- For additional details: http://eur-lex.europa.eu/Lex-UriServ/LexUriServ.do?uri=OJ: L:2011:306:0012:0024:FR:PDF
- For additional information: https://ec.europa.eu/info/ business-economy-euro/ economic-and-fiscal-policycoordination/eu-economicgovernance-monitoringprevention-correction/ european-semester_en
- ⁴ For additional information: http://ec.europa.eu/archives/ growthandjobs 2009/
- ⁵ EUROPEAN COMMISSION, EUROPE 2020 – Une stratégie pour une croissance intelligente, durable et inclusive, COM(2010) 2020, Brussels, 3.3.2010
- ⁶ EUROPEAN COUNCIL, Conclusions, Brussels, March 2010 For additional information: http://www.consilium.europa. eu/uedocs/cms_data/docs/ pressdata/fr/ec/113602.pdf
- ⁷ EUROPEAN COUNCIL, Conclusions, Brussels, June 2010 For additional information: http://www.consilium.europa. eu/uedocs/cms_data/docs/ pressdata/fr/ec/115348.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 taking 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 dropout 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 review⁸ 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.

For additional details: http://ec.europa.eu/transparency/regdoc/rep/1/2014/EN/1-2014-130-EN-F2-1.Pdf Now, in 2019, this ten-year strategy launched in 2010 is only one year away from its maturity date. The new European Commission that will take 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. The programme and policy guidelines for the upcoming European Commission (2019-2024) as put forward by the candidate to its Presidency, Ursula von der Leyen, promises to "refocus the European Semester into an instrument that integrates the United Nations Sustainable Development Goals" (July 2019)⁹. As a result, in the coming years, one can expect the new strategy to align itself more with the Sustainable Development Goals for 2030 ("Agenda 2030") that were adopted by world leaders in 2015 at a United Nations summit and entered into force on 1 January 2016. Countries will have to take action to end all forms of poverty, fight inequalities and climate change¹⁰. Eurostat allows monitoring the progress made in the EU context by means of a set of indicators¹¹.

4.1.2 Priorities, objectives and indicators

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

- Three mutually reinforcing priorities: 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 the progress in achieving the objectives¹²: 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 sources in final energy consumption, energy efficiency, employment rate for women and men aged 20-64, risk of poverty, material deprivation and jobless households.
- For additional details: https://ec.europa.eu/commission/sites/beta-political/files/ political-guidelines-next-commission_fr.pdf
- For additional details: https://www.un.org/sustainabledevelopment/fr/development-agenda/
- ¹ For additional details: https://ec.europa.eu/eurostat/ web/sdi/overview
- ¹² For additional details: https://ec.europa.eu/eurostat/ statistics-explained/index.php/ Europe_2020_indicators_-_ background



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 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 it had been originally done in the context of 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 specificities of each Member State, in dialogue with the European Commission.

Table 1 National targets set by Luxembourg, 2019 NRP

		European objective 2020	Luxembourg national target 2020
Priority 1 "smart growth"	Objective 1	"[] raising combined public and private investment levels to 3% "	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 who graduated from higher education or reached an equivalent level to at least 40% "	66% ^b
Priority 2 "sustainable growth"	Objective 3	"() reducing greenhouse gas emissions by 20% ()"	reducing non-ETS greenhouse gas emissions by -20% compared to 2005 (emissions of approximately 8,117 Mt CO ₂ in 2020) ^c
		"() increasing the share of renewable energy sources in final energy consumption to 20% "	11% °
		"() moving towards a 20% increase in energy efficiency"	final energy consumption 49,292 GWh, being 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 people by 2020 ^d

Sources: European Council, Eurostat

^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 (national resident population) 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 foreigner 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 indigenous people than among non-indigenous people.

^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 emissions 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%.

European objectives can only be achieved if, on the one hand the sum of national targets leads to the fulfilment of European objectives and on the other hand, the first condition being fulfilled, if each Member State meets its national commitments for 2020. This type of governance therefore includes a de facto system of "peer pressure", which should ensure that countries that do not adequately implement their national commitments are called to order by their peers as they may cause the failure of major European objectives, and therefore also the efforts of those countries that have fulfilled their commitments. In this context, reference is made to Luxembourg 2019 NRP¹³ within the European semester for the measures implemented by the government in the context of the Europe 2020 strategy.

> For additional details: https://odc.gouvernement.lu/ dam-assets/publications/ rapport-etude-analyse/ programme-nationalde-reforme/2019-pnrluxembourg-2020/2019pnr-luxembourg-2020-fr.pdf

Eurostat publishes periodically monitoring indicators for each Member State in order to be able to annually take stock of the state and determine if performances are going in the right direction. The following pages will analyse the updated indicators for Luxembourg and a descriptive overview¹⁴ will be presented based on last available data¹⁵ before the expiry of the strategy in 2020, and awaiting the follow-up to the Europe 2020 strategy by the new European Commission, which will take office at the end of 2019. 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 in 2020, as data for the year 2020 itself will only be available in the 2-3 years following the expiry of the strategy.

Table 2 Availability of annual data for Luxembourg on 1.7.2019							
	Europe 2020 Indicator	Last year available					
Priority 1	Gross domestic expenditure on R&D (GERD)	2017					
	Young people having left education and training prematurely, by gender	2018					
	Level of higher education graduates by gender in the age group 30-34	2018					
Priority 2	Greenhouse gas emissions in the sectors included in the effort sharing decision (ESD)	2017					
	Share of renewable energy in gross final energy consumption	2017					
	Energy consumption	2017					
Priority 3	People at risk of poverty or social exclusion	2018					
	Unemployment rate in the age group 20-64	2018					
Source: Eu	rostat						

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.

¹⁴ 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.

¹⁵ Downloaded on 1 July 2019.

The average R&D expenditure rate for EU countries in 2017 was 2.06%. With a rate of 1.26% in 2017, Luxembourg therefore falls short of the EU average for R&D expenditure.



Luxembourg is one of a group of Member States whose private company level expenditure on R&D is much lower than the EU-28 average. However, as the European Commission recorded 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 activities¹⁶: *"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 Non-financial 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%)."*

> ¹⁶ For additional details: https://ec.europa.eu/info/sites/ info/files/2018-europeansemester-country-reportluxembourg-fr.pdf

However, Luxembourg public R&D expenditure is 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 expenditure¹⁷, 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 46% at present (of which public research represents 26% and higher education 20%). R&D activities carried out by companies in the private sector therefore currently still account for just over 50% of total expenditure¹⁸.

As part of its NRP, Luxembourg set a national target to be achieved in 2020 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. In 2017 Luxembourg is still far from achieving its national target for 2020, as well as being significantly below the upward trend which necessary to achieve this national target.



Source: Eurostat, 2019 NRP

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 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%

- 17 The R&D expenditure (in millions of euros) of companies with commercial economic activity employing at least 10 people.
- 18 For additional details: http://ec.europa.eu/eurostat/ statistics-explained/index.php/ Europe_2020_indicators_ _R%26D_and_innovation
- 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 the domestic R&D expenditure (in % 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 over the past decades. However, if GDP grows faster than domestic R&D expenditure, the R&D expenditure indicator in % of GDP (ratio) automatically drops.

By means of this analysis, one can see that the two curves have evolved in quite similar fashions between 2003 and 2009. As a consequence, the ratio for R&D expenditure in % 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 40.1 billion EUR in 2010 to 55.2 billion EUR in 2017). Domestic R&D expenditure (total) also rose (603.7 million EUR in 2010 to 694.6 million EUR in 2017): the public sector spent much more in this area, compensating largely for a small drop in expenditure in the business sector. The gap between these two variables grew mainly between 2010 and 2012, where the two curves evolved very differently. To conclude, the increase in R&D expenditure did not lead an improvement for this indicator, and the ratio of R&D expenditure in % of GDP stagnated at about 1.3% of GDP between 2012 and 2017.



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, two objectives are 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 cyclic fluctuations.

a.2.1 Early school leavers

The EU-28 average for early school leavers 20,21 is 10.6% in 2018. Luxembourg's average score is 6.3% at national level.



The breakdown by gender shows that this rate is 6.8% for men and 5.9% for women in Luxembourg. As regards the distribution according to the employment status of the early school leavers, the rate is 3.4% for those who are in employment and 2.9% for those who are unemployed but want to work²²: in Luxembourg, there are therefore more school early school leavers with a job than those who are unemployed and want to work.

- 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.
- For additional details: http://ec.europa.eu/eurostat/ statistics-explained/index.php/ Europe_2020_indicators_-_ education
- 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 calculated by Eurostat result from the Labour Force Survey (LFS)²³ and are prone to yearly variations for Luxembourg, due to the limited size of the survey sample for small country such as Luxembourg. The Ministry of National Education (MENEJ) in Luxembourg has therefore set up its own national survey on early school leaving²⁴, 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. According to Eurostat, Luxembourg is therefore under its national target. However, according to MENEJ national statistics, Luxembourg exceeds the threshold.



Sources: Eurostat, Ministry of National Education, Childhood and Youth (MENEJ) Definition: The MENEJ's notion of "early school leavers" refers to young people who permanently left school without a diploma and who joined the labour market, benefiting from a professional integration measure or not having a specific occupation. It also includes young people who, after an initial leaving, have re-registered in a school, and then left again during the same period of observation, and for whose any additional information on their current situation is not available

- For additional details: http://ec.europa.eu/eurostat/ statistics-explained/index.php/ Early_leavers_from_education_and_training
- For additional details: http://www.men.public.lu/fr/ actualites/publications/secondaire/statistiques-analyses/ decrochage-scolaire/index. html

http://www.men.public.lu/fr/ actualites/grands-dossiers/ enseignement-secondaire/ decrochage/index.html

a.2.2 Share of higher education graduates

In 2018, the percentage of the population aged 30-34 with a higher education qualification was 40.7% for the EU-28. With a rate of 56.2% in 2018, Luxembourg is one of the best-performing Member States in this regard²⁵.



The overall EU objective is to achieve a rate of 40% of people aged 30-34 graduated in higher education by 2020. Luxembourg 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 close to 56.2% in 2018. More in detail, the rate of individuals having obtained a higher-education diploma is currently 52.5% for men and 59.8% for women. Luxembourg thus already exceeds by now the European objective but is still below its national target although it shows a positive mid- and long-term trend.

As the indicator for early school leaving, this indicator results from the Labour Force Survey (LFS). It is not fully 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 neither capture 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).

²⁵ For additional details: http://ec.europa.eu/eurostat/ statistics-explained/index.php/ Europe_2020_indicators_-_ education



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 national target set for 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 emissions reduction targets and the share of renewable energy in the total energy consumption are legally binding^{27,28}.

b.1.1 Greenhouse gas emissions

In the 2013-2020 post-Kyoto period, only the non-EU emission trading scheme (EU ETS) sectors have objectives which are set at Member State level. In Luxembourg, the 2020 target for non-EU ETS emissions is a 20% reduction on the 2005 reference level. This target is to be achieved 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 emission allocations. In 2020, non-EU ETS emissions will be limited to 8,12 Mt CO₂.

- ²⁶ 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.
- ²⁷ See EU Directive 2006/32/CE. The reduction in energy consumption is a policy objective endorsed by the Member States in their Energy efficiency action plan.
- ²⁸ For additional details: http://ec.europa.eu/eurostat/ statistics-explained/index.php/ Europe_2020_indicators_-_climate_change_and_energy

According to the forecast sent by Luxembourg to the European Commission, featured in the 2019 NRP, the government predicts that, for the 2013-2020 period, it could generate an emission surplus of around 0.44 Mt CO₂ equivalent (CO₂e) in the central "with existing measures" scenario. Under this scenario, the use of external credits should no longer be necessary. However, surplus or 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.



b.1.2 Share of renewable energy in energy consumption

In 2017, the share of renewable energies in gross final energy consumption accounted for an average of 17.5% among the EU-28. Luxembourg's rate was 6.4%, placing it at the bottom of the EU ranking.



As an objective, the EU has set the share of renewable energy to 20% by 2020. In this context, Luxembourg has set an overall target of 11% share of renewable energy in final energy consumption, with a series of interim targets. With regard of the fulfilment of its commitment, Luxembourg is currently halfway and close to the projected interim development but will have to make significant efforts in the coming years to achieve its 2020 national target.



Source: Eurostat, 2019 NRP

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

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 practical 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 remained unchanged, and based on economic predictions 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 oil equivalent³⁰ in order to assess the progress made in energy efficiency at national level.

- 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 transpar ency platform.
- Definition: The term "primary energy consumption" means gross inland consumption with the exception of any non-energy use of energy products (e.g. natural gas used not for combustion but for the production of chemicals). This quantity is relevant to measure the actual energy consumption. "Percentage of savings" is calculated using 2005 values and their forecasts for 2020. The Europe 2020 target will be achieved when this value reaches the level of 20%.

It is worth noting that the economic and financial crisis which 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 activity.

Taking all factors into account, final energy consumption fell more between 2005 and 2017 in Luxembourg (indicator of 93.43, 2005 = base 100) than in the EU as a whole (94.13). As a result, final energy consumption was about 6.5% lower in 2017 in Luxembourg than in 2005.



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

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. Indeed, the employment rate indicator is a very cyclical indicator. For example, the actual exit date of the 2008/2009 crisis plays a key role in the development of this indicator.

The EU-28 employment rate was 73.2% in 2018. With an employment rate of 72.1%, Luxembourg ranks below the EU average³¹.



³¹ For additional details: http://ec.europa.eu/eurostat/ statistics-explained/index.php/ Europe_2020_indicators_-_ employment The employment rate, which is an average of the resident workforce, does however hide considerable differences in the employment rate per socio-economic category observed. Proceeding to a narrower segmentation of the employment rate, for example according to gender or age of the worker, reveals important fluctuations in the employment rate³². For example, in 2018:

- The male employment rate is 76% in Luxembourg whilst the female employment rate is 68%;
- ▼ The employment rate for 55-59-year olds is close to 55.3% whilst the employment rate for 60-64-year olds is close to 22%;
- The employment rate of national residents is 69.5% whilst the employment rate of foreign residents is 74.0% (77.1% for EU citizens and 61.2% for non-EU nationals)³³.

Box 2

Employment rate for recent tertiary graduates³⁴

In 2018, for graduates aged 20-34 in the Luxembourg (94.0%) is among the coun-EU who had attained a tertiary level edu- tries with the highest employment rates. cation within the previous three years, the employment rate stood at 85.5%.



Source: Eurostat

For additional details: https://ec.europa.eu/eurostat/ statistics-explained/index. php?title=Employment_rates_ and_Europe_2020_national_ targets

Turkey North Macedonia

- For additional details: https://ec.europa.eu/eurostat/ statistics-explained/index. php?title=File:Employment_ rates_for_the_population_ aged_20-64_years,_by_coun-try_of_birth_and_by_ sex,_2018_(%25)_MI19.png
- For additional details: https://ec.europa.eu/eurostat/ web/products-eurostatnews/-/DDN-20190704-1?inher itRedirect=true&redirect=%2F eurostat%2F

Luxembourg set as a national target a 73% employment rate by 2020. The employment rate in the country has increased from 67% (2000) to 72.1% (2018), especially through an increase in the female and senior employment rates. This employment rate is calculated on the basis of data from the LFS (Labour Force Survey), and therefore reveals an upwards trend for the past few years in Luxembourg.

However, this trend must be interpreted with care. Indeed, STATEC has carried out technical studies on the matter³⁵. The employment rate can be calculated on the basis of 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. Over the past years, the development of the employment rate differs greatly depending on the sources consulted: the first indicates an increase in the employment rate and the second reveals 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, improved 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.



Source: Eurostat

Note: The green line connecting the years 2010-2015 and 2015-2020 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.

Finally, although a higher employment rate generally allows increasing the supply of domestic labour, boosting growth and relieving social spending and public spending, these statements must be put in perspective in the case of Luxembourg. ³⁵ For additional details: https://statistiques.public.lu/ catalogue-publications/ cahiers-economiques/2018/ PDF-Analyses-01-2018.pdf

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

36 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.

