

## 2015 COMPETITIVENESS REPORT

### Stability in a climate of risk



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

Observatoire de la compétitivité

# **2015 COMPETITIVENESS REPORT**

Stability in a climate of risk

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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# 2015 Competitiveness Report

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## Introduction

There are several indicators which allow for a resolutely optimistic reading of the current economic situation in Luxembourg. The GDP growth rate should come closer to the long-term average, which stood at 3.5% per year from 1990 to 2014. This performance stands out when compared to that of other eurozone Member States. We are right to rejoice in this, although we must remain aware of all negative risks. Outside of the European Union there is geopolitical turmoil in the Middle East and at the Russian borders, and emerging countries are slowing down, particularly China. Within the European Union we are facing Brexit, new fiscal competition rules, public and private debt management, etc.



The Organisation for Economic Cooperation and Development (OECD) has published its report on the situation of our economy. The OECD observed that our economy has withstood the effects of the financial and banking crisis, thanks to the transformation of the financial sector and multi-sectoral specialisation, focusing on dynamic and promising sectors as a priority. The government's policies have therefore been extremely sound.

But we must not rest on our laurels. As Jeremy Rifkin put it: 'We are, it appears, in the early stages of a game-changing transformation in economic paradigms. A new economic model is emerging in the twilight of the capitalist era that is better suited to organise a society in which more and more goods and services are nearly free.' We are witnessing a paradigm change which Rifkin calls 'The Third Industrial Revolution', which is going to change the way we work, consume, move around and learn.

The government aims to prepare our country for a constantly changing environment, with a long-term economic vision, developing a Luxembourg 3.0 (or even 4.0) strategy. Governing means anticipating! It is our duty to help future generations by establishing good framework conditions so that the growth potential in our economy can be harnessed and competitiveness ensured in an international context. Luxembourg already has strong foundations for establishing this new economic model. Significant efforts have been made during the past decade in the ICT, logistics and energy sectors. Now, we must ensure that these technologies converge in a smart grid. This will be a decisive factor for growth and will allow us to distribute resources more efficiently, with the end goal of improving the efficiency of our economy.

The *Observatoire de la compétitivité* analysis ensures detailed and regular monitoring of these decisive factors for growth in our economy, as well as its degree of competitiveness compared to our main trading partners. According to the results from this 2015 edition of the national Competitiveness Scoreboard, which is one of the tools used to analyse structural competitiveness, Luxembourg is ranked 6th out of the 28 EU Member States. We can be proud of this result. After over a decade of good and faithful service following its foundation by the Tripartite Coordination Committee, the scoreboard which acts as the main focus of the Report is now being revised, in partnership with social partners in the Economic and Social Committee (ESC). I expect to receive the new, modernised and structured scoreboard in the near future.

The *Observatoire* also monitors dozens of benchmarks and international rankings where Luxembourg is among the countries taken into consideration. We need to monitor these indicators both for 'nation branding' purposes, i.e. to monitor the brand profile of our country at international level, and to help us to pinpoint our weaknesses so that we can improve our country's performance.

In the 2015 edition of the Report, the *Observatoire* has also devoted a chapter to following up on the impact assessment for new priority sectors which the government is actively developing. This study will be useful in light of the critical analysis of the economic diversification policy we will be launching shortly, which we may need to review if necessary.

In conclusion, the Competitiveness Report is an interesting and rewarding read which, in particular, will provide food for thought and prepare us for the upcoming debate on competitiveness at the Chamber of Deputies, as well as for discussions between the government and social partners during the national social dialogue procedure established as part of the European Semester framework.

**Francine Closener**

Secretary of State for the Economy

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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 (Lisbon strategy and Europe 2020 strategy).

## 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<sup>1</sup>, 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 new strategy for the next decade: the Europe 2020 strategy<sup>2</sup>. 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 fifth update of Luxembourg's finalized NRP was sent to the European Commission in April 2015, along with the SGP 2015-2019<sup>3</sup>. Based on the NRP and the SGP, the Council issued in July 2015 country-specific recommendations for Luxembourg, for consideration during the national discussions to be conducted about the 2016 draft budget.

<sup>1</sup> For additional details:  
<http://www.odc.public.lu/publications/pnr/index.html>

<sup>2</sup> For additional details:  
[http://ec.europa.eu/eu2020/index\\_fr.htm](http://ec.europa.eu/eu2020/index_fr.htm)

<sup>3</sup> For additional details:  
<http://www.mf.public.lu>

## 1.3 Agency for standardization and the knowledge economy (ANEC)

Through the creation of the economic interest group ANEC in 2012, the government wanted to promote and support advocacy, awareness, training and monitoring in the field of standardization in order to support the competitiveness of companies in Luxembourg while developing a centre of excellence in research, development and innovation.

Research projects from 'Knowledge Economy Department' are followed among others by the *Observatoire de la compétitivité*, in collaboration with STATEC.

For 2015, the work program plans to deepen the activities undertaken to fulfil the foremost mission of ANEC, which consists in valuing STATEC's available statistical data through applied research. The work to be performed by ANEC in 2015 remains structured around applied research in the following areas: productivity, determinants of productivity (human capital, innovation, entrepreneurship, ICT), quality of life and solidarity economy<sup>4</sup>.

## 1.4 Events and publications in 2014-2015

The *Observatoire de la compétitivité* aims to inform both the economic players and the general public on competitiveness issues. To achieve this, 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.

<sup>4</sup> For additional details:  
<http://www.statistiques.public.lu/en/actors/statec/organisation/epr/index.html>

## 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 Days 2015<sup>5</sup>

The Ministry of the Economy, Chamber of Commerce and FEDIL, in partnership with PwC, organized the Economy Days in February 2015. This event offered an opportunity for international experts and Luxembourgish stakeholders to discuss the role of the State and the digital economy, a major issue for Luxembourg. Debates were also held on the appropriate economic model for Europe, just a few months after the Juncker Commission took office. This was also an opportunity to take a thorough and critical look at the economic models of Luxembourg's two main trading partners: Germany and France.

### Presentation of the OECD's 2015 economic report for Luxembourg<sup>6</sup>

Every two years, the OECD (Organisation for Economic Cooperation and Development) publishes a report on the economic situation and policies being implemented in each of its member countries. The Ministry of the Economy's *Observatoire de la compétitivité* assisted the OECD in drawing up the report, organising the relevant technical and political missions. The study focuses on the economic situation and public policies which are likely to improve long-term economic performance. The OECD secretariat compiles the content of the study. The main topics covered in the OECD's 2015 study are 'Strengthening performance and resilience in the financial sector' and 'Fostering the emergence of innovative industries'. The Secretary General, Mr Ángel Gurría, presented the 2015 report on 27th March 2015 and made the following remark: *'Luxembourg is one of the most prosperous countries in the OECD, with enviable levels of income and well-being, which are largely due to the performance of the financial sector. In order to ensure a good quality of life for future generations, economic diversification will need to be intensified, through a focus on structural reform.'*

<sup>5</sup> For additional details:  
[http://www.odc.public.lu/actualites/2015/02/Journees\\_economie\\_2015/index.html](http://www.odc.public.lu/actualites/2015/02/Journees_economie_2015/index.html)

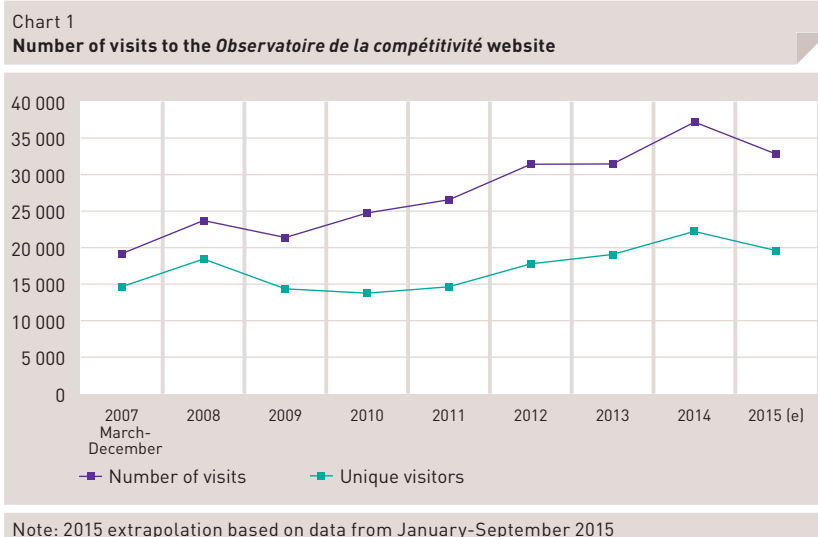
<sup>6</sup> For additional details:  
[http://www.odc.public.lu/actualites/2015/03/Rapport\\_OCDE\\_2015/index.html](http://www.odc.public.lu/actualites/2015/03/Rapport_OCDE_2015/index.html)

## 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<sup>7</sup>.

## 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: <http://www.odc.public.lu>. In particular this site provides information on Luxembourg's competitiveness in foreign 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 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. The number of visits to the site has grown significantly in recent years.



<sup>7</sup> All editions of '*Perspectives de Politique Économique*' can be downloaded from the website: <http://www.odc.public.lu/publications/perspectives/index.html>.

## 1.5 An overview of the 2015 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, on a yearly basis, the evolution of the competitiveness of Luxembourg in comparison with EU Member States according to the national Competitiveness Scoreboard indicators established in 2004. The calculation of a composite indicator of competitiveness based on this national scoreboard allows us to understand the relative competitive position of Luxembourg over the years.

**Chapter 4** aims at providing an overview of the European Semester, presenting the priorities and objectives of the structural thematic coordination of the Europe 2020 strategy and make an intermediate appraisal of Luxembourg's position for the indicators in the EU macroeconomic surveillance scoreboard, before the publication of the new edition by the end of 2015 by the European Commission.

**Chapter 5** aims to provide an overview of the five priority economic sectors in Luxembourg, whose development is being promoted actively by the Ministry for the Economy: ICT, logistics, health sciences and technologies, eco-technologies and space technologies.

Finally, **Chapter 6** presents the results of the main studies carried out by ANEC-STATEC researchers, mandated under the research agreement between ANEC, STATEC and the *Observatoire de la compétitivité*. The topics of these studies were the labour market, innovation and quality of life in Luxembourg.

## **2      Benchmarks and comparative competitiveness analysis**

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## 2.1 Introduction

We live in an age of international comparisons. It is now easier than ever before to compare how different countries measure and ensure their growth potential. The debate on such issues is fed by the frequent publication of benchmarks and related rankings. Composite indices enable best practices to be compared as they draw together multiple sets of information under a single numerical value<sup>1</sup>, thus covering a variety of characteristics to provide an approximate summary of complex issues such as territorial competitiveness, innovation, quality of life, etc. (albeit one which is by no means devoid of methodological limitations). Since 2008, rankings showing the fragility of public finances have risen to the fore. However, whilst governments' tasks of controlling the government account balance and public debt are indeed important ones, this cannot be the sole focus of economic policy. In fact, current account imbalances in certain countries demonstrate the importance of the notion of competitiveness. Supply-side policies and structural issues are essential for sustainable long-term growth and employment, especially with the economy becoming ever more globalised, inter-connected and integrated.

This chapter seeks to provide an overview of a raft of international benchmarks which have been published since the last edition of this Report in Autumn 2014. Furthermore, Luxembourg's position will be analysed and compared to those of other EU Member States<sup>2</sup>.

<sup>1</sup> For more information on composite indicators, see the European Commission's Joint Research Centre website: <http://composite-indicators.jrc.ec.europa.eu/>

<sup>2</sup> A list of more benchmarks may also be found on the website of the *Observatoire de la compétitivité*: [http://www.odc.public.lu/indicateurs/benchmarks\\_internationaux/index.html](http://www.odc.public.lu/indicateurs/benchmarks_internationaux/index.html)

## 2.2 Luxembourg's rankings

In the debate about the determinant factors of regional competitiveness, the best-known benchmarks and rankings published annually 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 classifications, there are a multitude of other reports, some of which we will look at in this chapter.

### 2.2.1 WEF, IMD, Heritage Foundation and European Commission

#### a. Growth Competitiveness Index<sup>3</sup>

Early September 2015 the World Economic Forum (WEF) published a new edition of its comparative study regarding the competitiveness of countries around the world. The objective of this study, called 'Global Competitiveness Report', is to assess the world economies' potential to achieve sustainable growth in both the medium and long term. In this study competitiveness is defined as 'the set of institutions, policies and factors that determine the level of productivity of a country.'

The study measures the competitiveness level of 140 countries based on indicators spread among three fundamental 'pillars':


























- ▼ The basic requirements of competitiveness (institutions, infrastructure, macroeconomic environment, health and primary education);
- ▼ Efficiency enhancers (higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size);
- ▼ Innovation and sophistication factors (business sophistication and innovation).

The study takes into account that all countries are not at the same level of development, and thus that the relative importance of the various factors of competitiveness is dependent on initial conditions. A composite index called 'Growth Competitiveness Index' (GCI) is calculated in order to rank countries on a scale from 1 (the least competitive) to 7 (the most competitive). This GCI composite index is constructed through 114 indicators, based on using a combination of statistical data and survey results, including the survey of business leaders, which is carried out annually by the WEF in collaboration with its network of partner institutes.

<sup>3</sup> For more information:  
<http://www.weforum.org/reports>

In the latest world rankings, Switzerland leads the way (5.76) followed by Singapore (5.68) and the United States (5.61). The WEF classes Luxembourg as being in the final stage of economic development (i.e. countries where the innovation and sophistication determinants are the highest). Whilst Luxembourg ranks 20th (5.20), Germany is 4th (5.53), the Netherlands 5th (5.50), Belgium 19th (5.20, almost on a par with Luxembourg) and France 22nd. The EU rankings are headed up by Germany, the Netherlands and Finland (5.45). As in 2014, Luxembourg ranks 8th in the EU sub-rankings.

Table 1  
Luxembourg's position according to the GCI (2015-2016)

	Economy	Score	Prev.	Trend
1	Switzerland	5.76	1	
2	Singapore	5.68	2	
3	United States	5.61	3	
4	Germany	5.53	5	
5	Netherlands	5.50	8	
6	Japan	5.47	6	
7	Hong Kong SAR	5.46	7	
8	Finland	5.45	4	
9	Sweden	5.43	10	
10	United Kingdom	5.43	9	
11	Norway	5.41	11	
12	Denmark	5.33	13	
13	Canada	5.31	15	
14	Qatar	5.30	16	
15	Taiwan, China	5.28	14	
16	New Zealand	5.25	17	
17	United Arab Emirates	5.24	12	
18	Malaysia	5.23	20	
19	Belgium	5.20	18	
20	<b>Luxembourg</b>	<b>5.20</b>	<b>19</b>	
21	Australia	5.15	22	
22	France	5.13	23	
23	Austria	5.12	21	
24	Ireland	5.11	25	
25	Saudi Arabia	5.07	24	

Source: WEF

In the rankings for the three key GCI pillars, Luxembourg performed as follows:

- ▼ Luxembourg is ranked 9th for basic competitiveness requirements. Within this pillar, Luxembourg ranks 6th for institutions, 17th for infrastructure, 14th for macroeconomic environment and 34th for health and primary education;

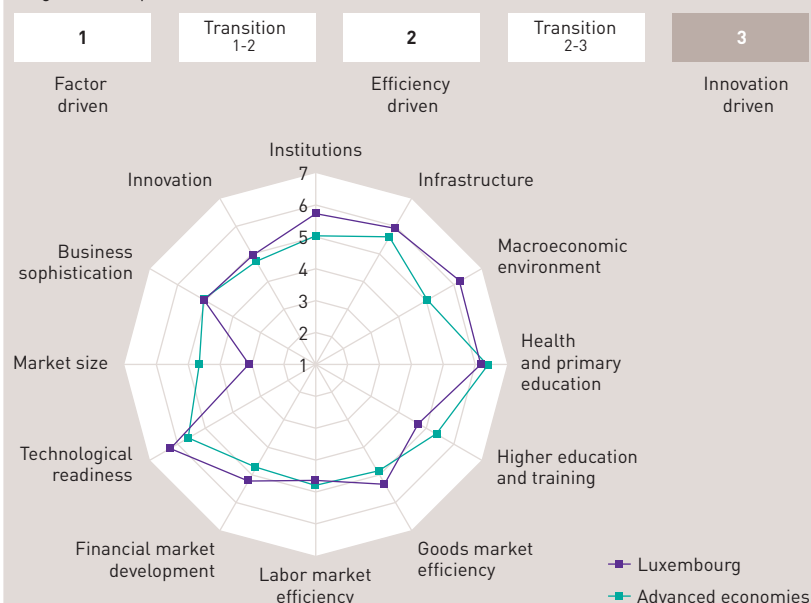
- Luxembourg occupies 23rd position (5.0) for efficiency enhancers. Within this pillar, it ranks 40th for higher education and training, 4th for goods market efficiency, 16th for labour market efficiency, 11th for financial market development, 1st for technological readiness and 95th for market size;
- Luxembourg ranks 18th (5.0) for innovation and sophistication factors. Within this pillar, it ranks 19th for business sophistication and 15th for innovation.

Chart 1

**Luxembourg's performance within the different pillars**

Global Competitiveness Index	Rank (out of 140)	Score (1-7)
<b>GCI 2015-2016</b>	<b>20</b>	<b>5.2</b>
GCI 2014-2015 (out of 144)	19	5.2
GCI 2013-2014 (out of 148)	22	5.1
GCI 2012-2013 (out of 144)	22	5.1
<b>Basic requirements (20.0%)</b>	<b>9</b>	<b>6.0</b>
1st pillar: Institutions	6	5.8
2nd pillar: Infrastructure	17	5.7
3rd pillar: Macroeconomic environment	14	6.2
4th pillar: Health and primary education	34	6.2
<b>Efficiency enhancers (50.0%)</b>	<b>23</b>	<b>5.0</b>
5th pillar: Higher education and training	40	4.9
6th pillar: Goods market efficiency	4	5.5
7th pillar: Labor market efficiency	16	4.9
8th pillar: Financial market development	11	5.0
9th pillar: Technological readiness	1	6.4
10th pillar: Market size	95	3.2
<b>Innovation and sophistication factors (30.0%)</b>	<b>18</b>	<b>5.0</b>
11th pillar: Business sophistication	19	5.1
12th pillar: Innovation	15	5.0

Stage of development



Source: WEF

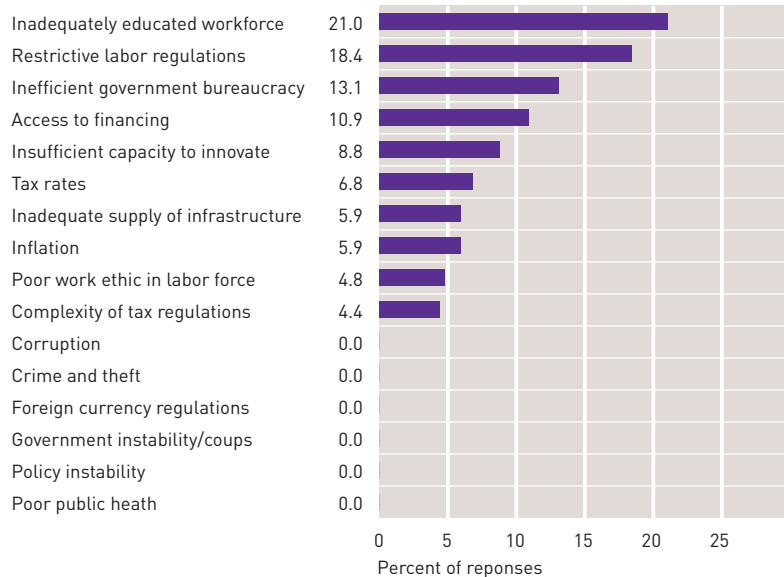
## Frame 1

### Results of the survey carried out in Luxembourg (WEF poll)

A yearly survey is carried out among business leaders in order to identify main factors hindering national competitiveness. With more specific regard to the results of the Luxembourg survey, it appears the main problems for doing

business in Luxembourg result from a restrictive labour regulation, an inadequately educated workforce, inefficient government bureaucracy and access to financing.

#### The most problematic factors for doing business

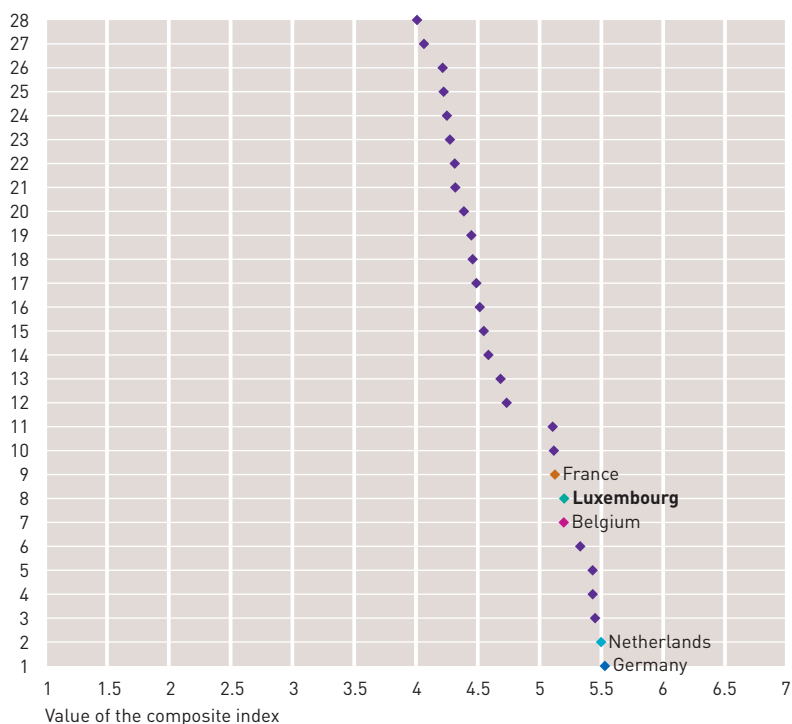


Note: Respondents are invited to select the 5 most problematic factors for doing business in their country from a list of 15, and to rank them from 1 (most problematic) to 5. Figures in this chart show the resulting answers weighted by their ranking.

**Composite indices and EU rankings (2015)**

The chart below shows the composite index values and positions in the EU rankings in the 2015 WEF Report. There are sometimes only slight differences between the indicator values across Member States, meaning that a slight

variation in a composite index can lead to a change in position in the rankings. For example, Belgium placed 19th with a composite index value of 5.20 whereas Luxembourg ranks 20th, despite having the same composite index value.

**EU-28 rankings**

Source: WEF

## b. Global Competitiveness Index<sup>4</sup>

The Swiss Institute IMD published in 2015 the latest version of its annual report on competitiveness, the 'World Competitiveness Yearbook' (WCY). This report is published yearly since 1989. In this new edition, 61 countries are analysed through more than 300 criteria. These criteria are both quantitative and qualitative (survey of business leaders), split into four main subcategories: economic performance, government efficiency, business environment and infrastructure.

The United States (with a score of 100 out of 100), Hong-Kong (96) and Singapore (94.9) top the 2015 world rankings. Luxembourg ranks 6th (89.4), Germany 10th (85.6), the Netherlands 15th (83.6), Belgium 23rd (75.4) and France is ranked 32nd (69). The European rankings are led by Switzerland (91.9) with Luxembourg in 2nd place. The EU rankings are topped by Luxembourg ahead of Denmark (87) and Sweden (85.9).

Table 2  
IMD global ranking (2015)

WCY 2015	Country	WCY 2014	Change		WCY 2015	Country	WCY 2014	Change	
1	USA	1	-	-	31	Estonia	30	-1	↘
2	China Hong Kong	4	+2	↗	32	France	27	-5	↘
3	Singapore	3	-	-	33	Poland	36	+3	↗
4	Switzerland	2	-2	↘	34	Kazakhstan	32	-2	↘
5	Canada	7	+2	↗	35	Chile	31	-4	↘
<b>6</b>	<b>Luxembourg</b>	<b>11</b>	<b>+5</b>	<b>↗</b>	36	Portugal	43	+7	↗
7	Norway	10	+3	↗	37	Spain	39	+2	↗
8	Denmark	9	+1	↗	38	Italy	46	+8	↗
9	Sweden	5	-4	↘	39	Mexico	41	+2	↗
10	Germany	6	-4	↘	40	Turkey	40	-	-
11	Taiwan	13	+2	↗	41	Philippines	42	+1	↗
12	UAE	8	-4	↘	42	Indonesia	37	-5	↘
13	Qatar	19	+6	↗	43	Latvia	35	-8	↘
14	Malaysia	12	-2	↘	44	India	44	-	-
15	Netherlands	14	-1	↘	45	Russia	38	-7	↘
16	Ireland	15	-1	↘	46	Slovak Republic	45	-1	↘
17	New Zealand	20	+3	↗	47	Romania	47	-	-
18	Australia	17	-1	↘	48	Hungary	48	-	-
19	United Kingdom	16	-3	↘	49	Slovenia	55	+6	↗
20	Finland	18	-2	↘	50	Greece	57	+7	↗
21	Israel	24	+3	↗	51	Colombia	51	-	-
22	China Mainland	23	+1	↗	52	Jordan	53	+1	↗
23	Belgium	28	+5	↗	53	South Africa	52	-1	↘
24	Iceland	25	+1	↗	54	Peru	50	-4	↘
25	Korea Rep.	26	+1	↗	55	Bulgaria	56	+1	↗
26	Austria	22	-4	↘	56	Brazil	54	-2	↘
27	Japan	21	-6	↘	57	Mongolia	N/A	-	-
28	Lithuania	34	+6	↗	58	Croatia	59	+1	↗
29	Czech Republic	33	+4	↗	59	Argentina	58	-1	↘
30	Thailand	29	-1	↘	60	Ukraine	49	-11	↘
					61	Venezuela	60	-1	↘

Source: IMD

<sup>4</sup> For more information:  
<http://www.imd.org/wcc/>

In the world rankings, Luxembourg moved up 5 places on its 2014 rank. This improvement is mainly due to a higher score in the business environment sub-category. Luxembourg's overall ranking for 2015 is now very close to its pre-crisis performance (2007: 4th, 2008: 5th).

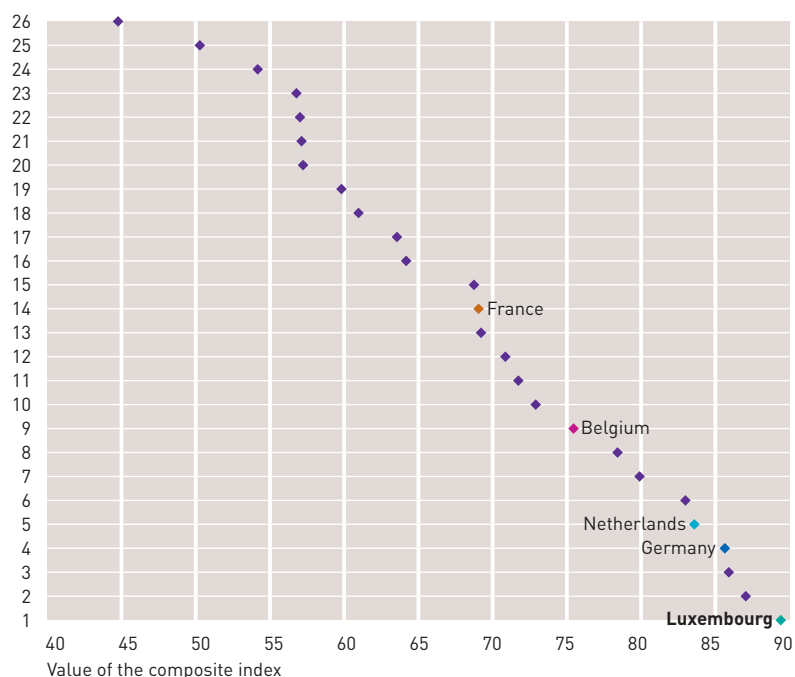
Frame 3

### Composite indices and EU rankings (2015)

The chart below shows composite index values and positions in the EU rankings in the 2015 IMD Report. Analysis of the available data (for 26 EU countries) reveals that the differences in indicator levels between Member States are sometimes very small, meaning that a slight variation in composite index levels

can lead to a significant change in the rankings. This is certainly the case for places 20 to 23, with 4 countries separated by a composite index difference of only 0.5. The same can be said of places 13 to 15, a section of the rankings which includes France.

#### EU-28 rankings



Source: IMD

In the four sub-categories which make up the GCI, Luxembourg performed as follows:

- ▼ Luxembourg is ranked 5th in the macroeconomic performance pillar, performing particularly well in international trade (placing 1st) and foreign investment (3rd) but with less promising results for employment (25th) and price (39th);
- ▼ Luxembourg ranks 12th in the government effectiveness pillar, placing 10th for public finances, 39th for budgetary policy but ranks 3rd for its overall institutional framework;
- ▼ Luxembourg is ranked 4th in the business environment pillar. The country scores highly in finance (10th), productivity (5th) and management (3rd);
- ▼ Luxembourg ranks 22nd for infrastructure, the country's poorest pillar rank. It is ranked 26th for basic infrastructure and 20th for technology infrastructure but ranks 6th for the environment and health and 11th for education.

### c. Index of Economic Freedom<sup>5</sup>

At the beginning of 2015, the American Heritage Foundation, in collaboration with The Wall Street Journal, published the 21st edition of the 'Index of Economic Freedom'. Economic freedom 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 measured through composite indicators spread among four categories ('rule of law', 'government size', 'regulatory efficiency' and 'open markets') in 186 countries across the world, divided into subcategories. Economic freedom is supposed to favour productivity and economic growth by supporting entrepreneurship and creation of value added. The more open an economy is (the closer its ranking is to the maximum index of 100), the fewer barriers there are to free trade and the better a country ranks.

The 2015 world standings are led by Hong Kong (89.6/100) followed by Singapore (89.4) and New Zealand (82.1). Luxembourg ranks 21st (73.2) and is considered to be 'mostly free'. Germany is ranked 16th (73.8), the Netherlands 17th (73.7), Belgium 40th (68.8) and France 73rd (62.5) in the world standings.

<sup>5</sup> For more information:  
<http://www.heritage.org/index/>

Table 3  
Excerpt of the rankings (2015)

World Rank	Regional Rank	Country	Overall Score	Change from 2014	Property Rights	Freedom from Corruption	Fiscal Freedom	Government Spending	Business Freedom	Labor Freedom	Monetary Freedom	Trade Freedom	Investment Freedom	Financial Freedom
5	1	Switzerland	80.5	-1.1	90	85.0	70.3	65.1	78.1	75.3	86.3	90.0	85	80
8	2	Estonia	76.8	0.9	90	68.0	80.6	53.2	81.5	58.7	77.6	88.0	90	80
9	3	Ireland	76.6	0.4	85	72.0	73.6	45.6	82.1	76.2	83.9	88.0	90	70
11	4	Denmark	76.3	0.2	95	91.0	39.6	1.8	97.4	92.1	87.6	88.0	90	80
13	5	United Kingdom	75.8	0.9	90	76.0	62.9	30.3	91.1	75.6	74.4	88.0	90	80
15	6	Lithuania	74.7	1.7	60	57.0	92.9	61.3	84.9	62.0	81.2	88.0	80	80
16	7	Germany	73.8	0.4	90	78.0	60.8	40.1	88.2	51.2	81.5	88.0	90	70
17	8	The Netherlands	73.7	-0.5	90	83.0	51.8	23.8	84.3	66.3	79.8	88.0	90	80
19	9	Finland	73.4	0.0	90	89.0	66.4	3.6	92.6	54.8	79.9	88.0	90	80
<b>21</b>	<b>10</b>	<b>Luxembourg</b>	<b>73.2</b>	<b>-1.0</b>	<b>90</b>	<b>80.0</b>	<b>62.3</b>	<b>42.2</b>	<b>71.3</b>	<b>42.1</b>	<b>80.7</b>	<b>88.0</b>	<b>95</b>	<b>80</b>
22	11	Georgia	73.0	0.4	40	49.0	87.2	73.8	88.6	79.9	82.7	88.6	80	60
23	12	Sweden	72.7	-0.4	90	89.0	43.0	19.2	87.9	54.0	85.5	88.0	90	80
24	13	Czech Republic	72.5	0.3	75	48.0	81.5	40.6	68.2	82.9	81.2	88.0	80	80
26	14	Iceland	72.0	-0.4	90	78.0	72.0	32.6	90.5	62.2	77.0	88.0	70	60
27	15	Norway	71.8	0.9	90	86.0	52.1	43.8	92.1	48.2	81.7	89.4	75	60
30	16	Austria	71.2	-1.2	90	69.0	50.1	19.8	78.0	76.7	80.3	88.0	90	70
37	17	Latvia	69.7	1.0	50	53.0	84.4	59.2	82.1	61.5	83.8	88.0	85	50
40	18	Belgium	68.8	-1.1	80	75.0	43.6	10.2	90.7	63.7	81.7	88.0	85	70
42	19	Poland	68.6	1.6	60	60.0	82.1	47.1	67.3	60.4	81.3	88.0	70	70
45	20	Cyprus	67.9	0.3	70	63.0	79.5	36.7	79.5	59.6	82.7	88.0	70	50
49	21	Spain	67.6	0.4	70	59.0	53.1	39.8	77.5	52.6	81.3	88.0	85	70
50	22	Slovak Republic	67.2	0.8	50	47.0	80.8	55.1	69.6	56.5	75.5	88.0	80	70

Source: The Heritage Foundation

In the different sub-categories of the 2015 global rankings, Luxembourg performed as follows:

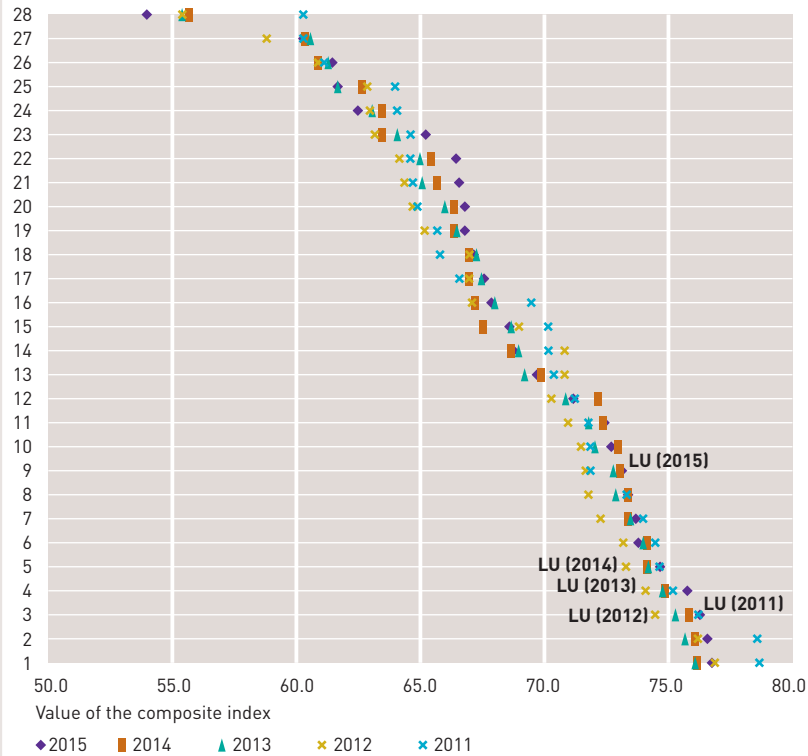
- Very good for property rights (90/100; 3rd in the world) and absence of corruption (80/100; 11th);
- Relatively poor for tax (62.3/100; 163rd) and government spending (42.2; 147th);
- Reasonably good for business environment (71.3/100; 63rd) and monetary environment (80.7; 46th) but less well for the labour market (42.1; 163rd);
- Very good for trade (88.0; 11th), investment (95.0; 1st) and finance (80.0; 3rd).