Labour supply in Luxembourg is based on three components: the indigenous, cross-border and the immigrant offers. However cross-border workers are not considered in the definition of the employment rate. This is a purely national concept, related to the place of residence of the worker. Yet cross-border workers in Luxembourg make up more than 45% of domestic employment. As noted by the Economic and Social Council (ESC)³⁷, 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 workers is useful for understanding the use of human resources 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 indicators. In June 2010 the European Council decided to ensure that 20 million people at least 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, 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 the income distribution, which takes into account all sources of monetary income, including market revenues and social transfers. It reflects the role of employment and social protection in the prevention and reduction of poverty;
- Material deprivation rate: people whose lives are severely limited by a lack of resources³⁸. The material deprivation rate is a nonmonetary 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 the 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. The long-term exclusion from the labour market is one of the main factors of poverty and increases the risk of transmission of disadvantage from one generation to another.
- ³⁷ CES, Deuxième avis sur les Grandes Orientations des Politiques Économiques des États membres et de la Communauté (GOPE), Luxembourg, 2003. For additional information: http://www.ces.public.lu/fr/ avis/index.html
- 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. Note that monetary indicators of poverty, such as the poverty rate, are significantly limited. They do not take into account the many non-monetary public services and benefits in kind that are available to citizens. In Luxembourg, among other things, we can mention in this context the childcare service vouchers that are not taken into account.

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

In 2018, an average of 21.7% of the overall population in the EU-28 was considered at risk of poverty or social exclusion. The share of people at risk of poverty or social exclusion was 21.9% in Luxembourg in 2019.



Note: Slovakia, United Kingdom, Ireland (2017)

In Luxembourg, in 2017, there were fewer people at risk of poverty or social exclusion among national residents (18.3%) than among foreign residents (26.8%). Among the latter, people from the EU (23.5%) are much less affected than those from third countries (46.0%)³⁹.

In 2018, the people considered to be at risk of poverty or social exclusion in Luxembourg are^{40,41} primarily people at risk of poverty after social transfers (18.3%). To a much lesser extent, these are people living in a family with a very low work intensity (8.3%) or people living in severe material deprivation (1.3%).

Box 3

Analysing the risk of poverty after social transfers⁴²

The at-risk-of-poverty threshold after social transfers is set at 60% of national median disposable income. For spatial comparisons, it is often expressed in purchasing power standards (PPS), in order to take account of the differences in the cost of living across countries. In 2017 in the EU, this threshold ranged from PPS 3,182 in Romania to PPS 17,604 in Luxembourg.

Different groups in society are more vulnerable than other ones to this risk of poverty after social transfers. For example, in people over 18 in Luxembourg, people in employment (13.7%) are certainly less concerned than unemployed (54.4%), but more than retired persons (9.3%).

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.



- ³⁹ For additional details: https://ec.europa.eu/eurostat/ statistics-explained/index. php?title=Migrant_integration_statistics_-_at_risk_of_ poverty_and_social_exclusion
- ⁴⁰ For additional details: http://ec.europa.eu/eurostat/ statistics-explained/index.php/ Migration_integration_statistics__at_risk_of_poverty_ and_social_exclusion
- ⁴¹ For additional details, see also: http://ec.europa.eu/ europe2020/pdf/themes/2016/ poverty_social_exclusion_201605.pdf
- ⁴² 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 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 need Luxembourg to display 6,000 people less in 2020 as compared to 2008 (72,000 people). This would imply that in 2020 only 66,000 people should be at risk of poverty or social exclusion in Luxembourg.



Source: Eurostat, 2019 NRP

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 national target set for 2020. 2020 target corresponds thus to 2008 figure minus the 6,000 people Luxembourg intends to lift out of poverty or social exclusion.
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 the light of the current trends, the 2020 targets seem unattainable.

Table 3 Summary tabl	Table 3 Summary table of the Europe 2020 strategy objectives													
Priorities	Smart growth Sustainable growth Inclusive grow													
Objectives	Improving conditions for innovation and R&D	Improv	ing education levels	Reach	ning the clim energ	ate change/ y objectives	Promoting employment	Reducing poverty						
Indicators	2 2 2 2	Early school leaving rate	Higher education	GHG emissions	Renewable energy	Energy efficiency	Employment rate	Poverty						
Unit	% of GDP	%	% of 30-34- year olds	Mtoe	%	Mtoe	% of 20-64- year olds	People						
LU*	1.26	6.3**	56.2	8.66	6.4	4.18	72.1	126,000						
National target 2020	2.3-2.6%	<10%	66%	8.12***	11%	4.2****	73.0%	66,000						

Source: Eurostat, STATEC, 2019 NRP

Notes: Colours level: orange = national target not yet achieved; green = national target achieved.

Colours trend: red = stagnation or opposite direction; green = desired direction

* Update according to the most recent data available (level) and assessment of the trend in relation to the respective benchmarks ** Most recent national data (MENEJ): 12,4% (2015/2016)

*** -20% in relation to 2005

**** Final energy consumption

In its country report⁴³ as part of the European Semester (February 2019), the European Commission made the following comments: "Regarding Luxembourg's progress towards its national targets under the Europe 2020 strategy, 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 meet the targets for reducing the risk of poverty or social exclusion, early school leaving, post-secondary educational attainment, research and development intensity and reducing greenhouse gas emissions."44

- ⁴³ For additional details: https://ec.europa.eu/info/sites/ info/files/file_import/2019-european-semester-countryreport-luxembourg_fr.pdf
- 44 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. According to the most recent national data, Luxembourg is indeed above the national target (10%) and has therefore not vet reached it. while with LFS data Luxembourg is below the national target.

In its monitoring report on Europe 2020 indicators (October 2019), Eurostat made the following observation concerning Luxembourg⁴⁵: "Luxembourg has continuously exceeded its target on early leavers from education and training since 2009. The country has the most ambitious target on tertiary education across the EU, aiming for 66% of the population aged 30 to 34 having attained tertiary education by 2020. Despite the fact that Luxembourg has the fourth biggest share of tertiary education graduates aged 30 to 34, it still has further to go to meet its national target than other Member States. Although in 2018 Luxembourg was closer to its employment target than the EU as a whole, a 0.9 percentage point gap persists. In 2017, the country spent less on R&D as a percentage of GDP than the EU overall and it has moved further away from its national target since 2008. The number of people at risk of poverty or social exclusion increased by 75% between 2008 and 2017, pushing Luxembourg further from its national target. In terms of climate change mitigation, it did not reach its national target on the expansion of renewable energy and had the lowest shares of renewables in gross final energy consumption in the EU in 2017. Also, the 14.6% reduction in ESD GHG emissions by 2017 (compared with the ESD base year) was not enough for the country to reach its national target to reduce emissions by 20%. On the other hand, Luxembourg has continued to meet its primary energy consumption target since 2012."



To conclude, this inventory carried out as part of the 2019 Competitiveness Report should again be considered as a provisional exercise, one year before the strategy's expiry in 2020. However, given that there is a significant time lag before the publication of annual results for most indicators, it will also not be possible to make a final assessment next year. Indeed, data for next year, 2020, will only be available 2-3 years after.

> ⁵ For additional details: https://ec.europa.eu/eurostat/ documents/3217494/10155585/ KS-04-19-559-EN-N.pdf/ b8528d01-4f4f-9c1e-4cd4-86c2328559de

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 characterized in the euro area by divergent macroeconomic developments that have 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 euro area. 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 competitiveness⁴⁶. 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 the European economies and because the existing mechanisms were insufficient. It was therefore important to reinforce and further coordinate economic policy.

So, 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 is able to destabilize the euro area and the functioning of the European Monetary Union. Based on this communication, in June 2010 the European Council decided to establish a European stabilization 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 to correct macroeconomic imbalances. In order to better detect these imbalances, the Commission along with the Member States established a first scoreboard with economic and financial indicators. On 29 September 2010, the Commission finally proposed a legislative package ("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 States⁴⁷. The European Parliament finally voted this legislative package on economic governance on 28 September 2011 and the European regulation entered into force in late 2011.

- MONETARY POLICY & THE ECONOMY, Prevention and Correction of Macroeconomic Imbalances: the Excessive Imbalances Procedure, Q4/2011
- Based on both European regulations 1176/2011 and 1174/2011 For additional details: http://eur-lex.europa.eu/legalcontent/EN/ ALL/?uri=CELEX:32011R1176 http://eur-lex.europa.eu/legalcontent/EN/ ALL/?uri=CELEX:32011R1174

4.2.2 Macroeconomic imbalance procedure

The monitoring procedure includes 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)⁴⁸ 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. This further analysis 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 can take into account both the specificities 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; 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), or factors having a direct impact on this aggregate such as cost competitiveness. In terms of internal imbalances, the experience gained through the crises in the past has allowed identifying various key indicators such as unusual developments in the financial sector or extreme changes in credit with a high increase in house prices. Statistics used in the scoreboard are updated periodically by Eurostat⁴⁹. 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 indicator⁵⁰.

- ⁴⁸ 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
- ⁴⁹ For additional details: http://ec.europa.eu/eurostat/ web/macroeconomic-imbalances-procedure/indicators
- ⁵⁰ For more details about the implementation methodology of the AMR scoreboard: EURO-PEAN 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 being in or out the euro area.

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), youth unemployment rate (active population aged 15-24). The scoreboard now contains fourteen main indicators⁵¹ for the identification and monitoring of 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, country-specific economic analysis. 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 that is either found to be satisfactory, which leads to the issuing of regular progress reports to the Council, or insufficient, and the Member State is then requested to amend its action plan. If, after the amendments, the action plan remains insufficient, the Council adopts sanctions on the basis of recommendations of the Commission, unless the Council supports the arguments of exceptional economic circumstances by a reverse gualified majority.

> In addition to the main scoreboard, there is an auxiliary scoreboard which enables performing more detailed analyses. This will not be reviewed in this chapter. For additional details: http://ec.europa.eu/eurostat/ cache/Imbalance Scoreboard/ MIPs_AUX_FR_banner.html

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AMR scoreboard indicator results (November 2018 edition)

	Ext	ernal imb	oalances ar	nd compet	itiveness	s Internal imbalances					alances	s Employment indicators ¹					
Year 2017	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 % change)	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	52.6	0.9	3.9	1.1	1.5p	-1.5	187.0	103.4	7.8b	0.7	0.3b	-0.8b	-3.9b			
BG	3.1	-42.8	-3.3	19.4	13.6p	6.2	6.2	100.1	25.6	7.7	1.1	2.3	-3.5	-10.9			
CZ	1.0	-26.5	5.4	8.2	5.9	9.1p	4.1	67.4	34.7	4.0	22.9	2.4	-1.7	-8.0			
DK	8.1	56.3	-2.1	0.5	3.0	3.2	-1.4	204.0	36.1	6.0	4.1	0.7b	-0.4b	-1.6			
DE	8.4	54.0	-2.5	6.5	5.1	2.9	4.9	100.1	63.9	4.2	4.0	0.5	-0.6	-0.9			
EE	2.3	-31.4	2.9	2.6	12.4	1.8	3.6	106.4	8.7	6.3	9.7	3.6	-1.4	-2.9			
IE	2.9	-149.3	-6.2	64.4	-17.2	9.5p	-7.5	243.6	68.4	8.4	4.3	0.9	-3.6	-9.0			
EL	-0.8	-142.5	-2.8	-10.0	-1.0p	-2.2e	-0.8p	116.4p	176.1	23.3	-12.9	0.9	-3.9	-8.8			
ES	1.8	-83.8	-2.5	9.8	0.0p	4.5	0.2p	138.8p	98.1	19.6	4.0	-0.3	-5.2	-14.6			
FR	-0.6	-20.1	-2.9	2.7	1.3p	1.8	7.0p	148.2p	98.5	10.0	4.3	0.5	-0.3	-1.9			
HR	3.6	-62.4	0.0	20.0	-4.3d	2.8	1.2	98.4	77.5	13.5	3.9	0.3	-5.5	-17.7			
IT	2.3	-5.3	-3.1	2.0	1.1	-2.0p	2.1	110.5	131.2	11.6	4.3	1.5	-1.2	-8.0			
CY	-5.0	-121.5	-6.6	6.9	-2.7p	1.3p	8.7p	316.3p	96.1	13.0	-2.3	-0.4	-3.2	-11.3			
LV	0.6	-56.3	1.7	7.8	14.7	5.5	0.3	83.5	40.0	9.4	6.1	2.4	-1.3	-2.6			
LI	-0.7	-35.9	2.3	9.7	16.0	5.4	3.7	56.1	39.4	8.0	14.0	2.2	-2.1	-6.0			
LU	5.0	47.0	-0.9	25.2	7.1	4.1	-15.5	322.9	23.0	6.1 E (-1.7	-0.6	0.5	-6.7			
HU	4.0	-52.7	0.1	11.3	0.7	3.3	0.9	/1.4	73.3	5.4	-8.0	4.2	-2.0	-7.7			
NI	0.4	50.7	-2.5	1.2	0.2p	4.1p	2.7	252 lp	57.0	5.0	4.7 2.0p	4.4	-1.1	-1.2			
AT	2.1	37.7	-1.0	2.3	-0.2p	3.5	5.0p	122.10	78.3	5.7	1.8	1.0	-1.0 0.3	-0.5			
PI	-0.3	-61.2	-3.4	2.0	4 5n	17	2.7	76.4	50.6	6.2	6.3	1.0	-2.3	-91			
PT	0.0	-104 9	-0.7	14.6	3.5n	79	1.3n	162 2n	124.8	10.2	1.8	1.5	-3.9	-10.9			
RO	-2.2	-47.7	-5.5	37.0	11.9p	4.0	1.7p	50.8p	35.1	5.9	8.1	1.6	-0.8	-5.7			
SI	5.7	-32.3	-2.0	18.6	3.4	6.2	0.8	75.6	74.1	7.9	5.1	3.3	-2.2	-9.0			
SK	-2.0	-65.6	-1.9	6.7	6.9	4.4	5.9	96.1	50.9	9.8	17.9	1.8	-4.2	-10.8			
FI	-0.7	2.4	-2.6	-4.3	-2.5	0.5	8.2	146.4	61.3	8.9	-3.8	1.3	0.2	-0.4			
SE	4.0	1.8	-5.4	-4.3	3.7	4.6	13.1	194.4	40.8	7.0	6.8	1.0	-0.2	-5.1			
UK	-4.6	-8.6	-10.7	-1.0	5.4	2.4	8.4	169.0	87.4	4.8	-1.6	0.9	-1.1	-4.9			

Flags: b: Break in series. e: Estimated. p: Provisional.

1) For the employment indicators, see page 2 of the AMR 2016. 2) House price index e = source NCB for EL.

3) For NULC HR, d: employment data use national concept instead of domestic concept.

4) Private sector debt, private sector credit flow: the decline for IE relative to 2015 predominantly reflects restructuring and

re-domiciling activities of large multinational companies. Source: European Commission, Eurostat and Directorate General for Economic and Financial Affairs (for Real Effective Exchange Rate), and International Monetary Fund data, WEO (for world exports series)

4.2.3 The 2019 edition of the macroeconomic imbalance procedure

The eighth edition of the scoreboard was published in the Alert Mechanism Report released in November 2018 as part of the European Semester. In this edition, the European Commission concluded Luxembourg analysis as follows: "In the previous round of the MIP, no macroeconomic imbalances were identified in Luxembourg. In the updated scoreboard, a number of indicators are beyond the indicative threshold, namely private indebtedness as well as the change in the activity rate and the long-term unemployment rate. (...) Overall, the economic reading points mainly to some contained risks related to constantly increasing housing prices and household debt. Therefore, the Commission will at this stage not carry out further in-depth analysis in the context of the MIP."

4.2.4 Updating alert mechanism scoreboard data

The data used in this chapter to illustrate the position of Luxembourg under the alert mechanism come from Eurostat database. This is an update of the data published in the last AMR scoreboard (November 2018). Therefore, differences can occur between the results in the Competitiveness Report and those of the last alert mechanism scoreboard. The present data were downloaded on 1st July 2019 and are thus an update halfway between the last alert mechanism report and the one that the Commission will publish in November 2019 in the context of its annual Growth Survey, which will launch the 2020 European semester.

4.2.4.1 External and competitiveness imbalances

a. Current account balance⁵²

Regarding the current account balance, unlike a country financing need (negative balance), a financing capacity (positive balance) does not seem an evidence of imbalance since it doesn't threaten the sustainability of its external debt. For this indicator, it has been agreed under the MIP that a country is potentially at risk if it has a current account balance with either a deficit higher than -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. The balance of payments is a statistical statement that systematically summarizes, for a specific period, the economic transactions of an economy with the rest of the world. It is divided into three main subbalances: 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.



Source: Eurostat; yellow and orange lines = thresholds of -4%/+6% set by MIP 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.

b. Net international investment position⁵³

The indicator of the net external position provides information on the relationship between foreign assets and the external debt of a country⁵⁴. For this indicator, it has been agreed under the MIP 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 on Luxembourg are 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.

- ⁵³ The statistics of the international investment position (IIP) records the status of 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.
- ⁵⁴ For additional details: http://ec.europa.eu/eurostat/ statistics-explained/index.php/ International_investment_ position_statistics



Source: Eurostat; orange line = threshold of -35% set by MIP 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.

c. Real effective exchange rate (REER)55

The REER indicator tracks the evolution of price competitiveness and cost competitiveness by analysing the relationship between domestic prices or costs and foreign prices or costs in euro. Thus, an increase in the REER is usually equivalent to a decline of 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 euro area 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 as not posing a risk of imbalances. According to the latest data available for 2018, Luxembourg shows a value of 3.3%.

55 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 excessive imbalance procedure is deflated with the price index 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). appreciation. Data are given in 3-year percentage change and in 1-year percentage change. The scoreboard indicator corresponds to the 3-year percentage change of the real effective exchange rate based on the consumer price index of the 42 trading partners.



Source: Eurostat; orange and yellow lines = thresholds of +/- 5% for euro area Member States. Note: A euro area 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.

d. Export market shares⁵⁶

The scoreboard includes an indicator on changes in the market share of a country 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 the increased demand. For this indicator, it has been agreed under the MIP that a country is potentially at risk if this indicator is less than -6%.

For the majority of the years under observation, Luxembourg has observed the established threshold limits, with the exception of 2012.

56 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 are developed in the context of the balance of payments of each country. To take into account the structural losses of 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 from the balance of payments provided to Eurostat by the 28 EU Member States.



Source: Eurostat; orange line = threshold of -6% set by the MIP 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.

e. Nominal unit labour costs⁵⁷

The nominal unit labour costs (nominal ULC) are the indicator traditionally used to measure the cost-competitiveness of an economy. The change in domestic nominal unit labour costs of a country, i.e. the cost of labour per unit of value added produced, is compared to those of the main trading partner countries. This indicator includes two factors: firstly, the average labour cost in an economy and secondly, the level of productivity. For this indicator, 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 of 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, over the course of the most recent years of the crisis, has implemented major job-saving plans. Luxembourg scored under the threshold limit in the period 2011-2017 and therefore did not face a macroeconomic imbalances risk under this indicator, but in 2018 Luxembourg exceeds again the threshold (10.3%).

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 are obtained through official data transmissions from countries' national accounts in the SEC2010 transmission programme. Data are expressed as a percentage change in indices between the year Y and the year Y-3.



Source: Eurostat; orange line = threshold of +9% for euro area Member States Note: A euro area 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.

4.2.4.2 Internal imbalances

a. House prices⁵⁸

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 under the MIP that a country is at risk if this indicator is higher than +6%.

Real estate prices (housing) have risen, in real terms, almost continuously since 2001, with the exception being in 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.



Source: Eurostat; orange line = threshold of +6% set by MIP Note: A Member State is considered to be at risk of imbalance if the change in housing prices is above +6%. If the indicator is below this threshold, a Member State is not considered to be at risk. 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). Therefore, this indicator measures inflation in the housing market compared to that of final consumption of households and NPI. Eurostat 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 built housing on own account is excluded. The land is included. Data show changes in percentage from year Y compared to the vear Y-1.

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b. Private sector credit flow⁵⁹

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 this indicator is above +14%.

Luxembourg's performance for this indicator varies greatly, much more than the performance of neighbouring countries. The structure of the Luxembourg economy, a very small but open economy, home to several large, non-financial companies, whose financial decisions can have a major impact on the national economy, could be the explanation for this situation.



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

> The private sector credit flow corresponds to the net changes in liabilities of the 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 the "Securities other than shares" (F.3) and "Credits" (F.4), to the exclusion of any other instrument. The concepts used in the definition of sectors and instruments are consistent with SEC2010. Data are expressed in EUR million and calculated on a non-consolidated basis, i.e. by including transactions among units of the same sector.

c. Private sector debt60

The private sector debt indicator is important because if it is excessively high, private sector debt involves significant risks to growth and financial stability of a country. The indicator measures the level of private debt of 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 at risk if this indicator is above +133% of GDP.

Since 2001 in Luxembourg, this indicator significantly overruns 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 need 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 out of Luxembourg because the 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 for housing acquisition.



Source: Eurostat; orange line = threshold of 133% set by MIP Note: A Member State is considered to be at risk of imbalance if the private sector debt exceeds 133% of GDP. If the indicator is below this threshold, a Member State is not considered to be at risk. The private sector debt corresponds to the outstanding amount of liabilities of nonfinancial corporate sectors (S.11), households and nonprofit institutions serving households (S.14_S.15). Instruments included in the calculation of the private sector debt are "Securities other than shares", to the exclusion of financial derivatives (F.33) and 'Credits" (F.4) to the exclusion of any other instrument. The concepts used in the definition of sectors and instruments are consistent with SEC2010. Data is calculated on a nonconsolidated basis, i.e. excluding transactions among units of the same sector. The PDM indicator is calculated as a percentage of GDP.

d. General government sector debt⁶¹

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 as a complement to the indicator on 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 this indicator is above +60% of GDP.

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



Source: Eurostat; orange line = threshold of 60% set by the Maastricht treaty 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.

> General government gross 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 the 479/2009 Regulation, as amended by the 679/2010 Council Regulation. National data for the general government sector is consolidated over sub-sectors. The series are available as a percentage of GDP. GDP denominator comes from the SEC2010 transmission programme, and not from the EDP notifications. The revised GDP data being transmitted in a delayed schedule, it may result in potential differences in debt as a % of GDP, according to the source, EDP or AMR scoreboard.

e. Unemployment rate⁶²

This indicator is intended to monitor high and persistent unemployment rates and it points a possible misallocation of resources (incompatibility) and the 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.



Source: Eurostat; orange line = threshold of 10% set by MIP

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.

The unemployment rate represents the number of unemployed persons as a percentage of the labour force as defined by the International Labour Organization (ILO). The labour force consists of employed and unemployed persons. Unem ployed persons 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. Data are 3-year moving averages, i.e. year Y data are the arithmetic mean of the years Y, Y -1, Y -2. In this context, it is not the national definition of unemployment used in Luxembourg, which is the one used by the Agency for Employment Development (Adem): "The unemployment rate is the ratio between the number of resident jobseekers available and the labour force. The latter consists of all persons living in the country who are working (employee or self-employed) or looking for a job (jobseeker). For additional details: https://adem.public.lu/fr.html

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f. Total financial sector liabilities⁶³

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 under the MIP that a country is potentially at risk if this indicator is higher than +16.5%.

In most of the years under analysis, Luxembourg was below the threshold limit. In 2000, 2003, 2005 and 2015, Luxembourg exceeded the threshold. Based on the latest available data, Luxembourg is below the threshold limit.



Source: Eurostat; orange line = threshold of 16.5% set by MIP 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.

> ⁶³ 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.

4.2.4.3 Employment indicators

a. Activity rate⁶⁴

This indicator measures variations in the activity rate amongst Member State 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 respected. On the opposite, in 2017, the activity rate in Luxembourg dropped (-0.6 p.p.) and the threshold was not respected. However, based on the latest available data for 2018, Luxembourg respects again the threshold (0, 2 p.p.).



Source: Eurostat; orange line = threshold of -0,2 p.p. set by MIP 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.

> 64 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 categorized 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 or 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.

b. Long-term unemployment rate⁶⁵

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, Luxembourg's long-term unemployment rate variation has been below or equal to the threshold limit.



Source: Eurostat; orange line = threshold of +0,5 p.p. set by MIP 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. 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 four previous weeks or have found a job which they will start within the following three months.

The scoreboard indicator corresponds to the change in percentage points over a three-year period. 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. Youth unemployment rate⁶⁶

This indicator measures the variation in the youth unemployment rate in the Member States. The indicator is expressed in percentage points over a three-year period. For this indicator, a country is deemed to be 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 far below the threshold in 2018 (-2.8 p.p.).



Source: Eurostat; orange line = threshold of +2 p.p. set by MIP 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.

The youth unemployment rate is the percentage of unemployed individuals aged 15-24 n the active population of 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 four previous weeks or have found a job which they will start within the following three months.

The scoreboard indicator corresponds to the change in percentage points over a three-year period. 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.

4.2.4.4 Interim conclusions

Based on the updated data used in this chapter, and pending the 2020 Alert Mechanism Report, issued in November 2019 by the European Commission, we note that Luxembourg has exceeded 2 thresholds:

- The consolidated private sector debt;
- ▼ The change in the nominal unit labour costs (% change over 3 years).

Table 5 Summary	Table 5 Summary table of the alert mechanism update, July 2019													
			Exte	rnal imb	alances				I	nternal ir	nbalances	Er	nployment i	ndicators
	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 govern- ment sector debt	Unemployment rate	Total financial sector liabilities	Activity rate	Long-term unemployment rate	Youth unemploy- ment rate
LUX*	4.9	46.5	3.3	9.58	10.3	5.2	-15	316.4	21.4	5.8	-1.6	0.2	-0.5	-2.8
Thresh- olds**	> -4% < +6%	> -35%	> -5% < +5%	> -6%	< 9%	< +6%	< +14%	< 133%	< 60%	< 10%	< +16.5%	> -0.2 p.p.	< +0.5 p.p.	< +2 p.p.

Source: European Commission, Eurostat

Notes: * Data 2018, except for the private sector credit flow, the private sector debt and the total financial sector liabilities (2017). ** Conditions for not being considered imbalanced (for some indicators these thresholds are different for the euro area Member States and for other Member States).

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5 Luxembourg in the World Bank's "Ease of Doing Business 2019" report

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5.1 Introduction

The World Bank released its annual edition of the *Ease of Doing Business* report (hereinafter referred to as the EODB) at the end of October 2018. It covers 190 economies in the world, including Luxembourg. The aim of the report is to measure and compare the ease with which an entrepreneur can create and manage a small or medium-sized company (SME) throughout its life cycle. Moreover, the objective of the report is twofold: its purpose is also to encourage countries to improve their legislations and business environments.

By gathering and analysing comprehensive quantitative data to compare business regulations environments across economies and over time, the EODB encourages economies to compete towards more efficient regulation. Quantitative data was requested from 15 Luxembourgish bodies¹. The EODB also offers measurable benchmarks for reform and serves as a resource for academics, journalists, private sector researchers and others interested in the business climate of each economy.

The first EODB report was issued in 2003 and used five sets of indicators for 133 countries. This year, the report covers ten sets of indicators for 190 economies. Luxembourg is in 66th place in the world and 26th in the EU Member State ranking (EU-28). The "Starting a business" category is important both for the country's attractiveness and access to entrepreneurship. Luxembourg ranks 73rd, in front of Germany (114th) but after Belgium (33rd), France (30rd) and the Netherlands (22nd).

The project has received opinions from some public authorities, academics, practitioners and observers. The primary aim, however, remains to provide an objective basis to understand and improve the business regulatory environments across the globe.

The data used for EODB is not the same as those in other reports and studies (e.g. the IMD's *World Competitiveness Yearbook*, the Heritage Foundation's *Index of Economic Freedom* and the WEF's *Global Competitiveness Index*²). Indeed, these are not macroeconomic data usually used in competitiveness benchmarks or macroeconomic analyses, such as GDP, poverty rates, employment rates, etc., but microeconomic data from surveys based in part on experience and practice.

In order to ensure the comparability of the data from one economy to another, the authors of the report defined, for each of the ten categories, several basic assumptions, more or less strong, which could potentially have a negative or positive impact on the representativeness of the results. These assumptions define the characteristics of typical cases, which then represent the starting point for each analysis in the EODB report. The same assumptions are applied to each country under analysis, meaning that they may not be quite appropriate to assess the situation of a small, highly open country such as Luxembourg, with special characteristics such as the high level of integration in the European Economic Area and a workforce composed of 73.3% of foreigners³.

For the 2019 report, the consulted bodies were: law firms, audit firms, an energy network manager, the administration responsible for registrations, domains and VAT and the Chamber of Commerce. Source: https://www.doingbusiness. org/en/contributors/doingbusiness/luxembourg

- For more information on these reports, refer to Chapter 2 of the 2019 Competitiveness Report.
- ³ Chart s from the fourth quarter of 2018, source: STATEC http://www.statistiques.public. lu/

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The *Ease of Doing Business 201*9 report

Luxembourg comes in 66th place in the world and 26th in the EU-28. In the overall ranking, Luxembourg's neighbours all rank better. Germany has the best performance, coming in 24th place, followed by France in 32nd place, then the Netherlands in 36th place and Belgium 45th.

Overa	Overall ranking in the Ease of Doing Business 2019 report ⁴ published in 2018													
Rank	Economy	EODB note	EODB variation note	Rank	Economy	EODB note	EODB variation note							
1	New Zealand	86.59	\rightarrow	34	Portugal	76.55	\checkmark							
2	Singapore	85.24	\uparrow	35	Czech republic	76.10	\uparrow							
3	Denmark	84.64	\uparrow	36	Netherlands	76.04	\uparrow							
4	Hong Kong SAR, China	84.22	\uparrow	37	Belarus	75.77	\uparrow							
5	Republic of Korea	84.14	\checkmark	38	Switzerland	75.69	\uparrow							
6	Georgia	83.28	\uparrow	39	Japan	75.65	\uparrow							
7	Norway	82.95	\uparrow	40	Slovenia	75.61	\uparrow							
8	United States	82.75	\checkmark	41	Armenia	75.37	\uparrow							
9	United Kingdom	82.65	\uparrow	42	Republic of Slovakia	75.17	\uparrow							
10	Macedonia, FYR	81.55	\uparrow	43	Turkey	74.33	\uparrow							
11	United Arab Emirates	81.28	\uparrow	44	Kosovo	74.15	\uparrow							
12	Sweden	81.27	\rightarrow	45	Belgium	73.95	\uparrow							
13	Taiwan, China	80.90	\uparrow	46	China	73.64	\uparrow							
14	Lithuania	80.83	\uparrow	47	Moldova	73.54	\uparrow							
15	Malaysia	80.60	\uparrow	48	Serbia	73.49	\uparrow							
16	Estonia	80.50	\uparrow	49	Israel	73.23	\uparrow							
17	Finland	80.35	\uparrow	50	Montenegro	72.73	\uparrow							
18	Australia	80.13	\checkmark	51	Italy	72.56	\checkmark							
19	Latvia	79.59	\uparrow	52	Romania	72.30	\checkmark							
20	Mauritius	79.58	\uparrow	53	Hungary	72.28	\uparrow							
21	Iceland	79.35	\uparrow	54	Mexico	72.09	\checkmark							
22	Canada	79.26	\uparrow	55	Brunei Darussalam	72.03	\uparrow							
23	Ireland	78.91	\checkmark	56	Chile	71.81	\uparrow							
24	Germany	78.90	\rightarrow	57	Cyprus	71.71	\uparrow							
25	Azerbaijan	78.64	\uparrow	58	Croatia	71.40	\uparrow							
26	Austria	78.57	\uparrow	59	Bulgaria	71.24	\uparrow							
27	Thailand	78.45	\uparrow	60	Morocco	71.02	\uparrow							
28	Kazakhstan	77.89	\uparrow	61	Kenya	70.31	\uparrow							
29	Rwanda	77.88	\uparrow	62	Bahrein	69.85	\uparrow							
30	Spain	77.68	\uparrow	63	Albania	69.51	\uparrow							
31	Russian Federation	77.37	\uparrow	64	Porto Rico (U.S.)	69.46	\uparrow							
32	France	77.29	\uparrow	65	Colombia	69.24	\uparrow							
33	Poland	76.95	\downarrow	66	Luxembourg	69.01	\rightarrow							

The variations are calculated according to the scores from the previous year.

The analysis below aims to provide crucial information and more in-depth explanations concerning the study published in 2018, namely in relation to the "Starting a business" category.

The overall result of the EODB report considers all the included categories on equal footing, thus providing an overview of the countries' performances. Luxembourg's overall result is 69.0 (out of 100), and it comes in 66th place (out of 190 countries). As far as the EU Member States are concerned, Luxembourg comes 26th (out of 28).