In conclusion, the Heritage Foundation makes the following observation with regard to Luxembourg: *'Small and landlocked, Luxembourg has made engagement with the global economy the cornerstone of its economic policy. Investment freedom, the world's most highly ranked, has led to the development of a robust banking sector. Regulations are relatively efficient, but labor markets are somewhat inelastic. Fiscal accounts must be managed more prudently for the economy to promote growth and return to the top ranks of the Index.'*

**Composite indices and EU rankings (2011-2015)**

The chart below shows composite index values and positions in the EU rankings for each year of the 2011-2015 period. Over the years, the Heritage Foundation has noted a reduction in Luxembourg's

economic freedom compared to that of other countries (lower composite index), which has led to Luxembourg moving down the EU rankings in the 2011-2015 period.

**EU-28 rankings**

Source: Heritage Foundation  
Calculation: ODC

#### d. European innovation union scoreboard<sup>6</sup>

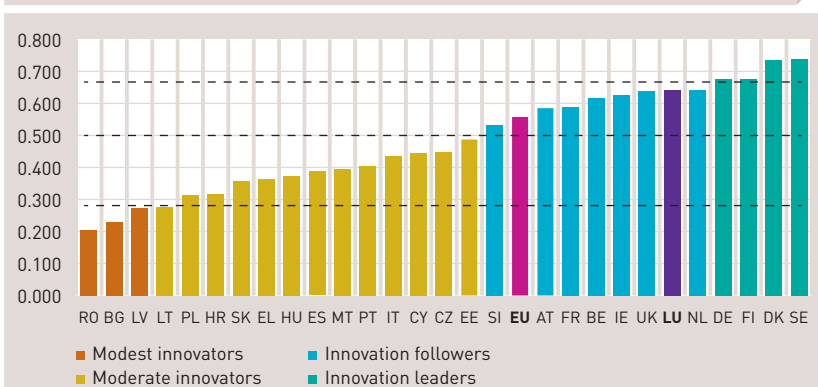
Early May 2015, the European Commission published the 5th edition of the European 'Innovation Union Scoreboard' (IUS). This scoreboard succeeds the European innovation scoreboard put in place under the Lisbon strategy (2000-2010). The purpose of this statistical tool, based on 25 indicators split into 3 main subcategories that group 8 dimensions of innovation, is to allow monitoring the implementation of the Europe 2020 strategy and more particularly the innovation flagship initiative. It allows measuring and comparing the relative performance of the Member States, and of the EU as a whole, with regards to innovation as well as an analysis of strengths and weaknesses of national research and innovation systems. Based on this scoreboard the Commission also calculates a composite index, called 'Summary innovation index' (SII), which offers a synthetic view of performances. On the basis of this composite index Member States are split into four categories, according to their performances:

- ▼ 'Innovation leaders' (performance more than 20% above the EU average);
- ▼ 'Innovation followers' (performance between 90% and 120% of the EU average);
- ▼ 'Moderate innovators' (performance between 50% and 90% of the EU average);
- ▼ 'Modest innovators' (performance less than 50% of the EU average).

In 2015, the SII composite index for the EU-28 stands at 0.555. The Member State rankings are headed up by Sweden (0.740), Denmark (0.736) and Finland (0.676). Luxembourg ranks 6th (0.642) with a score of almost 116% of the EU-28 average. Germany is in 4th place (0.676) and is the only one of Luxembourg's neighbouring countries to be classed in the 'Innovation Leaders' category. The other three neighbouring countries are all classed, as Luxembourg is, in the second category, i.e. 'Innovation Followers': the Netherlands ranks 5th (0.647), Belgium 9th (0.619) and France is in 10th place (0.591). Luxembourg is amongst the leaders in the 'Innovation Followers' category, performing above the EU average but not well enough to enter the 'Innovation Leaders' category.

<sup>6</sup> For more information:  
[http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/index\\_en.htm](http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/index_en.htm)

Chart 2  
IUS rankings of EU Member States (2015)



Source: IUS

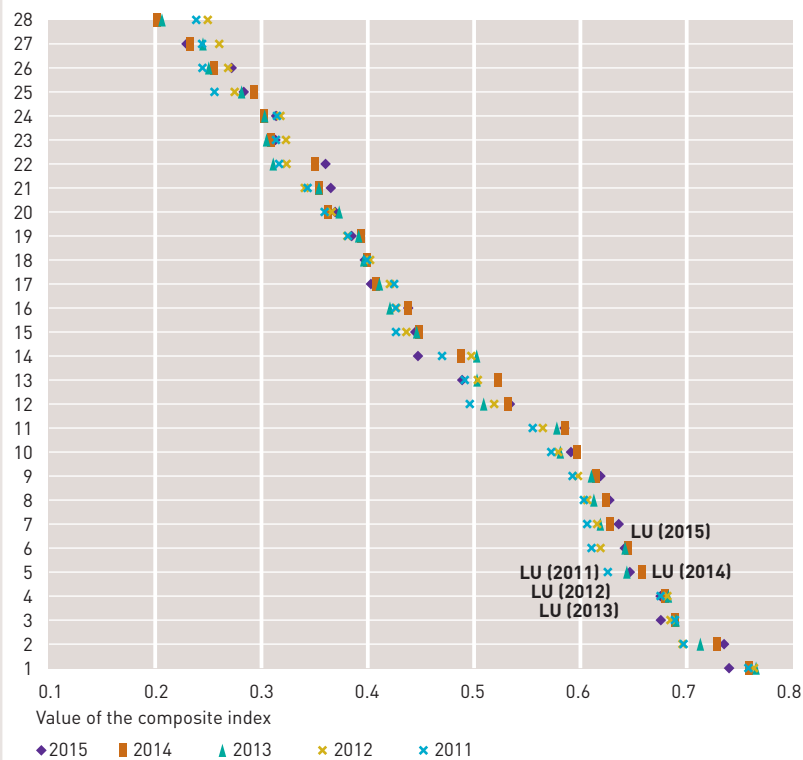
In conclusion, the report notes the following regarding Luxembourg's strengths and weaknesses: *'For most dimensions Luxembourg performs close to or above the EU average, with the only exception being Firm investments where performance is significantly worse. Relative strengths for Luxembourg at the indicator level are in Venture capital investments, Community trademarks and International scientific co-publications. Luxembourg performs well below the average for Non-R&D innovation expenditures and New doctorate graduates. Performance in Luxembourg's research system has been growing strongly (13%), mainly because of high growth in International scientific co-publications (23%) and Most cited publications (16%). Growth is observed for close to half of the innovation indicators. Strong declines are observed in Non-R&D innovation expenditures, Venture capital investments and R&D expenditures in the business sector'.*

Frame 5  
**Composite indices and EU rankings (2011-2015)**

The chart shows composite index values and positions in the EU rankings for each year in the 2011-2015 period. Between 2011 and 2014, the European Commission noted an increase in Luxembourg's innovation capacity compared with that of other countries (composite index in-

crease). However, Luxembourg remained in 5th place in the rankings between 2011 and 2014. In 2015, the reduction in Luxembourg's composite index score sees the country slip from 5th to 6th position in the EU-28.

**EU-28 rankings**



Source: European Commission  
 Calculation: ODC

## e. Ranking comparison and correlation analysis

To illustrate, the table below shows an extract of the rankings of the four major composite indicators that had been reviewed above, in which Luxembourg is appearing<sup>7</sup>.

Table 4  
Four major rankings (reports published in 2015)

	N°	World Economic Forum	IMD	Heritage Foundation	Commission européenne
		<i>GCI</i>	<i>GCI</i>	<i>Economic freedom</i>	<i>SII</i>
+	1.	Switzerland	United States	Hong Kong	Switzerland
	2.	Singapore	Hong Kong	Singapore	Sweden
	3.	United States	Singapore	New Zealand	Denmark
	4.	Germany	Switzerland	Australia	Finland
	5.	Netherlands	Canada	Switzerland	Germany
	6.	Japan	Luxembourg	Canada	Netherlands
	7.	Hong Kong	Norway	Chile	Luxembourg
	8.	Finland	Denmark	Estonia	United Kingdom
	9.	Sweden	Sweden	Ireland	Ireland
	10.	United Kingdom	Germany	Mauritius	Iceland
	11.	Norway	Taiwan	Denmark	Belgium
	12.	Denmark	United Arab Emirates	United States	France
	13.	Canada	Qatar	United Kingdom	Austria
	14.	Qatar	Malaysia	Taiwan	Slovenia
	15.	Taiwan	Netherlands	Lithuania	Estonia
	16.	New Zealand	Ireland	Germany	Norway
	17.	United Arab Emirates	New Zealand	Netherlands	Czech Republic
	18.	Malaysia	Australia	Bahrain	Cyprus
	19.	Belgium	United Kingdom	Finland	Italy
	20.	Luxembourg	Finland	Japan	Portugal
	21.	Australia	Israel	Luxembourg	Malta
	22.	France	China	Georgia	Spain
	23.	Austria	Belgium	Sweden	Serbia
	24.	Ireland	Iceland	Czech Republic	Hungary
-	25.	Saudi Arabia	South Korea	United Arab Emirates	Greece

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 red.

The table above shows the best performers in the world rankings. Amongst European countries, Luxembourg ranks 10th in the WEF rankings (8th in the EU), 2nd in the IMD rankings (1st in the EU), 10th in the Heritage Foundation rankings (9th in the EU) and 7th in the European Commission standings (6th in the EU).

<sup>7</sup> 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.

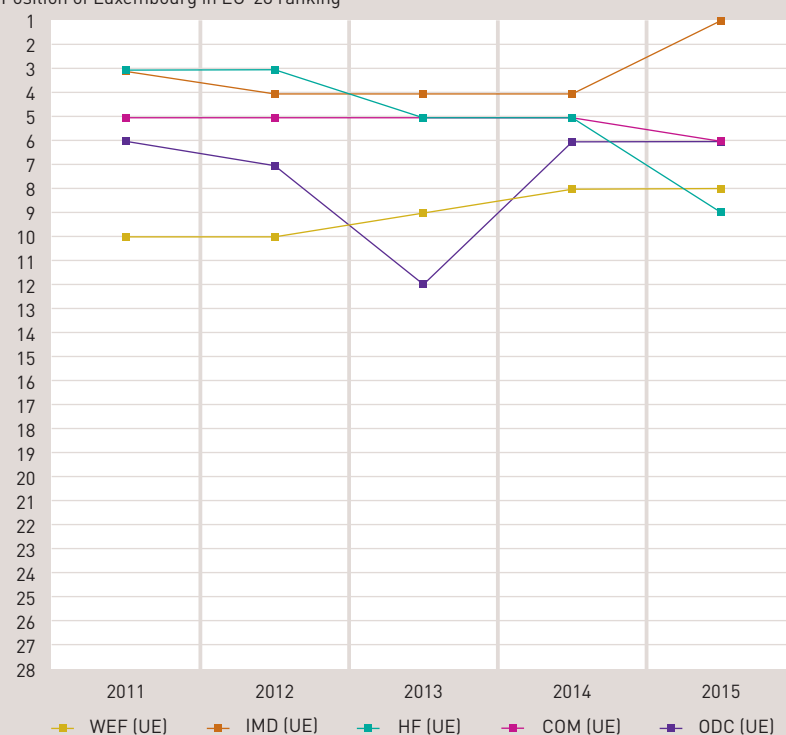
Table 5  
Adjusted rankings with the Top 10 European countries

N°	WEF	IMD	Heritage Foundation	Commission européenne
1.	Switzerland	Switzerland	Switzerland	Switzerland
2.	Germany	<b>Luxembourg</b>	Estonia	Sweden
3.	Netherlands	Norway	Ireland	Denmark
4.	Finland	Denmark	Denmark	Finland
5.	Sweden	Sweden	United Kingdom	Germany
6.	United Kingdom	Germany	Lithuania	Netherlands
7.	Norway	Netherlands	Germany	<b>Luxembourg</b>
8.	Denmark	Ireland	Netherlands	United Kingdom
9.	Belgium	United Kingdom	Finland	Ireland
10.	<b>Luxembourg</b>	Finland	<b>Luxembourg</b>	Iceland

The four rankings shown above can be used to analyse Luxembourg's development. For example, in the WEF EU rankings for 2015, Luxembourg is in 8th place, maintaining its 2014 position. In the IMD EU rankings, Luxembourg moves up 3 places to 1st position.

Chart 3  
Evolution of Luxembourg in the EU-28 rankings (2011-2015)

Position of Luxembourg in EU-28 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.

In reports published in 2015, Luxembourg's ranking varies within a range from 1st (IMD) to 9th (Heritage Foundation). In the 2015 ranking drawn up by the *Observatoire de la Compétitivité*<sup>8</sup>, Luxembourg ranks 6th, within this bracket. Therefore, it can be concluded that Luxembourg is one of the highest ranked countries in the EU in the four major annually-published rankings.

In general it is useful to analyse the correlation between these four 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 countries<sup>9</sup>. 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 four rankings<sup>10</sup>. In the 2015 version of the report, a fifth ranking has been added to the mix, namely the national scoreboard published by the *Observatoire de la Compétitivité*. On the basis of these 5 rankings, the Kendall coefficient equates to 0.82 (2015). Therefore, as in previous years, there is a strong correlation between the different EU rankings<sup>11</sup>.

Table 6  
Adjustment of the EU rankings (2015)

Countries	WEF	IMD	HF	EC	ODC
Germany	1	4	6	4	10
Austria	10	10	12	11	12
Belgium	7	9	14	9	18
Bulgaria	21	25	19	25	22
Croatia	25	26	24	21	24
Denmark	6	2	3	2	2
Spain	14	17	16	17	25
Estonia	12	13	1	13	8
Finland	3	8	8	3	4
France	9	14	22	10	13
Greece	26	24	26	19	26
Hungary	23	22	18	18	21
Ireland	11	6	2	8	9
Italy	18	18	23	15	20
Latvia	19	19	13	24	14
Lithuania	15	11	5	23	15
<b>Luxembourg</b>	<b>8</b>	<b>1</b>	<b>9</b>	<b>6</b>	<b>6</b>
Netherlands	2	5	7	5	3
Poland	17	15	15	22	17
Portugal	16	16	21	16	23
Slovak Republic	24	20	17	20	19
Czech Republic	13	12	11	14	7
Romania	20	21	20	26	16
United Kingdom	5	7	4	7	5
Slovenia	22	23	25	12	11
Sweden	4	3	10	1	1

Note: Excluding Cyprus and Malta  
Source: *Observatoire de la compétitivité*

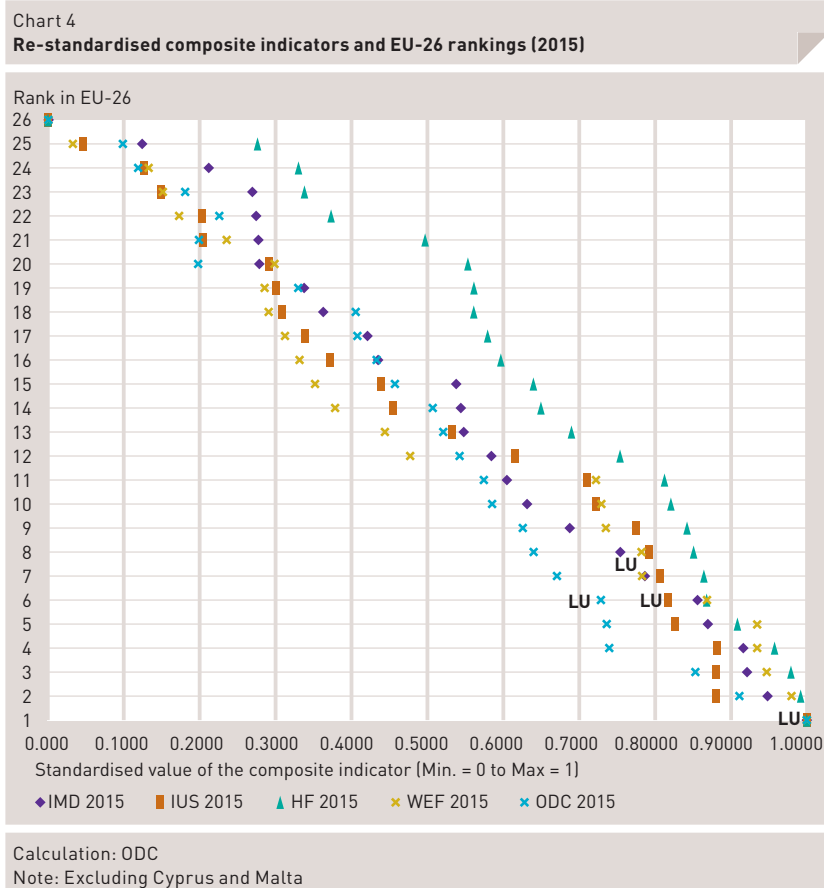
<sup>8</sup> For more information regarding the ranking of the *Observatoire de la compétitivité*, see chapter 3 of the 2015 Competitiveness Report.

<sup>9</sup> EU-28 excluding Cyprus and Malta. The list of countries used for making this calculation has changed over the years. Since the publication of the 2011 Competitiveness Report, only EU Member States are taken into account. Since the 2014 edition, Croatia has been added as new EU Member State.

<sup>10</sup> Kendall's coefficient for the same countries (27) was 0.86 in 2006, 0.83 in 2007, 0.86 in 2008, 0.87 in 2009, 0.84 in 2010, 0.83 in 2011, 0.83 in 2012, 0.83 in 2013 and 0.85 in 2014. Comparability between results before 2011 and after 2011 is limited. On one hand, another list of countries was used from 2011 (only countries being part of the EU). In the 2014 report, Croatia was added as new Member State. On the other hand, the SII indicator calculated by the European Commission is taken from the European Innovation Union Scoreboard (EIU) since 2011 and not from the European Innovation Scoreboard (EIS) anymore.

<sup>11</sup> The 2015 Competitiveness Report is the first to include the ODC national rankings in calculating the Kendall coefficient. Consequently, the 2015 results are not fully comparable with those of previous years.

In addition to comparing the rankings of EU Member States across the different benchmarks, it is also useful to gather information on how far behind the top EU performance Luxembourg is for each of the benchmarks. This renders the data more comparable. All things being equal, using the same formula<sup>12</sup> to standardise the initial composite indices a second time enables a gross estimation to be made, in spite of the numerous methodological problems inherent in this process<sup>13</sup>. Using this approach, Luxembourg has an interval of [0.73; 1].



<sup>12</sup> The standardisation formula used for the national competitiveness scoreboard (see Chapter 3) is also used here.

<sup>13</sup> Ideally, the source data for different benchmarks should be standardised using the same formula. However, given that most of the data cannot be accessed, this method provides an approximation.

## 2.2.2 Other benchmarks

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

### a. a. General indicators of competitiveness

#### a.1 Euro plus monitor 2014<sup>14</sup>

German Berenberg Bank and the Brussels The Lisbon Council think tank released end 2014 a new edition of their study on global health and adjustment of the economy of the 17 euro area countries and Sweden, Poland and the United Kingdom. This study analyses and classifies the Member States of the euro area on the basis of two main composite indicators:

- ▼ On one hand according to the capacity of adjustment API (adjustment progress indicator) – through indicators related to international trade, to financial sustainability, to competitiveness and to structural reforms over a given period of time;
- ▼ On the other hand according to the current state of health of the economy FHI (fundamental health indicator) – through indicators linked to the budgetary situation, to foreign trade, to unit labour cost and to structural reforms.

The countries are subsequently ranked by sub-category and by indicator on a virtue scale from 0 (worst performance) to 10 (best performance).

According to the authors, on a global basis the majority of countries with scores above the average with regards to the FHI composite index of global health make less effort to improve their situation and thus receive lower scores for the API adjustment indicator. However they also point out that a weaker score for the API adjustment indicator could simply signify that the country in question does not want to make adjustments or that it does not need any, considering the good health of its economy.

This study claims that Luxembourg is performing better in terms of the current health of its economy (score of 7.6; 1st position) than in terms of its adjustments to combat the crisis and other challenges (score of 2.8; 16th). Germany is ranked 3rd for FHI and 18th for API, Belgium 14th and 20th respectively, France ranks 17th for FHI and 15th for API whilst the Netherlands places 5th and 14th respectively.

<sup>14</sup> For more information:  
<http://www.lisboncouncil.net/>

Table 7  
Country rankings according to API and FHI

Adjustment Progress Indicator																	
Rank		Country	Total Score			External adj.			Fiscal adj.			Labour cost adj.			Reform drive		
2014	2013		2014	Change	2013	2014	Change	2013	2014	Change	2013	2014	Change	2013	2014	Change	2013
1	1	Greece	8.9	0.1	8.8	7.5	0.5	7.0	9.7	-0.2	9.9	8.3	0.1	8.3	10.0	0.0	10.0
2	2	Ireland	8.0	0.3	7.7	8.4	0.7	7.7	6.9	0.6	6.3	8.0	-0.4	8.4	8.5	0.3	8.2
3	n.a.	Latvia	7.0	n.a.	n.a.	9.0	n.a.	n.a.	4.4	n.a.	4.7	7.6	n.a.	n.a.	n.a.	n.a.	n.a.
4	4	Spain	7.0	0.1	6.8	6.8	-0.2	7.0	7.1	0.2	6.9	6.0	0.3	5.7	7.9	0.2	7.7
5	5	Portugal	6.7	0.0	6.7	6.0	-0.4	6.4	7.9	0.5	7.3	5.2	-0.1	5.3	7.8	0.1	7.7
6	7	Cyprus	6.0	0.0	6.1	5.2	-0.6	5.8	6.2	0.9	5.2	6.8	-0.5	7.2	n.a.	n.a.	n.a.
7	6	Slovakia	5.9	-0.2	6.1	6.1	-0.2	6.4	6.9	-0.8	7.7	5.2	0.3	4.9	5.5	0.0	5.5
8	8	Estonia	5.8	-0.2	6.0	7.6	0.3	7.3	1.7	0.3	1.4	5.7	-0.9	6.6	8.3	-0.5	8.8
9	12	Slovenia	4.7	0.7	4.0	6.5	0.9	5.6	5.1	0.1	5.0	3.7	0.3	3.3	3.6	1.4	2.2
10	9	Poland	4.4	-0.3	4.8	4.3	-0.4	4.7	6.2	0.3	5.9	1.8	-0.6	2.4	5.4	-0.6	6.1
11	10	Italy	4.2	0.0	4.2	4.2	0.3	3.9	5.1	-0.2	5.3	2.7	0.2	2.5	5.0	-0.3	5.2
-	-	<b>Euro 18</b>	<b>4.1</b>	<b>0.1</b>	<b>4.0</b>	<b>4.0</b>	<b>0.1</b>	<b>3.9</b>	<b>4.5</b>	<b>0.0</b>	<b>4.5</b>	<b>2.6</b>	<b>0.0</b>	<b>2.5</b>	<b>5.2</b>	<b>0.2</b>	<b>5.0</b>
12	11	UK	3.9	-0.3	4.2	2.8	-0.2	3.0	4.8	-0.6	5.4	1.9	-0.9	2.7	6.1	0.3	5.8
13	13	Malta	3.6	-0.2	3.8	6.2	-0.4	6.6	2.0	-0.1	2.1	2.5	-0.1	2.7	n.a.	n.a.	n.a.
14	14	Netherlands	3.3	-0.1	3.3	4.7	0.5	4.1	4.0	0.1	3.9	2.1	-0.8	2.9	2.4	0.0	2.4
15	16	France	3.1	0.1	3.0	2.8	-0.2	3.0	3.7	0.1	3.6	2.2	0.1	2.0	3.7	0.2	3.5
<b>16</b>	<b>17</b>	<b>Luxembourg</b>	<b>2.8</b>	<b>0.3</b>	<b>2.5</b>	<b>5.0</b>	<b>1.5</b>	<b>3.4</b>	<b>1.1</b>	<b>-0.7</b>	<b>1.8</b>	<b>3.9</b>	<b>-0.3</b>	<b>4.2</b>	<b>1.2</b>	<b>0.6</b>	<b>0.6</b>
17	15	Austria	2.8	-0.3	3.1	2.7	-0.5	3.2	1.9	0.1	1.8	1.4	0.1	1.2	5.1	-0.9	6.1
18	18	Germany	2.6	0.3	2.4	3.2	0.3	2.9	4.0	0.0	4.0	1.0	-0.1	1.1	2.4	0.9	1.5
19	19	Finland	2.4	0.1	2.3	1.3	-0.1	1.5	0.1	-0.1	0.2	2.9	0.1	2.8	5.1	0.4	4.7
20	20	Belgium	2.3	0.3	1.9	3.8	0.6	3.3	1.4	-0.1	1.5	2.0	0.6	1.4	1.8	0.2	1.6
21	21	Sweden	1.8	-0.1	1.9	2.0	-0.4	2.4	0.0	0.0	0.0	1.2	0.3	0.9	4.0	-0.2	4.3
Fundamental Health Indicator																	
Rank		Country	Total Score			Trend growth			Competitiveness			Fiscal sustainability			Resilience		
2014	2013		2014	Change	2013	2014	Change	2013	2014	Change	2013	2014	Change	2013	2014	Change	2013
<b>1</b>	<b>3</b>	<b>Luxembourg</b>	<b>7.6</b>	<b>0.3</b>	<b>7.3</b>	<b>7.0</b>	<b>0.0</b>	<b>7.0</b>	<b>7.7</b>	<b>0.9</b>	<b>6.8</b>	<b>9.5</b>	<b>-0.2</b>	<b>9.7</b>	<b>6.3</b>	<b>0.5</b>	<b>5.8</b>
2	1	Estonia	7.5	0.0	7.5	7.1	0.2	6.9	6.1	-0.3	6.4	9.2	0.1	9.1	7.5	0.1	7.4
3	2	Germany	7.4	0.0	7.4	6.2	0.0	6.1	8.3	-0.1	8.3	7.7	0.1	7.7	7.5	0.0	7.5
4	4	Slovakia	7.0	-0.2	7.1	5.8	-0.1	5.9	7.7	0.2	7.5	7.3	-0.3	7.6	7.1	-0.4	7.6
5	5	Netherlands	6.9	-0.1	7.0	7.4	-0.1	7.4	7.9	-0.2	8.1	6.6	0.0	6.6	5.7	-0.2	5.9
6	6	Poland	6.8	0.1	6.7	6.4	0.2	6.3	7.4	-0.3	7.7	6.5	0.3	6.2	6.9	0.2	6.7
7	n.a.	Latvia	6.5	n.a.	n.a.	6.2	n.a.	n.a.	5.3	n.a.	n.a.	8.1	n.a.	n.a.	6.5	n.a.	n.a.
8	7	Sweden	6.4	-0.3	6.7	7.1	-0.1	7.2	4.7	-0.7	5.3	6.7	-0.6	7.3	7.1	0.1	7.0
9	9	Slovenia	6.2	0.0	6.2	6.0	0.2	5.8	5.9	0.5	5.4	5.7	-0.3	6.0	7.3	-0.3	7.7
10	10	Malta	6.2	0.2	6.0	5.4	0.1	5.3	7.4	-0.2	7.6	6.5	-0.1	6.6	5.5	0.8	4.6
-	-	<b>Euro 18</b>	<b>5.8</b>	<b>0.0</b>	<b>5.8</b>	<b>4.9</b>	<b>0.0</b>	<b>5.0</b>	<b>6.2</b>	<b>0.2</b>	<b>6.0</b>	<b>6.3</b>	<b>0.0</b>	<b>6.3</b>	<b>6.0</b>	<b>0.0</b>	<b>5.9</b>
11	11	Austria	5.7	0.0	5.7	6.0	0.1	6.0	5.0	-0.2	5.2	5.4	-0.1	5.5	6.3	0.1	6.2
12	14	Ireland	5.6	0.2	5.4	5.2	0.2	5.1	6.8	-0.1	6.9	6.4	0.6	5.8	4.1	0.3	3.8
13	12	UK	5.5	-0.1	5.6	5.4	0.0	5.4	6.2	-0.2	6.4	5.4	-0.3	5.7	5.0	0.1	5.0
14	13	Belgium	5.3	-0.1	5.5	5.2	0.0	5.2	6.7	-0.1	6.8	4.1	-0.1	4.2	5.4	-0.3	5.7
15	16	Spain	5.2	0.1	5.1	3.7	-0.1	3.8	5.4	0.5	4.9	6.3	0.0	6.3	5.2	0.0	5.3
16	15	Finland	4.9	-0.3	5.2	5.5	-0.1	5.6	2.4	-0.7	3.1	6.0	-0.3	6.3	5.8	-0.1	5.9
17	17	France	4.9	0.1	4.8	5.0	0.0	5.0	4.8	0.3	4.5	4.3	0.0	4.3	5.5	0.0	5.5
18	18	Portugal	4.6	0.1	4.5	3.5	-0.2	3.7	5.6	0.3	5.3	4.9	0.2	4.7	4.4	0.2	4.3
19	19	Italy	4.6	0.1	4.5	3.2	0.0	3.2	3.9	0.3	3.6	5.4	-0.2	5.6	5.7	0.2	5.5
20	21	Cyprus	4.4	0.1	4.3	3.2	-0.4	3.6	3.5	0.1	3.4	6.9	0.2	6.7	4.0	0.4	3.6
21	20	Greece	4.3	0.0	4.3	2.6	-0.3	2.9	5.5	0.6	5.0	5.1	-0.2	5.3	4.2	-0.1	4.2

Source: Berenberg Bank / The Lisbon Council

In terms of the FHI global health indicators, Luxembourg is ranked:

- ▼ 4th for growth potential (score 7.0);
- ▼ 4th for competitiveness (score 7.7);
- ▼ 1st for sustainability of public finances (score 9.5);
- ▼ 9th for recovery capability (score 6.3).

For API, Luxembourg is ranked:

- ▼ 11th for external adjustment (score 5.0);
- ▼ 19th for budget adjustment capacity (score 1.1);
- ▼ 9th for wage costs;
- ▼ 18th for willingness to reform (score 1.2).

## b. Financial sector attractiveness and competitiveness indicators

### b.1 Global Financial Centres Index<sup>15</sup>

End of September 2015 the Z/Yen consultancy bureau and the Long Finance initiative released the 18th edition of the bi-annual competitiveness index of 98 financial centres around the world, the 'Global financial centres index'. In a world that is becoming increasingly globalised and interdependent through information and communication technologies, financial centres are faced with 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 study is based on two types of sources to assess the competitiveness of financial centres. On the one hand the study uses 105 quantitative determinants and on the other hand it resorts to a barometer of appreciation on the basis of online surveys among professionals of the sector. As defined in this study, competitiveness consists of five categories of indicators: the business environment (taxes, regulation, etc.), development of the financial sector, infrastructure (cost and availability of offices, etc.), human resources (training, flexibility, etc.) and global determinants of competitiveness (perception of cities as desirable places to live, etc.). Based on this information the authors calculate a composite index, called 'Global financial centres index' (GFCI), which can take a value between 0 and 1000, and which they use to rank financial centres worldwide.

<sup>15</sup> For more information:  
[http://www.longfinance.net/  
programmes/financial-centre-  
futures/fcf-publications.html](http://www.longfinance.net/programmes/financial-centre-futures/fcf-publications.html)

The latest edition of the study published in September 2015 sees London (796), New York (788) and Hong Kong (755) lead the way. Luxembourg (700) ranks 19th in the world rankings. At European level, Luxembourg is 5th behind London, Zurich (715), Geneva (707) and Frankfurt (706). At EU level, Luxembourg ranks 3rd behind London and Frankfurt.

Table 8  
Top 20 of global financial centres

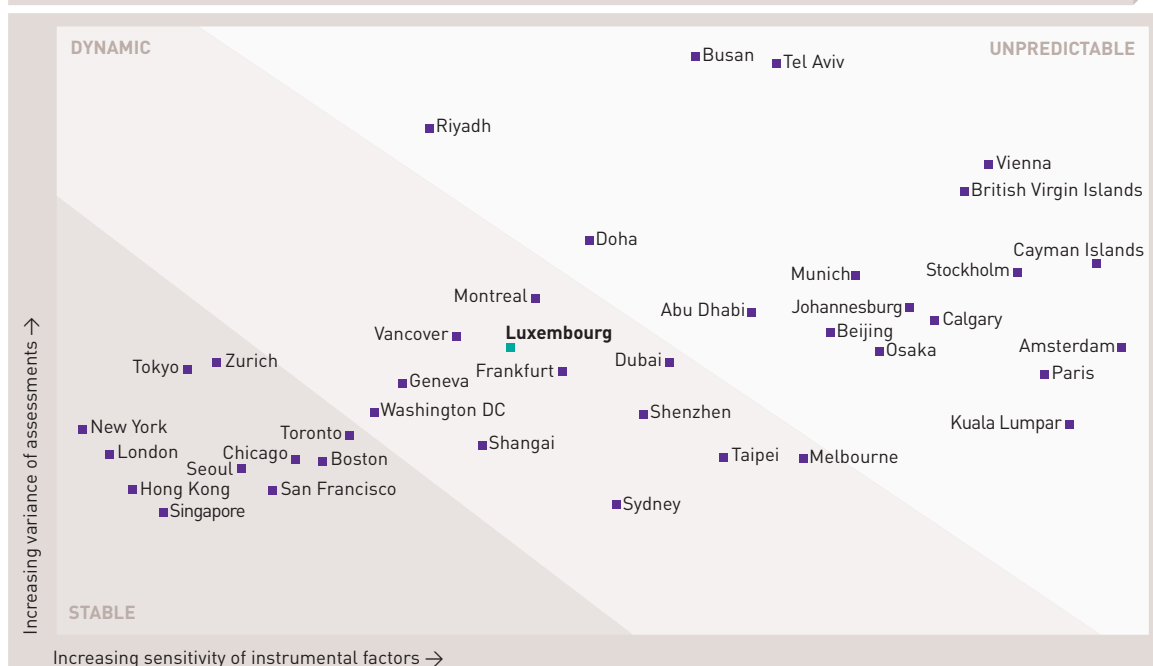
Centre	GFCI 18		GFCI 17		CHANGES	
	Rank	Rating	Rank	Rating	Rank	Rating
London	1	796	2	784	↑ 1	↑ 12
New York	2	788	1	785	↓ 1	↑ 3
Hong Kong	3	755	3	758	-	↓ 3
Singapore	4	750	4	754	-	↓ 4
Tokyo	5	725	5	722	-	↑ 3
Seoul	6	724	7	718	↑ 1	↑ 6
Zurich	7	715	6	719	↓ 1	↓ 4
Toronto	8	714	11	704	↑ 3	↑ 10
San Francisco	9	712	8	708	↓ 1	↑ 4
Washington DC	10	711	12	703	↑ 2	↑ 8
Chicago	11	710	9	707	↓ 2	↑ 3
Boston	12	709	10	706	↓ 2	↑ 3
Geneva	13	707	13	702	-	↑ 5
Frankfurt	14	706	19	692	↑ 5	↑ 14
Sydney	15	705	21	690	↑ 6	↑ 15
Dubai	16	704	23	688	↑ 7	↑ 16
Montreal	17	703	18	693	↑ 1	↑ 10
Vancouver	18	702	15	696	↓ 3	↑ 6
<b>Luxembourg</b>	<b>19</b>	<b>700</b>	<b>17</b>	<b>694</b>	<b>↓ 2</b>	<b>↑ 6</b>
Osaka	20	699	31	668	↑ 11	↑ 31

Source: Long Finance & Z/Yen

Compared to the previous edition of the study (March 2015), Luxembourg has made significant progress in the 'business environment' category, moving up 11 places to 8th in the world rankings, and in the 'infrastructure' category, climbing 31 places to 8th.

In the analysis of the volatility of the various financial centres, Luxembourg is considered to be a 'dynamic' financial centre, placed between 'stable' and 'unpredictable' financial centres. This means that Luxembourg as a financial centre has the potential to evolve in either direction.

Chart 5  
Variance of assessments and sensitivity of instrumental factors



Source: Long Finance & Z/Yen

According to the online survey sent to financial sector professionals, Luxembourg ranks 8th worldwide amongst the financial centres that respondents see as playing a more significant role in forthcoming years.

## b.2 Global venture capital and private equity country attractiveness index<sup>16</sup>

In July 2015 the IESE Business School in Barcelona published the sixth edition since 2006 of its international study of 120 countries on the venture capital and private equity. According to the authors this study provides institutional investors with a decision-making tool to spread geographically, in a first stage, the capital they invest.

This study includes a composite index called 'Global venture capital and private equity country attractiveness index' (VCPE) whose purpose is to measure the attractiveness of a country for venture capital and private equity investors. This index compares the attractiveness of the country from the point of view of an institutional investor, based on socio-economic parameters. The report identifies six categories that determine the attractiveness of a country, which group in total 65 indicators: economic activity, the depth of capital market, taxation, investor protection and corporate governance, human and social environment, the entrepreneurial culture and opportunities. Therefore, the report not only takes into account the growth potential of a country, but also the socio-economic and institutional environment. The United States is the basis to which other countries are compared (base 100).

<sup>16</sup> For more information: <http://blog.iese.edu/vcpeindex/>

The 2015 world VCPE standings are headed up by the United States (100/100), the United Kingdom (94) and Canada (93.9). Luxembourg is ranked 34th (65.1) with Germany 7th (89.5), the Netherlands 14th (83.3), Belgium 15th (81.7) and France in 17th place (80.7).

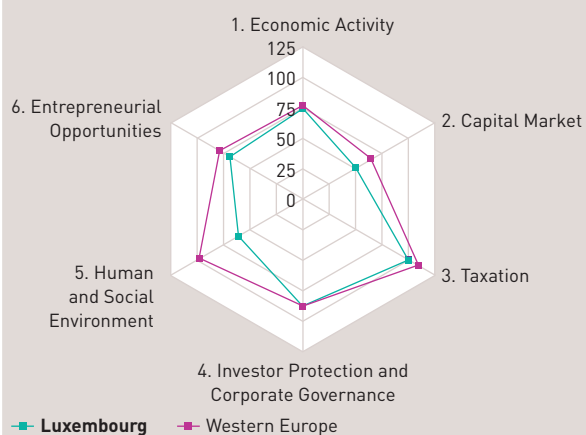
Table 9 VCPE Top 40 rankings (2015)		
Rank	Country	Score
1	United States	100.0
2	United Kingdom	94.0
3	Canada	93.9
4	Singapore	92.3
5	Japan	91.3
6	Hong Kong	90.1
7	Germany	89.5
8	Australia	88.5
9	New Zealand	86.0
10	Switzerland	85.7
11	Sweden	85.0
12	Malaysia	85.0
13	Norway	84.8
14	Netherlands	83.3
15	Belgium	81.7
16	Denmark	81.7
17	France	80.7
18	Finland	80.6
19	Korea, South	80.1
20	Israel	78.3
21	China	77.3
22	Austria	76.5
23	Ireland	76.0
24	Taiwan	73.6
25	Chile	72.4
26	Saudi Arabia	70.9
27	Spain	69.7
28	Poland	69.4
29	India	68.0
30	Thailand	67.4
31	Turkey	67.1
32	Portugal	66.0
33	Czech Republic	65.9
<b>34</b>	<b>Luxembourg</b>	<b>65.1</b>
35	United Arab Emirates	65.0
36	Italy	64.8
37	South Africa	64.3
38	Colombia	64.1
39	Russian Federation	63.8
40	Mexico	61.8
Source: IESE		

Generally speaking, Luxembourg tends to rank higher for venture capital than for financial participation.

Chart 6  
VCPE Performance of Luxembourg (2015)

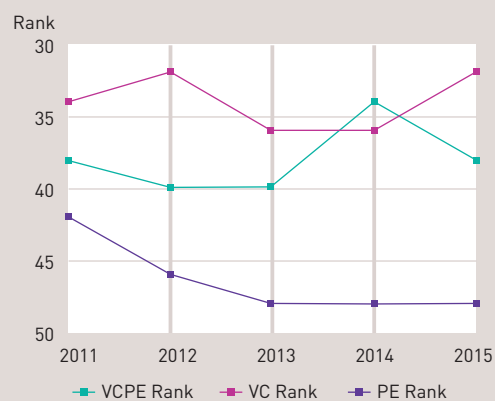
#### Key Driver Performance

United States = 100 points



#### Historic Development

Separate VCPE, VC and PE index time series



Source: IESE

Table 10  
Performance of Luxembourg per category and subcategory (2015)

	Rank 2011	Rank 2013	Rank 2015	Score 2015	Quartile 2015
VCPE Index	34	35	34	65.1	Q2
<b>1. Economic Activity</b>	<b>49</b>	<b>61</b>	<b>63</b>	<b>72.3</b>	<b>Q3</b>
1.1 Size of the Economy (GDP)	66	67	66	37.9	Q3
1.2 Expected Real GDP Growth	47	97	68	102.7	Q3
1.3 Unemployment	20	28	59	97.0	Q2
<b>2. Depth of Capital Market</b>	<b>50</b>	<b>47</b>	<b>47</b>	<b>50.7</b>	<b>Q2</b>
2.1 Size and Liquidity of the Stock Market	65	68	69	52.6	Q3
2.2 Total Trading Volume	76	80	81	29.3	Q4
2.3 IPOs and Public Issuing Activity	37	38	33	44.8	Q2
2.4 M&A Market	48	48	48	50.0	Q2
2.5 Debt and Credit Market	88	95	99	22.8	Q4
2.6 Bank Non Perf. Loans to Total Gross Loans	1	1	1	105.8	Q1
2.7 Financial Market Sophistication	3	8	2	103.2	Q1
<b>3. Taxation</b>	<b>17</b>	<b>30</b>	<b>31</b>	<b>104.9</b>	<b>Q2</b>
3.1 Entrepren. Tax Incentives and Admin. Burden	17	30	31	104.9	Q2
<b>4. Investor Protection and Corporate Governance</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>88.1</b>	<b>Q1</b>
4.1 Quality of Corporate Governance	72	80	85	49.9	Q3
4.2 Security of Property Rights	3	3	2	116.8	Q1
4.3 Quality of Legal Enforcement	5	6	5	117.3	Q1
<b>5. Human and Social Environment</b>	<b>44</b>	<b>46</b>	<b>48</b>	<b>61.1</b>	<b>Q2</b>
5.1 Education and Human Capital	30	27	23	86.2	Q1
5.2 Labor Regulations	117	119	119	20.2	Q4
5.3 Bribing and Corruption	10	9	7	130.8	Q1
<b>6. Entrepreneurial Opportunities</b>	<b>30</b>	<b>30</b>	<b>28</b>	<b>68.5</b>	<b>Q1</b>
6.1 Innovation	16	13	10	87.7	Q1
6.2 Scientific and Technical Journal Articles	70	70	69	41.4	Q3
6.3 Burdens of Starting and Running a Business	45	56	60	96.7	Q2
6.4 Simplicity of Closing a Business	43	45	47	76.6	Q2
6.5 Corporate R&D	29	28	25	56.2	Q1

Source: IESE

In the six categories which determine the attractiveness of a country in the VCPE rankings, in 2015 Luxembourg is ranked:

- ▼ 63rd in the world for economic attractiveness (score 72.3);
- ▼ 47th for the depth of capital markets (50.7);
- ▼ 31st for taxation (104.9);
- ▼ 19th for investor protection and corporate governance (88.1);
- ▼ 48th for human and social environment (61.1);
- ▼ 28th for entrepreneurial culture and opportunities (68.5).

### c. Innovation and technology indicators

#### c.1 Global innovation index<sup>17</sup>

The University of Cornell, INSEAD and the World Intellectual Property Organization (WIPO) issued in Fall 2015 the 8th edition of their 'Global innovation index' study. Innovation is a crucial determinant for a long-term sustained economic growth. Relevant indicators are thus necessary to evaluate innovation capacity and innovation policies implemented by public authorities. This study goes further than traditional indicators used for measuring the R&D and innovation (for example R&D expenses, number of scientific publications, etc.) and focuses more on the interaction between different agents of the innovation system (businesses, public sector, higher education and society). The authors consequently synthesise performance measured through different composite indicators, including the Global innovation index (GII). The GI composite index, which can obtain a score between 0 for worse performance and 100 for the best performance, is calculated on the basis of two sub-indices: inputs (institutions, human resources and research, infrastructure, market sophistication and business environment sophistication) and outputs (knowledge and technology, creativity) of the innovation system. The 2015 edition of the study includes 141 countries and is based on a total of 79 indicators.

Switzerland (68.3/100) tops the 2015 world GI rankings ahead of the United Kingdom (62.4) and Sweden (62.4). With a score of 59.0, Luxembourg is ranked 9th in the world rankings, ahead of its neighbouring countries: Germany places 12th (57.0), France 21st (53.5) and Belgium 25th (50.9). The Netherlands ranks 4th in the world rankings with a score of 61.5.

<sup>17</sup> For more information:  
[http://www.wipo.int/press-room/en/articles/2015/article\\_0010.html](http://www.wipo.int/press-room/en/articles/2015/article_0010.html)

Table 11  
GII Top 20 rankings

Global Innovation Index rankings									
Country/Economy	Score (0-100)	Rank	Income	Rank	Region	Rank	Efficiency Ratio	Rank	Median : 0.71
Switzerland	68.30	1	HI	1	EUR	1	1.01	2	
United Kingdom	62.42	2	HI	2	EUR	2	0.86	18	
Sweden	62.40	3	HI	3	EUR	3	0.86	16	
Netherlands	61.58	4	HI	4	EUR	4	0.92	8	
United States of America	60.10	5	HI	5	NAC	1	0.79	33	
Finland	59.97	6	HI	6	EUR	5	0.77	41	
Singapore	59.36	7	HI	7	SEAO	1	0.65	100	
Ireland	59.13	8	HI	8	EUR	6	0.88	12	
<b>Luxembourg</b>	<b>59.02</b>	<b>9</b>	<b>HI</b>	<b>9</b>	<b>EUR</b>	<b>7</b>	<b>1.00</b>	<b>3</b>	
Denmark	57.70	10	HI	10	EUR	8	0.75	49	
Hong Kong (China)	57.23	11	HI	11	SEAO	2	0.69	76	
Germany	57.05	12	HI	12	EUR	9	0.87	13	
Iceland	57.02	13	HI	13	EUR	10	0.98	4	
Korea, Republic of	56.26	14	HI	14	SEAO	3	0.80	27	
New Zealand	55.92	15	HI	15	SEAO	4	0.77	40	
Canada	55.73	16	HI	16	NAC	2	0.71	70	
Australia	55.22	17	HI	17	SEAO	5	0.70	72	
Austria	54.07	18	HI	18	EUR	11	0.77	37	
Japan	53.97	19	HI	19	SEAO	6	0.69	78	
Norway	53.80	20	HI	20	EUR	12	0.73	63	

Source: Cornell University/INSEAD

In terms of the two GII sub-indicators, Luxembourg performed as follows:

- ▼ With a score of 59.0 out of a possible 100, Luxembourg ranks 20th in the world and 10th in the EU for inputs (18th in the world for institutions, 34th for research and human resources, 25th for infrastructure and 2nd for sophistication and business environment). Luxembourg is behind the Netherlands (11th), France (17th) and Germany (18th) but ahead of Belgium (21st);
- ▼ Luxembourg also scored 59.0 out of a possible 100 for outputs, placing 2nd in the world and 1st in the EU (13th for knowledge and technology and 2nd for creativity). Luxembourg ranks ahead of the Netherlands (3rd), Germany (8th), France (23rd) and Belgium (28th).

## c.2 Measuring information society<sup>18</sup>

In late 2014, the International Telecommunication Union (ITU) published a new edition of its report entitled 'Measuring Information Society'. The report focuses on the role of information and communication technologies (ICT) in 166 countries as well as the development potential linked to ICT. The direct impact of the development and spread of ICT can lead to productivity gains. The report features a composite indicator, the ICT Development Index, which was established to measure both the level and development of ICT over time. The ICT Development Index consists of 11 basic indicators which fall into three sub-categories:

- ▼ Access to ICT (40% weighting): fixed-line telephone subscriptions, mobile-cellular telephone subscriptions, internet bandwidth per user, percentage of households with a computer, percentage of households with internet access;
- ▼ ICT use (40%): percentage of individuals using the internet, fixed-line broadband subscriptions, wireless broadband subscriptions;
- ▼ ICT skills (20%): adult literacy rate, rate of enrolment in secondary education, rate of enrolment in tertiary education.

Denmark (8.86) heads up the rankings ahead of South Korea (8.85) and Sweden (8.67). With a score of 8.26, Luxembourg ranks 10th, ahead of its neighbouring countries: Germany is 17th (7.90), France 18th (7.87) and Belgium 25th (7.57). The Netherlands ranks 7th with a score of 8.38. Generally speaking, the differences between the composite index scores of the top 10 countries are small.

<sup>18</sup> For more information:  
<http://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2014.aspx>

Table 12  
Top 20 of the rankings

ICT Development Index (IDI), 2012 and 2013				
Economy	Rank 2013	IDI 2013	Rank 2012	IDI 2012
Denmark	1	8.86	2	8.78
Korea (Rep.)	2	8.85	1	8.81
Sweden	3	8.67	3	8.68
Iceland	4	8.64	4	8.58
United Kingdom	5	8.50	7	8.28
Norway	6	8.39	6	8.35
Netherlands	7	8.38	5	8.36
Finland	8	8.31	8	8.27
Hong Kong, China	9	8.28	11	8.08
Luxembourg	10	8.26	9	8.19
Japan	11	8.22	10	8.15
Australia	12	8.18	12	8.03
Switzerland	13	8.11	13	7.94
United States	14	8.02	14	7.90
Monaco	15	7.93	17	7.72
Singapore	16	7.90	15	7.85
Germany	17	7.90	18	7.72
France	18	7.87	16	7.73
New Zealand	19	7.82	19	7.62
Andorra	20	7.73	24	7.41

Source: ITU (2014)

In the three sub-categories of the global composite index, Luxembourg is ranked:

- ▼ 1st for access to ICT (score of 9.46);
- ▼ 8th for ICT use (7.66);
- ▼ 82nd for ICT skills (7.08). The disappointing score for the third sub-category can be ascribed to a specific feature of Luxembourg which the study does not sufficiently take into account. In the report, Luxembourg scores poorly in terms of the number of students in tertiary education. The study only looks at students studying in Luxembourg and does not take into account the fact that the majority of students from Luxembourg enter tertiary education abroad. Therefore, Luxembourg's performance in this category is greatly under-estimated.

### c.3 Global information technology report<sup>19</sup>

In 2015, the World Economic Forum (WEF) published a new edition of its 'Global Information Technology Report'. The main goal of the report is to measure the transformational impact of information and communication technologies (ICT) on the economy and society in general. The new edition features an analysis of 143 countries and a composite index, Network Readiness Index (NRI), which enables the different countries' success in harnessing ICT to generate social and economic benefits to be compared. The NRI is calculated on the basis of 53 individual indicators, covering 4 pillars (environment, preparation, use and impact) and 10 sub-categories. Quantitative and qualitative data from the World Economic Forum's annual EOS opinion survey form the basis of the analysis. Data are standardised on a scale of 1 (poor performance) to 7 (best performance).

The 2015 rankings, calculated on the basis of the NRI, are led by Singapore (score of 6.0) ahead of Finland (6.0) and Sweden (5.8). Luxembourg is 9th in the world rankings whilst the Netherlands ranks 4th (5.8), Germany is 13th (5.5), Belgium 24th (5.3) and France 26th (5.2). Amongst European countries, Luxembourg is ranked 7th (5th in the EU).

Table 13

**Top 20 rankings**

Rank	Country/Economy	Value	2014 rank (out of 148)	Income level	Group
1	Singapore	6.0	2	HI	ADV
2	Finland	6.0	1	HI-OECD	ADV
3	Sweden	5.8	3	HI-OECD	ADV
4	Netherlands	5.8	4	HI-OECD	ADV
5	Norway	5.8	5	HI-OECD	ADV
6	Switzerland	5.7	6	HI-OECD	ADV
7	United States	5.6	7	HI-OECD	ADV
8	United Kingdom	5.6	9	HI-OECD	ADV
9	Luxembourg	5.6	11	HI-OECD	ADV
10	Japan	5.6	16	HI-OECD	ADV
11	Canada	5.5	17	HI-OECD	ADV
12	Korea, Rep.	5.5	10	HI-OECD	ADV
13	Germany	5.5	12	HI-OECD	ADV
14	Hong Kong SAR	5.5	8	HI	ADV
15	Denmark	5.5	13	HI-OECD	ADV
16	Australia	5.5	18	HI-OECD	ADV
17	New Zealand	5.5	20	HI-OECD	ADV
18	Taiwan, China	5.5	14	HI	ADV
19	Iceland	5.4	19	HI-OECD	ADV
20	Austria	5.4	22	HI-OECD	ADV

Source: WEF

<sup>19</sup> For more information:  
<http://reports.weforum.org/global-information-technology-report-2015/>

As for the four pillars and 10 sub-categories, Luxembourg performed as follows in the 2015 rankings:

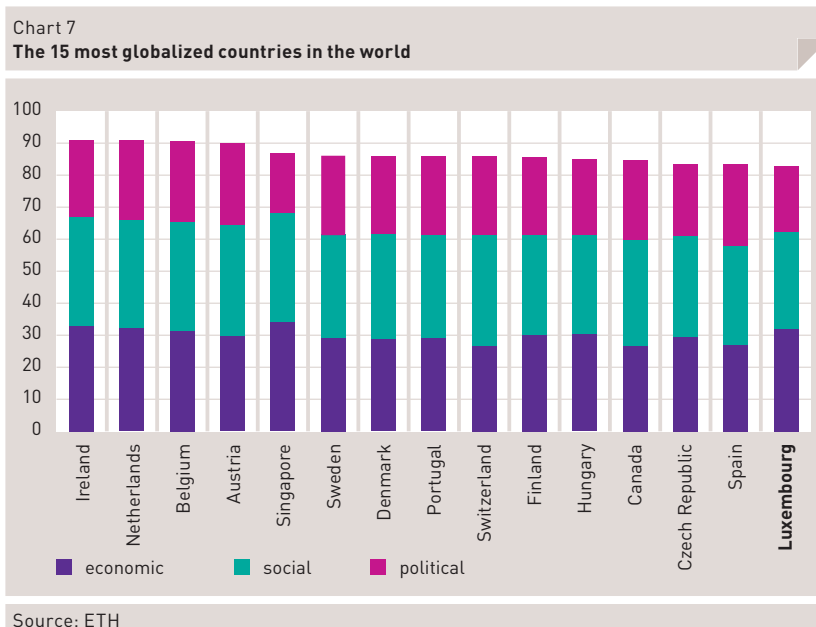
- ▼ 10th (5.4) for the environment pillar (3rd for political and regulatory environment and 27th for business environment);
- ▼ 19th (5.9) for the preparation pillar (18th for infrastructure, 50th for prices/costs and 18th for skills);
- ▼ 7th for the use pillar (6th for citizens, 11th for businesses and 11th for public administration);
- ▼ 12th for the impact pillar (8th for impact on the economy and 20th for impact on society).

In conclusion, the authors of the report make the following observation with regard to Luxembourg: *'Ranked 21st in 2012, Luxembourg continues on its impressive upward trend and enters the top 10 for the first time, at 9th place. The country benefits from a stable and efficient political and regulatory environment (3rd) with a well-developed ICT legislative framework (2nd). Venture capital availability (10th) and low tax rates (13th), among other factors, foster business development and innovation (27th). Luxembourg also possesses excellent infrastructure (18th). ICT usage is widespread among the population, business, and government alike, even though the country comes up short in terms of affordability (50th). A service-based economy, Luxembourg is greatly influenced by information technology. Almost 60 percent of the workforce is employed in knowledge-intensive jobs (1st), and ICTs largely foster the development of new services and products (7th) and new organizational models (17th). In recent years, the government has done a good job of developing a vision for ICTs (5th) and promoting its deployment (4th), helped by the public-private partnerships formed in the context of the Luxembourg ICT Cluster Initiative. However, there is room to improve government online services (42nd) and to facilitate citizens' e-participation (54th).'*

## d. Globalization indicators

### d.1 KOF Index of Globalization<sup>20</sup>

ETH Zurich released the new 2015 edition of its index of globalization 'KOF Index of globalization'. This index measures economic, social and political dimensions of globalization in 187 countries around the world on the basis of 23 variables. On the basis of these three sub-categories, the KOF index measures globalization on a scale of 1 (least globalized) to 100 (most globalized). The basic data used in this new edition date back to 2012. The economic dimension measures the flow of goods, services and capital, as well as information and perceptions linked to market exchange. It also measures the barriers to capital flow and market exchange. The social dimension measures the dissemination of ideas and information, of images and people, etc. The political dimension reflects the dissemination of government policies, such as the number of embassies in a country, the importance of affiliation to international organizations, etc.



The overall rankings are topped by Ireland (91.3), the Netherlands (91.2) and Belgium (91.0). Luxembourg ranks 15th in the world in the 2015 version of the study. Luxembourg scored particularly well in the economic domain (91.1), ranking 3rd behind Singapore and Ireland, and placing 26th and 62nd for social globalisation (79.3) and political globalisation (79.1) respectively.

<sup>20</sup> For more information:  
<http://globalization.kof.ethz.ch/>

## d.2 Crédit suisse - Globalisation<sup>21</sup>

A recent study carried out by Credit Suisse's research institute analysed countries' success in facing up to the challenges of an increasingly globalised world. The study features two composite indices, namely the 'CS Globalisation Index' and 'CS Country Strength Index'.

The first of these composite indices assesses a country's degree of globalisation on the basis of three categories of indicator: the economy (openness to international trade; foreign direct investment), society (telecommunications, import delays, etc.) and technology (number of internet users, secure servers). This information was used to calculate a composite index which was then used to rank individual countries (the closer the composite index is to 1, the more globalised the country is). Luxembourg (0.97) tops the rankings ahead of Singapore (0.89) and Switzerland (0.87). Belgium (0.81) is ranked 6th and the Netherlands (0.80) 9th.



The aim of the second composite index is to compare countries on the basis of their institutions and intangible infrastructure, development capabilities in a globalised world, ability to generate stable macroeconomic performance and level of human development. The rankings are led by Switzerland (0.87) followed by Australia (0.85) and Denmark (0.83). Luxembourg ranks 16th (0.78) whilst the Netherlands is 5th (0.83), Belgium 11th (0.79) and France 20th (0.76).

<sup>21</sup> For more information:  
<https://www.credit-suisse.com/lu/fr/news-and-expertise/news/economy/global-trends/article.html/article/pwp/news-and-expertise/2015/04/fr/economic-lessons-from-small-countries.html>

Table 14 Top 20 of most performing countries		
Country	Size	Country Strength Index
Switzerland	S	0.87
Australia	M	0.85
Denmark	S	0.83
Hong Kong SAR	S	0.83
Netherlands	M	0.83
United Kingdom	L	0.82
Singapore	S	0.82
Norway	S	0.82
Finland	S	0.80
Ireland	S	0.80
Belgium	M	0.79
New Zealand	S	0.79
Austria	S	0.79
Israel	S	0.79
Iceland	S	0.79
<b>Luxembourg</b>	<b>S</b>	<b>0.78</b>
Sweden	S	0.78
Korea, Rep.	L	0.77
Canada	L	0.76
France	L	0.76
Source: Cr�dit suisse		

## e. Quality of life and cost of living indicators

### e.1 Global liveability index 2015<sup>22</sup>

In early 2015, ECA INTERNATIONAL published a new edition of its report on the world's most liveable cities for expatriates. The report assessed a range of factors to estimate quality of life in 450 cities worldwide. The study seeks to assist human resources managers in calculating indemnities to compensate the difficulties expatriates face in adapting to their new environment. The rankings were drawn up on the basis of several criteria such as climate, healthcare services, housing, social life, leisure, infrastructure, security, political tension and air quality.

Bern, Copenhagen and The Hague are the most liveable cities in the world for European expatriates. Luxembourg ranks 4th alongside Geneva.

<sup>22</sup> For more information:  
[http://www.eca-international.com/news/press\\_releases/8132/Bern\\_and\\_Copenhagen\\_top\\_global\\_liveability\\_index\\_for\\_Europeans#.VNxxTy73jpl#.VNxxTy73jpl](http://www.eca-international.com/news/press_releases/8132/Bern_and_Copenhagen_top_global_liveability_index_for_Europeans#.VNxxTy73jpl#.VNxxTy73jpl)

[http://www.eca-international.com/news/press\\_releases/8131/Toronto\\_tops\\_global\\_liveability\\_index\\_for\\_North\\_Americans#.VNx0XS73jpl#.VNx0XS73jpl](http://www.eca-international.com/news/press_releases/8131/Toronto_tops_global_liveability_index_for_North_Americans#.VNx0XS73jpl#.VNx0XS73jpl)

[http://www.eca-international.com/news/press\\_releases/8130/Singapore\\_secures\\_top\\_spot\\_again\\_in\\_global\\_liveability\\_index\\_for\\_Asian\\_expatriates\\_\\_Bengaluru\\_best\\_of\\_Indian\\_locations#.VNx1Hy73jpl#.VNx1Hy73jpl](http://www.eca-international.com/news/press_releases/8130/Singapore_secures_top_spot_again_in_global_liveability_index_for_Asian_expatriates__Bengaluru_best_of_Indian_locations#.VNx1Hy73jpl#.VNx1Hy73jpl)

Table 15  
Top 20 for European expatriates

Global rankings 2015	Location	Country
1	Bern	Switzerland
1	Copenhagen	Denmark
3	The Hague	Netherlands
<b>4</b>	<b>Luxembourg City</b>	<b>Luxembourg</b>
4	Geneva	Switzerland
6	Basel	Switzerland
6	Stavanger	Norway
8	Antwerp	Belgium
8	Dublin	Irish Republic
8	Eindhoven	Netherlands
8	Gothenburg	Sweden
12	Stuttgart	Germany
12	Amsterdam	Netherlands
12	Munich	Germany
12	Bonn	Germany
16	Frankfurt	Germany
16	Rotterdam	Netherlands
16	Hamburg	Germany
19	Zurich	Switzerland
20	Dusseldorf	Germany
20	Berlin	Germany
20	Strasbourg	France

Source: ECA International

For North American expatriates, the most liveable city in the world is Toronto followed by Dublin. Copenhagen, Zurich, Ottawa and Vancouver all tie for 3rd place whilst Luxembourg is ranked 14th alongside Stavanger, Gothenburg, Basel, Vienna, Berlin, Eindhoven and Montreal.

Table 16  
Top 20 for North American expatriates

Global rankings 2015	Location	Country
1	Toronto	Canada
2	Dublin	Irish Republic
3	Copenhagen	Denmark
3	Zurich	Switzerland
3	Ottawa	Canada
3	Vancouver	Canada
7	Bern	Switzerland
7	Stockholm	Sweden
7	Seattle	USA
7	Boston	USA
11	Greenwich	USA
12	Geneva	Switzerland
12	The Hague	Netherlands
14	Stavanger	Norway
14	Gothenburg	Sweden
14	Basel	Switzerland
14	Vienna	Austria
14	Berlin	Germany
<b>14</b>	<b>Luxembourg City</b>	<b>Luxembourg</b>
14	Eindhoven	Netherlands
14	Montreal	Canada

Source: ECA International

The most liveable cities worldwide for Asians are Singapore, Adelaide and Sydney. Luxembourg ranks 15th alongside Auckland, Dublin and The Hague.

Table 17

**Top 20 for Asian expatriates**

Global rankings 2015	Location	Country
1	Singapore	Singapore
2	Adelaide	Australia
2	Sydney	Australia
4	Osaka	Japan
5	Brisbane	Australia
5	Wellington	New Zealand
7	Canberra	Australia
7	Copenhagen	Denmark
7	Nagoya	Japan
10	Perth	Australia
11	Bern	Switzerland
11	Melbourne	Australia
11	Tokyo	Japan
11	Yokohama	Japan
15	Auckland	New Zealand
15	Dublin	Irish Republic
<b>15</b>	<b>Luxembourg City</b>	<b>Luxembourg</b>
15	The Hague	Netherlands
19	Antwerp	Belgium
19	Eindhoven	Netherlands
19	Geneva	Switzerland
19	Gothenburg	Sweden
19	Stavanger	Norway

Source: ECA International

## e.2 Quality of living survey<sup>23</sup>

The consultancy firm MERCER has published the 2015 edition of its annual 'Quality of living survey', the purpose of which is to measure the quality of living for expatriates in their host cities around the world. This survey is conducted to help multinational companies and governments to establish the amount of compensation for their staff abroad. The survey is based on factors that expatriates consider as having a significant impact on their quality of life abroad. In this new edition, more than 230 cities were analysed and 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.

<sup>23</sup> For more information:  
<http://www.uk.mercer.com/newsroom/2015-quality-of-living-survey.html>

Table 18 Top 20 of the rankings		
1	Vienna	Austria
2	Zurich	Switzerland
3	Auckland	New Zealand
4	Munich	Germany
5	Vancouver	Canada
6	Dusseldorf	Germany
7	Frankfurt	Germany
8	Geneva	Switzerland
9	Copenhagen	Denmark
10	Sydney	Australia
11	Amsterdam	Netherlands
12	Wellington	New Zealand
13	Bern	Switzerland
14	Berlin	Germany
15	Toronto	Canada
16	Hamburg	Germany
16	Melbourne	Australia
16	Ottawa	Canada
<b>19</b>	<b>Luxembourg</b>	<b>Luxembourg</b>
Source: Mercer		

In 2015, the cities offering the best quality of life worldwide for expatriates are Vienna, Zurich and Auckland. Luxembourg ranks 19th worldwide. Vienna, Zurich and Munich occupy the top three places in the European standings whilst Luxembourg is 12th (9th in the EU).

### e.3 InterNations expat insider<sup>24</sup>

In 2015, InterNations, a worldwide expatriates network, published a new edition of its report on host countries for expatriates. The report is based on a (qualitative) survey of around 14,000 expatriates who scored different aspects of expatriate life (e.g. quality of life, family life, cost of living abroad, etc.) in 64 destinations across the world on a scale of 1 to 7. A classification of the best destinations for expatriates was drawn up on the basis of the responses submitted.

The 2015 standings are led by Ecuador followed by Mexico and Malta. Luxembourg ranks 5th worldwide whilst Germany is ranked 16th, the Netherlands 25th, Belgium 42nd and France 47th. Amongst European countries, Luxembourg ranks 2nd behind Malta.

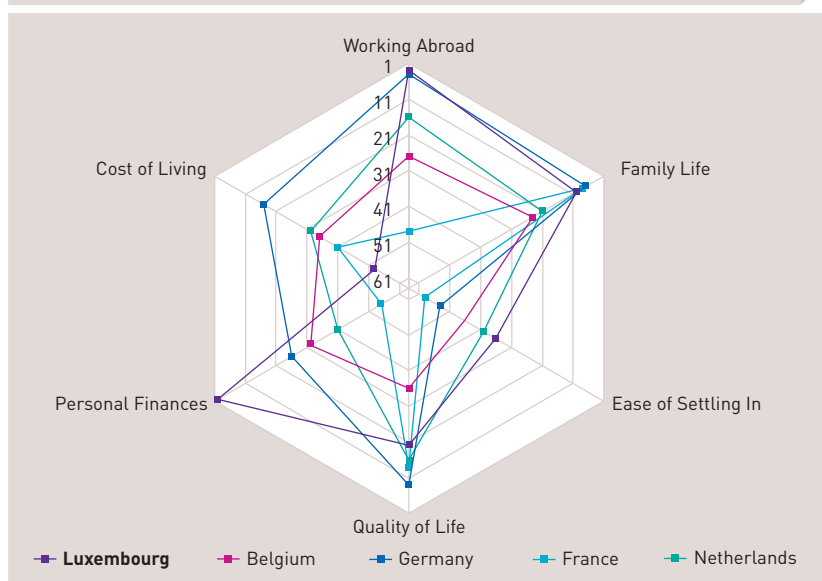
<sup>24</sup> For more information:  
<http://www.internations.org/expat-insider/>

Table 19	
<b>Top 10 of best destinations for expatriates (2015)</b>	
Rank	Country
1.	Ecuador
2.	Mexico
3.	Malta
4.	Singapore
<b>5.</b>	<b>Luxembourg</b>
6.	New Zealand
7.	Thailand
8.	Panama
9.	Canada
10.	Australia
Source: InterNations	

In the different sub-categories used to determine the overall standings, Luxembourg performed as follows:

- ▼ Working Abroad – Luxembourg is 3rd in the world rankings, ahead of Germany (4th), the Netherlands (16th), Belgium (27th) and France (48th). As for the three sub-indicators in this sub-category, Luxembourg is ranked 5th for work and career, 28th for work-life balance and 1st for job security;
- ▼ Family Life – Luxembourg ranks 10th in the world and is thus behind Germany (7th) and France (8th) but ahead of the Netherlands (21st) and Belgium. In the four sub-indicators, Luxembourg is ranked 19th for childcare and education, 15th for cost of childcare and education, 19th for quality of education and 8th for family well-being;
- ▼ Ease of Settling In – Luxembourg ranks 36th overall, ahead of the Netherlands (40th), Belgium (46th), Germany (54th) and France (59th). As for the four sub-indicators, Luxembourg is ranked 28th for 'feeling welcome', 48th for friendliness, 49th for finding friends and 30th for language;
- ▼ Quality of Life – Luxembourg is ranked 20th overall, behind Germany (9th), France (14th) and the Netherlands (16th) but ahead of Belgium (36th). In the rankings for the four sub-indicators, Luxembourg ranks 32nd for leisure options, 37th for personal happiness, 17th for travel and transport and 15th for health, safety and well-being;
- ▼ Personal Finance and Cost of Living – Luxembourg ranks 2nd for perceived personal finance and is thus ahead of Germany (26th), Belgium (32nd), the Netherlands (41st) and France (55th). However, Luxembourg is ranked 53rd for cost of living and is thus behind Germany (17th), the Netherlands (32nd), Belgium (35th) and France (41st).