Results

Table 2

Ranking (1-190) for the Benelux countries, France and Germany in the respective categories, in decreasing order for Luxembourgg

Rank (1 to 190)	Luxembourg	Belgium	France	Germany	Netherlands
Trading across borders	1	1	1	40	1
Dealing with construction permits	12	38	19	24	84
Enforcing contracts	15	54	12	26	74
Paying taxes	22	60	55	43	21
Getting electricity	41	112	14	5	56
Starting a business	73	33	30	114	22
Resolving insolvency	90	8	28	4	7
Registering property	92	143	96	78	31
Protecting minority investors	122	57	38	72	72
Getting credit	175	60	99	44	112
Overall result	66	45	32	24	36

Table 3

 ${\it Results} \ (0-100) \ for \ the \ Benelux \ countries, \ the \ EU, \ France \ and \ Germany \ in \ the \ respective \ categories,$

in decreasing order for Luxembourg

Indicator	Luxembourg	EU Average	Belgium	France	Germany	Netherlands
Trading across borders	100.0	97.4	100.0	100.0	91.8	100.0
Starting a business	88.7	89.5	93.0	93.3	83.6	94.3
Paying taxes	87.4	82.3	77.5	79.3	82.1	87.6
Getting electricity	84.3	82.4	67.3	92.0	98.8	81.6
Dealing with construction permits	83.7	72.8	75.4	79.3	78.2	69.4
Enforcing contracts	73.3	66.4	64.3	74.9	70.4	59.9
Registering property	63.9	74.4	51.4	63.3	65.7	80.1
Protecting minority investors	48.3	62.9	61.7	66.7	58.3	58.3
Resolving insolvency	45.5	70.8	83.9	74.1	90.1	84.3
Getting credit	15.0	60.4	65.0	50.0	70.0	45.0
Overall result	69.0	75.9	74.0	77.3	78.9	76.0



Like all other countries, Luxembourg has its strengths and weaknesses. It ranks rather badly in three categories, i.e., "Getting credit" (175th), "Protecting minority investors" (122nd) and "Resolving insolvency" (score: 45.5). The fact that Luxembourg comes towards the bottom of the EU ranking (just above Malta (84th) and Greece (72nd)) is the result of the application of those three indicators. In three out of ten categories, Luxembourg comes in the top 20 of the ranking, i.e. for "Enforcing contracts" (15th), "Dealing with construction permits" (12th) and "Trading across borders" (1st)⁶. Luxembourg's scores and positions are very diverse, going from top (score of 100) to 175th (score of 15).

⁵ Sorted as in the EODB 2019 report.

Due to the basic assumptions, 16 EU Member States come top in this category.

Table 4		
Comparison of the scores	for the categories	between 2007 ⁷ an

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Category	Lu	Luxembourg			Belgium			France		Germany		many	Netherland		lands
	2007		2019	2007		2019	2007		2019	2007		2019	2007		2019
Starting a business	84.3	$\mathbf{\uparrow}$	88.7	85.4	\uparrow	93.0	92.3	\uparrow	93.3	79.3	\uparrow	83.6	86.0	\uparrow	94.3
Dealing with construction permits	69.8	$\mathbf{\uparrow}$	83.7	73.3	\uparrow	75.4	75.8	\uparrow	79.3	82.7	\downarrow	78.2	69.3	\uparrow	69.4
Getting electricity*	73.9	\uparrow	84.3	56.4	\uparrow	67.3	81.2	\uparrow	92.0	98.3	\uparrow	98.8	75.4	\uparrow	81.6
Registering property	56.7	\uparrow	63.9	34.2	\uparrow	51.4	33.9	\uparrow	63.3	68.8	\downarrow	65.7	74.5	\uparrow	80.1
Getting credit	25.0	$ \psi $	15.0	56.3	\uparrow	65.0	50.0	=	50.0	81.3	\downarrow	70.0	56.3	\downarrow	45.0
Protecting minority investors	43.3	\uparrow	48.3	70.0	\checkmark	61.7	53.3	\uparrow	66.7	50.0	\uparrow	58.3	43.3	\uparrow	58.3
Paying taxes	88.4	\mathbf{V}	87.4	73.2	\uparrow	77.5	64.2	\uparrow	79.3	77.2	\uparrow	82.1	71.4	\uparrow	87.6
Trading across borders	81.9	\uparrow	100.0	83.9	\uparrow	100.0	81.3	\uparrow	100.0	89.2	\uparrow	91.8	87.2	\uparrow	100.0
Enforcing contracts	86.0	\mathbf{V}	73.3	75.6	\checkmark	64.3	77.8	\downarrow	74.9	76.7	\downarrow	70.4	74.9	\downarrow	59.9
Resolving insolvency	44.8	$ \uparrow $	45.5	93.0	\downarrow	83.9	51.5	\uparrow	74.1	87.7	\uparrow	90.1	95.0	\downarrow	84.3
* Comparison between 2010 and 2019.															

d 2019

As far as the relative evolution of Luxembourg's scores, most have improved between 2007 and 2019. It is for "Trading across borders" (+18.1 points), "Dealing with construction permits" (+14.0 points) and "Getting electricity" (+10.4 points) that the country made the best progress. The biggest decline for Luxembourg between 2007 and 2019 was for "Enforcing contracts" (-12.7 points) and "Getting credit" (-10.0 points).

Overall, Luxembourg's score is relatively low (< 33 points), three average scores (between 33 and 66 points) and six good to very good scores (> 66 points)⁸.

It must be noted that there are two sub-categories on equal footing under the "Getting credit" category (where Luxembourg scores rather poorly). One of these two sub-categories is the index on the scope of credit-related information (composite index for the coverage of the registration of the credit and the coverage of the credit bureau). In the case of Luxembourg, this index is equal to zero because there is currently no credit register or bureau.

- ⁷ For the EU Member States, the data are usually available as from 2004. However, the data for Cyprus, Malta and Luxembourg have been available since 2009, 2012 and 2007.
- ³ This assessment is for pedagogical purposes and was carried out within the framework of this report.

Analysis of the pertinence and usefulness of the EODB

An analysis limited to the overall result, which is highly appreciated by the media and the general public, bears the risk of a biased assessment of the real situation. It is difficult to interpret the overall result because it includes many dimensions.

Moreover, in order to compare the economies, one must consider the fact that the authors cannot take into account certain national specificities. They define "typical cases" for the case studies of each of the ten categories listed in the report.

Indeed, if the overall result truly reflected the economy's situation, then public statistics would confirm that Luxembourg's business environment is less beneficial than that of most other EU countries – which is not the case: business creation is quite prolific.

A first basic analysis approach is to compare the survival rates of businesses⁹ with the final EODB score.



This is the number of businesses during the reference period (t) that were founded in t-2 and survived in t, divided by the number of businesses started in t-2, in percentage, and only considering manufacturing and trade services, not counting holding company activities. The survival rate may be higher than 100% in the case of business splits in the two years. Source: Eurostat table [bd_9bd_sz_cl_r2]. In 2016, Luxembourg ranked 8th out of the EU-28 (no figures for Cyprus) with a 76.8% survival rate.

The correlation between the final score and the survival rate is low, as well as the determination coefficient (R^2 = 0.0408), which implies that the chosen model is inadequate because it does not allow any explanation for the survival rate variations on the basis of the final EODB score. However, in addition to the difficulties of starting a business, the survival rate also includes the assessment of entrepreneurial concepts. As a result, the survival rate involves a great deal more than the characteristics evaluated in the report.

Analysing the relationship between the survival rate of new businesses and the final score in the report would allow an evaluation of whether the circumstances faced by new businesses and aggregated under the final EODB score are that important, and if they play a decisive role for the businesses. This does not seem to be the case – at least for the analysis of EU Member States.

A second basic analysis approach is to compare the EODB's final score with the number of businesses per 10,000 inhabitants.



Note: Luxembourg is marked by green dots.

Luxembourg is represented by green dots.

The correlation is weak between the final score and the number of businesses, as well as the determination coefficient (R^2 = 0.0407), implying that the chosen model is inadequate because it does not allow any explanation as to the variations in the number of businesses by means of the final EODB score. However, as in the preceding case, the number of businesses also reflects other factors and considerations (e.g. political stability, quality of life, security, national characteristics, etc.) than those taken into consideration in the report.

Here, the idea of analysing the relationship between the number of businesses and the overall score is to see whether a high score – i.e. the presumption that it is easy to do business – means that there is a higher number of businesses per inhabitant. As in the situation above, this does not seem to be the case for EU Member States.

The correlations (i.e. the linear links between the overall EODB score and some of Eurostat's structural business statistics¹¹] demonstrate weak and even inexistent correlations and R² levels that are very close to 0. The models chosen don't allow to infer statistical significance nor causality between the variables explained (survival rate/number of businesses per 10,000 inhabitants) and the explanatory variables (final score).

To conclude, it is therefore not really possible to say that the final EODB score reflects reality. Moreover, it does not take into account all factors involved in economic reality in a universal fashion. In truth, there are other aspects that are not considered in the EODB which can play a decisive role. Examples of such factors include: existing infrastructures, grants available, the attractiveness of the country, market characteristics, social peace, the concept of the entrepreneur, the political and macroeconomic situation, etc.

It is therefore more important to analyse the scores individually, category by category, especially in the case of scores that are significantly different to those of other countries.

The EODB report is interesting for the authorities, allowing them to have an overview of the situation, detect potential areas for improvement and decide in which fields action may be required. One must take great care in the interpretation of the results, however, especially for the final score.

> SBS database: https://ec.europa.eu/eurostat/ web/structural-business-statistics/data/database

5.3 Starting a business

The most appropriate category for a more in-depth analysis in this context is "Starting a business". There are three reasons for this: first, this category plays an important role in terms of the attractiveness of a country and in access to entrepreneurship; secondly, it is the best fit to illustrate certain methodological problems; and thirdly, the analysis of the full report would go beyond the scope of this chapter.

The ease with which a business can be founded is important in terms of the attractiveness of an economy for foreign companies looking to expand and/or wanting to move to Luxembourg to access new markets. The same applies to Luxembourgish people and companies wanting to start new businesses.

"Doing Business records all procedures officially required, or commonly done in practice, for an entrepreneur to start up and formally operate an industrial or commercial business, as well as the time and cost to complete these procedures and the paid-in minimum capital requirement. These procedures include the processes entrepreneurs undergo when obtaining all necessary approvals, licenses, permits and completing any required notifications, verifications or inscriptions for the company and employees with relevant authorities."

A "typical case" here involves the following: the business is a limited liability company; it leases and occupies 929 square meter of office space in Luxembourg City; it is domestically owned and has five owners, none of whom is a legal entity; the company's initial capital totals 702,600 USD and it has a turnover of 7,026,000 USD¹², its company deed is ten pages long; the business does not perform foreign trade activities; and it has between 10 and 50 employees one month after the commencement of operations, all of them domestic nationals.

In the "Starting a business" category, four indicators are assessed in order to determine each country's performance.

Sub-indicators	Weight ¹³
The procedures required to open a business (number)	25%
The time needed to fulfil these procedural requirements (days) ¹⁴	25%
The costs linked to the procedures (in percentage of revenue per person ¹⁵)	25%
The payment of the minimum required capital (in percentage of revenue per person)	25%

- ¹² With an average exchange rate of 1.083 USD/EUR, the amounts would be approximately 648,650 EUR and 6,486,500 EUR respectively. Source: Doing Business, World Bank
- ¹³ The weight for the subcategory in the overall score of the category.
- ¹⁴ This represents the median timeframe required in practice to finish a procedure, according to lawyers specialised in business set-ups or notaries. It is assumed that the entrepreneur does not waste any time, knows about all the regulations in place to create a business and the steps to follow, and that he/ she strives to follow all ensuing procedures quickly. The time spent on collecting information is not included.
- ⁵ Per capita income is defined as the gross national income [GNI] for one year divided by the total number of inhabitants. In Luxembourg, the GNI per capita was 70,260 USD [equals ±64,865 EUR] in 2018 (source: World Bank).

Results

Table 5 Ranking in the "Starting a business" category											
Position (1 to 190)	Luxembourg	Belgium	France	Germany	Netherlands						
Starting a business	73	33	30	114	22						

Luxembourg ranks 73rd (with 88.73 out of 100), in front of Germany (114th) but after Belgium (33rd), France (30rd) and the Netherlands (22nd).



Compared to the EU Member States, Luxembourg's result is just under the EU average. The country comes 18th (out of 28). In the EU-28, Ireland did best (95.91 out of 100) and Slovakia fared the worst (with 82.02).

¹⁶ This is the simple arithmetic average of the EU Member States' scores. Source: Doing Business, World Bank.

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Results for the Benelux countries, the EU, France and Germany in the respective sub-categories														
Indicator	Luxembourg ¹⁷	EU average	Belgium	France	Germany	Netherlands								
Procedures (number)	5,0	5.4	4.0	5.0	9.0	4.0								
Time (days)	16.5	12.5	4.0	3.5	8.0	3.5								
Cost (% of GNI/capita)	1.7	3.4	5.4	0.7	6.7	4.2								
Paid-in minimum capital (% of GNI/capita)	18.5	9.6	16.0	0.0	31.0	0.0								
Overall score ¹⁸ (0-100)	88.7	89.5	93.0	93.3	83.6	94.3								

Chart 5

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No.	Procedure	Duration (days)
1	Payment of the minimum required capital	1
2	Check and reservation of the company name ¹⁹	0.5
3	Notarised incorporation deed	2
4	Application for a business permit	15
5	Registration at the single counter ("guichet unique")	4

In Luxembourg, there are five procedures required to start a limited liability company, which is only marginally lower than the EU average of 5.4. However, the total amount of time required to fulfil said procedures is higher than the average, due namely to the time spent on the fourth procedure (the application for a business permit), which takes 15 days in total according to the report. The total cost of the procedures is lower than the average. On the other hand, the minimum capital required to start a limited liability company is higher than the average. Compared to its neighbours, Luxembourg is the best country in terms of the cost of the procedures, with the exception of France, and it is the worst country for the time and capital aspects, after Germany.

- ¹⁷ The colours for these tables show Luxembourg's performance compared to that of the EU. Red means that Luxembourg's performance is over 10% lower than the EU's, green means that it is over 10% higher than the EU's and orange means that it lies between +/- 10% than the EU's.
- ¹⁸ Synthetic score on a scale of 0 to 100 (100 being the best possible score).
- ¹⁹ It is an online procedure that automatically accounts for 0.5 days.

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a) Break in the series in 2014; sample broadened by including additional towns for 11 countries (no incidence on the scores of the countries listed here).

Comparison of the scores between 2007 and 2019 ²⁰															
Indicator	Luxembourg		Belgium			France			Germany			Netherlands			
	2007		2019	2007		2019	2007		2019	2007		2019	2007		2019
Procedures (number)	5.0	=	5.0	5.0	\downarrow	4.0	5.0	=	5.0	9.0	=	9.0	6.0	\downarrow	4.0
Time (days)	28.0	\mathbf{V}	16.5	27.0	\downarrow	4.0	7.0	\downarrow	3.5	22.0	\downarrow	8.0	7.0	\downarrow	3.5
Cost (% of GNI/capita)	11.9	$\mathbf{\Psi}$	1.7	5.8	\downarrow	5.4	1.1	\downarrow	0.7	5.3	\uparrow	6.7	7.2	\downarrow	4.2
Paid-in minimum capital (% of GNI/capita)	22.7	\mathbf{V}	18.5	21.8	\downarrow	16.0	0.0	=	0.0	46.2	\downarrow	31.0	62.3	\checkmark	0.0

From 2007 to 2012, Luxembourg's progress in this category was positive, with an increase of approximately 4 index points. Luxembourg improved in terms of time, costs and the minimum capital required²¹. However, the number of procedures did not change. Since 2012, the overall score has remained quite stable (approx. 88.6 points). Since 2013, Luxembourg has ranked before-last amongst its neighbours, just above Germany.

- ²⁰ The colours show whether there was an improvement (green), a deterioration (red) or a stagnation (orange).
- ²¹ The improvement of the minimum capital required and the GNI per capita ratio is due solely to the increase of the latter.



a) Break in the series in 2014; broadened sample with the Includedion of additional towns for 11 countries.