Chart 9  
Performance of Luxembourg and neighbouring countries per subcategory (2015)



Source: InterNations

Note: The closer a country's position is to the edge of the chart (towards 1st place), the better its performance.

#### e.4 ECA International - cost of living<sup>25</sup>

ECA International, a solution and information provider for international human resources professionals, published in 2015 a new edition of its study on the cost of living for expatriates around the world. This study compares the price level in 440 cities and places of the world. Human resources professionals use this data to calculate cost of living premiums they grant their expatriates. ECA International defines and compares the level of cost of living on the basis of an average basket constituted of consumer goods and services. These items have been chosen because they represent products and services typically acquired by expatriates. Among these goods are 'food', 'basics' (drinks and tobacco, miscellaneous items and services) and 'general' (clothing, appliances, restaurants). While the cost of living index reflects everyday expenses, the study does not include certain costs such as housing, utilities (electricity, gas, water), the purchase of a car and school expenses. Fluctuating exchange rates, inflation and the availability of goods and services impact on the cost of living of expatriates.

According to ECA International, the most expensive cities in the world for expatriates in 2015 are Juba (South Sudan), Luanda (Angola) and Zurich (Switzerland). Luxembourg is ranked 120th in the 2015 world standings. The European classification is headed up by Zurich, Geneva and Bern with Luxembourg placing 24th. As for cities in close proximity to Luxembourg, Paris ranks 13th in the European standings whilst Brussels is 18th and Antwerp 22nd. Strasbourg (28th), Amsterdam (29th) and The Hague (32nd) are all considered to have a lower cost of living for expatriates than Luxembourg.

<sup>25</sup> For more information:  
[http://www.eca-international.com/news/press\\_releases/8190/Zurich\\_tops\\_list\\_of\\_most\\_expensive\\_European\\_cities\\_for\\_expatriates#.VaOpHvm1fSg#.VaOpHvm1fSg](http://www.eca-international.com/news/press_releases/8190/Zurich_tops_list_of_most_expensive_European_cities_for_expatriates#.VaOpHvm1fSg#.VaOpHvm1fSg)

Table 20 Top 30 of most expensive cities in Europe		
Regional rank 2015	Location	Global rank 2015
1	Zurich	3
2	Geneva	4
3	Bern	5
4	Basel	6
5	Oslo	11
6	Stavanger	13
7	Copenhagen	22
8	Helsinki	34
9	Central London	48
10	Stockholm	55
11	Göteborg	69
12	Outer London	73
13	Paris	75
14	Edinburgh	79
15	Berlin	87
16	Cardiff	90
17	Glasgow	97
18	Brussels	100
19	Manchester	104
20	Vienna	107
21	Belfast	111
22	Antwerp	118
23	Dublin	119
<b>24</b>	<b>Luxembourg City</b>	<b>120</b>
25	Munich	121
26	Marseille	123
27	Milan	126
28	Strasbourg	128
29	Amsterdam	129
30	Lyon	130
Source: ECA International		

## e.5 MERCER - cost of living<sup>26</sup>

The 2015 edition of the MERCER Cost of Living study measures the cost of living for expatriates in 207 cities across the world by assessing the cost of 200 products and services, including housing, transport, food, clothing, etc. This study provides key factors used to calculate compensation for expatriates during their stays abroad.

The 2015 version of the study reveals that the three cities with the highest cost of living are Luanda (Angola), Hong Kong and Zurich. Luxembourg is ranked 94th in the world standings whilst other European cities are ranked as follows: London 12th, Paris 46th, Dublin 49th, Milan 53rd, Amsterdam 69th, Frankfurt 98th, Brussels 102nd.

<sup>26</sup> For more information:  
<http://www.mercer.com/newsroom/cost-of-living-survey.html#data>

Table 21 Excerpt of the rankings			
80	90	Birmingham	United Kingdom
82	94	Aberdeen	United Kingdom
83	40	Dakar	Senegal
83	79	Wellington	New Zealand
83	114	Montevideo	Uruguay
86	131	Hanoi	Vietnam
87	55	Munich	Germany
88	132	Morristown, NJ	United States
89	139	San Juan	Puerto Rico
90	135	Ho Chi Minh City	Vietnam
91	150	Manama	Bahrain
92	143	Houston	United States
93	122	Maputo	Mozambique
94	111	Almaty	Kazakhstan
<b>94</b>	<b>56</b>	<b>Luxembourg</b>	<b>Luxembourg</b>
96	81	Port-au-Prince	Haiti
97	146	Kigali	Rwanda
98	59	Frankfurt	Germany
99	135	Istanbul	Turkey
99	158	Doha	Qatar
99	119	Jakarta	Indonesia
102	56	Brussels	Belgium
Source: MERCER			

## f. Miscellaneous indicators

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

### f.1 Corruption perceptions index<sup>27</sup>

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 thus weakens a country and harms the stability and security of the decisions economic agents make. It is from this point of view that Transparency international, a non-governmental organisation, published end of 2014 the 20th edition of its annual composite index of corruption perception: the Corruption Perceptions Index (CPI). The index is established on the basis of the opinions of specialists in the field of public sector corruption. Countries with a high score often have a transparent administration which enables citizens to hold their officials to account.

<sup>27</sup> For more information: [http://www.odc.public.lu/actualites/2014/12/Corruption\\_perception\\_2014/index.html](http://www.odc.public.lu/actualites/2014/12/Corruption_perception_2014/index.html)

A low score signifies systemic bribery, the absence of sanctions to combat corruption and a mismatch between the activities of the administration and the needs of the people. Countries are ranked on the basis of the extent of corruption present in the public sector. CPI scores range from 100 (very low corruption) to 0 (very corrupt) with 175 countries under scrutiny.

In the 2014 world standings, Denmark (92) led the way ahead of New Zealand (91) and Finland (89). Luxembourg (82) ranked 9th in the standings. The Netherlands (83) ranked 8th, Germany (79) 12th, Belgium (76) 15th and France (76) 26th. Therefore, Luxembourg was classed amongst the countries with a low level of public sector corruption.

Table 22

**Top 10 of the rankings**

Rank	Country/Territory	Score
1	Denmark	92
2	New Zealand	91
3	Finland	89
4	Sweden	87
5	Norway	86
6	Switzerland	86
7	Singapore	84
8	Netherlands	83
<b>9</b>	<b>Luxembourg</b>	<b>82</b>
10	Canada	81

Source: Transparency International (2014)

## f.2 Global talent competitiveness index<sup>28</sup>

In a globalised world, human capital is a key factor for national competitiveness as it is the origin of innovation and sustainable growth. Countries are competing in developing this human capital, but also in attracting and retaining it within their territory. In this context, the business school INSEAD, with the Human capital leadership institute and Adecco, published the 2nd edition of the 'Global Talent Competitiveness Index' (GTCI) early 2015. This composite index is based on an input-output model allowing it to evaluate those measures/policies/resources implemented to develop human capital (inputs), and the performance of the measures implemented. The GTCI measures two categories of competence: mid-level/technical skills of labour force (LV skills) and high-level skills (GK skills) needed for innovation and entrepreneurship (outputs). The GTCI uses a score between 0 (worst performance) and 100 (best performance).

The latest version of the index uses 65 indicators to assess 93 countries worldwide. The GTCI world rankings are led by Switzerland (71.46), Singapore (70.72) and Luxembourg (70.15). The Netherlands (63.25) ranks 12th, Germany (61.78) 14th, Belgium (59.71) 18th and France (56.49) 23rd.

<sup>28</sup> For more information:  
<http://global-indices.insead.edu/gtci/>

Table 23  
Rankings of the human capital

Country	Score	Overall Rank
Switzerland	71.46	1
Singapore	70.72	2
<b>Luxembourg</b>	<b>70.15</b>	<b>3</b>
United States	68.32	4
Canada	66.49	5
Sweden	65.71	6
United Kingdom	64.72	7
Denmark	64.13	8
Australia	64.03	9
Ireland	63.67	10
Norway	63.55	11
Netherlands	63.25	12
Finland	62.18	13
Germany	61.78	14
Austria	61.42	15
New Zealand	60.58	16
Iceland	60.54	17
Belgium	59.71	18
Estonia	58.40	19
Japan	58.01	20

Source: INSEAD

In the inputs sub-category, Luxembourg ranks 3rd in the world standings with a score of 74.47. Luxembourg is ranked 24th for facilitators, 2nd for attractiveness, 16th for growth and 1st for talent retention. In the outputs sub-category, Luxembourg leads the world standings with a score of 61.51. Luxembourg is ranked 6th for labour and vocational skills (LV) and 1st for global knowledge skills (GK).

With regard to Luxembourg, the authors of the study make the following observation: *'Luxembourg (3rd) continues the trend of high performance distributed evenly across the Input (3rd) and Output (1st) sub-indices. As a small country that has built an international reputation as a centre of finance and industry, it occupies top spots on the Retain (1st) and Attract (2nd) pillars, driven by high scores on External openness (2nd) and Sustainability (1st). Given its population limitations, Luxembourg prefers to attract talent from outside rather than develop it internally. Aside from its ability to attract and retain, its talent infrastructure leaves room for improvement in domains such as its Market (29th) and Business (62nd) landscapes, Formal education (27th) and Lifelong learning (21st), which ultimately affect its rankings on the Enablers (24th) and Grow (16th) pillars. Luxembourg's Ease of doing business (48th), Intensity of local competition (44th), Difficulty of hiring (85th) and redundancy (47th) could also be bolstered. As befits a financial and industrial headquarter hub, the country displays high levels of FDI inflow and Prevalence of foreign ownership (ranked 1st on both), in addition to Male adult migrants (1st), Female adult migrants (4th) and Brain gain (6th). It shows robust performance across both the LV skills (6th) and GK (1st) pillars. Within these, it leads the world on Talent impact and Labour productivity (ranked 1st on both), but underperforms on Employable skills (21st) and Higher skills and competencies (19th). While this is largely due to its limited stock of human capital, others areas such as the State of cluster development (20th), Relationship of pay to productivity (38th) and Sophisticated exports (38th) could be improved'.*

## 2.3 Conclusions

Many reports are published each year on competitiveness and territorial attraction. Even if since 2008 the global financial crisis has prompted the economic policy debate to focus primarily on short-term measures implemented to support the economy and on public finance consolidation rather than on structural issues, still, in a general way, the interest in this type of comparative studies tends to grow with the increased phenomenon of globalization.

Country rankings are undoubtedly the most mediatised sections of reports by far. However, interpreting the results consists of much more than merely looking at the final standings. Reports tell a more complex tale which belies the apparent simplicity of overall rankings. Two articles recently published in *The Economist* provide an overview of the pros and cons of composite indices and country rankings<sup>29</sup>. The writers of these articles conclude that if the composite indices and rankings are correctly structured, their simplicity and clarity should enable shortcomings to be identified, solutions to be suggested and indifference to be avoided for fear of a country's image being harmed. However, the articles also conclude that indicators and rankings are far from perfect and are subject to a wide range of problems such as the absence of a clear definition of what is being measured, the risk of simplifying the factor under analysis, the quality, availability and comparability of the data used, weighting, the impact on the rankings of minor discrepancies in the values of composite indices, etc. The *Economist* also notes the proliferation of composite indices and rankings over the past few years with report authors trying to increasingly optimise the degree of dissemination of the outcomes of their reports by focussing on quantification to draw international comparisons (level of competitiveness, quality of life, etc.) with the prevailing thought being *'if you can't measure it, it doesn't exist'*.

When analysing benchmarks and rankings, one should not lose sight of the intrinsic limitations of such an exercise, namely:

1. A rise or fall in the rankings does not mean that the performance of Luxembourg has improved or deteriorated over the past year. A development may also stem from the fact that other countries have experienced the effects of the crisis 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. The composite indices analysed in this 2015 edition of the Report still often use statistics dating back to 2011, 2012, 2013 and 2014. Therefore these rankings should not be considered as short-term predicting tools.

<sup>29</sup> For more information:  
THE ECONOMIST, How to lie  
with indices - Learn the ruses  
of international country rank-  
ings, November 2014

THE ECONOMIST, International  
comparisons are popular, influ-  
ential - and sometimes flawed,  
November 2014

3. Despite the attraction of their apparent simplicity, many rankings assume methodological differences. While the WEF attempts for example 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 rankings therefore vary from one ranking to another. For example, while Luxembourg is 6th in the IMD world rankings, it is only 20th in the WEF rankings.
4. The different rankings are criticized over suffering from methodological weaknesses that appear especially in three areas: the quality of sources (primary and secondary data used), the core indicators used and the method for calculating the composite index (formulas, weights, etc.). For example, the 'one size fits all' indicators used in the same way for all countries 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' which, by its statistical construction, does not take into account the large flow of cross-border workers in Luxembourg<sup>30</sup>. It strongly overestimates Luxembourg's performance. Another example is the number of Luxembourg students in higher education for which the data used often ignores the fact that a majority of Luxembourg students are studying abroad, which considerably underestimate Luxembourg's performance.
5. The detail of which countries are analysed has an impact on comparability. For example, the WEF compares 140 countries, the IMD only 61 and the Heritage Foundation 178. This affects the relative position of countries in the rankings. For example a decision could be made to only compare the EU. Luxembourg would then climb from the 20th world position to the 8th position (WEF), from the 6th to the 1st position (IMD) and from the 21st to the 9th position (Heritage Foundation).
6. There are countries or groups of countries in these rankings for which the performance is relatively close, i.e. whose numerical values of the calculated composite indices are very close to each other, a fact that the mere country rankings can usually not show. 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 rankings should therefore not be looked at separately from the value of the composite index. Significant differences in the rankings of countries may sometimes be related to small differences in the index.

<sup>30</sup> More than 40% of the labour force in Luxembourg is currently border-workers.

Following some of the above remarks, what should one finally think of these rankings and how should they be interpreted? 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 figure and are thus extremely efficient communication tools that favour political debate and allow public authorities to evaluate their policies by comparing them to best practice. On the other hand, due to press coverage, these benchmarks and rankings also have a significant impact on the brand image of a territory and can influence the investors' perception, even if they are more likely to be interested in the sub-categories (e.g. rigidity of labour market, cost of energy, etc.) than merely in the position a territory takes in the final rankings. Over the last few years, this thematic information detailed in the benchmarks has incidentally allowed investors to acquire more refined data on markets and has ensured that these benchmarks have developed as decision-making tools able to influence on decisions of localisation of activity.

Consequently, it is important to avoid caving into the syndrome of ranking for the sake of ranking. The indications provided in the final rankings are often of a character too general to be used and should help to focalise 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 national social cohesion are in perfect balance. To this end, in 2003 the Tripartite Coordination Committee in Luxembourg had identified the need for a enlarged indicator scoreboard in order to gain a better insight into the competitiveness of the country, through indicators that take better reflect the specificities of the country than do the international benchmarks. The Committee entrusted Professor Fontagné (University Paris I - Sorbonne) the task of elaborating proposals (November 2004)<sup>31</sup>. Since then the *Observatoire de la compétitivité* updates this national scoreboard annually.

<sup>31</sup> 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 further details:  
[http://www.odc.public.lu/publications/perspectives/PPE\\_003.pdf](http://www.odc.public.lu/publications/perspectives/PPE_003.pdf)

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## 3 The Competitiveness Scoreboard

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## 3.1 Introduction

Given the numerous methodological problems when drawing up an international competitiveness analysis, such as those outlined in the previous chapter for example, pertaining to international benchmarks which often fail to adequately take into consideration Luxembourg's specific characteristics as a small, open economy integrated into the Greater Region (e.g. 45% of Luxembourg's workforce is made up of cross-border workers), the Tripartite Coordination Committee asked Professor Fontagné (University of Paris I - Sorbonne) in 2003 to draw up a national scoreboard to evaluate Luxembourg's competitiveness (known as the TBCO or Competitiveness Scoreboard).

Since the publication of this report in 2004, the *Observatoire de la compétitivité* (ODC) has updated the indicators of the Competitiveness Scoreboard annually. The initial version of the Scoreboard included 88 indicators divided into 10 categories. Over the years, the various contributors stopped updating several of the indicators from this initial version. This explains why the updated version of the national Scoreboard now includes just 77 indicators in this text, which serves as the annual update of the national Scoreboard. However, the Scoreboard still includes certain indicators which no longer provide relevant information or which have been replaced by new indicators of better statistical quality, making it necessary to revise the national Scoreboard.

The revision of the Scoreboard was begun in early 2014 in partnership with the Economic and Social Committee (ESC). As the revision has not yet been finalized, the ODC has updated the Scoreboard as it currently stands. However, the revision of the Scoreboard indicators does not mean that the definition of competitiveness itself is under question. The *Observatoire de la compétitivité* recalls the broad definition of competitiveness, a definition which has been upheld by the Tripartite Committee and which was initially established by the Economic and Social Committee. The latter sets the following targets for the government: *'... the main role of the State is to contribute to achieving and maintaining a sustainable and high quality of life of the population of the country'*. According to the ESC, competitiveness is a means to achieve these goals. Also according to the ESC, a country can be considered as being competitive if: *'its productivity increases at a similar or higher rate than that of its major trading partners having a comparable level of development, it manages to maintain a balance within an open market economy context, it has a high level of employment'*.

The notion of competitiveness being rather complex, the Scoreboard aims to shed light on the different aspects of it and to simplify the global picture so that policy-makers, employees and employers strike the right balance in the formulation of future policies.

Table 1

**Competitiveness Scoreboard Indicators****Category 1: Macroeconomic Performance (12 indicators)**

- ▼ **A1:** Gross National Income per capita PPS (2014)
- ▼ **A2:** Real growth rate of GDP (2014)
- ▼ **A3:** Growth in domestic employment as a % (2014)
- ▼ **A4:** Unemployment rate as a % (2014)
- ▼ **A5:** Inflation rate as a % (2014)
- ▼ **A6:** Public balance as a % of GDP (2014)
- ▼ **A7:** Public debt as a % of GDP (2014)
- ▼ **A8:** Gross fixed capital formation of the public administration (2014)
- ▼ **A9:** Terms of trade (2014)
- ▼ **A10:** Real effective exchange rate 1995=100 (2014)
- ▼ **A11:** Diversification – Entropy coefficient (2014)
- ▼ **A12:** Foreign Direct Investment inflows and outflows (2013)

**Category 2: Employment (9 indicators)**

- ▼ **B1:** Employment rate as a % (Total) (2014)
- ▼ **B2:** Employment rate as a % (Men) (2014)
- ▼ **B3:** Employment rate as a % (Women) (2014)
- ▼ **B4:** Employment rate of persons aged 55-64 (Total) (2014)
- ▼ **B5:** Employment rate of persons aged 55-64 (Men) (2014)
- ▼ **B6:** Employment rate of persons aged 55-64 (Women) (2014)
- ▼ **B7:** Unemployment rate of persons under 25 (2014)
- ▼ **B8:** Long-term unemployment rate as a % (2014)
- ▼ **B9:** Persons holding a part-time job (2014)

**Category 3: Productivity and Labour Costs (4 indicators)**

- ▼ **C1:** Trends in total factor productivity (2014)
- ▼ **C2:** Trends in apparent work productivity (2014)
- ▼ **C3:** Productivity per hour worked as a percentage of U.S. Charts (2014)
- ▼ **C4:** Changes in unit labour costs (2014)
- ▼ Costs / Revenue ratio in the banking sector (2006)\*

**Category 4: Market Operations (8 indicators)**

- ▼ Percentage of full-time employees on minimum wage<sup>1\*2</sup>
- ▼ **D2:** Price of electricity (excl. taxes and levies) – industrial users (2014)
- ▼ **D3:** Price of gas (excl. taxes and levies) – industrial users (2014)
- ▼ **D4:** Market share of the primary operator in cellular telephones (2010)
- ▼ Composite basket of fixed and cellular telecommunications (ex-VAT) (2004)\*
- ▼ **D6:** Composite basket of cellular telephone rates (ex-VAT) (2014)
- ▼ **D7:** Broadband Internet access rates (2014)
- ▼ **D8:** Basket of domestic royalties for 2 Mbits leased lines (2014)
- ▼ **D9:** Value of public tenders using open procedure procurement (2011)
- ▼ **D10:** Total State aid as a % of GDP (except horizontal objectives) (2011)
- ▼ Market share of the primary operator in fixed telecommunications<sup>3\*</sup>

**Category 5: Institutional and Regulatory Framework (10 indicators)**

- ▼ **E1:** Corporate tax rate (2014)
- ▼ **E2:** Income tax rate (2014)
- ▼ **E3:** Standard VAT rate (2014)
- ▼ **E4:** Tax wedge – Single, without children (2014)
- ▼ **E5:** Tax wedge – Married, with 2 children, one-wage-earner (2014)
- ▼ **E6:** Administration efficiency index (2014)
- ▼ **E7:** Law compliance index (2014)
- ▼ **E8:** Regulation quality index (2014)
- ▼ **E9:** Degree of sophistication of online public services (2014)
- ▼ **E10:** Full online availability of public services (2014)
- ▼ Public sector wage costs\*

<sup>1</sup> "Eurostat would like to inform countries that the table 'Full-time employees on the minimum wage' has been deleted on Eurostat's website as the methodological concept needs to be developed."

<sup>2</sup> Indicators signalled on a lighter background could not be updated for years and are therefore not taken into account for the analysis of the Scoreboard nor for the calculation of the composite indicator.

<sup>3</sup> Indicators marked with an asterisk have not been updated.

Table 1  
Continuation

**Category 6: Entrepreneurship (4 indicators)**

- ▼ **F1:** Propensity for entrepreneurship (2012)
- ▼ **F2:** Self-employed jobs as a percentage of total employment (2014)
- ▼ **F3:** Net change in number of companies – start-up rate minus wind-up rate (2013)
- ▼ **F4:** Volatility amongst companies – start-up rate plus wind-up rate of disappearance (2013)

**Category 7: Education and Training (5 indicators)**

- ▼ **G1:** Annual cost per student in public educational facilities (2011)
- ▼ **G2:** Part of the population aged 25 to 64 with at least a secondary education (2014)
- ▼ Share of population aged 25 to 34 with university education\*<sup>4</sup>
- ▼ **G4:** Share of human resources in scientific and technological fields as a % of total employment (2014)
- ▼ **G5:** Lifelong learning (participation of adults in training and teaching programmes) (2014)
- ▼ **G6:** Secondary school drop-outs (2014)
- ▼ Relative share of foreign nationals employment in science and technology human resources\*
- ▼ Share of highly qualified workers (ICT) in total employment\*

**Category 8: Knowledge Economy (13 indicators)**

- ▼ **H1:** Internal R&D expenditure (2012)
- ▼ **H2:** Public R&D budget credits (2013)
- ▼ **H3:** Portion of public research financed by the private sector (2013)
- ▼ Percentage of sales allocated to the introduction of new products on the market (new or significantly improved products) (2003)\*
- ▼ **H5:** Number of researchers per 1,000 employed persons (2013)
- ▼ Scientific publications per million inhabitants (2005)\*
- ▼ **H7:** Number of USPTO patents per million inhabitants (2014)
- ▼ **H8:** Number of OEB patents per million inhabitants (2012)
- ▼ **H9:** Use of broadband connections by companies (2013)
- ▼ **H10:** Investment in public telecommunications as a percentage of gross fixed capital formation (2009)
- ▼ **H11:** Percentage of households that have Internet access at home (2014)
- ▼ **H12:** Number of cell and fixed phones per 100 inhabitants (2013)
- ▼ **H13:** Percentage of households that have broadband Internet access (2014)
- ▼ **H14:** Number of secure web servers per 100,000 inhabitants (2014)
- ▼ **H15:** Percentage of total employment in medium or high technology sectors (2014)

**Category 9: Social Cohesion (5 indicators)**

- ▼ **I1:** Gini coefficient (2014)
- ▼ **I2:** At-risk-of-poverty rate after social transfers (2014)
- ▼ **I3:** At persistent risk of poverty rate (2014)
- ▼ **I4:** Life expectancy at birth (2013)
- ▼ **I5:** Gender wage gap (2013)
- ▼ Serious work-related accidents (2006)\*

**Category 10: Environment (7 indicators)**

- ▼ **J1:** Number of ISO 14001 certifications (2014)
- ▼ **J2:** Number of ISO 9001 certifications (2014)
- ▼ **J3:** Total greenhouse gas emissions (2012)
- ▼ **J4:** Share of renewable energy (2013)
- ▼ **J5:** Volume of municipal waste generated (2013)
- ▼ **J6:** Energy intensity of the economy (2013)
- ▼ **J7:** Modal breakdown in transportation choice for passenger – Percentage of car users (2013)

Source: Fontagné (2004)

<sup>4</sup> For these indicators, indicators for Luxembourg are not available.

Since the 2004 Fontagné report, indicators of Luxembourg's Competitiveness Scoreboard are analysed in detail from two points of view. First, Luxembourg's position compared to the European average is highlighted.

- If Luxembourg shows a value that is 20% better (or equal) than the EU-x average, then the indicator is classified as 'green' (favourable position).
- If Luxembourg shows a value that is between +20% and -20% in relation to the EU-x average, then the indicator is classified as 'orange' (neutral position).
- If Luxembourg shows a value that is 20% lower (or equal) than the EU-x average, then the indicator is classified as 'red' (unfavourable position).

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

Secondly, Luxembourg's 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-x. As a reminder, the following acronyms are used:

Table 2

### Acronyms

<b>DE</b>	Germany	<b>FR</b>	France	<b>NL</b>	Netherlands
<b>AT</b>	Austria	<b>GR</b>	Greece	<b>PO</b>	Poland
<b>BE</b>	Belgium	<b>HU</b>	Hungary	<b>PT</b>	Portugal
<b>BU</b>	Bulgaria	<b>IE</b>	Ireland	<b>SK</b>	Slovak Republic
<b>CY</b>	Cyprus	<b>IT</b>	Italy	<b>CZ</b>	Czech Republic
<b>HR</b>	Croatia	<b>LV</b>	Latvia	<b>RO</b>	Romania
<b>DK</b>	Denmark	<b>LT</b>	Lithuania	<b>UK</b>	United Kingdom
<b>ES</b>	Spain	<b>LU</b>	Luxembourg	<b>SL</b>	Slovenia
<b>EE</b>	Estonia	<b>MT</b>	Malta	<b>SE</b>	Sweden
<b>FI</b>	Finland				

Source: Eurostat

Finally, the indicators are synthesised by calculating a composite indicator with all the advantages and disadvantages this may imply. The composite indicator, combining all information in order to give a synoptic view, is a tool appreciated by the media, enjoying instantaneous compact information. In no instance does it replace a serious and thorough analysis, by indicator, domain and sector of activity. This Scoreboard does not come up with 'pseudo-scientific' truths claimed by its critics: it merely measures a set of criteria based on the data supplied by the public statistics in a common conceptual framework.

The *Observatoire de la compétitivité* warns the reader against certain aspects: the yearly updating of data does not merely concern the previous year, but all the data from 2000 onwards is updated, depending on availability. This obviously has an influence on the outcome resulting from the current scoreboard, and especially on the ranking obtained from the composite indicator, as it is not stable in time and differences may appear from one edition of the report to the next for the same year. Thus, the yearly and quarterly data for the GDP are marked by two fundamental changes, namely the move to the new European System of Accounts ESA 2010 and the statistical revision of Charts for the period 2000-2013.

The missing data in the Scoreboard have a significant impact on the outcome of the Scoreboard, including on the composite indicator. As several EU countries are not OECD members (Bulgaria, Cyprus, Croatia, Latvia, Lithuania, Malta and Romania), the ranking provided by the composite indicator should be interpreted with caution, since some underlying indicators are not available for these countries. The same applies to the indicators of the Market Operations category, often derived from the OECD database that is only updated every two years. The Table 3 provides information on the percentage of missing data in the Scoreboard for all countries. The indicators with at least 95% of data available are represented on darker background.

Table 3  
Non-availability of data over time, as a %

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Macroeconomic Performance	3.0	2.4	1.2	1.5	1.2	0.3	0.3	0.3	0.3	0.3	0.3	0.0	0.0	0.0	8.3
Employment	3.6	3.2	0.0	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Productivity and Labour Costs	8.9	1.8	1.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.8
Market Operations	50.4	58.5	33.0	55.8	19.6	45.5	17.9	32.1	17.0	31.7	15.6	42.9	50.9	75.9	51.3
Institutional and Regulatory Framework	26.4	48.2	18.2	18.2	7.1	25.0	7.5	6.1	25.0	5.7	5.7	25.0	25.0	25.0	5.7
Entrepreneurship	15.2	15.2	15.2	15.2	15.2	28.6	28.6	6.3	28.6	4.5	28.6	28.6	4.5	28.6	75.0
Education and Training	22.9	15.7	2.9	4.3	2.9	0.7	2.1	1.4	2.9	2.1	2.9	1.4	20.0	20.0	20.0
Knowledge Economy	32.1	28.0	24.7	20.3	16.8	10.2	11.0	8.0	10.2	8.0	15.1	13.2	14.8	26.4	63.5
Social Cohesion	22.9	20.7	45.0	34.3	37.1	21.4	23.6	11.4	4.3	4.3	2.9	2.9	2.9	5.0	72.1
Environment	28.6	14.8	14.8	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3	71.4

Source: *Observatoire de la compétitivité*

The Macroeconomic Performance, Employment, Productivity and Labour Costs, and Environment categories show the least missing data. Missing data are influenced by the source of the data. Actually, when it comes to OECD data, data concerning EU Member States which are not members of the OECD are automatically missing.

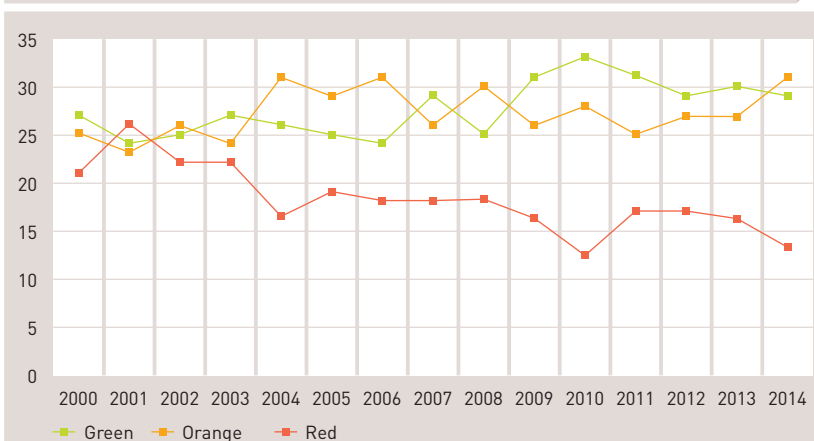
For the more 'structural' categories, data are published with some delay and a majority of 2014 data are not available for the Market Operations, Institutional and Regulatory Framework, Entrepreneurship, Knowledge Economy, Social Cohesion and Environment categories. From the moment they are available, this missing data obviously have a significant impact on the result of the ranking.

## 3.2 2015 Competitiveness Scoreboard

This sub-chapter analyses the indicators of the 10 categories. The green, orange and red colours inform on the position of Luxembourg in comparison with the EU average (EU-28 or OECD average). In 2014, the number of indicators in green was slightly lower: for 29 of the 73 indicators, Luxembourg recorded performances at least 20% higher than the European average (-1 in comparison with 2013). The group of indicators in red was also lower: for a mere 13 indicators (-3 in comparison to 2013), Luxembourg's results were well below average.

Since 2001, the number of indicators in red has continuously decreased in favour of indicators in orange and green, which have slightly increased over the years.

Chart 1  
Indicator evolution



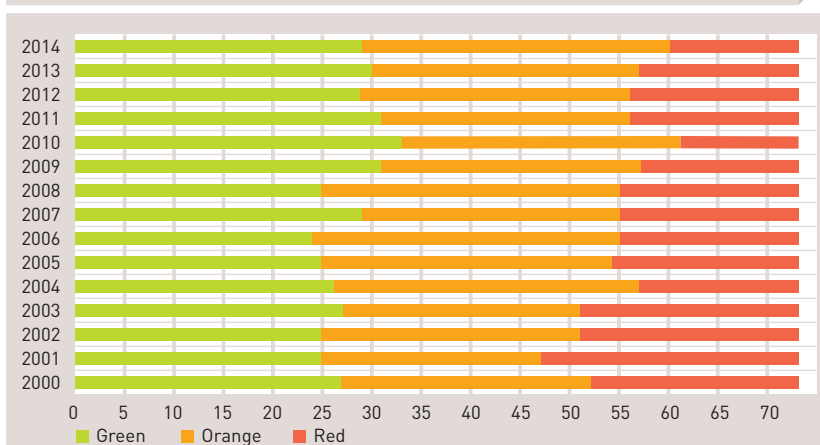
Source: *Observatoire de la compétitivité*

Table 4  
Colour evolution since 2000

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Macroeconomic Performance		8	7	8	7	8	8	8	8	7	8	8	8	7	8	8
		1	2	2	3	2	2	1	2	2	1	2	2	2	2	2
		1	1	0	0	0	0	1	0	1	1	0	0	1	0	0
Employment		2	2	2	2	1	2	1	1	1	1	2	2	2	2	1
		3	3	3	4	5	4	6	5	5	7	7	6	7	6	7
		4	4	4	3	3	3	2	3	3	1	0	1	0	1	1
Productivity and Labour Costs		3	1	1	1	2	2	1	4	1	1	4	1	1	2	4
		1	0	0	0	1	0	1	0	0	0	0	0	0	0	0
		0	3	3	3	1	2	2	0	3	3	0	3	3	2	0
Market Operations		2	2	2	3	4	3	3	3	3	4	4	4	4	4	3
		4	4	4	3	4	4	3	3	3	2	1	1	1	1	3
		2	2	2	2	0	1	2	2	2	2	3	3	3	3	2
Institutional and Regulatory Framework		5	5	6	6	5	5	5	5	5	5	5	5	5	5	5
		3	2	2	2	4	2	3	3	4	4	4	4	4	4	4
		2	3	2	2	1	3	2	2	1	1	1	1	1	1	1
Entrepreneurship		1	1	0	0	0	0	0	0	1	1	1	1	1	1	1
		2	2	3	2	2	2	3	2	2	2	2	1	2	2	2
		1	1	1	2	2	2	1	2	1	1	1	2	1	1	1
Education and Training		0	0	0	1	1	0	0	0	0	3	3	3	3	3	3
		3	3	4	2	3	4	4	3	4	1	1	1	1	1	1
		2	2	1	2	1	1	1	2	1	1	1	1	1	1	1
Knowledge Economy		5	5	5	5	5	5	6	7	6	7	4	5	4	4	3
		2	2	2	3	3	4	4	3	5	4	7	6	6	6	7
		6	6	6	5	5	4	3	3	2	2	2	2	3	3	3
Social Cohesion		1	1	1	1	0	0	0	1	1	1	2	2	2	1	1
		4	4	4	4	5	5	5	4	4	4	3	3	3	4	4
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Environment		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		2	1	2	1	2	2	1	1	1	1	1	1	1	1	1
		3	4	3	3	3	3	4	4	4	4	4	4	4	4	4
Total		27	24	25	27	26	25	24	29	25	31	33	31	29	30	29
		25	23	26	24	31	29	31	26	30	26	28	25	27	27	31
		21	26	22	22	16	19	18	18	18	16	12	17	17	16	13
Total of indicators		73	73	73	73	73	73	73	73	73	73	73	73	73	73	73

Source: *Observatoire de la Compétitivité*

### The Competitiveness Scoreboard



Note: For 4 indicators ('Terms of Trade', 'Real effective exchange rate', 'Total greenhouse gas emissions' and 'Modal breakdown in transportation choice for passenger') Luxembourg's performance over time is to be monitored through the base index 100. A comparison with the EU average does not make sense. The total of indicators amounts thus to 73 indicators.

The previous table leads to the conclusion that the overall situation of Luxembourg has remained constant in relation to the EU average. Even if the notion of competitiveness is a relative one, an analysis of evolution of the Luxembourg indicators as compared to the previous year is essential. Out of 77 indicators, 38 have improved and 31 have deteriorated.

A more detailed analysis of each category, presented below in sections 3.2.1 - 3.2.10, is necessary to detect Luxembourg's strengths and weaknesses.

Table 5  
LU indicator development compared to the previous year

		2008	2009	2010	2011	2012	2013	2014
Macroeconomic Performance	↑	4	4	6	8	5	3	5
	=	1	0	1	0	0	0	0
	↓	7	8	5	4	7	9	7
Employment	↑	4	9	5	1	7	4	7
	=	0	0	1	1	0	0	0
	↓	5	0	3	7	2	5	2
Productivity and Labour Costs	↑	0	0	4	1	0	4	3
	=	0	1	0	0	0	0	0
	↓	4	3	0	3	4	0	1
Market Operations	↑	6	5	7	3	3	4	4
	=	0	0	0	1	1	1	1
	↓	2	3	1	4	4	3	3
Institutional and Regulatory Framework	↑	6	7	4	2	2	2	2
	=	2	2	3	1	5	3	3
	↓	2	1	3	7	3	5	5
Entrepreneurship	↑	1	1	2	2	2	3	2
	=	0	0	0	0	0	0	0
	↓	3	3	2	2	2	1	2
Education and Training	↑	3	4	3	3	3	4	2
	=	1	1	2	1	1	1	2
	↓	1	0	0	1	1	0	1
Knowledge Economy	↑	8	8	6	7	5	6	6
	=	1	1	1	0	2	2	2
	↓	4	4	6	6	6	5	5
Social Cohesion	↑	4	2	4	4	1	2	3
	=	0	0	1	0	1	0	0
	↓	1	3	0	1	3	3	2
Environment	↑	4	5	1	5	6	6	4
	=	0	0	2	2	0	0	0
	↓	3	2	4	0	1	1	3
<b>Total</b>	↑	<b>40</b>	<b>45</b>	<b>42</b>	<b>36</b>	<b>34</b>	<b>38</b>	<b>38</b>
	=	<b>5</b>	<b>5</b>	<b>11</b>	<b>6</b>	<b>10</b>	<b>7</b>	<b>8</b>
	↓	<b>32</b>	<b>27</b>	<b>24</b>	<b>35</b>	<b>33</b>	<b>32</b>	<b>31</b>
<b>Total of indicators</b>		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>

Source: *Observatoire de la compétitivité*

## 3.2.1 Macroeconomic Performance

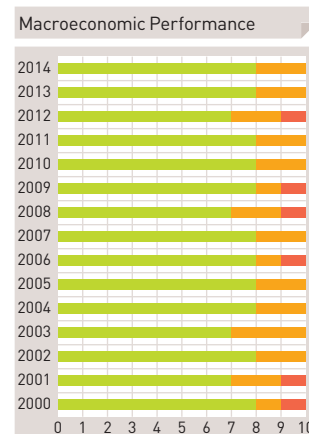
Table 6  
Category A Macroeconomic Performance

Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
A1	Gross national income at market prices, per capita in PPS (2014)	↓	193.4	1 / 28	100	132	120.5	132.1	BU 20.7	LU
A2	Growth rate of real GDP, as a % (2014)	↓	4.1	2 / 28	1.4	1.6	0.2	1.1	CY -2.3	IE 5.2
A3	Growth rate of domestic employment, as a % (2014)	↑	2.3	4 / 28	1.0	0.8	0.3	0.4	CY -1.9	MT 4.5
A4	Unemployment rate, as a % (2014)	↓	7.2	8 / 28	10.2	5.0	10.2	8.5	DE 5	GR 26.5
A5	Inflation rate, as a % (2014)*	↑	0.63	22 / 28	0.55	0.78	0.61	0.54	BU -1.60	AT 1.46
A6	Public balance, as a % of GDP (2014)	↑	1.4	2 / 28	-2.9	0.6	-4.0	-3.2	CY -8.8	DK 1.8
A7	Public debt, as a % of GDP (2014)	↑	23.0	2 / 28	86.8	74.7	95	106.5	EE 10.6	GR 177.1
A8	Gross fixed capital formation, as a % of GDP (2014)	↑	3.8	12 / 28	2.9	2.2	3.7	2.3	CY 1.8	HU 5.2
A9	Terms of trade (2014)	↓	103.1	12 / 28		100.5	99.8	97.5	FI 87.6	RO 139.8
A10	Real effective exchange rate (index 2000 =100) (2014)	↓	106.0	21 / 28	101.5	99.6	99.7	104.1	UK 93.2	SK 133.35
A11	Diversification – Entropy coefficient (2014) <sup>5</sup>	↓	0.875	20 / 28	0.899	0.881	0.893	0.861	LT 0.782	IE 0.973
A12	Market integration (2013)	↓	605.2	1 / 28	2.6	1.2	-0.1	-2.8	MT -11	LU

\* LU inflation rate: IPCN, other IPCH; harmonized unemployment rate EUROSTAT/BIT LU: Adem

Although green is the dominant colour in this category, for 7 of the 12 indicators the situation has deteriorated in comparison with the previous year in Luxembourg. Luxembourg is in first place for 2 indicators, and in 2nd place for three others.

In this key category, Luxembourg has two indicators in orange: the inflation rate and the diversification coefficient. Nonetheless, the inflation rate in Luxembourg (0.63%, measured using the national consumption price index) is close to the European Union average (0.55%) and the inflation differential between Luxembourg and its neighbouring countries narrowed considerably in 2014. The diversification indicator calculates the degree of economic diversification by taking into account the added value of the different sectors.



<sup>5</sup> The recent change of the NACE rev 1.1 (6 branches) in Nace rev.2 (10 branches) has a significant impact on the result of the entropy coefficient. In-depth analyses are necessary.

The real GDP growth rate amounted to 4.1% in 2014, putting Luxembourg in 2nd place after Ireland. This growth is actually close to pre-crisis levels, where Luxembourg experienced average annual growth rates of 4.7% (between 2000 and 2007). The real effective exchange rate (REER) indicator, which measures price competitiveness and cost competitiveness in one country in comparison with its trading partners (an indicator which is also listed in the European Scoreboard for the Macroeconomic Imbalances Procedure or MIP), has deteriorated in Luxembourg in 2014 in comparison with 2013. Under the MIP criteria, a country is considered to be a potential risk if the REER is higher than +5% or lower than -5%<sup>6</sup>.

The 'Growth in domestic employment rate' grew more rapidly, at a rate of 2.3% in 2014 compared to 2.0% in 2013. The European average was 1.0%. Despite the increase in domestic employment, the unemployment rate increased from 6.9% to 7.2%. This is a paradox particular to Luxembourg: unemployment increases, and at the same time employment increases. This can be explained by the growing number of cross-border workers in Luxembourg.

In comparison with other EU countries, Luxembourg's public debt remains low (23.0% of GDP, compared to the European average of 86.8%), beaten only by Estonia (10.6%). The 'Public balance' indicator, which is still in green, improved slightly between 2013 and 2014, increasing from 0.7% of GDP to 1.4% of GDP. However, only four countries reported a surplus government balance: Denmark, Germany, Estonia and Luxembourg. The other 24 members of the EU reported deficits of up to -8.8% of GDP (Cyprus) for 2014.

Please note that some of the information for this category has changed following the transition to the new European System of Accounts (ESA 2010) and the statistical revision of figures since the year 2000.

<sup>6</sup> See also chapter 4: 'Luxembourg in the European Semester' in the Competitiveness Report for further details.

## 3.2.2 Employment

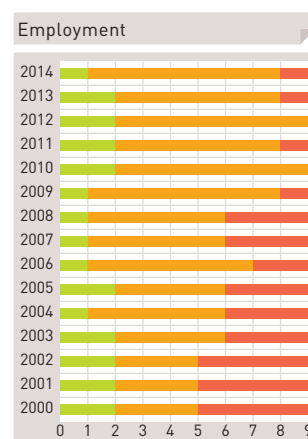
Table 7  
Category B Employment

Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
B1	Employment rate, as a % (aged 15-64) (2014)	↑	66.6	10 / 28	64.9	73.8	64.3	61.9	GR 49.4	SE 74.9
B2	Employment rate – Men (aged 15-64) (2014)	↑	72.6	10 / 28	70.1	78.1	67.7	65.8	GR 58	NL 78.1
B3	Employment rate – Women (aged 15-64) (2014)	↑	60.5	13 / 28	59.6	69.5	60.9	57.9	GR 41.1	SE 73.1
B4	Employment rate of persons aged 55-64, as a % (2014)	↑	42.5	22 / 28	51.8	65.6	47.0	42.7	GR 34	SE 74
B5	Employment rate of persons aged 55-64 – Men (2014)	↑	49.8	22 / 28	58.8	71.4	48.9	48.4	SL 41.8	SE 76.5
B6	Employment rate of persons aged 55-64 – Women (2014)	↑	35.0	22 / 28	45.2	60.0	45.3	37.0	MT 19.8	SE 71.5
B7	Unemployment rate of persons under 25, as a % (2014)	↓	22	14 / 28	22.2	7.7	24.2	23.2	DE 7.7	ES 53.2
B8	Long-term unemployment rate, as a % (2014)	↑	1.6	3 / 28	5.1	2.2	4.4	4.3	AT / SE 1.5	GR 19.5
B9	Persons holding a part-time job (2014)	↓	18.9	9 / 28	20.4	27.6	18.9	24.1	BU 2.7	NL 50.4

In the employment category Luxembourg improved in 7 of the 9 indicators. In particular, the employment rate for women rose by 1.4 percentage points, and the employment rate for the 55-64 age group rose from 40.5% to 42.5% between 2013 and 2014. The government introduced a series of measures following the European Council Recommendation to increase the participation rate among older workers, such as the law reforming the retirement system which entered into force on 1 January 2013.

7 out of 9 indicators are in orange, and are therefore close to the European average. Only one indicator is in green: the long-term unemployment rate, where Luxembourg ranks 3rd after Sweden and Austria.

In order to more fully investigate and understand the situation with regard to developments in the labour market and employment, RETEL (the labour market and employment research network) publishes a quarterly employment scoreboard which aims to show indicators pertaining to workforce movements (recruitment and contract terminations), to provide a better analysis of the dynamics of Luxembourg's labour market<sup>7</sup>.



<sup>7</sup> For more details about RETEL – Observatoire du marché de l'emploi: <http://www.mte.public.lu/retel/index.html>

<http://www.jugendgarantie.lu/>

The unemployment rate among young people (<25 years old) in Luxembourg has been increasing continually for several years. In 2000, the rate was still less than 7%. By 2013, 17.4% of young people were looking for a job. In 2014, this rate increased sharply and came closer to the EU average. This indicator has therefore changed from green to orange. Although this development in Luxembourg cannot be ignored, the situation for under-25s in other countries is much more dramatic. In Spain and Greece, the rates reached 53.2% and 52.4% respectively in 2014. Following a European Council recommendation to Member States, Luxembourg introduced a Youth Guarantee in 2014 which included a package of measures for providing every young person aged between 16 and 25 with a job offer, supplementary education, a course of vocational training or an internship within four months of leaving school or losing their job<sup>8</sup>. When the Youth Guarantee was introduced, ADEM (the national employment agency) revised its approach towards 16-25 year olds. These young people benefit from a multidisciplinary framework, put in place by around 15 advisors who are specially trained to more efficiently support the young job seekers signed up to ADEM. Since the introduction of the Youth Guarantee in Luxembourg, 4,027 job seekers aged under 25 have signed up to the ADEM programme (during the observation period from the end of June 2014 to the beginning of April 2015)<sup>9</sup>.

The only indicator in red is the employment rate among older female workers, although the rate has in fact improved from 32.4% to 35%. It is useful to note that the employment rate reported in the Scoreboard refers to the 15-64 age group, while the employment rate of the Europe 2020 Strategy (national strategy: 73%) applies to the 20-64 age group, in order to reduce potential disparities due to employment and education policies. The national employment rate for this age group stood at 72.1% in 2014.

<sup>8</sup> <http://www.jugendgarantie.lu/>

<sup>9</sup> For further information, see the ADEM's 2014 annual report: [http://www.adem.public.lu/publications/rapports/ADEM\\_Rapport\\_Annuel\\_2014.pdf](http://www.adem.public.lu/publications/rapports/ADEM_Rapport_Annuel_2014.pdf)

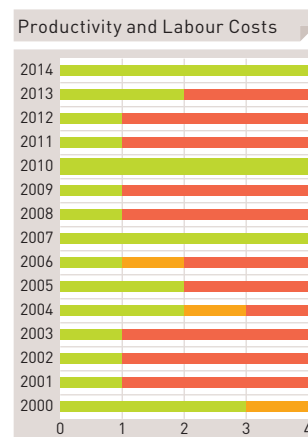
### 3.2.3 Productivity and Labour Costs

Table 8  
Category C Productivity and Labour Costs

Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
C1	Trends in total factor productivity (2014)	↑	0.62	12 / 28	0.41	0.74	-0.20	0.38	HR -2.56	IE 3.16
C2	Trends in apparent work productivity (2014)	↑	3.1	3 / 28	0.4	0.7	-0.1	0.7	HR -3.0	LV 3.8
C3	Productivity per hour worked, as a % of US figures (2014)	↓	92.1	1 / 27	60.2	76.4	91.5	89.5	RO 18.1	LU
C4	Changes in unit labour costs (2014)	↑	-1.2	5 / 28	1.6	1.9	1.5	0.3	CY -4.3	EE 6.4

All of the indicators in the 'Productivity and Labour costs' section are in green for the year 2014. Luxembourg is in 3rd place for total factor productivity per person employed (behind Latvia and Ireland), with an increase of 3.1% compared to 2013, and in 1st place for productivity per hour worked, despite a slight decrease in comparison with the previous year.

The 'nominal unit labour cost' (ULC) cross-examines the total labour cost and the volume of production in the economy, and as such integrates the average labour cost of an economy and the level of productivity. In 2014, the nominal ULC improved considerably in comparison with the previous year (-1.2%). The nominal ULC is also a factor taken into account by the EU as part of the macroeconomic imbalances procedure (MIP).



## 3.2.4 Market Operations

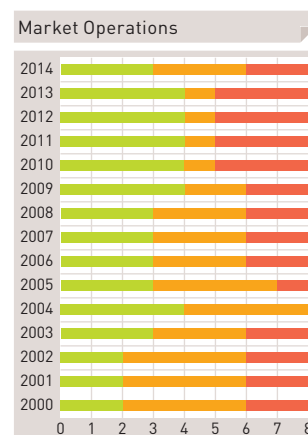
Table 9

### Category D Market Operations

Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
D2	Price of electricity (excl. taxes and levies) – industrial users, in EUR per 100 kWh (2014)	↓	0.0949	18 / 28	0.0916	0.0844	0.0743	0.0916	FI 0.664	MT 0.1861
D3	Price of gas (excl. taxes and levies) – industrial users, in EUR per GJ (2014)	↑	11.72	25 / 26	10.03	11.35	10.36	8.42	RO 5.92	GR 12.11
D4	Market share of the primary operator in cellular telephones, as a % (2010)	↑	51	23 / 27	38	33	41	43	PO 31	CY 76
D6	OECD basket of mobile telephone rates for large consumers, VAT included – Total in USD (2014)	↑	562.46	11 / 20	618.07 *	789.30	321.25	723.17	FR	GR 1137.62
D7	Broadband Internet access rates in USD PPP/MB (VAT included) (2014)	↑	6.56	8 / 21	24.02 *	25.58	6.29	1.73	BE	PO 188.8
D8	OECD Basket of domestic royalties for 2 Mbits leased lines (excl. VAT) in USD (2014)	↓	9067	3 / 19	23623 *	14505	21529	16929	DK 1426	HO 3067549
D9	Value of public tenders using open procedure procurement, as % of GDP (2011)	↓	1.30	26 / 27	3.4	1.3	4.0	3.0	DE	LV 17.6
D10	Total State aid as a % of GDP (except horizontal objectives) (2011)	→	0.24	2 / 27	0.51	0.53	0.62	0.43	BU 0.10	MT 1.60

\*OECD

Only three of the eight indicators in the 'Market Operations' category are in green, i.e. one fewer than in the three previous years. In addition, there is one less indicator in red and therefore two more indicators in orange in comparison to previous years. The 'mobile telephone rates for large consumers' indicator has improved slightly in comparison to the previous data, but given that other countries have improved more, this indicator is no longer in green, but only in orange, and therefore close to the OECD average. However, the definition of the baskets of rates according to the OECD has changed during the past few years, thus comparing current performance with historical ones is not worthwhile.



Although there was a drop in the price of gas for industrial users in 2014 compared to 2013, and an improvement while remaining in the neutral (orange) zone, the price of gas for industrial users rose significantly in Luxembourg between 2000 and 2014, from €4.94 to €11.72. The price of electricity also increased sharply (from €0.075 per kWh in 2005 to €0.095 in 2014). The average price across the European Union rose similarly (€0.067 in 2005 to €0.092 per kWh in 2014). At first sight, Luxembourg does not seem to be competitive on these two indicators, as the prices of electricity and natural gas for industrial users are high in comparison to the rest of Europe. However, these indicators do not take into account specific taxes (such as environmental taxes), VAT or recoverable taxes. If we take these specific taxes into account in the analysis, Luxembourg moves up to 14th position for electricity and 19th for gas. If we add VAT as well, Luxembourg moves up to 8th position (indicator D2) and 12th position (indicator D3). Sub-chapter 3.4 analyses these two indicators in greater detail.

The 'Market share of the primary operator in cellular telephones' indicator (D4) has not been updated by Eurostat since 2010. However, the Luxembourgish Regulations Institute (ILR) published statistics on the number of subscriptions to mobile services in its 'Statistical Telecommunications Report for Luxembourg'<sup>10</sup>: 'with regard to the number of subscriptions, the market share occupied by POST Telecom remains stable and higher than that of other operators. POST Telecom's market share stood at 51.2% in 2014, in comparison to 52.8% in 2013.' These figures are therefore close to the most recent figures published by Eurostat.

Finally, the indicators entitled 'Total State aid as a % of GDP (except horizontal objectives)' and 'Value of public tenders using open procedure procurement' were not published by Eurostat and the latest available figures date back to 2011.

<sup>10</sup> [http://www.ilr.public.lu/communications\\_electroniques/statistiques/rapp\\_statistiques\\_ILR/rapport-statistique-telecom-2014.pdf](http://www.ilr.public.lu/communications_electroniques/statistiques/rapp_statistiques_ILR/rapport-statistique-telecom-2014.pdf)

## 3.2.5 Institutional and Regulatory Framework

Table 10  
Category E Institutional and Regulatory Framework

Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
E1	Corporate tax rate, as a % (2014)	→	29.22	21 / 28	22.90	29.58	33.33	33.99	BU 10	MT 35
E2	Income tax rate, as a % (2014)	→	43.6	11 / 28	39.4	47.5	50.3	53.7	BU 10	SE 56.9
E3	Standard VAT rate, as a % (2014)	→	15	1 / 28	21.54	19	20	21	LU	HU 27
E4	Tax wedge – Single, without children, as a % (2014)	↓	37.6	4 / 21	36 **	49.3	48.4	55.6	IE 28.2	BE
E5	Tax wedge – Married, with 2 children, one wage-earner (2014)	↓	15.1	2 / 21	26.9 **	33.8	40.5	40.6	HO 9.9	GR 43.4
E6	Administration efficiency index (2014)	↑	1.66	6 / 28	1.13	1.73	1.40	1.40	RO -0.00	FI 2.02
E7	Law compliance index (2014)	↑	1.89	6 / 28	1.18	1.85	1.47	1.51	BU -0.08	FI 2.12
E8	Regulation quality index (2014)	↓	1.65	9 / 28	1.17	1.70	1.09	1.17	GR 0.35	FI 1.90
E9	Degree of sophistication of online public services, as a % (2014)	↓	63	22 / 27	76.8	75	82	72	HU 43	MT / ES 100
E10	Full online availability of public services, as a % (2014)	↓	64	20 / 27	72.7	67	75	74	SK 44	MT 97

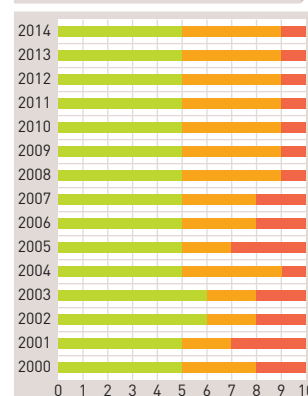
\*\*OECD

In the 'Institutional and Regulatory Framework' category, the status quo has been maintained since 2008: 5 indicators are in green, 4 in orange and just one indicator is mediocre in its performance in comparison to the rest of Europe, i.e. the corporate tax rate. It is worth noting that only the posted rate is included in the Scoreboard, and not the rate actually paid by companies.

A deterioration can be observed in indicators pertaining to the fiscal environment for companies and households. Two of the three World Bank indices improved in comparison to the previous year, namely the 'Administration efficiency index' and the 'Law compliance index', while the 'Regulation quality index' indicator declined.

The standard VAT rate remained stable at 15% in Luxembourg from 1992 to 2014. As the Scoreboard analyses the performances of European countries up to 2014, the recent rise in the various VAT rates in Luxembourg has not yet been taken into account. Beginning in January 2015, all VAT rates increased by 2%, and the standard VAT rate therefore increased from 15% to 17% (which still remains the lowest rate in the European Union). Medium rates increased from 12% to 14% and 6% to 8%. The highly reduced rate remained stable at 3%. Additionally the new 17% standard rate applies to all property investments, except to the investment for the principal residence for which the 3% highly reduced rate applies. However, people who submitted requests in 2014 continue to benefit from the highly reduced rate. From 1st January 2017 onwards, housing VAT on dwellings which are to be rented will climb to 17%. From 2015 onwards, alcoholic drinks in restaurants and cafés will also be subject to the standard 17% rate instead of the highly reduced rate.

Institutional and Regulatory Framework



A new report on digital public service delivery was published in June 2015<sup>11</sup>. Due to the new data analysis method used, the data are no longer comparable to those of previous editions. 'Online availability' (indicator E10) assesses the online offer of public services while 'Degree of sophistication' (indicator E9) measures the overall ease and speed of use. The report concludes that although a growing number of services are available online, ease and speed of use can be improved throughout the EU. According to this report, Luxembourg is one of a group of countries with high potential, along with Greece, Ireland, France, Hungary and the United Kingdom. These countries share a low degree of digitalisation and a high level of penetration. Efficiency of public administration procedures could be improved and savings be made by implementing the necessary measures. In spite of the efforts that need to be made, citizens have faith in the potential of eGovernment and use online services.

<sup>11</sup> Future-proofing eGovernment for the Digital Single Market: 'An assessment of digital public service delivery in Europe': [https://www.capgemini.com/resource-file-access/resource/pdf/egov\\_benchmark\\_2014\\_background-report\\_v18.pdf](https://www.capgemini.com/resource-file-access/resource/pdf/egov_benchmark_2014_background-report_v18.pdf)

## 3.2.6 Entrepreneurship

Table 11

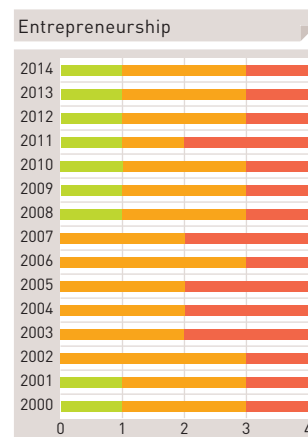
### Category F Entrepreneurship

Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
F1	Propensity for entrepreneurship, as a % (2012)	↓	36	13 / 27	37	29	40	30	SE 22	LT 58
F2	Self-employed as a percentage of total employment (2014)	↓	5.1	27 / 27	15.5	10.3	10.1	16.6	SE 4.9	GR 32.1
F3	Net change in number of companies, as a % (2012)	↑	2.46	8 / 26	0,51	-1.08	4.50	1.19	HU -8.41	RO 9.47
F4	Volatility among companies, as a % (2012)	↑	17.10	17 / 26	20.53	15.86	15.78	5.99	BE	LT 41.22

In the Entrepreneurship category, the performance of Luxembourg is within the EU average: two indicators are orange, one is green and one is red. It is noteworthy that half of the indicators have deteriorated compared to the previous year and the other two have improved compared to the latest available figures.

According to a recent OECD report<sup>12</sup>, 60% of individuals interviewed in Luxembourg stated 'opportunity' as the main reason for having set up a company. Luxembourg is thus in 4th place after Denmark, the Netherlands and Finland. Only 20% of respondents (*individuals who have set up or taken over a company, planned to do so before giving up the idea, or have the opportunity of taking over a family business*) mentioned necessity as the reason for becoming involved in entrepreneurship. However, this rate is higher in Southern European countries which have been hit hard by the economic and financial crisis, such as Greece (42%) and Spain (38%).

According to a survey<sup>13</sup>, 36% of Luxembourg population wish to work as freelancers, a rate similar to the EU average rate. This rate in Luxembourg has declined compared to 2009. Between 2009 and 2012, the preference to work as an employee has declined in 22 EU Member States. This can be explained by the effect of the financial crisis. Although approximately one third of Luxembourg population wishes to be self-employed, only few people (5.8% of the population) put this into practice and work as freelancers.



<sup>12</sup> OECD: Panorama de l'entrepreneuriat 2014

<sup>13</sup> ENTREPRENEURSHIP IN THE EU AND BEYOND. Fieldwork: June - August 2012. Flash Eurobarometer 354'

The Global Entrepreneurship Monitor (GEM) project is an annual assessment of entrepreneurial activity, aspirations and attitudes of individuals across a wide range of countries. Since its launch in 1999 with 10 countries, the project currently includes nearly 100 'national teams' from all over the world who participate in this project. The aim of GEM is to collect comparable data at international level so as to improve understanding of the impact of entrepreneurial activity on a country's economic performance. Luxembourg has been part of the Global Entrepreneurship Monitor (GEM) consortium since 2013. A first data collection project was launched in 2013. In 2014, STATEC conducted a second study, supported by the Ministry of the Economy and the Luxembourg Chamber of Commerce.

The GEM survey has confirmed that entrepreneurs creating an enterprise in Luxembourg do so because they see it as an opportunity. Luxembourg thus is clearly different from many countries where economic perspectives are poor and where the creation of a company is often the only way to generate an income. The study has also revealed an apparent paradox, which is highlighted in the survey. Many participants in the study say they are ready to become entrepreneurs, but only a small minority put this ambition into practice. The gathered data provides useful information to shape a solid policy favouring the creation of companies and the support they need. In fact, it is important to engage in changing our society's attitude towards bankrupt entrepreneurs who have to stop their activity. Whilst on one hand it is important to fight the phenomenon of fraudulent bankruptcies, a second chance should be granted to the bankrupt entrepreneur without being responsible.

The small rate of women ready to become entrepreneurs is another axis demanding further efforts.

A STATEC working paper analyses the role of immigration and education in the establishment of start-ups in Luxembourg, based on data collected in 2013 and 2014 by the GEM project. The econometric results show that first-generation immigrants are more interested in the idea of starting a new company than residents. Interest is even higher among people with a high level of education. However, the disparity between immigrants and residents disappears in the later stages of the entrepreneurial process. The results imply, therefore, that there is huge potential for entrepreneurship among first-generation immigrants, particularly among highly educated individuals. As highly innovative companies are more likely to make a positive contribution to long-term growth in a country, it is advisable to support policies aiming to attract highly qualified immigrants.

The results of the Luxembourg study may be found using the following link:  
<http://www.statistiques.public.lu/fr/actualites/entreprises/entreprises/2014/07/20140703/index.html>

The working paper No. 81/2015 'Entrepreneurship and immigration: evidence from GEM Luxembourg' may be found under the following link:  
<http://www.statistiques.public.lu/catalogue-publications/economie-statistiques/2015/81-2015.pdf>. A summary of this working paper appears among the thematic studies in chapter 6.

For further information:  
<http://www.gemconsortium.org/>

## 3.2.7 Education and Training

Table 12

### Category G Education and Training

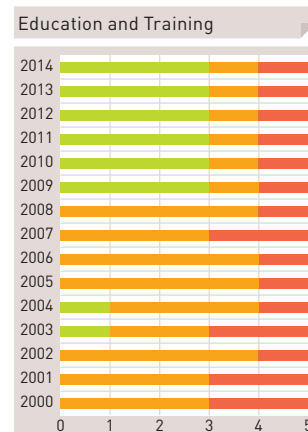
Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
G1	Annual cost per student in public educational facilities, in PPS (2011)	→	13033	28 / 28	6914	7493	7716	9088	RO 2088	LU
G2	Part of the population having achieved at least the second cycle of secondary education, as a % (2014)	↑	82	14 / 28	76	86.9	77.4	73.6	MT 42.2	LT 93.3
G4	Share of human resources in scientific and technological fields, as a % of total employment (2014)	↑	64.1	1 / 28	44.4	47	50.1	51.1	RO 25.6	LU
G5	Lifelong learning, as a % of the population aged between 25-64 (2014)	↓	14.0	8 / 28	10.7	7.9	18.6	7.1	RO 1.5	DK 31.7
G6	Secondary school drop-outs, as a % (2014)	→	6.1	6 / 28	11.1	9.5	8.5	9.8	HR 2.7	ES 21.9

Since 2009, 3 of the 5 indicators in the Education and Training category have been green, one orange, and one red, namely 'Annual cost per student in public educational facilities' (indicator G1)<sup>14</sup>, where Luxembourg is in last place. It would be useful to find an indicator which measures the efficiency of this expenditure. The data on Luxembourg for this indicator date back to 2010.

With regard to the 'Share of human resources in scientific and technological fields, as a % of total employment', Luxembourg achieved a result of 64.1% in 2014. This figure has been steadily increasing since 2000 from 37.7%.

82% of people aged between 25 and 64 completed secondary education, placing Luxembourg in 14th position in the EU. Germany's result is higher (86.9%), but Luxembourg's other two neighbouring countries have a lower rate than Luxembourg. This figure has been steadily increasing since 2000, when Luxembourg ranked 21st with 60.9% of the target population.

The early school leaving rate stood at 6.1% in Luxembourg for the year 2014, remaining consistent with results from the previous year. Luxembourg is in 6th place, outranking its neighbouring countries. The Eurostat data differs from the figures published by the national Ministry of Education, Childhood and Youth, which are taken from the EFT workforce survey. The latter are used to calculate the early school leaving indicator in the framework of the Europe 2020 strategy ('improving education levels, in particular by aiming to reduce school drop-out rates to less than 10% (...)')<sup>15</sup>. The ministry's figures vary significantly year on year, due to the limited size of the sample. Moreover, the EFT does not provide any information about the identity of the students concerned nor the reasons for leaving school. The rate was 11.6% for the 2012/2013 school year, thus higher than the 10% threshold which the country set itself as a target for 2020.



<sup>14</sup> <http://www.oecd.org/edu/Luxembourg-EAG2014-Country-Note.pdf>

<sup>15</sup> See 2015 National Reform Programme for more details: [http://www.odc.public.lu/publications/pnr/2015\\_PNR\\_Luxembourg\\_2020\\_avril\\_2015.pdf](http://www.odc.public.lu/publications/pnr/2015_PNR_Luxembourg_2020_avril_2015.pdf)

The government has developed a national survey<sup>16</sup> for analysing the causes of early school leaving in order to provide better support to early school leavers.

Regarding the reasons given by the early school leavers, the following are the most frequently mentioned:

- ▼ 24,6% leave education because of school failure, compared to 24,1% the previous year;
- ▼ 24,8% feel they have been badly orientated, compared to 23,8% the previous year;
- ▼ 12,2% mention they were unable to find an apprenticeship or the contract had been terminated; compared to 11,1% the previous year;
- ▼ 8,2% give personal reasons, compared to 8,1% the previous year;
- ▼ 7,0% report a lack of motivation to continue a vocational training or to attend their old school, a rate that has substantially declined compared to previous years (7,6% in 2011/2012);
- ▼ 3,6% of people questioned give no reason (4,4% the previous year).