Table 8 Comparison of the positions between 2007 and 2019															
Indicator	Luxembourg			Belgium			France			Germany			Netherlands		
	2007		2019	2007		2019	2007		2019	2007		2019	2007		2019
Position	30	$\mathbf{\Psi}$	73	28	\downarrow	33	5	\downarrow	30	51	\downarrow	114	26	\uparrow	22

The Netherlands was the only country to have improved its position between 2007 and 2019. Germany lost 63 places, Luxembourg went down by 43, France by 25 and Belgium by 5.

During the 2007-2019 period, the efforts made by Germany, Luxembourg, France and Belgium were insufficient to progress in the ranking and/ or other countries may have improved better their performance here.

It must be noted that the authors of the report defined that only limited liability companies would be taken into consideration in their study. In the case of several legal forms of limited liability companies, the most common type was used for the purpose of the analysis. This explains why only the "SARL" was used for Luxembourg, and not the "SARL-S" (simplified SARL), which entered into force in January 2017, or other legal forms.
Table 9 Luxembourg's rankin	g compared to the othe	r EU Member States	
Luxembourg's positio	ns compared to other E	EU Member States	
Procedures (number)	Time (days)	Cost (% of GNI/ capita)	Paid-in minimum capital (% of GNI/capita)
12/28	20/28	16/28	25/28

The comparison between Luxembourg and the other EU Member States demonstrates that Luxembourg scores towards the bottom of the ranking for two sub-categories, i.e., time and paid-in minimum capital. For the procedures and costs, Luxembourg ranks towards the middle of the ranking.

Analysis of the "typical case" category and characteristics

The "typical case" described at the beginning of this section of the paper clearly does not reflect a typical company in Luxembourg. The surface of office space, initial capital and turnover are indeed all too high for a small economy. In addition, the assumptions that the company does not engage in foreign trade and the condition relating to nationality are not in line with the reality experienced by a small open economy.

However, the only condition that has an impact on the ranking here is that the company must be a limited liability company. This determines the number of procedures, the minimum capital required and indirectly, the timeframe and costs.

The score for this category should reflect the ease with which a company may be opened and consequently the number of businesses created. Thus, the idea of analysing the relationship between the number of businesses per 10,000 inhabitants and the overall result is to determine whether the processes and procedures (badly designed or undertaken), leading to a lower score, also represent a barrier to starting a business.



As in the previous cases, this does not seem to apply to EU Member States. A similar analysis to the one applied to the final score was performed, demonstrating that the correlation between the number of business creations per 10,000 inhabitants, the score in said category and the determinant coefficient was very low ($R^2 = 0.0126$). Consequently, this means that it is not possible to explain the variations in business creation rates by the score in the "Starting a business" category. This outcome indicates that factors and considerations other than those considered in the report play relatively important parts, such as political stability, quality of life, security, etc.

The World Bank estimated that the timeframe for the fourth procedure (i.e. obtaining a business permit) was 15 days. However, this does not match the internal statistics of the Directorate General of the Middle Class of the Ministry of the Economy in Luxembourg, who is responsible for issuing such authorisations.

According to the latter body's internal statistics, the timeframe for this procedure is under 15 days, especially if it is assumed that the company is active in trade or manufacturing, the time for data collection is not considered and all the information required is immediately available. According to the Directorate General of the Middle Class, based on those assumptions, the timeframe to deliver a business permit was **approximately 13 days²³ in 2018**. For the 2010-2019 (April) period, the average timeframe was 10.5 days²⁴. These figures were collected from the database listing timeframes of the Directorate General of the Middle Class.

- ²² Luxembourg is represented by green dots.
- ²³ This timeframe is composed of 12 days for processing and one day to send the permit by post.
- ²⁴ This timeframe is composed of 9.5 days for processing and one day to send the permit by post.

Table 10 Timeframe required to pr in days	rocess entire applications between 2010 and 2019 (Trade),
Timeframes in days, per	year
Year	Timeframe
2010	13.0
2011	11.5
2012	7.5
2013	6.5
2014	10.5
2015	5.5
2016	9.5
2017	8.5
2018	12.0
201925	8.0
2010-2019 period	9.5

Note: These figures were collected from the database listing timeframes of the Directorate General of the Middle Class of the Ministry of the Economy, Luxembourg



Note: These figures were collected from the database listing timeframes of the Directorate General of the Middle Class of the Ministry of the Economy, Luxembourg

It would be useful if the World Bank authors consulted the competent authorities on these matters, instead of only private actors, such as law firms. If the discrepancies are great, then the authors may assess which are the best sources of information.

An increase of the gross national income per capita would have a positive impact on the scores for costs and minimum capital required, because they are listed in percentage of GNI.

²⁵ From January to April 2019.

Given SARL-S (simplified limited liability company) has existed since 16 January 2017²⁶, if it had been considered in the determination of a "typical case", it would have had a positive impact on the scores for the minimum capital required, for procedures and for costs. In reality, potential entrepreneurs already benefit from a simpler form of business than the one considered in the EODB report.

Taking the SARL-S type of business into account, the following results ensue:

Table 11 Comparison between the results, taking the SARL and SARL-S I into account	ousiness type	95	
Indicator	SARL		SARL-S
Procedures (number)	5.0	\mathbf{V}	4.0
Time (days)	16.5	=	16.5 ²⁷
Cost (% of GNI/capita)	1.7	\mathbf{V}	0.2
Paid-in minimum capital (% of GNI/capita)	18.5	\mathbf{V}	0.0

Some countries monitor the report to improve their EODB score. Administrations in Singapore, for instance, "perform in-depth analyses of their respective indicators and comparative studies of the performances in other jurisdictions" and they "identify the areas in which a better implementation or legal reform is required, internally assessing the various proposals for action put forward"²⁸.

The scores for the sub-categories and implicitly, the score for the category, could be influenced in several ways with different outcomes. It would be possible to use the report's assumptions to intentionally set up purely cosmetic reforms without any real impact on the parties involved. Concrete examples of such reforms would include the payment of the minimum capital required in instalments²⁹ or pooling procedures so that new entrepreneurs could perform them all in one office or at a single counter. These reforms would not have many tangible effects but would improve this category's score.

Of course, the reforms could also be designed to improve entrepreneurs' real situations. It must be said, however, that some of the reforms suggested in the report could have a negative effect, such as the suggestion concerning the timeframe to obtain a business permit. More checks and stages (thus lengthening the timeframe to start a business) need not be considered bad in themselves, because a more demanding system can also prevent bankruptcies. In the same vein, the point of demanding documentation, specifically certain qualifications and items of proof required for a given planned business activity, is to ensure the entrepreneur has the skills and knowledge required for the business.

- ²⁶ Law of 23 July 2016, that modifies in order to establish the simplified limited liability company: 1. the amended Law of 10 August 1915 on commercial companies; and 2. the amended Law of 19 December 2002 on the Register of Trade and Companies, as well as accounting and the annual accounts of companies.
- ²⁷ The timeframe has not changed because only the notarised constitution deed is no longer required. When founding an SARL, this is done at the same time as the request for a business permit.
- ²⁸ Source: http://www.fondationidea.lu/2017/02/15/classements-internationaux-de-competitivite-utiles-a-reforme/ For further information on how Singapore uses the EODB reports: "The Doing Business Index on Minority Investor Protection: The Case of Singapore" https://papers.ssrn.com/sol3/
 - nttps://papers.ssrn.com/sol3/ papers.cfm?abstract_ id=2762088
 - For example, in El Salvador in May 2018, the required minimum capital totalled 2,000 USD, of which 5% had to be deposited before the registration of the business in the trade register. Thus, the minimum amount recorded for El Salvador is 100 USD, i.e. 2.7% of the revenue per inhabitant. Source: https://www.doingbusiness. org/en/methodology/startinga-business

5.4 Comparisons of the EODB results

As its name clearly suggests, the EODB report zooms in on business environments and the ease with which entrepreneurs can "do business". It takes a number of related indicators into account. Some aspects are not considered though, e.g. political stability, absence of corruption, the social system, workforce qualifications and skills, etc.

It is therefore useful to look at other benchmarks too, such as the IMD's *World Competitiveness Yearbook*, the Heritage Foundation's *Index of Economic Freedom* and the WEF's *Global Competitiveness Index*. These three reports are some of the most important in the world of economics. They take a multitude of aspects into account, thus allowing a more encompassing overview of the situation in combination with the EODB. These other reports have a different structure and the matters evaluated are not quite the same. However, they apply a number of indicators used in the EODB report³⁰. Consequently, it is possible to compare the EODB, the IEF and the GCI, resulting in interesting outcomes.

Table 12 Ranking of the WCY, GCI, IEF and EODB indicators ³¹						
Rankings	WCY	GCI	IEF	EODB		
Singapore	3	2	2	2		
Hong Kong	2	-	1	4		
United States	1	1	12	8		
Denmark	6	10	14	3		
United Kingdom	20	8	7	9		
New Zealand	23	18	3	1		
Sweden	9	9	19	12		
Switzerland	5	4	4	38		
Canada	10	12	8	22		
Taiwan	17	-	10	13		
United Arab Emirates	7	27	9	11		
Australia	19	14	5	18		
Norway	8	16	26	7		
Netherlands	4	6	13	36		
Finland	16	11	20	17		
Ireland	12	23	6	23		
Germany	15	3	24	24		
South Korea	27	15	29	5		
Iceland	24	24	11	21		
Malaysia	22	25	22	15		
Estonia	31	32	15	16		
Austria	18	22	31	26		
Japan	25	5	30	39		
Lithuania	32	40	21	14		
Luxembourg	11	19	17	66		
Czech republic	29	29	23	35		

Continuing on next page

- ³⁰ See Impact of the EODB report.
- ¹¹ The States covered in the various reports are different, hence why this table only lists the States considered in these reports except Hong Kong and Taiwan (not in the GCI report).

Table 12 Continued				
Israel	21	20	27	49
Latvia	40	42	35	19
Thailand	30	38	43	27
Belgium	26	21	48	45
Chile	35	33	18	56
France	28	17	71	32
Spain	36	26	57	30
Poland	34	37	46	33
Qatar	14	30	28	83
Portugal	33	34	62	34
Slovenia	37	35	58	40
Kazakhstan	38	59	59	28
Cyprus	41	44	44	57
China	13	28	100	46
Bulgaria	48	51	37	59
Romania	49	52	42	52
Slovakia	55	41	65	42
Italy	42	31	80	51
Hungary	47	48	64	53
Indonesia	43	45	56	73
Mexico	51	46	66	54
Russia	45	43	98	31
Turkey	46	61	68	43
Peru	54	63	45	68
Colombia	58	60	49	65
Saudi Arabia	39	39	91	92
Croatia	61	68	86	58
Jordanie	52	73	53	104
Greece	57	57	106	72
Philippines	50	56	70	124
South Africa	53	67	102	82
India	44	58	129	77
Ukraine	59	83	147	71
Mongolia	62	99	126	74
Brazil	60	72	150	109
Argentina	56	81	148	119
Venezuela	63	127	179	188

In the three other reports, Luxembourg ranks rather well, whereas for the EODB, it ranks as third to last in the EU. The discrepancy between the positions of Luxembourg in the EODB ranking and in the others is striking.

5.5 Impact of the outcomes of the EODB report

Numerous institutions and reports refer to the results of the EODB, such as the Heritage Foundation's *Index of Economic Freedom*, the IMD's *World Competitiveness Yearbook*, the World Economic Forum's *Global Competitiveness Index*, the European Commission, the International Monetary Fund, and the World Bank, of course. All these bodies use the EODB's results in their own reports.

In its 2019 Country Report for Luxembourg, the European Commission stated:

"According to the World Bank, Luxembourg is ranked 66th in doing business (cf. World Bank 2018), lagging behind the majority of EU countries. Opening a business is still burdensome, requiring on average 16.5 days and five procedures (cf. World Bank 2018) while in most EU countries procedures are faster."³²

It refers to the overall score, but also to the time and number of procedures required to start a business. Moreover, in its *"Product market performance"* and business environment assessments, the European Commission often used EODB data.

The three reports mentioned also refer to EODB outcomes relatively regularly.

³² https://ec.europa.eu/info/sites/ info/files/file_import/2019european-semester-countryreport-luxembourg_en.pdf

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EO	DB indicators taken on by the IEF, WCY and the GCI			
	EODB ³³	IEF	WCY	GCI
1	Level of investor protection	Included	-	-
2	Quality of land administration	Included	-	Included
3	Quality of judicial administration	Included	-	-
4	Starting a business – number of procedures	Included	Included	-
5	Starting a business – time	Included	Included	Included
6	Starting a business – costs	Included	-	Included
7	Starting a business – paid-in minimum capital	Included	-	-
8	Obtaining a business permit – number of procedures	Included	-	-
9	Obtaining a business permit – time	Included	-	-
10	Obtaining a business permit – costs	Included	-	-
11	Closure of a business – time	Included	-	-
12	Closure of a business – costs	Included	-	-
13	Closure of a business – recovery rate	Included	-	Included
14	Getting electricity – number of procedures	Included	-	-
15	Getting electricity – time	Included	-	-
16	Getting electricity – costs	Included	-	-
17	Minimum wage compared to the average added value per worker	Included	-	-
18	Barriers to recruitment	Included	-	-
19	Rigidity of working hour systems	Included	-	-
20	Barriers to the dismissal of redundant employees	Included	-	-
21	Legal notice period	Included	-	-
22	Mandatory severance pay	Included	Included	Included
23	Labour market participation rate	Included	-	-
24	Quality of regulation of conflicts of interest	-	-	Included
25	Shareholder governance index	-	-	Included
26	Total tax and contribution rates	-	-	Included
27	Pertinence of the legal insolvency framework	-	-	Included

The Index of Economic Freedom uses 23 EODB sub-indicators; the World Competitiveness Yearbook uses 3; and the Global Competitiveness Index uses 9.

T 1 1 10

One of the most-commonly applied sub-indicators is the **time required to start a business** (Starting a business – time), in which the **timeframe to obtain a business permit** is included. The other sub-indicator is that of "Severance costs". The first is also taken up by the European Commission in its country reports. It seems that the results are indeed referred to many times in various economic studies, whether cited above or not.

Of course, the use of the EODB results in other reports and studies means that a poor score in one or several areas can have a negative impact on the outcomes in other papers. On the other hand, an improvement in one or several EODB sub-indicators can lead to a better score in several other reports and studies. As a conclusion, the outcomes of the EODB (along with other information and analyses) are used as a base for part of other major reports.

> ³³ The names of the categories vary between the different reports.

5.6 Conclusions

Generally speaking, the EODB report is useful for economic players who are considering Luxembourg for their entrepreneurial activities, as well as for other interested parties and bodies wanting to improve the business environment.

As noted in the introduction, the report does not always take sufficient notice of Luxembourg's legal and socioeconomic particularities and legal traditions (e.g. the high rate of cross-border workers and foreigners working and living in the country, the size and openness of the country and its economy, etc.), leading to somewhat debatable results.

The EODB report does not consider all the factors impacting the success level of businesses or of an economy. It must also be noted that players are all subject to widely differing economic, social and environmental criteria and conditions, which must be fulfilled before launching an entrepreneurial activity. In addition, these conditions and criteria are not always of a regulatory or procedural nature. Consequently, it does not seem appropriate to focus exclusively on the areas defined as problematic by the report.

Data collection could be more extensive. It would be useful if the World Bank did not only request data from private bodies, but also from the public authorities that are qualified to provide their opinions, assessments and data so that a more encompassing view of the regulatory environment may be drawn up. This is especially important because the EODB is used by many other institutions (including the European Commission) and organisations as a basis for their analyses and studies of the economic and business environment in Luxembourg.

That being said, the elements and conclusions of the EODB report can prove to be very useful when making comparisons with other countries, to follow their best practices and define priorities for reforms to improve the regulatory framework and consequently making entrepreneurship easier in Luxembourg.

Some countries, such as Singapore, actively use the results and key outcomes of the EODB report to undertake regulatory reforms in order to improve their position in the ranking and make the country more attractive.