<sup>16</sup> <http://www.men.public.lu/catalogue-publications/secondaire/statistiques-analyses/daccrochage-scolaire/daccrochage-12-13/fr.pdf>

## 3.2.8 Knowledge Economy

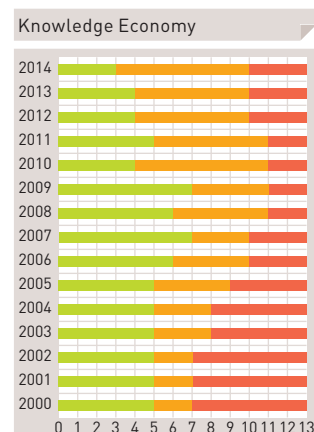
Table 13

### Category H Knowledge Economy

Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
H1	Internal R&D Lisbon expenditure, as a % of GDP (2013)	↑	1.30 (*)	16 / 28	2.01	2.85	2.23	2.28	RO 0.39	FI 3.31
H2	Public R&D budget credits, as a % of GDP (2011)	↓	30.5	19 / 28	32.8	29.2	35.0	23.4	BE	CY 66.4
H3	Portion of public research financed by the private sector, as a % of GDP (2013)	↓	20.5	26 / 28	55.0	66.1	55.4	60.2	CY 10.9	DE
H5	Number of researchers per 1,000 employed persons (public and private sectors taken together) (2013)	↑	6.76	16 / 22	7.72	8.38	9.81	9.83	RO 2.08	FI 15.68
H7	Number of USPTO patents per million inhabitants (2014)	↓	78.23	11 / 28	87.97	204.91	101.63	108.89	LT 1.70	SE 286.89
H8	Number of OEB patents per million inhabitants (2012)	↓	137.24	7 / 28	112.6	279.17	136.71	135.71	RO 3.33	SE 298.48
H9	Use of broadband connections by companies, as a % (2013)	↑	98	6 / 28	93	88	99	98	RO 73	CY 100
H10	Investment in public telecommunications, as a % (2009)	↓	1.54	12 / 21	1.66*	1.16	1.33	1.91	AT 0.76	PT 2.75
H11	Percentage of households that have Internet access at home, as a % (2014)	↑	96	1 / 28	81	89	90	83	BU 57	LU / NL 96
H12	Number of cell phones per 100 inhabitants (2013)	↓	217.22	1 / 21	166.31*	204.12	176.06	179.89	SK 143.35	LU
H13	Percentage of households that have broadband Internet access (2014)	↑	93	2 / 28	78	87	77	81	BU 56	NL 95
H14	Number of secure web servers per 100,000 inhabitants (2014)	↑	261.79	1 / 21	90.59*	138.35	64.66	84.18	GR 14.40	LU
H15	Percentage of total employment in medium or high technology sectors (2014)	↑	1.3	26 / 28	5.7	9.8	4.5	4.8	CY 0.9	CZ 10.9

\* OECD; forthcoming STATEC data

The colours seem to indicate a slight deterioration in Luxembourg's performance in the 'Knowledge Economy' category, as only 3 indicators are in green, compared to 4 during the previous two years and 7 in green in the years 2007 and 2009. However, it should be noted that Luxembourg is in 1st and 2nd place for two indicators in orange (H11 and H13, which measure internet access), but, because of the high average percentage for the whole of the EU, it has become almost impossible to outdo the EU rate of 20%. In fact, with an accessibility rate of 81% and 78% being the EU average, a country would have to have rates of 97.2% and 93.6% for the indicator to be in green. Luxembourg is just below this threshold, but is nonetheless the group leader. The European average for the H9 indicator ('Use of broadband connections by companies, as a %') is 91%, and it has now become impossible for a country to exceed this 20% rate.



However, there are also indicators in this category where Luxembourg has recorded a mediocre performance, such as 'R&D expenditure as a % of GDP', which decreased from 1.69% in 2006 to 1.30% in 2013 (STATEC data yet to be published). The OECD recommended 'a better evaluation of the efficiency of public R&D expenditure and policies for creating business clusters', as part of its economic study of Luxembourg, published in March 2015<sup>17</sup>. In a response to a Parliamentary question, the Minister of the Economy stressed that *'the economic and financial crisis of the past few years has therefore had a highly negative impact on R&D expenditure. In millions of euros, total R&D expenditure was still around €618 million in 2008, but now amounts only circa €523 million according to the latest available data for 2013 (forecast). The drop in total R&D expenditure can mainly be attributed to the lack of spending of private companies, where spending has been downsized considerably. On the other hand, public sector expenditure, i.e. on the part of the State and higher education, has risen steadily. This expenditure amounted to €127 million in 2008 and according to the latest available data stood at €196 million in 2012.'*<sup>18</sup> The 2015 NRP<sup>19</sup> includes a plethora of measures to be implemented as part of a strengthened RDI policy both for the public and private sectors, such as, for example, the law of 27th August 2014 modifying the National Research Fund (FNR), the law of 3rd December 2014 aiming to organize public research centres, the FNR's CORE and INTER projects, the Luxembourg Cluster Initiative, the creation of the Luxembourg Intellectual Property Institute (IPIL), etc.

Luxembourg is in 1st place in the domain of secure web servers, which is a testament to the country's commitment to promote the information and communication technologies (ICT) sector. Chapter 5 of the present Competitiveness Report analyses in greater detail the five priority sectors (including the ICT sector) identified by the government as part of its new economic diversification policy with a view to multi-sectoral specialisation.

<sup>17</sup> OECD Economic Studies: Luxembourg 2015

<sup>18</sup> Response of the Minister of the Economy to parliamentary question n° 766 of 3rd December 2014 from MP Marcel Oberweis.

<sup>19</sup> 2015 National Reform Programme: [http://www.odc.public.lu/publications/pnr/2015\\_PNR\\_Luxembourg\\_2020\\_avril\\_2015.pdf](http://www.odc.public.lu/publications/pnr/2015_PNR_Luxembourg_2020_avril_2015.pdf)

## 3.2.9 Social Cohesion

Table 14

Category I Social Cohesion

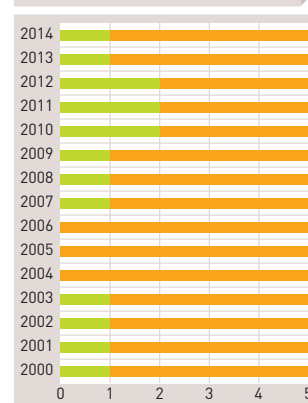
Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
I1	Gini coefficient (2014)	↑	28.7	12 / 28	30.5	29.7	30.1	25.9	CZ 24.6	LV 35.5
I2	At-risk-of-poverty rate after social transfers, as a % (2014)	↓	16.4	17 / 28	16.6	16.1	13.7	15.5	CZ 8.6	RO 22.4
I3	At persistent risk-of-poverty rate, as a % (2014)	↓	9.2	12 / 27	9	10.6	8.5	9.5	SE 4.1	RO 18.2
I4	Life expectancy at birth in numbers of years (2013)	↑	81.9	6 / 28	80.6	80.9	82.4	80.7	LT 74.1	ES 83.2
I5	Gender wage gap, as a % of gross hourly wages of male employees (2013)	↑	13.3	5 / 28	21.7	26.5	13.8	14.7	SL 7.1	EE 29

Three of the 5 indicators in the 'Social Cohesion' category have improved in comparison to the previous year, namely the 'Gini coefficient', 'gender wage gap' and 'life expectancy at birth' indicators. For the latter indicator, a similar analysis of the life expectancy 'in good health' would also be useful. The Wellbeing Scoreboard (PIBien-être) analyses these social issues in greater detail.

A Gini coefficient of 0 indicates that the entire population receives the same income (state of perfect equality). Conversely, a Gini coefficient of 1 denotes a situation where a single individual would possess all income, whilst everyone else would receive an income equalling 0. In 2014, Luxembourg's Gini coefficient stood at 28.7%, around the European average. The Gini coefficient is lowest in Slovenia, which is thus the best-performing country in the EU (24.4%), while Latvia recorded the worst Gini coefficient in the EU.

The 'at-risk-of-poverty after social transfers' rate fell in comparison with the previous year, standing at 16.4% in 2014. The 'persistent risk-of-poverty' rate worsened, standing at 9.2% in 2013.

Social Cohesion



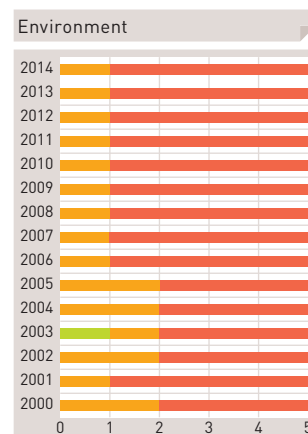
## 3.2.10 Environment

Table 15  
Category J Environment

Code	Indicator		LU	Position of LU	EU-28	DE	FR	BE	MIN	MAX
J1	Number of ISO 9001 certifications per million inhabitants (2014)	↓	273	27 / 28	869	686	442	327	PL 252	IT 2780
J2	Number of ISO 14001 certifications per million inhabitants (2014)	↓	127	20 / 28	225	95	126	108	PO 58	CZ 555
J3	Total greenhouse gas emissions (index 1990=100) (2012)	↑	98	20 / 28	82	77	89	83	LT 43	MT 157
J4	Share of renewable energy (2013)	↑	3.6	28 / 28	15	12.4	14.2	7.9	LU	SE 52
J5	Volume of municipal waste generated in kg per person, per year (2013)	↓	653	27 / 28	481	617	530	439	RO 272	DK 747
J6	Energy intensity in kg of oil equivalent per thousand of euros (2013) <sup>20</sup>	↑	127.6	6 / 28	141.6	130.6	143	173.1	IR 82.4	BU 610.6
J7	Modal breakdown in transportation choice for passenger method – Percentage of car users in passenger kilometres (pkm) (2013)	↑	94.2	16 / 27	93.1	93.5	103.7	98.2	SK 55.6	GR 134

The red colour is dominant in the Environment category, only one indicator being orange. Out of 7, 4 indicators have improved as compared to the latest available figures. It is noteworthy that the indicators of this category are often updated with some delay, and the majority of data dates back to 2012 and to 2013. In this category, a lot of indicators are part of the former Lisbon strategy. The European Commission has since developed new and more pertinent indicators in the last few years. During the revision of the Scoreboard, it is important to keep these new indicators into account. The EU sustainable development strategy highlights the need to achieve a decoupling of economic growth and transport demand in order to minimise environmental damage. Of course this implies choosing more energy-efficient and environmentally friendly modes of transport.

Luxembourg's renewable energy policy<sup>21</sup> is mainly guided by the EU legal framework, specifically by the 2009/28/EC Directive. The directive demands that each EU Member State increases its share of renewable energy in its final energy consumption in order to achieve a European share of renewable energy of 20% by 2020. Luxembourg's national target is to achieve a share of 11% of renewable energy of its gross final energy consumption. With a significant projected increase in wind energy, biogas and solid biomass, Luxembourg aims to achieve its 11% target by an input of 4% of electricity, heating and cooling, a contribution of 5% of biofuels and electro-mobility, and approximately 2% through cooperation mechanisms. The biggest contribution should come from biofuels, mainly from biodiesel and electro-mobility, signifying an increase of 110% compared to 2005.



<sup>20</sup> This indicator differs from the indicator chosen for the Europe 2020 strategy.

<sup>21</sup> Energy Policies of IEA Countries: Luxembourg 2014 Review, International Energy Agency.

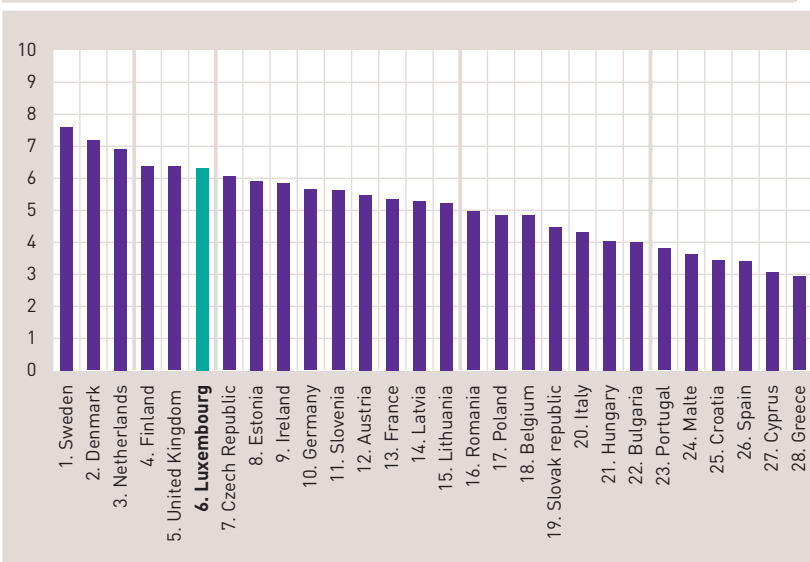
## 3.3 Competitiveness composite indicator

### 3.3.1 General result

In 2014, Luxembourg ranked in 6th place, remaining consistent with the results of the previous year. Sweden, Denmark and the Netherlands were the group leaders as usual. Germany (10th place) moved up two positions while France (13th) moved down 6. Belgium fell 2 positions in comparison with 2013 to 18th place. The bottom rungs are occupied by Greece, Cyprus, Spain and Malta. The major winner in the overall rankings was Ireland, which seems to have overcome the serious crisis of the past few years, rising from 18th to 8th place.

Luxembourg's 6th place is the best position the country has held since the Competitiveness Scoreboard was developed over a decade ago. Looking at the levels of the composite indicator on the graph below, we see that some countries have recorded very similar results. In recent years, the same group of countries has consistently dominated the top 3 spots: Sweden, Denmark and the Netherlands; followed by Finland, the United Kingdom and Luxembourg, whose final scores are very close. The middle section of the rankings (from 7th to 22nd position) can be divided into an upper group including Ireland, Germany and France, and a group trailing behind which includes Belgium, Poland and Italy. Portugal, Malta, Croatia, Spain, Cyprus and Greece are at the foot of the table.

Chart 2  
Final score of the composite indicator



Source: Calculation *Observatoire de la compétitivité*

The method for calculating the composite indicator remains unchanged. However, we remind the calculation method hereunder. Only the updating of data may have an impact on the rankings of previous years.

## Frame 2 Methodology

Concerning the methodology for calculating the composite indicator, we take the recommendations made by the audit into account (2010 Competitiveness Report, Perspectives économiques No. 15).

For some indicators, there are outliers. In particular, the indicator<sup>22</sup> on the terms of trade (A9), direct investment (A12) and the basket of domestic royalties for 2 Mbits leased lines (D8). For each of these indicators, there is a country that has a value significantly higher than all other countries: Romania (A9), Luxembourg (A12) and Hungary (D8). Given that these indicators are likely to influence the result too much, extreme values are replaced by the value of the country in second position.

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 performance for the other indicators in the same category.

For the composite indicator calculation, basic indicators are standardized first. Each indicator is processed by the following formula by country  $j$  at time  $t$ .

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

The composite index  $C$  for a category  $k$  ( $k = 1, \dots, 10$ ) at time is calculated by averaging the sub-indicators of this category in the new scale:

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

The composite indices of the 10 categories are then standardized in order to balance the impact of the 10 categories in the final composite indicator.

$$\hat{C}_{k,j}^t = \frac{C_{k,j}^t - \min_j C_{k,j}^t}{\max_j C_{k,j}^t - \min_j C_{k,j}^t}$$

The final composite indicator  $CI$  is achieved by a simple arithmetic mean of its composite indicators, which means the 10 categories are equally weighted.

$$CI_j^t = \frac{1}{10} \sum_{k=1}^{10} \hat{C}_{k,j}^t$$

As every year, the *Observatoire* warns the reader that certain technical aspects have a considerable impact on the result of the rankings. Firstly, the positions of the seven countries that are not OECD members (Bulgaria, Cyprus, Croatia, Latvia, Lithuania, Malta and Romania) need to be put into perspective, as a number of the Scoreboard indicators do not exist for these countries.

Secondly, the rankings are constructed relatively, which means that Luxembourg's ranking also depends on the performance of the other countries. Even if Luxembourg's performance is bad, it may be that other countries have deteriorated much more, so that the relative position of Luxembourg improves at the end. The rankings do not say anything about the absolute performance of Luxembourg.

<sup>22</sup> Technically, these indicators have been identified by the fact they have a very high skewness and kurtosis.

In other words, an improvement of a country's ranking may be caused by a deterioration in the performance of other countries. That is why the *Observatoire de la compétitivité* always recommends interpreting the rankings by completing it with the additional information provided by the Scoreboard, i.e. basic indicators.

### 3.3.2 Results per category

Luxembourg was able to maintain its 6th place in the overall rankings, and also displayed a degree of continuity in the 10 categories in relation to 2013, maintaining its 2013 position in 7 of the 10 categories. It climbed 3 places in the 'Knowledge Economy' category (from 10th to 7th position), fell one spot in the 'Productivity and Cost of Labour' category, and fell two spots in the 'Institutional and Regulatory Framework' category. However, Luxembourg's performance in these two categories remains excellent, placing 2nd ('Productivity and Cost of Labour') and 5th ('Institutional and Regulatory Framework'). It also ranked in the top 10 in 2 other categories, coming in first place in Category A ('Macroeconomic performance') and 10th place in Category I ('Social Cohesion').

Nevertheless, the 'Productivity and Cost of Labour' category requires careful interpretation, as the standings in this category are highly volatile given that the indicators are largely dependent upon the economic situation, and tend to seesaw. Moreover, the indicators are revised regularly, which can trigger further changes in the rankings.

Performance remains mediocre in the environmental domain, with only Greece, Malta and Cyprus falling behind Luxembourg. It should be noted that the majority of the indicators in this category date back to 2013, as the data are published after quite some length of time.

The aggregation formula gives equal weight to the 10 categories, regardless of the number of indicators within each category. Competitiveness in a broad sense is measured through the 10 categories of the Scoreboard. No dimension is prioritised by construction.

Table 16  
Rankings by category in 2014

	Cat A	Cat B	Cat C	Cat D	Cat E	Cat F	Cat G	Cat H	Cat I	Cat J
Germany	12	2	10	18	14	26	16	4	19	20
Austria	19	8	22	4	12	22	15	6	11	15
Belgium	22	16	4	8	23	23	21	8	9	21
Bulgaria	5	18	24	17	22	4	20	27	28	18
Cyprus	28	22	16	28	13	14	22	19	16	28
Croatia	20	27	28	12	27	16	14	21	17	13
Denmark	2	4	9	2	8	24	3	2	6	19
Spain	27	26	13	19	18	18	26	20	23	12
Estonia	4	6	23	7	2	12	5	11	24	7
Finland	21	7	12	20	6	25	2	1	5	8
France	17	14	11	6	20	11	8	10	8	23
Greece	25	28	17	26	28	1	23	22	22	26
Hungary	6	21	25	25	25	27	19	17	13	9
Ireland	7	13	1	21	1	17	18	15	15	24
Italy	26	25	21	9	24	8	25	14	18	1
Latvia	18	10	6	15	9	6	12	25	27	5
Lithuania	16	11	26	11	7	3	4	24	25	11
<b>Luxembourg</b>	<b>1</b>	<b>12</b>	<b>2</b>	<b>16</b>	<b>5</b>	<b>21</b>	<b>11</b>	<b>7</b>	<b>10</b>	<b>25</b>
Malta	9	15	27	27	10	20	28	13	7	27
Netherlands	10	3	5	3	4	13	10	5	3	22
Poland	11	20	19	14	17	5	9	26	20	17
Portugal	23	19	20	23	15	7	27	18	21	16
Romania	8	17	18	1	26	2	24	28	26	2
United Kingdom	13	5	8	5	3	9	13	9	14	10
Slovak republic	24	24	14	22	21	15	17	23	12	6
Czech Republic	14	9	15	13	16	19	7	16	2	3
Slovenia	15	23	3	24	19	10	6	12	4	14
Sweden	3	1	7	10	11	28	1	3	1	4

Note: Cat. A Macroeconomic Performance, Cat. B Employment, Cat. C Productivity and Labour Costs, Cat. D Market Operations, Cat. E Institutional and Regulatory Framework, Cat. F Entrepreneurship, Cat. G Education and Training, Cat. H Knowledge Economy, Cat. I Social Cohesion, Cat. J Environment

Luxembourg has been in 1st place in the 'Macroeconomic performance' category since 2000, and its performance in the 'Institutional and Regulatory Framework' and 'Knowledge Economy' categories have been relatively stable from 2000 to 2014. In the 'Employment' category, Luxembourg's ranking fell between 2004 and 2008 before later rebounding. Although the results for some indicators in this category were rather poor in comparison to 2000 (e.g. the increase in the youth unemployment rate from 6.6% in 2000 to 22.0% in 2014), other countries performed even worse.

In recent years, Luxembourg has been able to improve its performance in the 'Education and Training' category (from 24th in 2007 to 11th in 2014), while its performance in the 'Environment' category have been mediocre for many years. Luxembourg was in 5th place in the 'Social Cohesion' category from 2010 to 2012, but fell 5 spots in 2013 to 10th position.

The 'Productivity and Cost of Labour' category is highly volatile given that the indicators are largely dependent upon the economic situation. The transition to the new European System of Accounting (ESA 2010) led to a thorough revision of productivity data, which explains these latest changes in the standings for this category.

Table 17  
Rankings of Luxembourg by category between 2000 and 2014

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Macroeconomic Performance	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Employment	13	14	13	14	17	16	17	17	19	11	9	11	11	12	12
Productivity and Labour Costs	6	25	10	19	9	10	12	2	21	18	5	18	25	1	2
Market Operations	16	13	13	13	10	15	12	16	16	10	11	9	14	16	16
Institutional and Regulatory Framework	6	6	3	3	3	3	5	4	4	3	3	2	2	3	5
Entrepreneurship	14	17	24	18	17	24	20	27	24	21	20	20	19	21	21
Education and Training	23	24	23	24	22	22	23	24	23	14	12	11	13	11	11
Knowledge Economy	7	9	8	8	6	6	6	6	6	6	7	6	10	10	7
Social Cohesion	6	12	12	11	11	10	11	9	6	10	5	5	5	10	10
Environment	24	26	22	23	24	24	24	24	24	24	27	25	25	25	25

Source: *Observatoire de la compétitivité*

### 3.3.3 The composite indicator stress test

The *Observatoire de la compétitivité* has undertaken a stress test of its composite indicator. The test consists in excluding one by one the 77 indicators and recalculating the rankings. Other scenarios include not imputing missing values or not treating outliers. This gives 84 different scenarios.

The following table shows that Luxembourg ranks in 4th place in 10.7% of the scenarios, in 5th place in 21.4% of the scenarios, in 6th place in 65.6% of the scenarios and in 7th place in 2.4% of the scenarios. There is therefore a bracket within which Luxembourg places for the most part (4-6). The stress test also shows that in all of the alternative scenarios, Sweden remains in 1st place, Denmark in 2nd and the Netherlands in 3rd. The group of followers (Finland, the United Kingdom and Luxembourg) oscillate between 4th, 5th and 6th place, whereas the mid-range zone of the standings begins with the Czech Republic in 7th place. Volatility is high in this group: for example, France places in the range between 12th and 16th place. At the bottom of the list the positions stabilise once again, with Greece in last place in 89% of the scenarios.

Table 18  
The 2014 stress test, as a %

Country	Main scenario	Average of 84 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
Sweden	1	1.0	100																											
Denmark	2	2.0		100																										
Netherlands	3	3.0			100																									
Finland	4	4.7				50	31	19																						
United Kingdom	5	4.7				39	48	13																						
<b>Luxembourg</b>	<b>6</b>	<b>5.6</b>				<b>11</b>	<b>21</b>	<b>65</b>	<b>2</b>																					
Czech republic	7	7.0						2	93	5																				
Estonia	8	8.2							5	75	19		1																	
Ireland	9	8.8								20	76	4																		
Germany	10	10.3									1	70	29																	
Slovenia	11	10.7									4	26	67	4																
Austria	12	12.1											4	88	7		1													
France	13	13.3											2	74	20	2	1													
Latvia	14	13.8											5	19	67	10														
Lithuania	15	14.9											1		13	83	2													
Romania	16	16.3														1	82	10	5	2										
Poland	17	17.3														2	6	54	38											
Belgium	18	17.5															8	37	55											
Slovak republic	19	19.0																		2	90	7								
Italy	20	19.9																		7	93									
Hungary	21	21.2																				79	20	1						
Bulgaria	22	21.8																				21	75	4						
Portugal	23	23.0																					4	92	5					
Malta	24	24.0																					1	4	88	7				
Croatia	25	25.2																							5	76	14	2	2	
Spain	26	25.8																							2	14	81	2		
Cyprus	27	27.0																								2		89	8	
Greece	28	27.8																									5	6	89	

Source: *Observatoire de la compétitivité*

### 3.3.4 Evolution of the final position of Luxembourg in the Competitiveness Scoreboard over time

The Competitiveness Scoreboard rankings are not fixed over time. In fact, the data are reviewed regularly by the various organizations that serve as major sources, such as Eurostat, OECD and the World Bank. In particular, national accounts are regularly updated, which has a significant influence on some of the indicators. Another factor is the non-availability of certain data when publishing the Competitiveness Report: part of the data, especially for the Social Cohesion and Environment categories, are published with some delay, and other data are only issued every two years (e.g. several indicators of the Market Operations category).

These factors explain the 2014 rankings do not remain fixed. Once all the data is available, the final rankings can change more or less dramatically. The following table shows the ranking variation of Luxembourg over time, depending on the publication of the Competitiveness Report:

Table 19

**Evolution of the position of Luxembourg in the Competitiveness Scoreboard over time**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
2007 Report	2	7	7	8	6	5	5								
2008 Report	5	7	5	8	6	7	6	9							
2009 Report	7	9	9	9	7	8	8	10	13						
2010 Report	6	11	9	9	8	6	8	9	11	9					
2011 Report	8	11	9	10	6	6	9	8	10	9	10				
2012 Report	6	10	10	9	6	6	11	9	9	6	8	11			
2013 Report	7	10	8	9	6	6	11	9	9	8	8	9	13		
2014 Report	6	9	7	7	6	7	11	9	10	8	6	10	13	6	
2015 Report	6	11	8	7	6	7	7	7	9	6	6	7	12	6	6

Source: *Observatoire de la compétitivité*

In the 2012 Competitiveness Report, Luxembourg was ranked 11th for the year 2011, and after reviewing several indicators and receiving other data not yet available at the time of its release, Luxembourg gained two positions in the 2013 edition. After the review of several indicators, Luxembourg is currently ranked 7th for this year 2011.

In general, we can say that changes in Luxembourg's position were small in the latest editions of the Competitiveness Report. Other countries, especially non-OECD countries, vary more, as part of the data is not available. A revision of the indicators has therefore a greater effect on their final score. Finally, it should be noted this is a relative ranking and Luxembourg's position depends not only on its own performance but also on the performance of other countries.

In 2010 the *Observatoire de la compétitivité* had commissioned an audit with the Joint Research Centre (JRC)<sup>23</sup> of the European Commission<sup>24</sup>. This JRC is the centre of excellence in quantitative analysis that has collaborated, among other things, in drafting the OECD manual on the construction of mathematical indicators. This audit was performed in order to carry out a thorough statistical analysis and a critical assessment of the Scoreboard and of the competitiveness composite indicator while providing suggestions for possible improvements. Following the recommendations of the external audit, the *Observatoire de la compétitivité* took into account some changes in the imputation of missing values, the processing of outliers and of strongly correlated indicators<sup>25</sup>. These recommendations have been implemented since the 2010 Competitiveness Report.

In general, the external audit by Michaela Saisana was very positive about the *Observatoire de la compétitivité*'s Competitiveness Scoreboard composite indicator. She emphasized the transparency in the calculation of the indicator and the precise definition of competitiveness, the phenomenon to be measured. The Competitiveness Scoreboard is based on the definition from the Economic and Social Council (ESC), which is '*the ability of a nation to sustainably improve the standard of living of its inhabitants and to provide them with a high level of employment and of social cohesion while preserving the environment*'. The indicator also does not simply reflect the size of the country. Indeed, the result of the composite indicator is not correlated with a country's population or the gross domestic product (GDP). A simple correlation with GDP would portray the competitiveness of Luxembourg as simply productivity, but for the *Observatoire de la compétitivité* the competitiveness definition of the ESC prevails and is much broader.

The *Observatoire de la compétitivité* has always advocated an analysis on multiple levels, i.e. not simply establishing a mere country ranking. On the contrary, a detailed analysis of indicators is essential, as it was done in this chapter.

<sup>23</sup> For further information: <http://composite-indicators.jrc.ec.europa.eu/>

<sup>24</sup> Perspectives de politique économique No. 15: The Luxembourg Competitiveness Index: Analysis & Recommendations: [http://www.odc.public.lu/publications/perspectives/PPE\\_015.pdf](http://www.odc.public.lu/publications/perspectives/PPE_015.pdf)

<sup>25</sup> Details of the changes are explained in point 3.4 of the 2010 Competitiveness Report.

## 3.4 Analysis of electricity and gas prices for industrial consumers

### 3.4.1 Price of electricity – industrial users (indicator D2)

#### A. Components of the price of electricity

The end price of electricity is a composite value made up of four components: electrical energy, transport via grid, taxes and specific duties, and VAT and other recoverable taxes and duties. The degree of influence of each component differs not only between countries but also over time.

The *Energy* component refers to the electricity itself. Its price notably includes production and supply costs, i.e. the purchase price of a supplier on the wholesale market, as well as a commercial margin. The price of electricity is also affected by the energy source. Three main categories can be distinguished in the energy mix: nuclear energy, fossil fuels (oil, coal, natural gas etc.) and renewable energies (solar/photovoltaic, wind, hydroelectricity, biomass etc.). Renewable energies are currently the most expensive, so the energy price is higher in countries with a higher share of renewable energies in their energy mix. In addition to production costs, availability and environmental impact also differ depending on the energy source. The price of energy is a market price. Energy is in fact the only one of the four components which is directly influenced by market competition. The laws of supply and demand, as well as the characteristics and qualities of the various energy sources, are factors which influence the price on the wholesale market, and the price of this component therefore varies widely.

*Network* costs include transportation and distribution of electricity to end clients and their points of consumption. Since the liberalization of the EU electricity markets, network operators must offer all suppliers access to their infrastructures without discrimination. Network usage prices are administered prices. Generally, this is the prerogative of national regulatory authorities. In Luxembourg, the ILR (Luxembourgish Regulatory Institute) decides upon the means for determining usage prices for the network and accessory services, and the resulting rates must be approved by the ILR<sup>26</sup>. As network usage is essentially a monopoly, in that a consumer must be connected to the existing network infrastructure in their geographical location and cannot, therefore, freely choose their network operator, administered prices must be used for the *Network* component to protect consumers from arbitrary rate-setting.

<sup>26</sup> [http://www.ilr.public.lu/electricite/decisions\\_reglements/index.html](http://www.ilr.public.lu/electricite/decisions_reglements/index.html)

The *taxes and specific duties* applicable to electricity consumption are determined by national laws and regulations, and are not recoverable or deductible for taxation purposes. These include universal energy and environmental taxes, in particular contributions to compensation schemes and greenhouse gas emissions taxes. The income generated by environmental taxes is mainly used to counteract the harmful effects of non-renewable energy source usage, often by promoting energy efficiency and bolstering energy production from renewable sources.

*VAT and recoverable taxes* include VAT-type taxes on consumption, which are therefore deductible as per the rules applicable to VAT, and all taxes which are recoverable in part or entirely under certain circumstances.

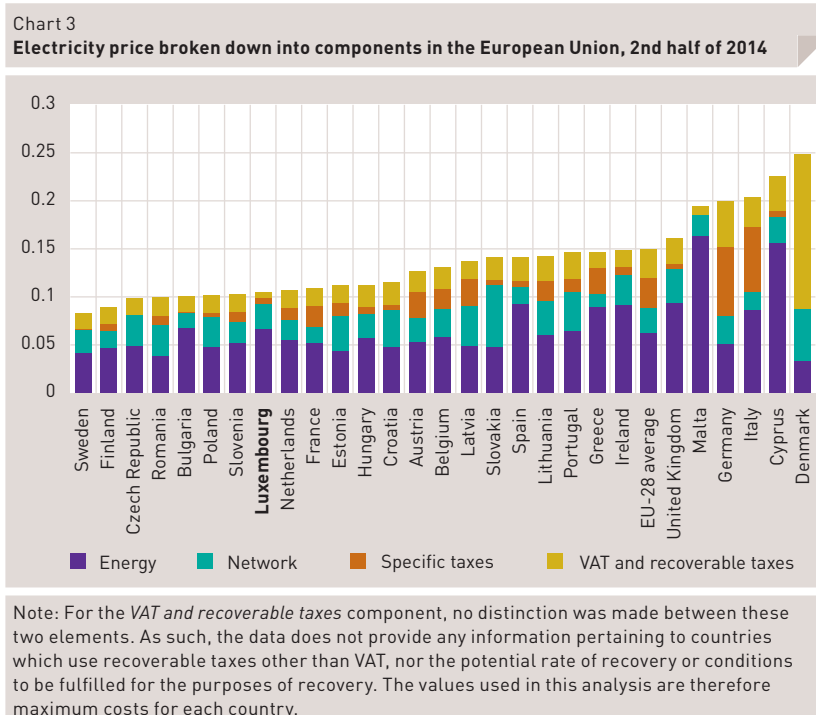
## **B. Prices of the different components of the price of electricity**

Although the components which make up the price of electricity are the same in all EU countries, the prices which consumers pay are not. It is therefore useful to analyse in detail the price levels in the 28 Member States to assess their respective levels of competitiveness in this area. In this context, a low price is considered an advantage for an economy and boosts the country's competitiveness.

The group of end clients referred to under indicator D2 of the scoreboard denotes industrial consumers with an annual consumption of between 500 MWh and 2,000 MWh. Industrial and professional clients with a different consumer profile and residential clients are not taken into account. Due to the lack of availability of Eurostat data, the prices of the different components used in the detailed electricity price analysis date from the second half of 2014, and may differ from the prices recorded under indicator D2 in the scoreboard which date from the first half of 2014.

Chart 3 shows the composition of the electricity price per kWh in the 28 EU Member States, as well as the average price among the EU-28. We can see significant disparities both in the end price and in the prices of the different components. The end price (all taxes included) varies between €0.0833 (Sweden) and €0.2484 (Denmark). The European average is €0.1490. Denmark's standing here is quite surprising at first glance, as this country ranks highest for the *Energy* component (€0.0338) which is over four times cheaper than in the two island states Cyprus (€0.1564) and Malta (€0.1639) at the bottom of the table, far below the European Union average (€0.0630). For the *Network* component, prices range from €0.0135 in Greece to €0.0649 in Slovakia. With regard to *Specific taxes*, Malta has none at all, whereas Sweden, Denmark, Bulgaria and the Czech Republic all have very low taxes. At the bottom of the table we find Germany (€0.0712) and Italy (€0.0683), whose specific taxes are much higher than other countries and the average for the EU-28 (€0.0309). For the *VAT and recoverable taxes* component, no distinction was made between these two elements. As such, the data does not provide any information pertaining to countries which use recoverable taxes other than VAT, nor the potential rate of recovery or conditions to be fulfilled for the purposes of recovery.