6 The economic impact of the 5 new priority sectors: focus on health and space technologies

6.1	Update of the health technologies sector's mapping	192
6.2	Update of the space technologies sector's indicators	199

Every year since 2014, the Observatoire de la compétitivité carries out an annual assessment of the economic impact of the 5 new priority sectors. This work allows the analysis of the economic growth and employment generated by these sectors. The monitoring indicators are regularly updated, whenever new data become available. Since the data relating to Information and Communications Technologies (ICT) and logistics are currently only available up to 2016, a decision was made to focus solely on the space and health technologies sectors for this edition of the Competitiveness Report.

In addition to updating the key economic indicators relating to the space technologies sector, this chapter presents the new approach used to map companies active in the health technologies sector in order to ensure a better coverage of the sectoral activities in Luxembourg, as well as the main findings that emerged of the process.

6.1 Update of the health technologies sector's mapping

6.1.1 Context

The Observatoire de la compétitivité of the Ministry of the Economy has been assessing the economic impact on Luxembourg of the government's priority sectors since 2014. The sectors monitored are: Information and Communications Technologies (ICT), space technologies, logistics, health technologies and eco-technologies. The findings of this work are published annually in the Competitiveness Report and allow the analysis of the economic growth and employment generated by these sectors. For some sectors however, including the health technologies sector in particular, it was noted that the companies listing used so far did not exhaustively represent the activities of the sector in the country. Indeed, until now, the companies in the sector were identified using specific NACE codes¹ relating to the activities of private companies in the health technologies sector via STATEC's Business directory², with a particular focus on diagnostics and biotechnologies. This targeted process, which helped identify 32 companies active in the sector for 2016, only partially reflected the reality of the sector's development.

> As a reminder, the NACE (Statistical classification of economic activities in the European Community) code is awarded according to the company's core activity, i.e., the one that contributes most to the company's overall worth.

https://statistiques.public.lu/ fr/publications/series/repertoire-entreprises/2017/repertoire-2017/index.html A pilot project, launched thanks to the collaboration between Luxinnovation and the Ministry of the Economy, allowed the development of a more systematic approach enabling the structured identification of companies in the health technologies sector and the creation of an inventory covering the diverse technologies and activities, now referred to as "HealthTech" in Luxembourg. Thanks to this new approach, trends in the sector can be monitored and adequate policies can be defined for its high-quality sustainable development. The approach may also be adapted to the study of other economic sectors in future.

6.1.2 Methodology

General approach

The developed approach is based on the combination of the expertise and analytical tools of the Market Intelligence Department of Luxinnovation, the Observatoire de la compétitivité and sectoral expert reports relating to the health technologies used by Luxinnovation and the Ministry of Health. In order to be listed as a HealthTech sector company in Luxembourg, the business must meet the following criteria:

- 1. It must have been active and registered in Luxembourg in 2018;
- 2. The majority of the company's activity must relate to the HealthTech sector, whether in research, development and innovation, production, marketing or services (see paragraph C.2);
- 3. It must possess economic substance³.



Scope of the HealthTech sector

To be included within the scope of the sector, most of the company's activity must relate to HealthTech. This excludes a certain number of activities, such as those relating to healthcare providers (e.g. doctors, dentists, prosthetists, etc.) and the public sector (e.g. public bio medical research centres, hospitals, etc.). Moreover, a decision to include the following companies as belonging to the sector was made: (1) companies whose target market relates to human health-care and whose placement on the market

of technologies and products must comply with European regulatory requirements to protect patient health and safety as well as public health (e.g. CE marking on medical devices, GMP certification of production units for medical devices or pharmaceutical products, etc.); and (2) companies offering services related to the above. The approach therefore only includes companies directly related to the sector, while those indirectly related to the sector⁴ are not considered.

- "There is no clear and unanimous definition of this notion [of economic substance]. Instead, it is an evolving concept embracing all elements of proof indicating that the purpose of a company or activity is economic, legal, commercial, operational or non-fiscal" (https://www.fmv. lu/fr/section/11/154/substance-economique) whether in terms of offices, tangible assets or salaried employees, for example" (http://www.oecd. org/fr/ctp/BEPS-FAQsFrench. pdf)
- Health centres, health insurance companies, patient transport services, pharmacies, services or products related to well-being, strictly diet-related advice or products, non-specialised advisory companies, investment funds, biomedical public research centres and bodies performing mainly veterinary activities, etc. are not included in the survey.

To identify companies meeting these criteria, a three-stage methodological approach was devised:

- Extraction of a preliminary list from various databases (e.g. Orbis, Editusdata, etc.) according to six target channels (see graphic below). This preliminary list aims to be as exhaustive as possible;
- 2. Preliminary review in application of the three criteria, allowing to select companies based on their sectoral relevance, status (active in 2018 and registered in Luxembourg) and economic substance;
- Detailed analysis of each company and classification according to sub-sectors ((a) biopharmaceutical, (b) diagnosis and medical devices, (c) other health technologies, including support and advice) and to the type of operational activity (e.g. management activities, research, manufacturing, etc.). "Category-specific fields" are then assigned to these companies to identify key topics, such as their digital dimension, for example.

The following chart describes the approach, starting with the extraction from the databases up to the final review by the sectoral experts.



Detailed approach

A. Creation of a preliminary list of companies

A preliminary list of companies was created by extracting businesses from six different target channels:

NACE

An initial selection of companies linked to the health technologies sector was drawn up based on certain NACE codes identified in STATEC's Companies' registry potentially related to the sector, such as the manufacture of pharmaceutical preparations code, the activities of research and experimental development on biotechnology, etc.

Group structure

Based on the Orbis database, it was then possible to identify the NACE codes of the shareholders and subsidiaries of the companies domiciled in Luxembourg. This allowed to add Luxembourgish HealthTech companies classified in a NACE code not directly linked to health (e.g. computer programming) whose shareholders or subsidiaries have a NACE HealthTech code.

Patent

A survey of intellectual property-related databases was also performed. Starting with the official "A61. Medical or Veterinary Science; Hygiene" category in the International Patents Classification (IPC), companies registered in Luxembourg and having filed a patent in an intellectual property office anywhere in the world were pre-selected.

Legal name

Again, based on the databases, a semantic search was made into the legal names of all the entities registered in Luxembourg. Starting with a non-exhaustive list of key words commonly used in the health technologies sector, such as "Biogen", "Brain", "Medica", "Pharma" and the like, companies whose legal name contained these key words were pre-selected.

Cluster/Expert

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A review of experts from the Luxembourg HealthTech Cluster and the Ministry of the Economy allowed the list to be consolidated by adding start-ups from the local ecosystem but not included in the list.

Editus "Activity sector"

Finally, the Editusdata⁵ database was used to extract pertinent companies based on a sectoral classification referred to as "activity sectors" and exclusively listed by Editus. Editus supplements the official NACE codes and enables a more in-depth analysis with "activity sector" references such as "digital health", thus improving the representativeness of the selection.

> Editusdata is a paying marketing and financial database listing some information available on the Luxembourg Business Registers, as well as company classification per activity sector. www.editusdata.lu

B. Preliminary review

The second stage was to ensure that the three criteria of sectoral pertinence, status and economic substance were correctly applied to the selected companies so that they might be considered for the following stage.

C. Classification of companies

In the third and last stage of the methodological approach, the companies were approved and classified by the sectoral experts from Luxinnovation and the Ministry of the Economy. This classification was drawn up on three levels, as described below.

Sub-sector

An initial unique 1st level "**sub-sector**" for each legal entity. The company can therefore only be classified into one activity sub-sector.

- Biopharmaceuticals: sub-sector relating to any product or technology subject to a Marketing Authorisation, such as medication, biosimilars, generics, gene therapy, tissue engineering for therapeutic purposes, regenerative medicine, vaccines, other products and substances, etc. but excluding nutritional health (i.e. food supplements);
- In vitro diagnosis and medical devices: sub-sector relating to any product or technology subject to the obtaining of the CE marking attesting to compliance with European directives 93/42/EEC, 98/79/ EC and 90/385/EEC⁶; product or technology designed, manufactured, repaired and distributed according to the requirements of ISO 13485 such as in vitro diagnosis kits, tubes, valves, prostheses, stents, medical decision-making software, companion diagnostic tests, medical equipment and related software;
- Other health technologies: heading relating to any product or technology not included in the aforementioned categories, such as ISO 15189 certified medical analyses, digital tools for care organisation, medical research equipment, etc.

These directives have been replaced by two new European regulations, i.e. [EU] MDR 2017/745 and IVDR 2017/746, the application of which will come into effect in 2020 and 2022, respectively.

Operational activities

A 2nd level surveying **operational activities** in the country. A legal entity may have several operational activities.

- Management (or intellectual property) activities only (holding).
- ▼ Commercial or sales activities (e.g. resale or medical representatives).
- Research and/or development activities.
- Manufacturing, production or development activities (and research services).
- Service activities in the health industry (e.g. medical analysis laboratories, regulatory consultancy, etc.).

Companies performing management activities only were later excluded from the list.

Classification fields

A 3rd level, "**classification fields**", defined by the sectoral experts, allowed assigning specific codes to companies, e.g. "IT" for companies whose activity is based on digital processes.

6.1.3 Findings of the analysis

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The methodology described allowed the identification of 131 companies whose activity could be linked to the health technologies sector. According to the analysis of the available data relating to these 131 surveyed companies, the Luxembourgish HealthTech technologies sector generated 175 million euro in added value in 2016, i.e. $0.38\%^7$ of the country's economy. The HealthTech sector counted nearly 1,600 salaried employees in 2016, nearly 80% of whom worked in companies with less than 10 salaried employees. The health technologies sector in Luxembourg may be considered as young, since half the companies identified were founded less than 8 years ago.

Nearly half (46%) of the relevant companies in the HealthTech sector are engaged in activities in the field of in vitro diagnosis and medical devices in their Luxembourgish headquarters, while 31% are active in the field of biopharmaceuticals, and the rest are engaged in other activities linked to health technologies (e.g. regulatory consultancy services, medical analyses, etc.). In the past, most of the companies in the sector were located in Luxembourg City. For a few years now, however, these activities have begun moving away from the centre, mostly towards the south-east of the country, probably due to the attractiveness of the University of Luxembourg and the House of BioHealth.

7 Based on October 2018 data.

Among the 131 companies in the sector, 31 focus on digital technologies and have a digital process as core activity, which is in line with the international trend of increasing digitalisation in the health industry and among healthcare service providers.

This survey supplied an initial exhaustive image of the activities relating to the HealthTech sector in Luxembourg and should be considered as a base that aims to evolve and provide an increasingly clear image of the sector and its potential evolution over the short, medium and long term. This study will continually feed ideas for specific actions aimed at the qualitative and sustainable growth, sustainable growth of the sector to meet the needs of patients and of the Luxembourgish population.



Source: Luxinnovation (https://www.luxinnovation.lu/wp-content/uploads/2019/07/healthtech-keyfigures.pdf)

6.2 Update of the space technologies sector's indicators

A new update of key indicators was performed, such as the number of players and jobs in the space technologies sector, as well as the gross added value it generated⁸ in Luxembourg.

The data were gathered by means of specific questionnaires sent directly to the companies, thus allowing the compilation of essential and precise information relating to the share of added value created by the individual companies, as well as the jobs directly linked to the space activities.

These data show that the number of companies active in the space technologies sector doubled between 2012 and 2018, particularly thanks to the arrival of many new companies between 2016 and 2017 (Table 1). The number of jobs in the sector thus rose from 639 to 840 over this period, representing a job growth rate of 31.6%. It should be noted that these figures do not include jobs at the LIST public research centre or the University.

While SES remains the largest employer, employment with other companies in the sector nearly doubled over the 2016-2018 period, rising to over 270 jobs.

Table 1 Indicators relating to the space technologies sector – Private sector							
Indicators relating to the space 2012 2013 2014 2015 2016 2017 2018 (
Number of companies	16	18	18	19	22	30	32
Number of companies	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Number of employees	639	634	598	618	648	723	840
Number of employees	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Value added at factor cost	670.8	694.8	803.3	823.3	777.7	753.8	800.8
(in EUR millions)	1.7%	1.7%	1.8%	1.8%	1.6%	1.5%	1.5%

(p): provisional data

Source: Data gathered by means of a questionnaire submitted to companies by the Luxembourg Space Agency (LSA), Luxembourg Trade and Companies Register (RCS-LBR)W Calculations: Observatoire de la compétitivité (ODC)

In 2018, the space sector generated over EUR 800 million in gross added value, or nearly 1.5% of the total gross added value of the country (Chart 3). Despite a drop in the gross added value generated in relative terms due to a more rapid growth of the overall economy compared to that of the sector, the gross added value generated rose by 21.7% in absolute terms between 2012 and 2018.

The definition of the space sector which has been used in this study taken on for Luxembourg is an adaptation of the OECD definition and includes private sector players' activities "involved in the development, supply and use of space-related products and services, ranging from research and development and the manufacturing and use of space infrastructure (ground stations, launchers and satellites) to applications for space components (navigation equipment, satellite telephones, weather service) and to scientific knowledge generated by these activities". The areas of application for space technologies are satellite communication, satellite navigation, satellite earth observation, space exploration and space science.



(p): provisional data

Source: Data gathered by means of a questionnaire submitted by the Luxembourg Space Agency (LSA), Luxembourg Trade and Companies Register (RCS-LBR) Calculations: Observatoire de la compétitivité (ODC)

Since the creation of SES in 1985, telecommunications and media capabilities via satellite, along with corresponding ground infrastructure have generated most of the growth in the Luxembourgish space sector. Today, this aspect remains dominant, but it has been offset by the recent arrival of new players in Earth observation, especially geo-information services, integrated applications and space security, as well as Luxembourg's position with regards to the exploration and use of spatial resources.

7 The OECD's Economic Survey Luxembourg

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On 10 July 2019, the Secretary-General of the OECD, Ángel Gurría, presented the Economic Survey Luxembourg 2019¹ in the presence of Pierre Gramegna, Minister of Finance, and Sam Tanson, Minister of Housing. This OECD survey forms part of the work of the Economic and Development Review Committee (EDRC). Each peer review draws up a diagnosis of the state of the economy of Luxembourg and then examines a matter in greater depth. For its 2019 edition, the OECD selected the issue of housing. The survey was published under the responsibility of the OECD's EDRC.

7.1 The process

Every two years, the OECD publishes a report on the economic situation and policies of each of its Member States. Peer review, a method applied since the creation of the Organisation, focuses on structural policies and their interaction with macroeconomic policies. The study also includes a detailed analysis of a specific structural subject, such as education, innovation or housing. The choice of macroeconomic or structural subjects for the chapters entails prior consultation between the Secretariat of the OECD and the country under review at the beginning of the process. The aim of said consultation is to identify important topics for the political decision-makers of the targeted country, for whom recommendations could be made to help significantly improve its economic performance.

7.1.1 The technical mission and the political mission

The Observatoire de la compétitivité of the Ministry of the Economy and the Embassy of Luxembourg in Paris join forces to coordinate the work and support the OECD in its preparation of the survey, while also organising the necessary technical and political missions. Between 27 and 30 November 2018, the Secretariat of the OECD met with high officials and representatives from the various ministries and administrations. Meetings were also held with the Central Bank of Luxembourg and the Financial Sector Supervisory Commission (CSSF), as well as with employers and salaried staff. For matters relating to the specific chapter, the Secretariat also held meetings with the National Affordable Housing Company (SNHBM), the Social Housing Agency (AIS) and the Housing Fund. These meetings all had a technical objective, i.e., gathering information and clarifying matters. Pursuant to the technical mission, the Secretariat prepared a first draft of the survey and recommendations, which were then presented to the concerned ministers, the CSSF and BCL Executive Boards during the political mission on 1 and 2 April 2019, as well as to the Bureau of the Economic and Social Council.

> OECD, OECD Economic Survey Luxembourg 2019, OECD Editions, Paris https://doi.org/10.1787/2 a4a718c-fr

7.1.2 EDRC plenary session – Peer review and bilateral session

After the political mission, the study is distributed to the members of the EDRC and presented in a plenary session. This stage marks the beginning of the peer review. The other Member States make their observations to the EDRC, and the OECD must take these into account. Two of the peer review countries play a particularly important role in this regard, and in the case of the Luxembourg survey, these countries were Portugal and Estonia. At a bilateral meeting between the Secretariat and Luxembourg, the amendments proposed by the EDRC are drafted and integrated into the document. The final version of the survey is then officially approved by the Committee before publication under its own responsibility.

7.2 The content of the survey

7.2.1 Key Policy Insights

In Luxembourg, well-being benefits from high income levels, a healthy work-life balance and relatively low gender inequalities. However, economic prosperity and quality of life face some risks. For example, important challenges remain in education and skills, partly due to the large diversity of the population. Another risk factor is the ageing population. Indeed, despite the measures taken by the government in 2012, the OECD believes that the relatively high replacement rates and a gap between the legal retirement age and the effective retirement age of the pension system will entail considerable fiscal pressure in the long run. The OECD thus recommends raising the retirement age by linking it to changes in life expectancy and/or reducing the generosity of the replacement rate.



The sound fiscal balance allows for counter-cyclical measures to be taken in the event of a recession, while at the same time maintaining ample fiscal space. Budgetary reforms aimed at mitigating the rise in retirement-related expenditure and increasing environmental and estate tax revenues should drive growth, equity and sustainability. Luxembourg faces outside risks, such as the deteriorating international trade and slowing growth in the euro area. As for productivity, which is very high in level, Luxembourg is highly reliant on services. According to the OECD, the weak growth rate in the country's productivity is the result of stagnation in the services economy, especially in the financial sector, due to low interest rates and the high cost of compliance with European and international regulations.



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Source: Eurostat, Information Society Database

The OECD also highlights the lack of skills to respond to the demand generated by the digitalisation of the economy.

Nevertheless, it must be acknowledged that the productivity slowdown is a problem common to all developed economies. To improve productivity, the OECD recommends modernising insolvency laws, promoting advanced technologies and performing regular analyses of economic diversification measures.





To drive productivity growth, companies further away from the productivity frontier must be assisted so that they can catch up, namely through an increase in digitalisation and the improvement of required skills, as well as by means of the promotion of innovation in companies located at the productivity frontier.



In addition to the public policy analysis, the OECD takes stock of Luxembourg's progress relating to structural reforms. The various measures taken by Luxembourg as a result of the recommendations formulated in the last OECD economic survey are listed in a summary table.

7.2.2 Thematic chapter: Policies for a more efficient and inclusive housing market

The OECD's thematic chapter is dedicated to the housing market, an important topic in Luxembourg. The price of housing has risen steeply in Luxembourg as the result of remarkable demographic growth. Chart 6 shows that the growth in population does not go hand in hand with the growth in built-up surface areas.



Indeed, the supply is too low compared to demand, leading to a dramatic rise in housing prices and therefore a drop in affordability. Chart 7 shows that the cost of housing for home-owning households with mortgage loans compared to their disposable income is higher in Luxembourg than any other Member State of the OECD.



Note: In Chile, Korea, the United States, Mexico and New Zealand, gross income instead of disposable income is used due to data limitations. No data on mortgage principal repayments available for Denmark due to data limitations. Data for Japan only available on the respondent level due to data limitations. Source: OECD Affordable Housing Database

In view of the above, the OECD has attempted to draw up recommendations regarding housing policies to make the housing market more efficient and inclusive.

According to the OECD, planning instruments are insufficient to prevent land hoarding, since the land available for housing construction is mainly in private ownership (92%), and many landowners are not impelled to sell or develop their land. The municipalities, public providers of housing and the State own the remaining 8% of the land. The OECD attributes the land hoarding to two main drivers. First, the mere ownership of land is virtually cost free, given the low level of property taxes, and secondly, there are few constraints or real incentives for municipalities to implement the guidelines from the Master Programme for Spatial Planning in municipal Land Use Plans and to initiate new developments. The OECD thus recommends improved coordination in spatial planning and infrastructure provision.

In its study, the OECD observes that the cost of new housing has also been increasing following the introduction of more stringent energy efficiency requirements, an investment that will ultimately reduce energy costs.



Note: Construction includes residential buildings, except residences for communities. Source: Eurostat, Short-term business statistics

The OECD is nevertheless of the opinion that the State subsidises the construction of housing generously, distinguishing between public and private developers. Despite a potentially high rate of subsidisation for the launch of new housing construction, according to the OECD, the current 2008 Housing Pact has not been successful in stimulating sufficient supply of housing. The OECD thus proposes to increase the costs associated with land holding by introducing a recurrent tax on unused building land for residential purposes. In Ireland, for example, a register of vacant sites was recently introduced to stop property owners hoarding land suitable for development. Local authorities identified unused properties that in 2019 attract a levy of 3% of the land value, raising to 7% in 2020, if the land remains undeveloped.

The OECD is also examining The OECD also looks at policies to make homeownership equally attractive as other forms of providing housing services, the so-called tenure neutrality, and ensure more equal access to housing. Tax stimulation of homeownership tends to be regressive and can lead to overinvestment in housing and stoke housing prices growth.





According to the OECD, housing should be taxes similarly to other investment. The first best solution would be to tax imputed rental income, less depreciation allowances, while allowing for interest rate deductibility (Andrews, Caldera Sánchez and Johansson, 2011). More progressivity of the tax could also be achieved by introducing a recurrent progressive tax schedule to the owner or by allowing deferral of the recurrent tax on immovable property until the death of the taxpayer or sale of the property for older taxpayers.



Such a reform of the property tax would release additional fiscal resources to municipalities, allowing them to capture part of the value associated with soaring land prices. That would improve the efficiency of public goods and services provision and the quality of territorial development, while helping to release unused land that is kept mainly for speculative purposes.

While Luxembourg displays levels of both homeownership and wealth inequality close to the OECD average, there is a larger difference between homeownership rates in the top and bottom income quintiles. In the top income quintile, 86% of households are homeowners, while the OECD average is 85%. In the bottom income quintile, some 38% of households are homeowners, compared to the OECD average of 50%. Housing is an especially important asset for households in the middle income and wealth quintiles. In Luxembourg, housing net wealth represents 62% of the total wealth of households in the middle net wealth quintile. However, housing is much less prominent at the top of the wealth distribution: the share of housing in the portfolios of households in the top percentile of the wealth distribution is 18%, well below the OECD average.

Participation in the mortgage market is high. On aggregate, 29% of households have a mortgage loan on their main residence, compared to 17% in Germany, 19% in France and the OECD average of 25%. Moreover, the access to mortgage is better in the middle of the income distribution. Unlike in most OECD countries, households in the middle income quintile are almost as likely to have a mortgage as those in the top income quintile. Middle income quintile households are 2.1 times more likely to have a mortgage than in France and 2.6 times more likely than in Germany.





The stock of social housing in Luxembourg is one of the lowest in the OECD. The limited stock partly reflects the preference of public providers who used to allocate about one third of constructed units to renting and two thirds for sale (Ministry of Housing, 2018), and the past practice of allowing re-sale of subsidised housing on the unregulated market (European Social Housing Observatory, 2007). However, efforts to increase the share of social rental housing are underway. Since 2017, the sale of social has taken the form of a long-term lease. This policy is welcome, as it effectively captures the value of developed land, which remains a property of the public housing providers. The provision of social housing is insufficiently targeted and does not appear to protect the low-income households from the shortage of affordable housing and socio-economic segregation. Waiting lists of public social providers are long and turnover low. While rents in the protected sector are on average 30% below market rents (Ministry of Housing, 2018), the admission criteria are flexible, at the cost of lower transparency, and the waiting times may vary considerably, due to the discretion in matching households' specific needs. Consequently, the equity of access to social housing may not be warranted. In general, housing support in Luxembourg should be better targeted, as less than 10% of total public support related to rental and owner-occupied housing is clearly earmarked, based on socio-economic or environmental criteria (Mellouet, 2018). For example, housing allowances in Luxembourg do not include any spatial differentiation, such as coupling the allowance to local reference rents, as in Germany. However, considering the heterogeneity of housing and rental prices in Luxembourg, this may be useful in making them more effective (de Boer and Bitetti. 2014).

8 Thematic studies

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This chapter provides an account of selected studies carried out by STATEC Research ASBL in the last year. This research aims to provide insights into the social and economic reality of Luxembourg, focusing on relevant economic facts such as entrepreneurship, the effects of certain characteristics of the population structure, and the quality of life in the country.

Several years ago, the research team engaged in the PIBien-être project. The project's aim was to assess the quality of life of Luxembourg's residents, by compiling and analysing a set of indicators relevant to people's well-being, beyond standard income-based measures of welfare. This set, largely inspired by the OECD well-being index, included measures of income inequalities, risk of poverty, unemployment, environmental degradation, trust, housing quality, etc. From this analysis, the first PIBien-être report was released at the end of 2017, and is now part of STATEC's regular statistical production. From then, researchers have continued a research programme focused on well-being, its determinants and consequences (Fumarco et al., 2018).

Among indicators of well-being, life satisfaction is increasingly recognised as an effective measure of quality of life, and a useful indicator of the overall state of a country. At the macro level, it correlates meaningfully with important variables such as unemployment, inflation, income, and trust. At the individual level, it correlates with objective measures of well-being, as it is shown in the field of psychology and health studies. Moreover, life satisfaction has the advantage that it can be directly measured with surveys. European countries are measuring their population's well-being through surveys such as the EU Commission's Eurobarometer, Eurostat's EU-SILC, and prominent academic surveys such as the European Social Surveys and the European Value Study. Despite these efforts, however, the availability of data on life satisfaction in Luxembourg is limited.

The first section of this chapter presents results from a novel analysis of well-being in Luxembourg, taking a macroeconomic perspective, and setting the scene for further research. The study depicts, to the best of our knowledge for the first time, the evolution of well-being in Luxembourg since the early 1980s. It also discusses the links of life satisfaction with important variables such as trust, inequality and social policy, in the light of the latest research results from the field. Indeed, recent studies found that those variables shape the relation of wellbeing with economic growth. The trend of life satisfaction in Luxembourg appears flat, in face of continuous economic growth. The analysis suggests that this may be due to the offsetting effects on well-being of increasing unemployment and inequality, on the one hand, and on the other hand, of increasing trust and social expenditures. The second section reports on research on the impact of immigration in European countries. The evidence, based on the Eurobarometer and on UN data for Luxembourg and other European countries, shows that increasing migrant shares do not lower the well-being of natives. This is relevant because, despite the prominence of migration issues in the public debate, there is limited quantitative evidence on the effects of immigration in host countries, and this evidence is often restricted to economic outcomes. This research looks at the impact of migrations on well-being

The third and last contribution presents the main results from the Luxembourg Global Entrepreneurship Monitor (GEM) report 2018/2019. GEM gives a unique account of entrepreneurship in Luxembourg, based on representative surveys on individuals, and allows researchers to analyse entrepreneurial activities in a comparative perspective. The report presents indicators of the magnitude of entrepreneurship, showing the good placement of Luxembourg in the international ranking. The survey provides information on entrepreneurs' well-being, on individual traits of entrepreneurs, and on several institutional factors that affect the business environment in Luxembourg. GEM also collects information on migration backgrounds of respondents, showing that migrants have a high propensity to entrepreneurship compared to the rest of the population. In addition, for the first time, the report investigates family-based entrepreneurship and provides the point of view of entrepreneurs on policies and programmes for entrepreneurship in Luxembourg.

8.1. Economic growth and well-being beyond the Easterlin paradox¹

The relationship between economic growth and well-being is controversial. Investigation began in 1974 with Richard Easterlin's work, which found that Americans' well-being did not grow despite a growing economy. This finding represents the most important part of what has become known as the Easterlin paradox. Since then, Easterlin and others have further substantiated the conclusion that economic growth is unrelated to well-being over time, while others have strongly opposed these findings. Two additional views have recently enriched the debate: firstly, whether economic growth is related to well-being in time is negligible because the relation is small in magnitude; secondly, the quality of growth is what matters for well-being, not the amount - if economic growth occurs in a cohesive and inclusive society, then wellbeing improves; but if instead, social poverty and increasing inequality accompany economic growth, then well-being declines. In Luxembourg, well-being has been fairly flat since 1981, despite strong economic growth. Perhaps the quality of growth in Luxembourg can help explaining this trend.

8.1.1 The Easterlin paradox and Luxembourg

Luxembourg's economy has grown continuously since 1981, with one exception, the "great recession" of 2008. Such growth improved the lives of Luxembourg's residents in a number of ways, for instance, granting them better health technology, safer working conditions, better infrastructure, greater number of goods and services, and more materially comfortable lives. Despite these improvements, the share of residents declaring to be satisfied with their lives remained substantially unchanged (see Figure 1). Observing this difference, a natural question arises: are the life satisfaction figures reliable? Life satisfaction is generally regarded as a reliable and valid measure of well-being (see for example Durand, 2015), but it is possible that our particular source is inaccurate. There is only one source of historical data on life satisfaction for Luxembourg, the Eurobarometer. This is a set of surveys administered by the European Commission multiple times a year in every country of the European Union. We provide some reassurance that our life satisfaction data are indeed reliable by comparing it with other, albeit, shorter datasets. We find that the Eurobarometer, European Values Study, and the European Quality of Life Survey each provide similar trends for life satisfaction when the data are jointly available. Moreover, the fact that life satisfaction is flat in Luxembourg does not mean that it is always constant over time. For instance, in France and the Netherlands the share of people very satisfied with their life has increased since the early 80s, it has stayed constant in Belgium, and it has followed a "J" trajectory in Germany. In other words, Luxembourg stands out as an example of country in which economic growth did not translate into greater well-being, as in the United States, Great Britain, and China. Can the evidence from previous studies explain why Luxembourg follows this pattern?

This article draws upon the paper "Economic growth and well-being beyond the Easterlin paradox" forthcoming in Economie et Statistique, the STATEC working paper series.



8.1.2 Conditions for inclusive growth

The literature on the conditions for "inclusive growth" – a growth that benefits all the members of society – is in its infancy; however, the available evidence suggests that we can expect an increase in wellbeing when economic growth is associated with low income inequality, low unemployment, high social capital, and generous welfare state policies. If this evidence applies to Luxembourg, then the flat trend of life satisfaction should result, at least in part, from the contrasting effects of economic growth and these four conditions. We checked whether the available data support this hypothesis.

8.1.3 The evidence

Descriptive statistics suggest that income inequality, unemployment, trust (a synthetic measure of the quality and quantity of relationships with others)², and social expenditures (a proxy for the generosity of the welfare state) each have increased in Luxembourg since the early 1980s. Income inequality, as measured by the Gini index of income³, increased by about 5 points, from 23.9 to 28.7, between 1985 and 2015. Similarly, unemployment⁴ increased nearly 9 fold in 35 years, ranging from 0.7% in 1980 to 6.7% in 2015. According to previous literature, these changes hindered life satisfaction, possibly overcoming a positive contribution of economic growth expected from traditional economic theory. On the other hand, the increases in trust in others⁵ and social expenditures should have positively contributed to life satisfaction. Since 1980, the share of people who feel that others can be trusted nearly doubled, from about 20% to nearly 50%, and social expenditures grew three fold, from 8190 USD per capita (base year 2013) in 1980 to 23880 USD in 2015.

- Trust is based on responses to the question, "Generally speaking, would you say that most people can be trusted, or that you could not be too careful in dealing with people?"
- Income is measured as equivalent household disposable (post-tax, posttransfer) income. Source: Standardized World Income Inequality Database (Solt, 2016). The SWIID provides the longest, most complete, and comparable set of data on income inequality. It is based on data from the World Income Inequality Database (WIID), but it hinges on additional assumptions to ease crosssectional comparability and to impute missing data. For these reasons some scholars have expressed criticism towards the SWIID (Jenkins, 2015). However, we find that figures from SWIID positively and significantly correlate with two alternative sources of information on income inequality in the years and countries when the three data sources are jointly available (WIID and the World Inequality Database (WID)).
- Unemployment is measured as a percentage of total labor force. Source: World Development Indicators, World Bank, 2018.
- ⁵ Unfortunately, the best data on trust that covers a long time period in Luxembourg has limitations - only the Eurobarometer collected this information and only in the years 1986, 2004, 2009, 2010, and 2014.
We tested our hypothesis using an econometric technique that allows us to jointly study short and long term dynamics of gross national income, social expenditures, trust in others, income inequality, and unemployment. Results indicate that our model fits the data rather well: predicted and observed life satisfaction correlate at 84%. Moreover, we found evidence supporting the hypothesis that the offsetting influences of increasing unemployment, on the one hand, and of trust in others and economic growth, on the other, can partially explain the flat trend of life satisfaction in Luxembourg.