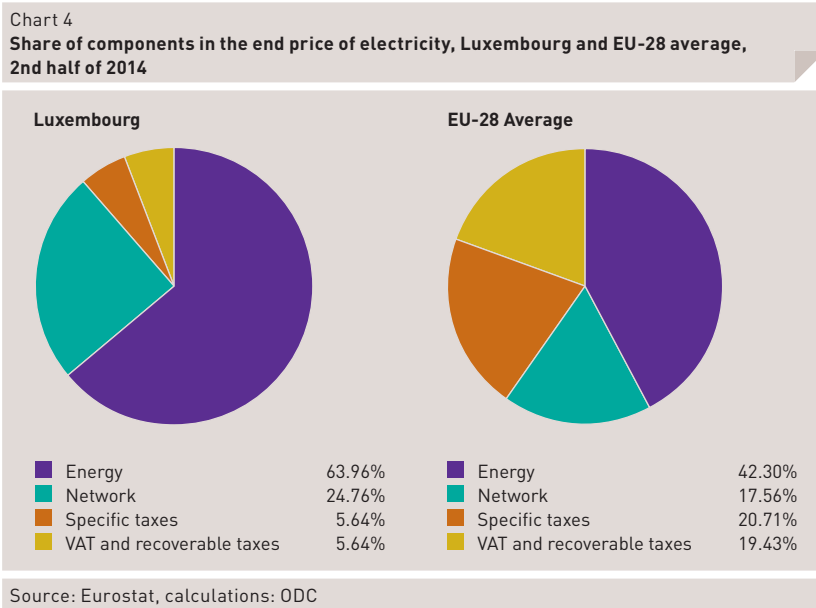
The values used in this analysis are therefore maximum costs for each country. These costs are by far the highest in Denmark, (€0.1606) at over five times the EU average (€0.0289). Luxembourg (€0.0059) ranks first in this category. VAT applicable to electricity consumption varies from 5% (United Kingdom, Malta) to 27% in Hungary.



The differences in price reveal the complex nature of setting an end price for electricity. Price differences for the *Energy* and *Network* components are an indication that European energy markets are fragmented and are not well integrated at the present time. It should be noted that the European Commission is making efforts to improve the situation, with the Energy Union having been identified as a priority<sup>27</sup>.

<sup>27</sup> [http://ec.europa.eu/priorities/energy-union/index\\_fr.htm](http://ec.europa.eu/priorities/energy-union/index_fr.htm)

Chart 4 shows the share of the four components in the end price for electricity in Luxembourg and the EU-28. There are significant differences. Whilst the *Energy* component in Luxembourg makes up 63.96% of the end price of electricity, the EU-average for this component is just 42.30%. For the *Network* element, the proportionate difference is smaller, standing at 24.76% in Luxembourg and 17.56% on average in the EU-28. It is useful to add the *Energy* and *Network* values together, as this is the same aggregation used for indicator D2 in the Scoreboard. This indicator thus accounts for 88.72% of the end price of electricity (all taxes included) for Luxembourg, but just 59.86% for the EU-28 average, which serves as a reference point for drawing comparisons with other EU countries. As for the *Specific taxes* and *VAT and recoverable taxes* components, Luxembourg has a clear advantage when compared against the EU average.



The table below shows the price of the *Energy*, *Network*, *Specific taxes* and *VAT and recoverable taxes* components as well as the end price (all taxes included) in Luxembourg (LU), its neighbouring countries i.e. Germany (DE), France (FR) Belgium (BE) and the EU-28 average.

**Table 20**  
**Price of components per country, 2nd half of 2014, in EUR/kWh**

	LU	DE	FR	BE	EU-28 Average
Energy <sup>(1)</sup>	0.0669	0.0519	0.0522	0.0581	0.0630
Network <sup>(2)</sup>	0.0259	0.0289	0.0165	0.0298	0.0262
Specific taxes <sup>(3)</sup>	0.0059	0.0712	0.0221	0.0207	0.0309
VAT and recoverable taxes <sup>(4)</sup>	0.0059	0.0472	0.0182	0.0223	0.0289
Price, all taxes included <sup>(1+2+3+4)</sup>	0.1046	0.1992	0.1090	0.1309	0.1490

Source: Eurostat

The results are mediocre. The *Energy* component in Luxembourg's three neighbouring countries is between 13.15% and 22.42% cheaper than in Luxembourg, which comes in at 5.78% higher than the EU-28 average. On the *Network* component, Luxembourg's performance is better and very close to the European average. Network costs are higher in Germany and Belgium, while France leads the three other countries in this field. For *Specific taxes* and *VAT and recoverable taxes*, Luxembourg is the most competitive country, easily beating its neighbours and the EU-28 average. The specific taxes applied in France and Belgium, and the EU-average, are 3-5 times higher than in Luxembourg, while taxes in Germany are 12 times higher than Luxembourg. The result is similar for VAT and recoverable taxes, but to a lesser extent. When the four components are added together, Luxembourg appears to be the cheapest country, beating France by 4.21%. Belgium comes in 3rd place with an all-inclusive cost 25.14% higher than that of Luxembourg. Germany, whose costs exceed those of Luxembourg by 90.44%, lies at the bottom of the table. Luxembourg has a 42.46% advantage in comparison to the European average.

### C. Luxembourg's results

Luxembourg's ranking varies a great deal depending on the category. Although in 20th position when energy costs alone are taken into account, Luxembourg nonetheless manages to achieve 8th position for the all-inclusive price, i.e. the price paid by the end client. Its excellent results in the domain of specific taxes (11/28) and VAT and recoverable taxes (1/28), as well as relatively low network prices (13/28), are the reason behind this improvement. In total, Luxembourg gains 10 places in comparison to its position under indicator D2 of the Scoreboard, which only takes into consideration the Energy and Network components, and where Luxembourg came in 18th position out of the 28 Member States.

Table 21  
Ranking of Luxembourg, 2nd semester 2014

Category	Ranking of Luxembourg
Energy <sup>(1)</sup>	20/28
Network <sup>(2)</sup>	13/28
Specific taxes <sup>(3)</sup>	11/28
VAT and recoverable taxes <sup>(4)</sup>	1/28
Total price, not including VAT and recoverable taxes <sup>(1+2+3)</sup>	14/28
Price all taxes included <sup>(1+2+3+4)</sup>	8/28
Indicator D2 of Scoreboard <sup>(1+2)</sup>	18/28

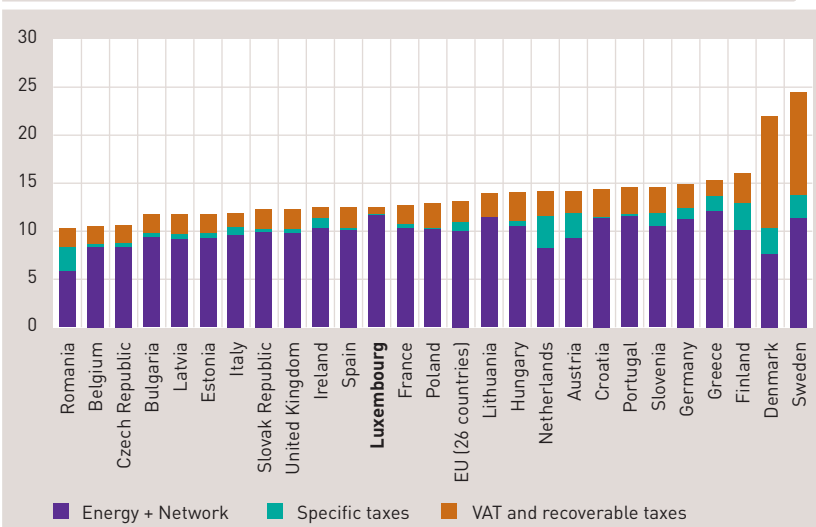
Source: Eurostat, calculations: ODC

### 3.4.2 Price of gas – industrial consumers (indicator D3)

The end price of natural gas is also made up of the price of energy, transport and distribution costs, and various taxes and duties. The components are similar in nature to those of the electricity market. However, the differences between prices in the various EU countries are smaller than the differences in prices of electricity.

The group of end clients referred to denotes industrial consumers with an annual consumption of between 10,000 and 100,000 Gigajoules (GJ). As with indicator D2 ('price of electricity'), only the prices of energy and networks are factored into indicator D3, and not those of taxes and duties. Luxembourg comes in 25th place out of 26th countries, with a price of €11.72 per GJ, with only Greece performing worse (data for Cyprus and Malta for indicator D3 was not available). The top three positions were occupied by Romania (€5.92), Denmark (€7.62) and the Netherlands (€8.19). If we factor specific taxes, VAT and other duties into the analysis, Luxembourg's position in the EU improves: with an end price of €12.58 per GJ, Luxembourg is cheaper than the EU average, beating Germany (€14.84) and France (€12.65). Its distance from Belgium (2nd in this ranking) also decreases substantially.

Chart 5  
Price of natural gas broken down by component in the European Union, 2014



Source: Eurostat, calculations: ODC.  
Note: no data available for Cyprus or Malta

As is the case for electricity, supply and distribution prices are also extremely high for natural gas. Luxembourg ensures its competitiveness in this domain thanks to specific taxes, VAT and other recoverable taxes, where it has a clear advantage in comparison to the other EU Member States.

Table 22

**Price of components per country, 2014, in €/Gigajoules, range of 10,000 - 100,000 GJ**

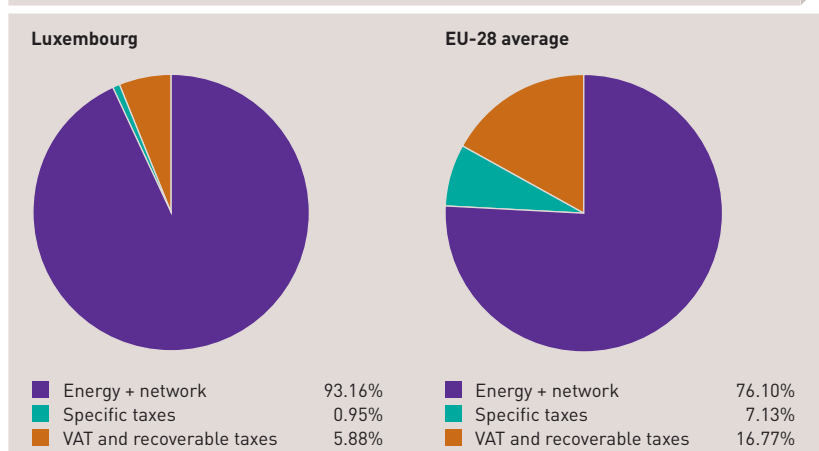
	LU	DE	FR	BE	EU-28 average
Energy + Network <sup>(1)</sup>	11.72	11.35	10.36	8.42	10.03
Specific taxes <sup>(2)</sup>	0.12	1.12	0.38	0.32	0.94
VAT and recoverable taxes <sup>(3)</sup>	0.74	2.37	1.91	1.82	2.21
Price, all taxes included <sup>(1+2+3)</sup>	12.58	14.84	12.65	10.56	13.18

Source: Eurostat

In Luxembourg, the energy and network components make up 93.2% of the end price, whereas these two components amount to just 76.1% of the end price for the EU-28. Chart 6 shows the share of the three components in the end price of natural gas in Luxembourg and the EU-28.

Chart 6

**Share of the three components in the end price of natural gas, Luxembourg and EU-28 average, 2014**



Source: Eurostat, calculations: ODC

When taking just the energy and network costs into account (i.e. the components considered under indicator D3 of the Scoreboard), Luxembourg comes in at 25th position in the European Union, but when specific taxes, VAT and recoverable taxes are factored in Luxembourg rises to 12th position. This improvement can be explained by the country's good performance in the domain of specific taxes (2nd place out of 26 countries) and VAT and recoverable taxes (1/26). Luxembourg thus jumps forward 13 places.

Table 23  
Standings for Luxembourg, 2014

Category	Standing of Luxembourg
Energy + Network <sup>(1)</sup> = Indicator D3 of Scoreboard	25/26
Specific taxes <sup>(2)</sup>	2/26
VAT and recoverable taxes <sup>(3)</sup>	1/26
Total price, not including VAT and recoverable taxes <sup>(1+2)</sup>	19/26
Price, all taxes included <sup>(1+2+3)</sup>	12/26
Source: Eurostat, calculations: ODC	

### 3.4.3 Conclusion

In the Scoreboard, Luxembourg comes in 16th place in the 'Market Operations' category for the year 2014. When the taxes and duties under indicators D2 and D3 are taken into consideration, Luxembourg moves up to 15th place in this category. When VAT is also factored in, i.e. into the end price of electricity and gas, Luxembourg moves forward 8 places in the 'Market Operations' category. Such an improvement in one category would have a serious impact on the overall rankings: Luxembourg (and the United Kingdom) would move ahead of Finland to 5th place if specific taxes are factored in, and to an even higher 4th place when all taxes are factored in (specific taxes, recoverable taxes and VAT) under these two indicators.

The detailed analysis of the prices of electricity and gas for industrial consumers in the Scoreboard demonstrates that each competitiveness indicator needs to be carefully defined, especially in the case of complex or composite indicators. Various taxes were not taken into account for energy prices, which has a major impact on the standings in the 'Market Operations' category. Moreover, other parameters, such as the target group of clients (differences in profile and energy consumption volume) or the price monitoring period (average biannual, annual or other price) can affect the result significantly. It is therefore vital to choose and define the indicators with precision in order to be able to assess the competitiveness of an economy objectively and accurately.

## 3.5 Competitiveness Scoreboard 2.0

Since the development of the Scoreboard, numerous other scoreboards have emerged both at national level, such as *PIBien-être* and the sustainable development scoreboards, or at EU level such as the alert mechanism report which is part of the Macroeconomic Imbalances Procedure and the monitoring of structural indicators under the Europe 2020 Strategy. It is therefore important to ensure harmony between Luxembourg's Scoreboard and these new scoreboards.

The aim must be to establish an up-to-date and coherent system of indicators which simultaneously incorporates the degree of competitiveness, wellbeing and sustainability. This revision should, on the one hand, enable a review of some of the indicators which have now been in use for over a decade, where the data in some cases is no longer available or the added value has decreased, and on the other hand ensure as much coherence as possible with the various national and European scoreboards published in the meantime. The choice of indicators must *in fine* ensure comparability in space and time, have a high statistical quality and avoid going over old ground.

In the preface of the 2013 Competitiveness Report, the Minister of Economy and Foreign Trade, Mr Étienne SCHNEIDER, expressed the following wish: *"...In order to ensure better operational and integrated monitoring of this competitiveness, I suggest to introduce a new system of indicators at the national level, based on the European Union's macroeconomic imbalances' procedure scoreboard, called 'MIP'. This new system should allow us to better detect any significant internal and external deterioration in our competitiveness. But I also want this new system of indicators to be further enriched by the ongoing discussions in the Economic and Social Council and in the Higher Council for Sustainable Development within a long-term perspective of the PIBien-être project and, after consulting the Tripartite Coordination Committee, I hope this new system will be enshrined in a new 'Law on competitiveness'. This law would replace the set of obsolete indicators mentioned in the Grand-Ducal Regulation of 4 April 1985 adopted in application of the amended law of 24 December 1977, that is to say, the law establishing the Tripartite Coordination Committee."*

In response to this request, the Economic and Social Committee (ESC) set up a working committee in 2014 to revise the Scoreboard, together with STATEC and the *Observatoire de la Compétitivité*. The working committee held several meetings in 2014 and 2015 to try to come to an agreement with the stakeholders on a structure which reflects as efficiently as possible all of the aspects of competitiveness: the competitiveness pillar *strictu sensu*, the social aspect and the environmental pillar. External experts were also consulted in order to identify indicators which better reflect the situation in Luxembourg.

## **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 procedure (MIP)<sup>1</sup>. These two pillars of the new 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 policies<sup>2</sup>. This chapter focuses mainly on Luxembourg performances and national targets. Consequently it doesn't aim to assess European indicators and objectives at EU level.

## 4.1 The new European economic governance

Since the European ten-year strategy for growth and jobs, called Lisbon strategy, expired in 2010, the European Council had set up in 2010 the foundations of new European economic governance. Since 2011 it is part of the 'European semester', in an integrated and parallel way, according three pillars: 1) the thematic coordination of structural policies (Europe 2020 strategy); 2) the surveillance of macroeconomic imbalance procedure (MIP); 3) the coordination of budgetary policies (Stability and Growth Pact).

EU Member States must agree each year on a series of concrete actions to be implemented within a period of twelve months. These commitments are reflected in the National Reform Programmes (NRPs) developed as part of the Europe 2020 strategy and in the Stability programmes developed under the SGP, which Member States are required to submit each year during the European Semester.

The fifth European Semester began in January 2015, following the Commission's publication of the Annual Growth Survey. In February 2015, the European Commission published initial country-specific reports for all European Union Member States, including Luxembourg<sup>3</sup>. The main aim of this new procedure was to assess the implementation of the country-specific recommendations of the previous year, as well as to allow more time for discussions with stakeholders prior to the publication of the new country-specific recommendations in May 2015. Then, in April 2015, Luxembourg sent its NRP and SGP to the European Commission<sup>4</sup>. Finally the Commission published its proposals for the 2015-2016 recommendations for each EU Member State by the end of May.

<sup>1</sup> 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 2015 NRP, submitted in April 2014 by the government to the European Commission within the framework of the 2015 European Semester.

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

<sup>3</sup> For additional details: [http://ec.europa.eu/europe2020/pdf/csr2015/cr2015\\_luxembourg\\_en.pdf](http://ec.europa.eu/europe2020/pdf/csr2015/cr2015_luxembourg_en.pdf)

<sup>4</sup> GOVERNMENT OF GRAND-DUCHY OF LUXEMBOURG, Programme national de réforme Luxembourg 2020, Luxembourg, April 2015

Table 1  
Thematic distribution of proposals for country-specific recommendations (2015-2016)<sup>5</sup>

	Public finances and welfare systems				Financial sector		Labour market			Product and service markets		Educ- ation	Social inclusion	Adminis- tration
	Public finances	Taxation	Pension system	Healthcare system	Banking and access to finance	Housing and private debt	Labour market	Labour taxation	Wage-setting	Services and network industries	Innovation and business environment	Education and skills	Poverty and social inclusion	Administrative modernisation and rule of law
AT														
BE														
BG														
CZ														
DE														
DK														
EE														
ES														
FI														
FR														
HR														
HU														
IE														
IT														
LT														
<b>LU</b>														
LV														
MT														
NL														
PL														
PT														
RO														
SE														
SI														
SK														
UK														
Euro area														

Source: European Commission (2015)

On the basis of the proposals and following the discussions and negotiations in the different Committees and the formations of the Council of Ministers in Brussels, the Council finally adopted in July 2015 the latest version of the legal document with the new recommendations<sup>6</sup>. This ended the 2015 European Semester and launched the 'National Semester' in the Member States, which now need to ensure that these recommendations are implemented within the context of their budgetary discussions. Since 2013 Member States have to submit annually their Draft budgetary plan (DBP) for the following year to the Commission by mid-October at the latest<sup>7</sup>. This standardised report should include information on how country-specific recommendations are integrated in national budget debates.

<sup>5</sup> For additional details: [http://ec.europa.eu/europe2020/pdf/csr2015/csr2015-overview-table\\_en.pdf](http://ec.europa.eu/europe2020/pdf/csr2015/csr2015-overview-table_en.pdf)

<sup>6</sup> For additional details: <http://www.consilium.europa.eu/fr/press/press-releases/2015/07/14-council-issues-recommendations-member-states/>

<sup>7</sup> For example, see Luxembourg 2014-2015 Draft Budget Plan: [http://www.mf.public.lu/publications/projet\\_budget/budget2015\\_projet\\_151014.pdf](http://www.mf.public.lu/publications/projet_budget/budget2015_projet_151014.pdf)

The recommendations from the previous year, which then formed part of the NRP implemented by Luxembourg, notably included requests from the Council for 2015 that Luxembourg enlarge its tax base, reduce the gap between the legal and effective retirement age and, finally, reform its wage-setting system so that wages would be linked to productivity, particularly at sectoral level. During the next European Semester (2016) the Commission will assess the extent to which Luxembourg has implemented the 2015-2016 recommendations which it received in July 2015.

Table 2  
Country-specific recommendations made for Luxembourg by the Council during the 2011, 2012, 2013, 2014 and 2015 European Semesters

2011 European Semester for 2011-2012 <sup>8</sup>	2012 European Semester for 2012-2013 <sup>9</sup>	2013 European Semester for 2013-2014 <sup>10</sup>	
<i>To take advantage of the improving cyclical conditions, to strengthen the fiscal effort and to use unexpected additional revenue in order to further reduce the headline deficit and reach the medium-term objective in 2012</i>	<i>To preserve a sound fiscal position by correcting any departure from a MTO that ensures the long-term sustainability of public finances, in particular taking into account implicit liabilities related to ageing; to this end, to reinforce and rigorously implement the budgetary strategy, supported by sufficiently specified measures, for the year 2013 and beyond, including meeting the expenditure benchmark</i>	<i>To preserve a sound fiscal position and to remain at the medium-term objective so as to ensure the long-term sustainability of public finances, in particular by taking into account implicit liabilities related to ageing. To strengthen fiscal governance by adopting a medium-term budgetary framework covering the general government and including multi-annual expenditure ceilings, and by putting in place the independent monitoring of fiscal rules</i>	
<i>To propose and implement a broad pension reform to ensure the long-term sustainability of the pension system, starting with measures that will increase the participation rate of older workers, in particular by discouraging early retirement. With a view to raising the effective retirement age, measures such as a link between the statutory retirement age and life expectancy, could be considered;</i>	<i>To strengthen the proposed pension reform by taking additional measures to increase the participation rate of older workers, in particular by preventing early retirement, and by taking further steps to increase the effective retirement age, including through linking the statutory age to life expectancy, in order to ensure the long-term sustainability of the pension system</i>	<i>To curb age-related expenditure by making long-term care more cost effective, in particular through a stronger focus on prevention, rehabilitation and independent living, strengthening the recently adopted pension reform, taking additional measures to curb early retirement and increasing the effective retirement age, including by linking the statutory retirement age to life expectancy.</i>	
<i>To take steps to reform, in consultation with social partners and in accordance with national practices, the system of wage bargaining and wage indexation, to ensure that wage growth better reflects developments in labour productivity and competitiveness;;</i>	<i>To take further steps to reform, in consultation with the social partners and in accordance with national practice, the wage bargaining and wage indexation system, with a view to preserve the competitiveness of the Luxembourg economy in the longer term, as a first step by maintaining the current one-year indexation interval beyond 2014 and by reducing the impact of energy and other volatile items on the reference index</i>	<i>Beyond the current freeze, to take further structural measures, in consultation with the social partners and in accordance with national practices, to reform the wage setting system, including wage indexation, to improve its responsiveness to productivity and sectorial developments and labour market conditions and to foster competitiveness; to set up efforts to diversify the structure of the economy, fostering private investment in research, and notably by developing cooperation between public research and firms</i>	

Continuing on next page

	<b>2014 European Semester for 2014-2015<sup>11</sup></b>	<b>2015 European Semester for 2015-2016<sup>12</sup></b>
	<i>To preserve a sound fiscal position in 2014; significantly strengthen the budgetary strategy in 2015 to ensure that the medium-term objective is achieved and remain at the medium-term objective thereafter, in order to protect the long-term sustainability of public finances, in particular by taking into account implicit liabilities related to ageing. Strengthen fiscal governance by speeding up the adoption of a medium-term budgetary framework covering the general government and including multi-annual expenditure ceilings, and by putting into place the independent monitoring of fiscal rules. Further broaden the tax base, in particular on consumption.</i>	<i>To broaden the tax base, in particular on consumption, recurrent property taxation and environmental taxation.</i>
	<i>In view of ensuring fiscal sustainability, to curb age-related expenditure by making long-term care more cost-effective, pursue the pension reform so as to increase the effective retirement age, including by limiting early retirement, by aligning retirement age or pension benefits to change in life expectancy. Reinforce efforts to increase the participation rate of older workers, including by improving their employability through lifelong learning.</i>	<i>To close the gap between the statutory and effective retirement age, by limiting early retirement and by linking statutory retirement age to life expectancy</i>
	<i>To speed up the adoption of structural measures, in consultation with the social partners and in accordance with national practices, to reform the wage setting system including wage indexation with a view to improving the responsiveness of wages to productivity developments, in particular at sectoral level. Pursue the diversification of the structure of the economy, including by fostering private investment in research and further developing cooperation between public research and firms.</i>	<i>To reform the wage-setting system, in consultation with the social partners and in accordance with national practices, with a view to ensuring that wages evolve in line with productivity, in particular at sectoral level</i>

<sup>8</sup> For additional details: <http://register.consilium.europa.eu/pdf/fr/11/st11/st11321-re02.fr11.pdf>

<sup>9</sup> For additional details: <http://register.consilium.europa.eu/pdf/fr/12/st11/st11263.fr12.pdf>

<sup>10</sup> For additional details: <http://register.consilium.europa.eu/pdf/en/13/st10/st10644-re01.en13.pdf>

<sup>11</sup> For additional details: <http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2010795%202014%20REV%201>

<sup>12</sup> For additional details: <http://www.consilium.europa.eu/fr/press/press-releases/2015/07/14-council-issues-recommendations-member-states/>

**Table 2**  
**Continued**

<i>To take steps to reduce youth unemployment by reinforcing training and education measures aimed at better matching young people's qualifications to labour demand.</i>	<i>To continue efforts to reduce youth unemployment by reinforcing stakeholders' involvement, and by strengthening training and education measures, in particular for those with low education level, with the aim of better matching young people's skills and qualifications to labour demand</i>	<i>To set up efforts to reduce youth unemployment by improving the design and monitoring of active labour market policies; to strengthen general and vocational education to better match young people's skills of with labour demand, in particular for people with migrant background; to take resolute action to increase the participation rate of older workers, including by improving their employability through lifelong learning</i>	
/	<i>To ensure that the targets for reducing greenhouse gas emissions from non-ETS (Emissions Trading System) activities will be met, in particular by increasing taxation on energy products</i>	<i>To set up measures to meet the target for reducing non-ETS greenhouse gas emissions, in particular by increasing taxation on energy products for transport</i>	
/	/	<i>To take measures to address the debt-bias in corporate taxation and to extend the application of the standard VAT rate</i>	

Source: EU Council (July 2011, July 2012, July 2013, July 2014, July 2015)

Note: The chronological sequence does not match the numbering of legal documents but has been adapted to facilitate monitoring over time.

From 2013 onwards the European Semester formally spreads over the second semester for euro area members, since two new European regulations (called 'Two Pack') have entered into force in May. They further strengthen the budgetary surveillance and transparency in relation to the SGP and the four regulations already included in the legislative package passed in 2011 ('Six Pack'). These two new regulations introduce in particular a common budgetary calendar. Each Member State shall submit annually by 30 April its medium-term budget planning (t+3), by 15 October its Draft budgetary plan (DBP) (t+1) and by 31 December the final approved budget. A major innovation of the Two Pack is that the European Commission may now examine the draft annual budget and give its opinion on it. If the Commission notices that the draft budget goes against the broad medium-term SGP guidelines, it may request the Member State to revise its draft annual budget.

	<i>To pursue efforts to reduce youth unemployment for low-skilled jobs seekers, including those with a migrant background, through a coherent strategy, including by further improving the design and monitoring of active labour market policies, addressing skills mismatches, and reducing financial disincentives to work. To that effect, accelerate the implementation of the reform of general and vocational education and training to better match young people's skills with labour demand.</i>	/
	<i>To develop a comprehensive framework and take concrete measures to meet the 2020 target for reducing greenhouse gas emissions from non-ETS activities, especially through the taxation of energy products for transports.</i>	/
	/	/

## 4.2 Thematic coordination of structural policies

### 4.2.1 Implementation of thematic coordination under the Europe 2020 strategy

The Europe 2020 strategy<sup>13</sup>, which is a central element of the EU's response to the global economic crisis, has been designed to update and replace the Lisbon strategy<sup>14</sup> 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 strategy<sup>15</sup>.

<sup>13</sup> For additional details: [http://ec.europa.eu/eu2020/index\\_fr.htm](http://ec.europa.eu/eu2020/index_fr.htm)

<sup>14</sup> For additional details: [http://ec.europa.eu/archives/growthandjobs\\_2009/](http://ec.europa.eu/archives/growthandjobs_2009/)

<sup>15</sup> EUROPEAN COMMISSION, EUROPE 2020 - A strategy for smart, sustainable and inclusive growth, COM[2010] 2020, Brussels, 3.3.2010

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 elements<sup>16</sup>. The June European Council<sup>17</sup> finally completed the development of the new Europe 2020 strategy. 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.*

<sup>16</sup> EUROPEAN COUNCIL, Conclusions, Brussels, March 2010  
For additional information: [http://www.consilium.europa.eu/uedocs/cms\\_data/docs/pressdata/en/ec/113602.pdf](http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/113602.pdf)

<sup>17</sup> EUROPEAN COUNCIL, Conclusions, Brussels, June 2010  
For additional information: [http://www.consilium.europa.eu/uedocs/cms\\_data/docs/pressdata/en/ec/115348.pdf](http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/115348.pdf)

Chart 1  
**Priorities and objectives of the Europe 2020 strategy**

	<b>Targets</b>	<b>Flagship initiatives</b>
Smart Growth	<ul style="list-style-type: none"> <li>- 3% of GDP to be invested in the research and development (R&amp;D) sector.</li> <li>- Reduce the rates of early school leaving to below 10% and at least 40% of 30 to 34 year olds to have completed tertiary or equivalent education.</li> </ul>	<ul style="list-style-type: none"> <li>- Innovation Union</li> <li>- Youth on the move</li> <li>- A digital agenda for Europe</li> </ul>
Sustainable Growth	<ul style="list-style-type: none"> <li>- Reduce greenhouse gas emissions by 20% compared to 1990 levels.</li> <li>- Increase the share of renewables in final energy consumption to 20%.</li> <li>- 20% increase in energy efficiency.</li> </ul>	<ul style="list-style-type: none"> <li>- Resource efficient Europe</li> <li>- An industrial policy for the globalisation era</li> </ul>
Inclusive Growth	<ul style="list-style-type: none"> <li>- 75% of 20 to 64 year old men and women to be employed.</li> <li>- Reduce poverty by lifting at least 20 million people out of the risk of poverty and social exclusion.</li> </ul>	<ul style="list-style-type: none"> <li>- An agenda for new skills and jobs</li> <li>- European platform against poverty and social exclusion</li> </ul>

Source: Eurostat

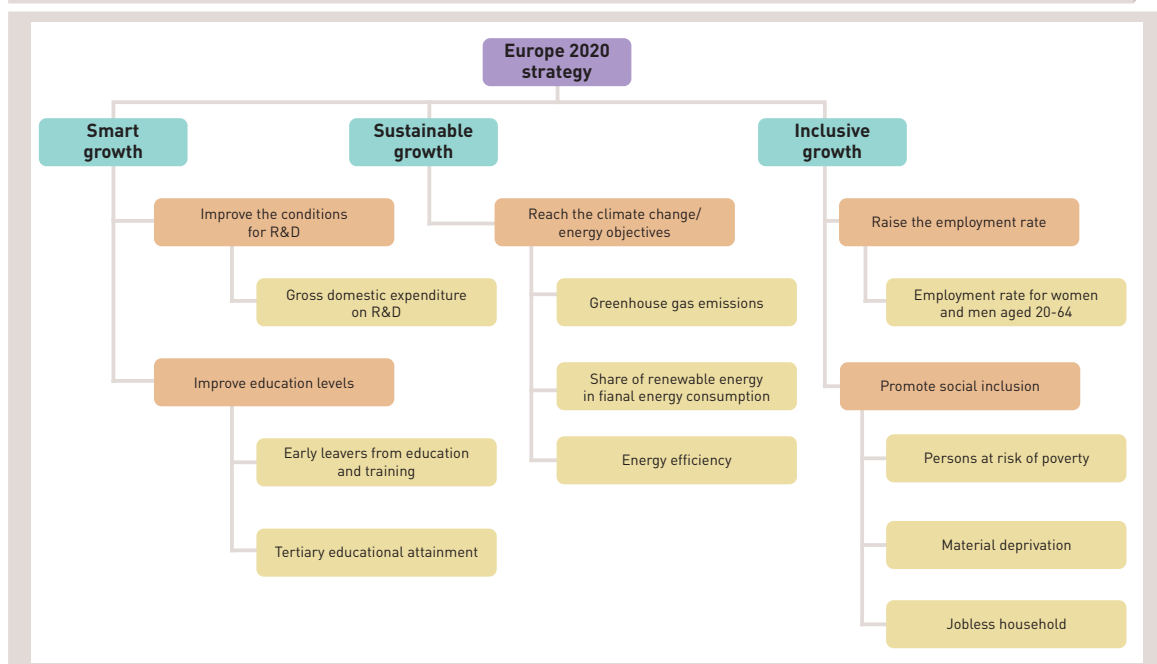
## 4.2.2 Priorities, objectives and indicators

Obviously the new governance of the Europe 2020 strategy, including main European objectives and monitoring indicators, will not alone create growth, jobs and prosperity. It should nevertheless ensure that major emphasis on quantitative targets and indicators. Implementing policies without measurable goals and without monitoring indicators is not the way forward because the assessment would then be totally subjective. Despite the many limitations of the indicators (data availability, comparability, etc.) such a tool for decision support is the best way to measure the performance of policies. Past experience has shown that for a successful monitoring the system must meet certain initial conditions. It is not enough to base the monitoring mechanism only on territory rankings resulting from a list of indicators selected during painstaking negotiations and based on compromise (and which is therefore likely to please everyone); to discuss objectives and indicators only amongst experts, without ensuring an adequate involvement of the general public; to be restricted to ex-ante indicators (input) measuring the resources invested, without resorting to indicators measuring ex-post performance and the efficiency of the resources involved (output).

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

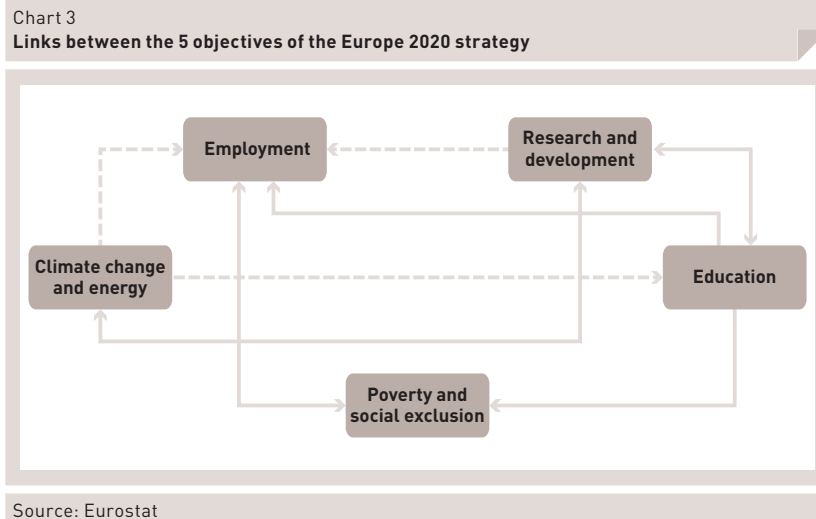
- ▼ Three mutually reinforcing priorities - smart growth, sustainable growth and inclusive growth;
- ▼ Five major European goals to reach by 2020 - to improve the conditions for R&D, to improve education levels, to reach the climate change and energy objectives, to promote employment and to reduce poverty;
- ▼ Ten indicators to measure the progress in achieving the objectives - 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 household.