8.1.4 Conclusion

These findings are relevant for various reasons. We are the first to analyze the well-being of people in Luxembourg over a period of more than 30 years in the light of a broad theoretical framework and using state-of-the-art econometric techniques. Luxembourg is a representative case of countries in which there is no association between economic growth and well-being. Indeed life satisfaction was fairly flat over the period 1981-2015, despite economic growth. This puzzling evidence does not find any immediate answer, therefore we turned to recent academic literature for an answer. We expected that the trend of life satisfaction in Luxembourg was flat because of changes in four conditions that can have an offsetting effect on life satisfaction. These conditions are: decreasing income inequality, and unemployment; increasing social capital, and welfare state policy. We found evidence supporting the hypothesis. In particular, the growth of unemployment hampered the well-being of residents in Luxembourg more than the gains from growing GDP and trust. The single most impactful factor for well-being over time was trust in others. The estimated relations indicate that the longrun effect of trust on well-being was nearly twice the effect of economic growth – indicating that there are more important factors for well-being than economic growth. What is more, these results are based on more sophisticated econometric techniques than most previous studies.

A growing economy is traditionally seen as a sign of improving quality of life. However, the pursuit of an ever-growing economy can miss keeping its promise: growth may not lead us toward greater subjective well-being or happiness, which is arguably the ultimate goal of economics.⁶ Indeed, previous studies have shown that a thriving economy can be the consequence of unhappy, unhealthy, overspent, isolated, and polluting lives. This understanding paves the road to another important aspect of the present research. We support the view that the quality of growth matters. At a time when scholars debate economic growth or de-growth, we argue that the issue is under which conditions growth should occur – which conditions favour lasting well-being. Based on the available research, we have identified and tested some important candidates for these conditions: quality and quantity of social relationships, employment, economic equality, and welfare state policies. We expect the list will grow in the coming future.

> Jeremy Bentham (1776) and John Stuart Mill (1863) defined utility as human happiness and concluded that society should aim at the "greatest happiness for the greatest number" (Veenhoven, 2010).

The good news is that it is possible to combat or promote each condition with policies. Experiments in urban organization provide examples of actions that have had a number of desirable outcomes that contribute to well-being, for instance improving green areas, pedestrian areas, pedestrian and cycle paths, and public transport. Such initiatives provide people with greater opportunities to develop social relations and networks; people get more involved in local communities and care more for the environment; they exercise more which positively affects health; neighborhoods become less dangerous and more livable; and inequalities become less severe because everyone has greater access to public goods, which reduces the importance of individuals' purchasing power.

In other words, it is possible to imagine a society in which what people own matters less for their well-being, in which money is a tool and not a goal in life; a society freed from the need of money. This is maybe a society in which the economy grows slowly, but it does so compatibly with people's well-being, and arguably, with the quality of the environment.

8.2 The effect of immigration on natives' well-being in the European Union⁷

Immigration is seen as one the most important issues facing Europeans today. Although the present social and political environment *suggests* people feel negatively about immigrants, numerous papers have demonstrated that there are positive impacts on *economic* outcomes, e.g., productivity, employment, and entrepreneurial activity [see for example, Aleksynska and Tritah, 2015; Alesina et al., 2016; Jaumotte et al., 2016; Ortega and Peri, 2009; Peroni et al., 2016). However, many of the channels through which immigrants may affect natives are *non-economic*, which relatively few studies have examined. If we assume that policy-makers are interested in the overall well-being of their constituents, then we need to assess both the economic and non-economic effects of immigration.

The analyses summarized by this section evaluate the overall impact of immigration on a broadly defined measure of well-being. Specifically, we use survey data from the Eurobarometer regarding individuals' satisfaction with their lives (life satisfaction) (European Commission, 2018). Life satisfaction is well suited as a comprehensive single-item measure that captures both economic and non-economic factors that are otherwise often ignored.⁸ Assessing the impacts of immigration on subjective well-being may be the only way to appropriately account for each of the factors people deem to be important. ⁷ This section is based on O'Connor (2019).

Life satisfaction is measured as 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 reflect factors such as: material conditions, family/ social relationships, health, and community, among others (Cantril 1965: Cummins 1996) They predict future behavior, 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.

The evidence presented in this section suggests natives need not worry about immigration affecting their overall feelings of well-being. If immigration affects the life satisfaction of natives, then when the immigrant population share changes in a country there should be a corresponding change in life satisfaction. Figure 2 illustrates the changes in life satisfaction and the corresponding change in immigrant population shares.⁹ The changes occur within a country generally over a period of five years. Percentage point changes in immigrant shares are presented along the horizontal axis, and percentage point changes in life satisfaction, along the vertical axis. Life satisfaction is measured as the native population share reporting they are very or fairly satisfied (one of the two positive categories). By visual inspection, it is clear that there is no relation between changes in immigrant shares and life satisfaction. For example, in one period the population share of immigrants grew in Luxembourg by more than 15 percentage points, yet during this period life satisfaction changed little. In a different period, the immigrant population share declined in Luxembourg and again life satisfaction remained nearly the same. In other countries, such as in Romania (ROU) and Greece (GRC), life satisfaction substantially changed, yet the immigrant share did not change much. There are limits to the interpretation of this figure however; it does not address omitted variables or the possibility that emigrants move to happier countries (reverse causality).

To overcome the limitations of Figure 2, we estimated the relation between life satisfaction and immigration using regression techniques. When visually inspecting Figure 2, we looked to see if changes in immigrant population shares were associated with changes in life satisfaction in a systematic way, e.g., increases in one corresponding to increases in the other, but Figure 2 is limited to two dimensions. Regressions, in contrast, allow for the inclusion of additional dimensions. In the present analysis, we use them to assess whether immigration has a direct effect on life satisfaction that is free from the influence of external variables and reverse causality.¹⁰ The benchmark regressions evaluate whether changes in immigration population shares affect the life satisfaction of the full population of natives in the full set of EU countries and in subsamples of the EU15 and new member states (NMS) that joined in the 2000s. Additional regressions were used to both assess the life satisfaction of natives in different education and age groups and to assess different types of immigration. It is plausible to expect lower skilled or elderly natives to be affected by different factors than their counterparts. Likewise, immigrants from different countries may influence natives differently.

Immigrant stocks are available from the United Nations (United Nations Population Division, 2017). For most countries, immigrants are defined as people residing in a country other than where they were born. Immigrant stocks also exclude refugees. Refugee data are from the UN Refugee Agency population statistics including refugees and asylum seekers (UN Refugee Agency, 2018).

In particular, we use instrumental variable regressions that exploits variation in the time-varying characteristics of sending countries (so called "push factors") to isolate any effects of immigration on destination countries.



EU15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and United Kingdom. The NMS countries include: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic, and Slovenia. Although Bulgaria, Croatia, and Romania joined the EU in 2007 and 2013, the Eurobarometer also began coverage of them in 2004. Source: Author calculations. Eurobarometer; and United Nations Population Division.

The regression results indicate increasing immigrant population shares did not have a positive or negative effect on natives' life satisfaction in 28 European Union countries, over the nearly 30-year period 1990 to 2017. This conclusion holds in the EU15 and NMS, and among different population groups, notably the poorly educated or elderly. What is more, immigrants do not affect the life satisfaction of natives whether or not they are from EU member states and neither do refugees. While EU natives believe immigration is an important issue, there are other issues that have a greater influence on how satisfied they report being with their lives – for examples see Section 8.1. The results are important and contribute to the scientific literature. Few studies have evaluated the impact of immigration and refugees on natives using a broad measure of well-being.

8.3 Main results from the Luxembourg Global Entrepreneurship Monitor 2018/2019¹¹

Entrepreneurship plays an important role in the creation and diffusion of innovation and technological progress, contributing to firm dynamics, job creation, and economic growth. As a result, governments and policy organisations have become increasingly active in designing programmes to encourage and sustain entrepreneurial efforts. In this context, the Global Entrepreneurship Monitor (GEM) initiative was launched to study entrepreneurship across many countries in 1999. GEM collects and analyses data to better understand entrepreneurship and its link with countries' economic performances, to assess the evidence on links between entrepreneurship and growth, and to provide information needed to support policy actions. Data is collected through surveys on an annual basis, and harmonised to enable international comparisons. GEM is made up of two surveys. The Adult Population Survey (APS) provides information on the characteristics of individuals and their involvement in entrepreneurial activities over the different stages of venturing, from starting-up a business to running established firms; and on the business environment. Additionally, the National Expert Survey collects experts' evaluations on the socio-economic context shaping entrepreneurship in the country.

This contribution summarises the main results from the Global Entrepreneurship Monitor Luxembourg 2018/2019, the 6th GEM country report for Luxembourg. Since STATEC joined the GEM project in 2013, the GEM Luxembourg report has continued to provide unique information on entrepreneurial activities in Luxembourg. Over time, GEM Luxembourg 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. Moreover, GEM records have enabled researchers to establish links between entrepreneurship and the presence of migrants in Luxembourg, and to study well-being among entrepreneurs. In 2018, for the first time, a set of questions provided information on the administrative burden of setting up a business in Luxembourg, and on family entrepreneurship.

> ¹¹ This section is based on the GEM Luxembourg report 2918/2019 (Peroni and Riillo, 2019).

8.3.1 Main indicators of entrepreneurship

According to the 2018 Luxembourg's APS survey¹², the entrepreneurship rate in Luxembourg is high among European and innovation-driven countries. The entrepreneurship rate is measured as the proportion of residents over total who are nascent entrepreneurs and new business leaders. This is referred to as the share of population engaged in earlystage entrepreneurial activity (TEA). TEA is one key indicator produced by GEM to compare across countries and track the evolution of entrepreneurship.

GEM also makes an important distinction between necessity-driven TEA and opportunity-driven TEA. The first definition refers to entrepreneurs who are motivated primarily by a lack of other options to make a living, while the latter refers to those who are starting a business to take advantage of a business opportunity.

Figure 3 reports the 2018 ranking of 17 European countries participating in GEM, according to their TEA rates and opportunity-driven TEA. Luxembourg's TEA, at 10.7 percent, is the fourth highest TEA rate among European participants. In terms of opportunity-driven entrepreneurship, Luxembourg is ranked second.



Another important contributor of entrepreneurship is the entrepreneurial activity carried out by existing business. Entrepreneurial activities in Luxembourg are also high within existing organizations; data show that 7.1% of respondents are involved in entrepreneurial activities such as setting up a business unit, a plant, or developing new goods and services on behalf of their employers. The European average is 4.9%.

The APS is a survey addressed to the active population, that is, all people resident in a country who are between 18 and 65 years old. Each of the participating countries conducts the survey by interviewing a representative sample of at least 2000 individuals. The fieldwork takes place during the spring/ summer of each year. The questionnaire is comprised of: core questions that are the same every year and common to all participating countries, modules on special topics lasked only once and common to all participating countries), and country-specific questions.

8.3.2 Barriers and enablers

Institutional and cultural differences shape the business environment, and together determine the outcomes of the entrepreneurial process. Both experts and the overall population regard infrastructure and governmental policies as the main strengths of Luxembourg's system of entrepreneurship. In contrast, lack of financing and resource availability - such as office space and qualified human resources - are perceived as the major barriers to entrepreneurship in Luxembourg. This was also found in previous GEM Luxembourg reports.

8.3.3 Programmes to foster entrepreneurship

Recent policy programmes have focused on entrepreneurship education, on the provision of support and funding to entrepreneurs, and on administrative simplification. Those actions aim to raise public engagement in entrepreneurship, and to ease the burden of setting up a company. Since 2016, the APS has included a set of country-specific questions concerning the relevance and effectiveness of policy actions in fostering entrepreneurship in Luxembourg. Initial findings on these programmes are listed below.

Training programmes are popular among entrepreneurs, with one third of entrepreneurs declaring that they have engaged in entrepreneurship training at secondary school, and nearly a half after leaving school. These figures are higher for entrepreneurs than for non-entrepreneurs, which suggests a positive association between entrepreneurship training and starting a new business (Figure 4). The answers might simply indicate that the individuals that are more willing to start a business are more motivated to attend entrepreneurship trainings. Nevertheless, the findings are encouraging.



Usually, businesses are set up using online procedures, however entrepreneurs' satisfaction with *on-line services* is mixed. 40% of nascent entrepreneurs report to be fairly or highly satisfied, while more than 30% of them report to be dissatisfied (Figure 5).



Note: 8% of respondents have not used this service; 5% don't know and 0.5% refused.

Lengthy and cumbersome procedures to start a business are often regarded, together with access to funding, as barriers to effective entrepreneurship. GEM Luxembourg devotes attention to both these aspects. In 2018, the APS inquired about the length of time needed to start a business in Luxembourg.

Figure 6 shows that more than half of nascent entrepreneurs declared that they needed 35 days or more to start a business in Luxembourg in 2018. (Here, starting a business includes completing all of the necessary administrative procedures to become operational as an economic activity.) 74% declared they needed more than 25 days.



8.3.4 Traits of entrepreneurs

Effective policies and actions to promote entrepreneurship require knowledge of motivations, fears, and individual traits of residents and entrepreneurs. GEM includes much information on the individual characteristics of entrepreneurs.

Respondents are rather *cautious* – 44% feel they possess the required skills to start a business, and 55% perceive Luxembourg as a favourable environment for starting a business. However, 51% of the people that perceive there are good opportunities to start a business report that fear of failure prevents them from starting a business, which is high compared to the comparable figure for Europe, nearly 38%.

The main traits of early stages entrepreneurs, based on GEM surveys are presented below.

Unsatisfied

In recent years, policy-makers have engaged in efforts to complement traditional measures of economic welfare with measures of well-being and quality of life. At the same time, a growing body of scholarly literature has examined determinants and consequences of well-being, often in connection with measures of economic growth and activity. The APS question on life satisfaction provides a much needed annual measure of residents' well-being in Luxembourg, which also allows us to analyse the link between SWB and career choices. The first question of interest is whether entrepreneurs experience higher well-being than people making different career choices. Entrepreneurs may be happier than non-entrepreneurs because entrepreneurs experience more autonomy and have a higher sense of purpose. In contrast, new entrepreneurs might experience more stress related to longer working hours and uncertainty than non-entrepreneurs or established entrepreneurs. In 2018, 62% of new entrepreneurs reported being satisfied with their lives, which is low compared to the 75% of other people. Concerning gender and entrepreneurship, the proportion of entrepreneurs that are satisfied with their lives is higher among women than among men (65% and 60%, respectively).

Family oriented

The special GEM topic for 2018 focused on family businesses and family entrepreneurship. Luxembourg entrepreneurs greatly rely on family members when starting a business. One out of four new entrepreneurs expects to own and manage their businesses with their family members (Figure 7).



Note: Strong indication represents family members co-owning and co-managing part of a business, and "some indication" represents full ownership by an entrepreneur, at least one employee and co-management by family members.

Immigrant

The issue of immigrants' involvement in host countries' economies and in entrepreneurship is of general interest. Immigration is of special relevance to Luxembourg in view of the country's labour force structure. Data on employment show that, at the end of 2018, 46% of all domestic payroll employment were cross-border workers and 28% were foreign resident workers (STATEC, 2019).

Since 2013, GEM Luxembourg has been collecting information on the migration background of respondents. These data permit one to track migrant entrepreneurs in Luxembourg. Figure 8 presents descriptive statistics on the involvement of immigrants in entrepreneurial activities in Luxembourg. In 2018, the proportion of entrepreneurs among first generation immigrants is consistently larger (13.0%) than for natives (8.8%) and second generation immigrants (9.4%). Similar patterns can also be observed in previous years, confirming the important role of immigration for entrepreneurship in Luxembourg.



The entrepreneurship gender gap

In previous years, we have provided evidence of the existence of a persistent gender entrepreneurship gap. In 2018, the share of early entrepreneurs among men (12.7%) continued to be higher than the share of new entrepreneurs among women (8.7%). However, compared to the previous year, this gap decreased. Indeed, in 2017, 12.5% of men were early entrepreneurs, compared to 5.9% of women. Gaps exist also along age and education dimensions.

8.3.5 Profile of start-ups

In addition to providing information on the individual characteristics of entrepreneurs, GEM also allows us to describe characteristics of start-up firms in Luxembourg. The typical start-up has one owner (57%), employs a maximum of 5 employees (85%), provides business services (39%) and is innovative (48%, the highest value in the world); this confirms the strong service orientation and innovativeness of Luxembourg's economy.

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