Chart 2  
Priorities, objectives and indicators of the 'thematic coordination' in Europe 2020



Note: Diagram drafted by the *Observatoire de la compétitivité* based on the communication from the European Commission (March 2010) and the conclusions of the European Council (June 2010)

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 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 Agenda, 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 3  
National targets set by Luxembourg

		European objective 2020	Luxembourg target 2020
Priority 1 'smart growth'	Objective 1	'[...] raising combined public and private investment levels to 3% of GDP'	2.3 to 2.6% interval
	Objective 2	'[...] reduce the early school leaving rate to less than 10%'	sustainably less than 10% <sup>a</sup>
		'[...] increasing the share of people aged 30-34 who graduated from higher education or reached an equivalent level to at least 40%'	66% <sup>b</sup>
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 8.085 Mt CO <sub>2</sub> in 2020) <sup>c</sup>
		'[...] increasing the share of renewable energy sources in final energy consumption to 20%'	11% <sup>c</sup> (2015/2016 average 5.45%)
		'[...] moving towards a 20% increase in energy efficiency'	2016 target: 14.06% 2020 target: final energy consumption 48,789 GWh <sup>d</sup>
Priority 3 'inclusive growth'	Objective 4	'[...] raise to 75% the employment rate for women and men aged 20-64'	73% (71.5% for 2015)
	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

Sources: European Council, Eurostat

Notes: p=provisional, u=unreliable

<sup>a</sup> 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.

<sup>b</sup> 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 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.

<sup>c</sup> 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.

<sup>d</sup> In July 2013, the government submitted to the European Commission its first annual report on progress made towards achieving national energy efficiency targets. The management and implementation of Directive 2012/27/EU are partially dealt with in the third action plan, submitted to the European Commission in December 2014. The EEAP III includes updated estimates of the overall final and primary energy consumption levels which will be recorded by 2020.

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.

Eurostat publishes periodically monitoring indicators for each Member State<sup>18</sup> 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 in more detail and a descriptive overview<sup>19</sup> of its performance will be presented as well as a comparison between Luxembourg and its neighbouring countries<sup>20</sup>. Reference is made to the 2014 NRP for Luxembourg for more details on the measures implemented, in order to explain the evolution of the indicators.

## A. Smart growth

### a.1 Improving conditions for innovation and R&D

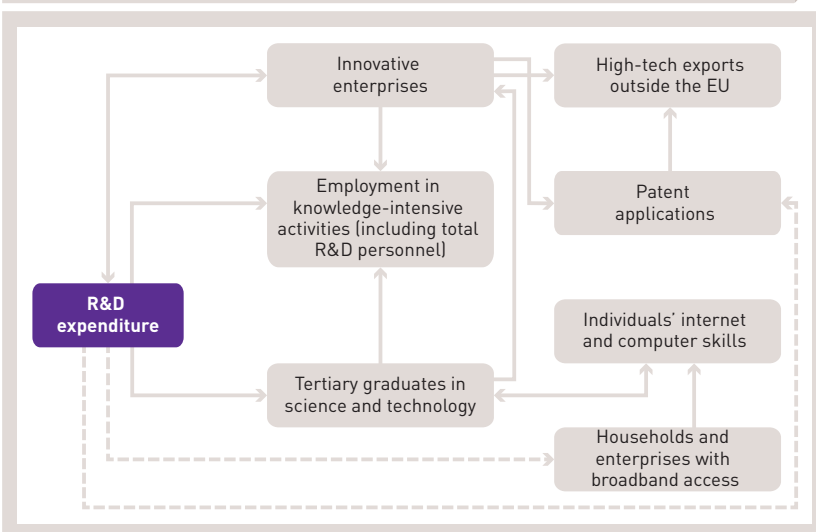
Investment in R&D, along with human capital, is essential for the development of knowledge and new technologies. The Barcelona European Council set the spending target of 3% of GDP on R&D in March 2002. This was one of the two key objectives of the former Lisbon strategy. The logic underlying the setting 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% target 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.

<sup>18</sup> For additional information:  
<http://ec.europa.eu/eurostat/web/europe-2020-indicators/statistics-illustrated>  
The new Europe 2020 indicators will replace in the future the Lisbon structural indicators used in the *Observatoire de la Compétitivité's* Competitiveness Scoreboard.

<sup>19</sup> 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.

<sup>20</sup> For more details about other EU Member States: EUROSTAT, Europe 2020 Strategy - towards a smarter, greener and more inclusive EU economy?, Statistics in focus 39/2012, 21.9.2012

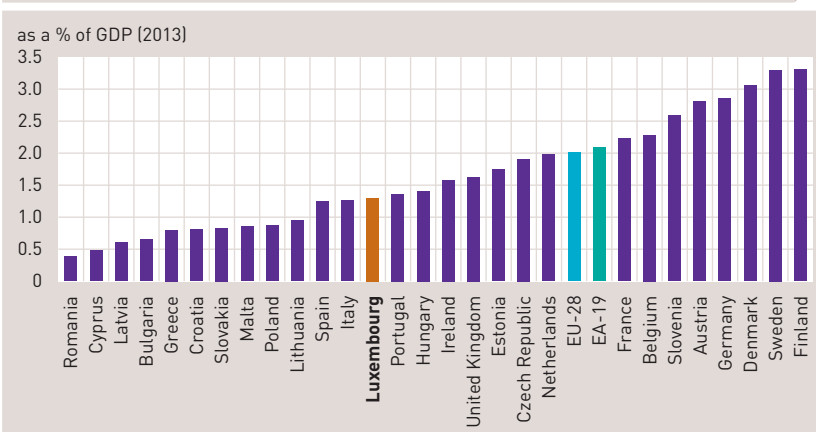
Chart 4  
R&D objectives



Source: Eurostat

In 2013, average R&D expenditure among the EU-28 amounted to 2.01% of GDP. Of all the Member States, the Scandinavian countries spend the most on R&D, with Denmark, Finland and Sweden all spending over 3% in 2013. Luxembourg spent 1.30% of GDP on R&D in 2013 (STATEC statistics, as yet to be published); a rate therefore significantly lower than the EU average which leaves the country in last position when compared to its neighbouring countries.

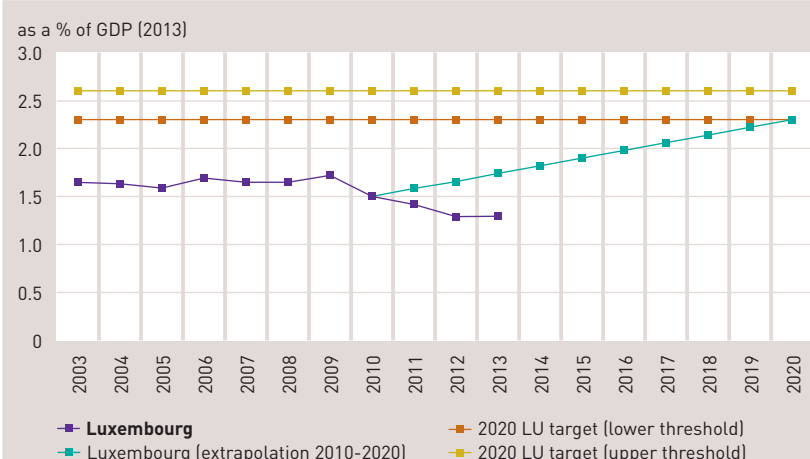
Chart 5  
Gross domestic expenditure on R&D (2013)



Source: Eurostat, STATEC  
Note: Ireland (2012)

As part of its NRP, Luxembourg set a national target of spending 2.3-2.6% of GDP by 2020, with 1.5-1.9% being contributed by the private sector and 0.7-0.8% by the public sector. Therefore, Luxembourg is still far from achieving its national targets for 2020, as well as being significantly below the upward trend which needs to materialise if it is to achieve its national 2020 objectives.

Chart 6  
Gross domestic expenditure on R&D (GERD)<sup>21</sup>



Source: STATEC, Eurostat, PNR 2015

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, i.e. 2.3%.

Public spending on R&D (research, development and innovation) has been rising consistently since 2000. However, research conducted by businesses in the private sector has not risen in the same way. According to the latest available data, the private sector accounts for around 52% of all research expenditure at national level. Private research expenditure<sup>22</sup>, which amounts to several million euros, fell between 2007 and 2012, although a slight increase was recorded in 2013 in comparison to the previous year.

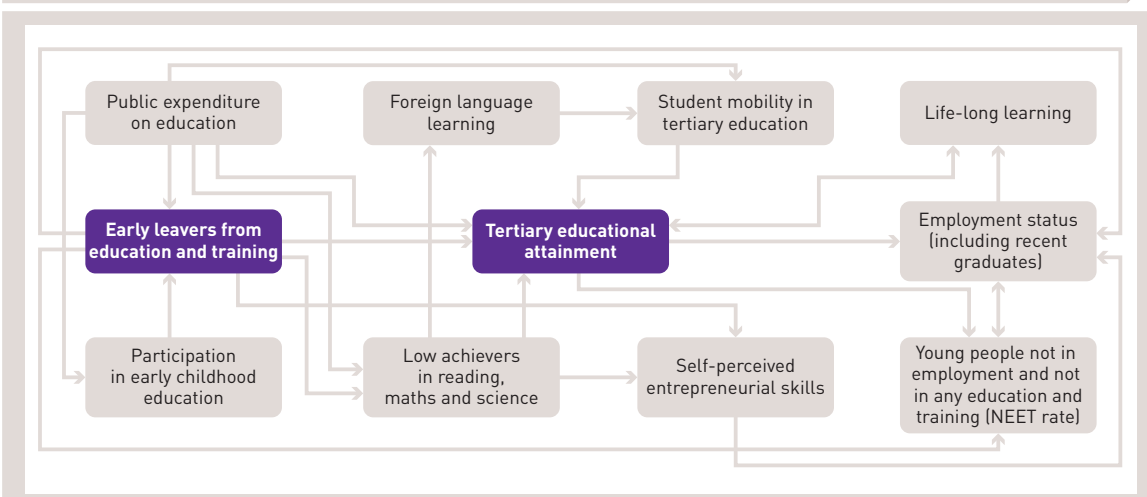
## a.2 Improving education levels

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.

<sup>21</sup> 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.

<sup>22</sup> The R&D expenditure (in millions of euros) of companies with commercial economic activity employing at least 10 people.

Chart 7  
Objectives regarding levels of education

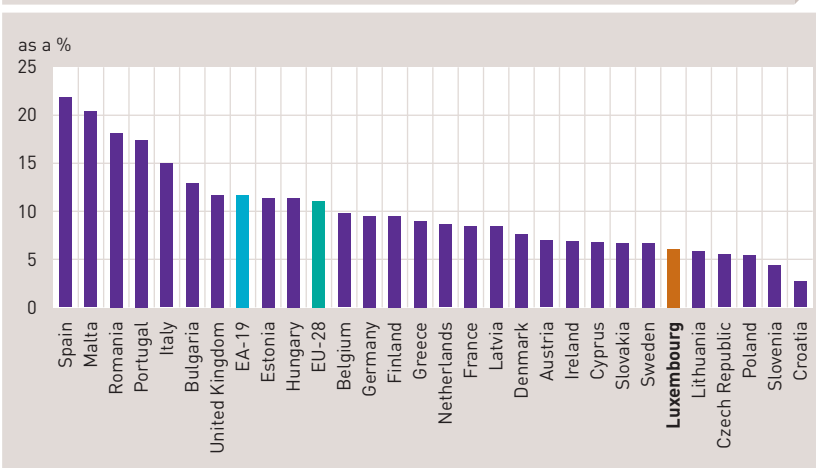


Source: Eurostat

### a.2.1 Early school leavers

The average early school leaving rate<sup>23</sup> among the EU-28 stood at 11.1% in 2014. The best-performing Member States in 2014 were Croatia (2.7%), Slovenia (4.4%) and Poland (5.4%). With a rate of 6%, Luxembourg has one of the lowest early school leaving rate of all the EU Member States, significantly out-performing its neighbouring countries in this regard.

Chart 8  
Young people having left education and training prematurely, % of 18-24 year olds not in education or training with up to lower secondary education (2014)



Source: Eurostat

<sup>23</sup> 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.

The underlying statistics of this indicator calculated by Eurostat result from the Labour Force Survey (LFS) and are prone to yearly variations for Luxembourg, due to the limited size of the survey sample. The Ministry of National Education in Luxembourg has therefore set up its own national survey on early school leaving, and levels of early school leaving calculated for Luxembourg are not identical.

Table 4  
**Statistics on early school-leaving rate according to the national study on early school leaving (national figures)**

Study (No.)	School year	Early school-leaving rate
1	2003/2004	17.2%
2	2005/2006	14.9%
3	2006/2007	9.4%
4	2007/2008	11.2%
5	2008/2009	9.0%
6	2009/2010	9.0%
7	2010/2011	9.0%
8	2011/2012	9.2%
9	2012/2013	11.6%

Source: Ministry of National Education, Childhood and Youth (MENEJ)

Definition: The 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.

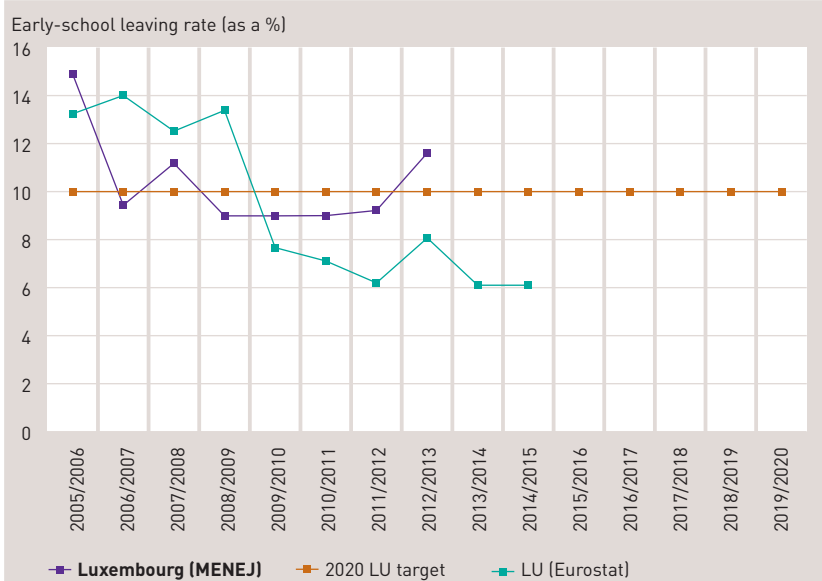
Note: National early school-leaving rate not available for 2004/2005.

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. Luxembourg's overall early school leaving rate currently stands at 6.1% according to Eurostat. The average early school leaving rate among Luxembourg nationals is lower than that of foreigners residing in Luxembourg (5.6% compared to 7.8%)<sup>24</sup>.

According to Eurostat, Luxembourg is therefore well within its national target of 10%. However, according to national government statistics (MENEJ, Luxembourg Ministry of Education), Luxembourg exceeded this symbolic threshold for the 2012/2013 school year (11.6%) after four years below the limit.

<sup>24</sup> For additional details:  
[http://ec.europa.eu/eurostat/statistics-explained/index.php/Migrant\\_integration\\_statistics\\_-\\_education](http://ec.europa.eu/eurostat/statistics-explained/index.php/Migrant_integration_statistics_-_education)

Chart 9  
People having left education and training prematurely



Source: Eurostat, PNR 2015

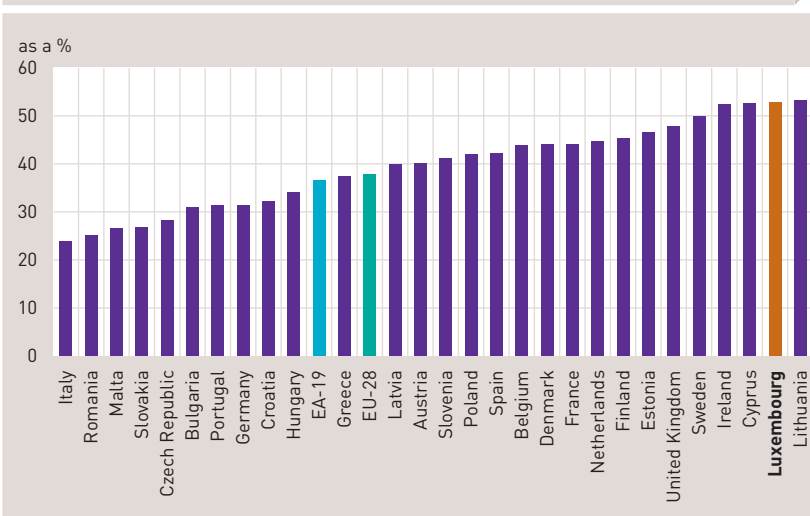
Note: There is a time gap between MENEJ and Eurostat data.

The statistics compiled by Eurostat also provide a deeper analysis of the situations of young early school leavers and whether or not they are employed or unemployed. According to the latest available data, the shares of young early school leavers in 2014 who were 'employed/unemployed' stood at 3.8% and 2.3% respectively (adding up to a total 6.1%).

## a.2.2 Share of higher education graduates

The average share of higher education graduates (30-34 years old) among the EU-28 stood at 37.9% in 2014. Luxembourg is among the best-performing countries in the EU, with a rate of 52.7% in 2014, just behind Lithuania which recorded the highest result (53.3%). Luxembourg therefore out-performs its neighbouring countries in this regard.

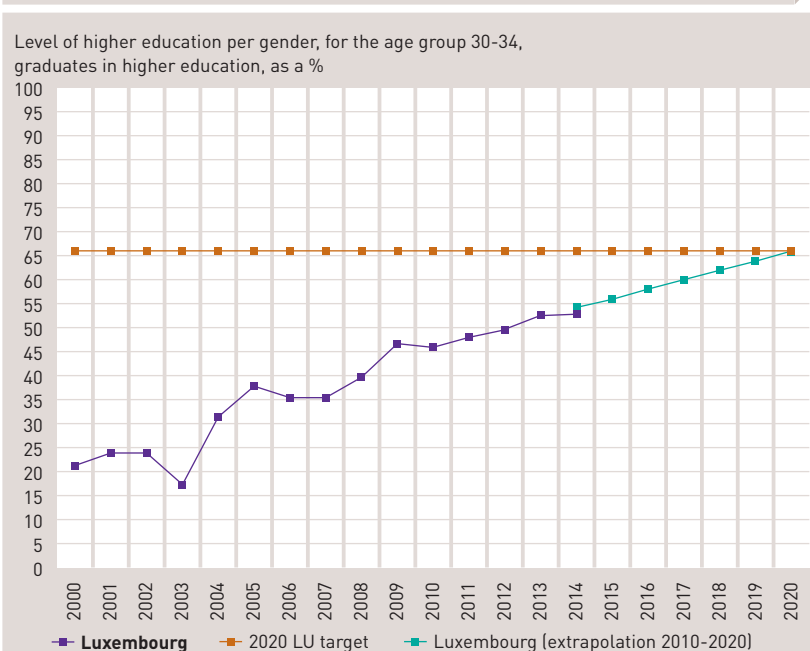
Chart 10  
Level of higher education graduates in the age group 30-34 (%), 2014



Source: Eurostat

The overall EU objective is to achieve a rate of 40% of people aged 30-34 graduated in higher education by 2020. Luxembourg set a much higher objective in its NRP (66%). Since 2000 Luxembourg has experienced a significant increase in this indicator: it rose from 21.2% to 52.7% in 2014. Luxembourg thus already exceeds the European objective for this age group and is also currently on the right track towards achieving its ambitious objective by 2020.

Chart 11  
Level of higher education graduates in the age group 30-34<sup>25</sup>



Source: Eurostat, PNR 2015

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.

<sup>25</sup> 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.

As the indicator for early school leaving, this indicator results from the Labour Force Survey (LFS). It is not fully representative for Luxembourg since on the one hand it includes foreign graduates living and working in Luxembourg (currently around 45% of residents in Luxembourg do not have Luxembourg nationality), and on the other hand it can neither capture national from Luxembourg who graduated and work abroad, nor the cross-border workers. The actual rate of higher education graduates among the sole national Luxembourg residents (slightly higher than 40%) is lower than the one of foreign residents in Luxembourg (close to 60%)<sup>26</sup>. Aside from the current indicator used in the context of the Europe 2020 strategy, giving an indication of the qualification of Luxembourg's labour force, Luxembourg needs also to follow indicators allowing it to better distinguish people who attended Luxembourg schools in order to more accurately assess the quality of the national education system and thus to provide more information on the Luxembourg national school system's ability to enable young people to successfully complete a tertiary education<sup>27</sup>.

<sup>26</sup> For additional details: [http://ec.europa.eu/eurostat/statistics-explained/index.php/Migrant\\_integration\\_statistics\\_-\\_education](http://ec.europa.eu/eurostat/statistics-explained/index.php/Migrant_integration_statistics_-_education)

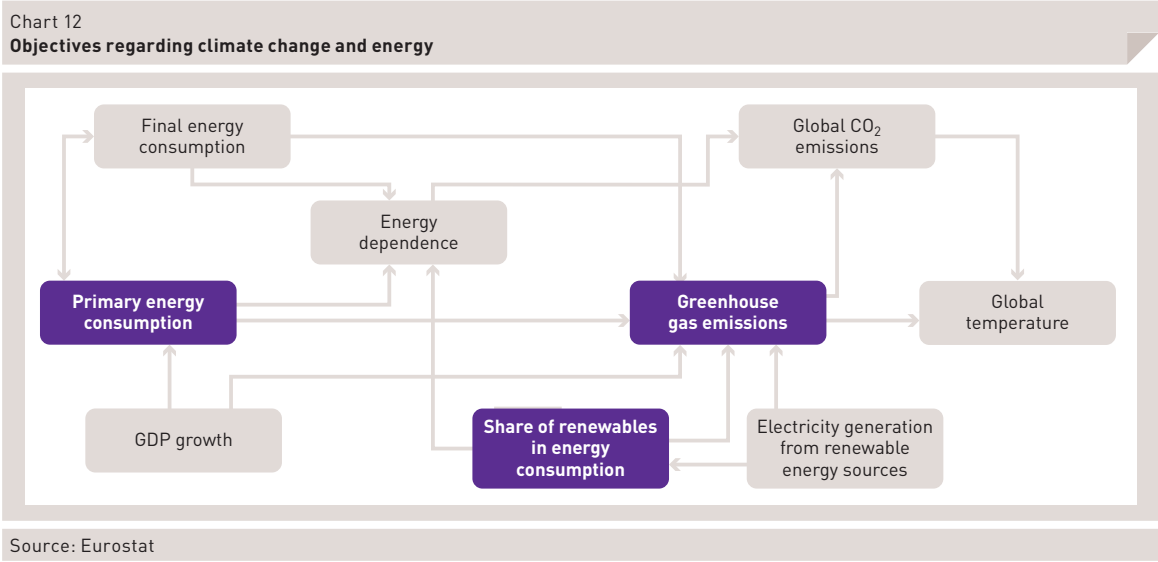
<sup>27</sup> According to the 2012 NRP, in Luxembourg 30% of people aged between 25 and 64 are higher education graduates. This proportion is 31% in Belgium and 26% in France. In Luxembourg however, there is a large disparity per country of birth. Indeed, among people born in Luxembourg, only 22% have a higher education degree, while this proportion is 40% among those born abroad. In neighbouring countries, the differences between these two populations are much less marked. Moreover, in these countries the proportion of higher graduates is higher among indigenous people than among non-indigenous people.

<sup>28</sup> 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.

## B. Sustainable growth

### b.1 Reaching the climate change and energy objectives

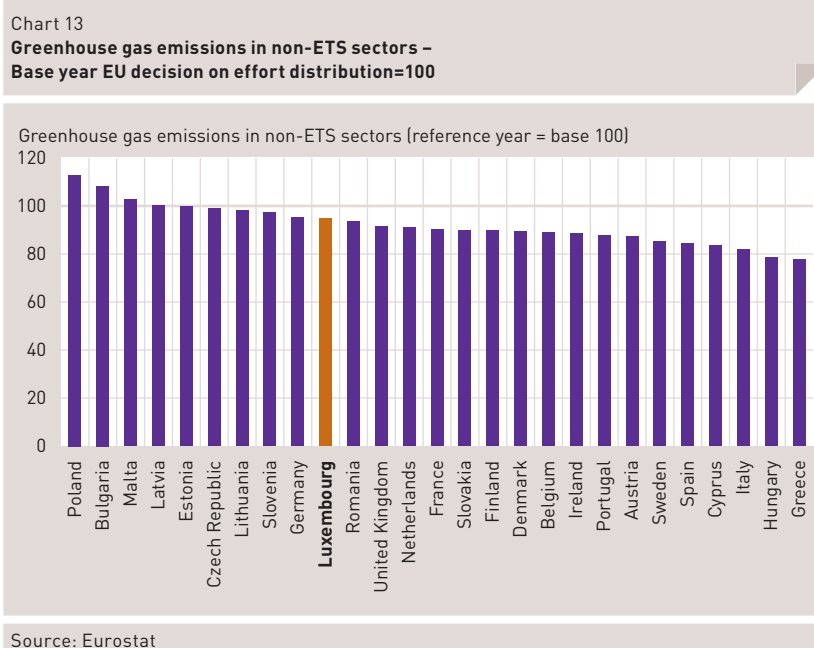
In order to reach the climate change and energy objectives, the objectives set at the European Council in March 2007 were kept within the framework of the Europe 2020 strategy. The greenhouse gas emissions reduction targets and the share of renewable energy in the total energy consumption are legally binding<sup>28</sup>.



### b.1.1 Greenhouse gas emissions

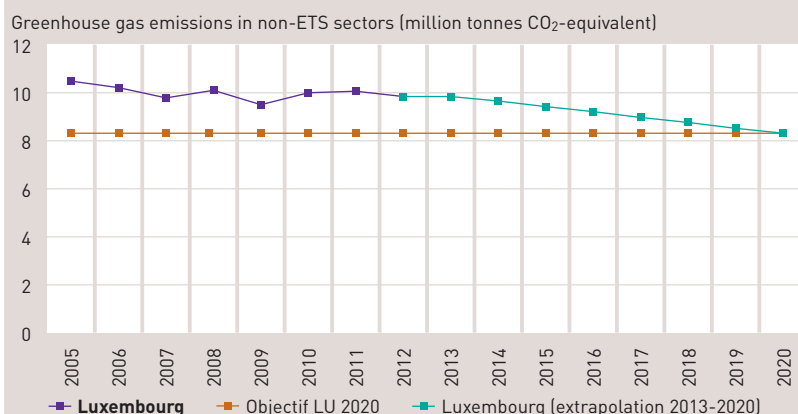
For the 2013-2020 post-Kyoto period only non-ETS sectors are subject to fixed objectives in the Member States. For Luxembourg, the target of reducing non-ETS gas emissions amounts to an emission reduction of 20% in 2020 compared to the level in 2005.

In 2012, according to latest available Eurostat data, Luxembourg is, with an index level of 94.6, below the 2005 emission level (base 100).



However, although Luxembourg is currently below its 2005 level, the country will need to make significant efforts in the next few years in order to stay on track towards achieving its national target for 2020 (index 80). The 80 value means that Luxembourg will be able to emit a volume of around 8.085 MtCO<sub>2</sub> in 2020. Interim targets must also be respected in the 2013-2019 period. These have been plotted on a linear trajectory whose starting-point in 2013 was calculated based on the average number of non-ETS emissions in the years 2008-2010. The economic crisis has clearly had detrimental effects on Luxembourg. Emissions were relatively low during the crisis years due to the downturn in economic activity, which reduced the emissions budget for 2013 and beyond. Luxembourg has estimated the deficit which needs to be accounted for during the 2013-2020 period at 11.3 Mt CO<sub>2</sub> in the scenario with 'existing measures', and at 7.5 Mt CO<sub>2</sub> in the 'additional measures' scenario. Over this eight-year period, the use of external credits will no doubt continue to be necessary, although the volumes will nonetheless be lower than during the Kyoto phase. This is notably thanks to existing and planned national measures.

Chart 14  
GHG emissions, non-LULUCF & ETS



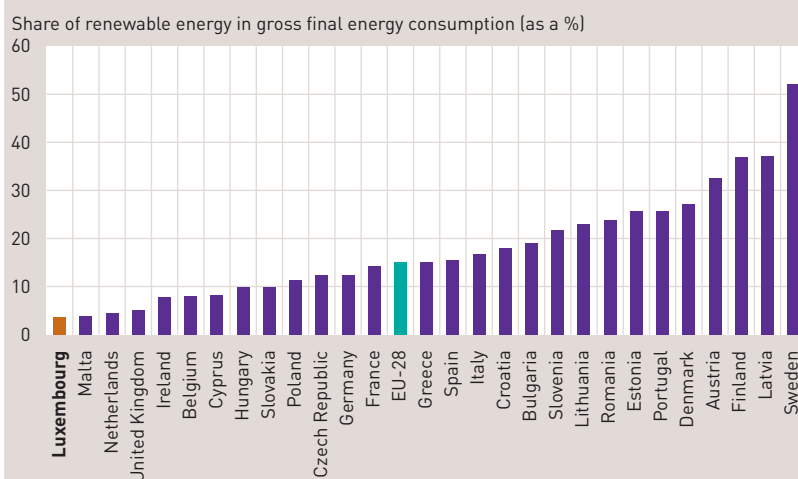
Source: Eurostat

Note: The green line linking 2013 to 2020 denotes developments with the interim targets which need to be respected in order to achieve the national target set by Luxembourg for 2020. The starting-point in 2013 was calculated based on the average value of non-ETS emissions in the years 2008-2010.

### b.1.2 Share of renewable energy in energy consumption

In 2013, the share of renewable energy in final, gross energy consumption stood at an average of 15% in the EU-28. Sweden recorded the highest percentage, with renewable energy accounting for over half of final consumption (52.1%). Luxembourg recorded a rate of 3.6% in 2013, and is therefore one of the lowest-performing EU Member States.

Chart 15  
Renewable energy in gross final energy consumption, 2013



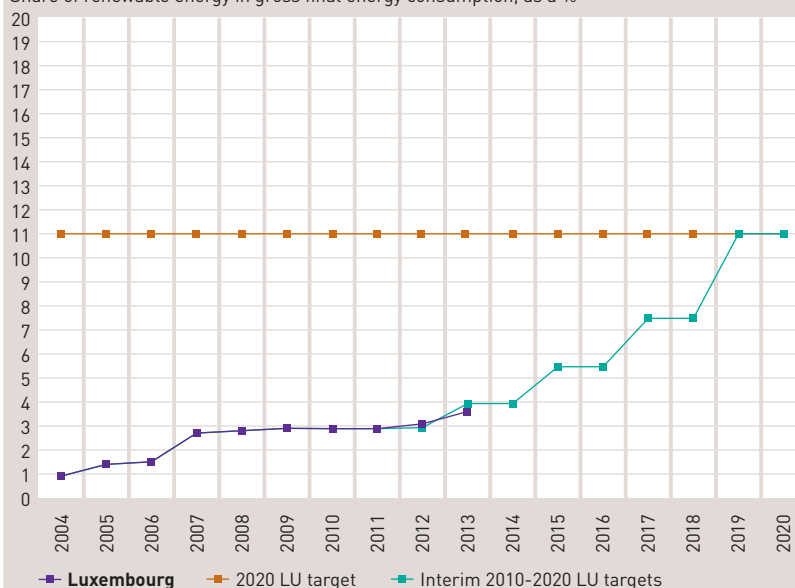
Source: Eurostat

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 by 2020, with a series of interim targets. Luxembourg is in this interim national evolution but will have to make significant efforts in the coming years to achieve its 2020 national target.

Chart 16

**Share of renewable energy in gross final energy consumption<sup>29</sup>**

Share of renewable energy in gross final energy consumption, as a %



Source: Eurostat, PNR 2015

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

In 2013, the share of renewable energy in Luxembourg was highest in heating and cooling (5.6%), followed by electricity (5.3%) and transport (3.9%).

<sup>29</sup> Definition: This indicator is calculated on the basis of energy statistics covered by the Energy Statistics Regulation. It may be considered an estimate of the indicator described in Directive 2009/28/EC, as the statistical system for some renewable energy technologies is not yet fully developed to meet the requirements of this Directive. However, the contribution of these technologies is rather marginal for the time being. More information about the renewable energy shares calculation methodology and Eurostat's annual energy statistics can be found in the Renewable Energy Directive 2009/28/EC, the Energy Statistics Regulation 1099/2008 and in DG ENERGY transparency platform.

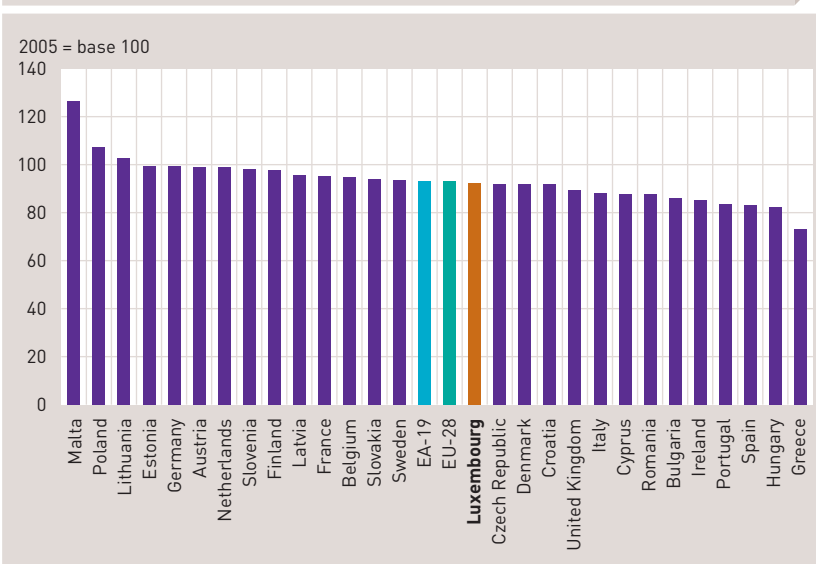
### b.1.3 Energy efficiency

The Energy Efficiency Directive has set an energy efficiency objective for the whole of Europe by 2020. The EU has set an objective of a 20% increase in energy efficiency by that date. Although it applies to the EU as a whole, the Europe 2020 indicator does not provide 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 equivalent (Mtoe)<sup>30</sup> in order to assess the progress made in energy efficiency at national level. 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 signal an increase in energy efficiency, but may also be the result of declining activity.

All things being equal, final energy consumption in Luxembourg fell more between 2005-2013 than the average for the EU as a whole, and more than in all of its neighbouring countries.

Chart 17

**Final energy consumption in 2013 (2005 = base 100)**



Source: Eurostat

<sup>30</sup> 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%.

#### Frame 1

#### Economic growth and final energy consumption (2005 = base 100)

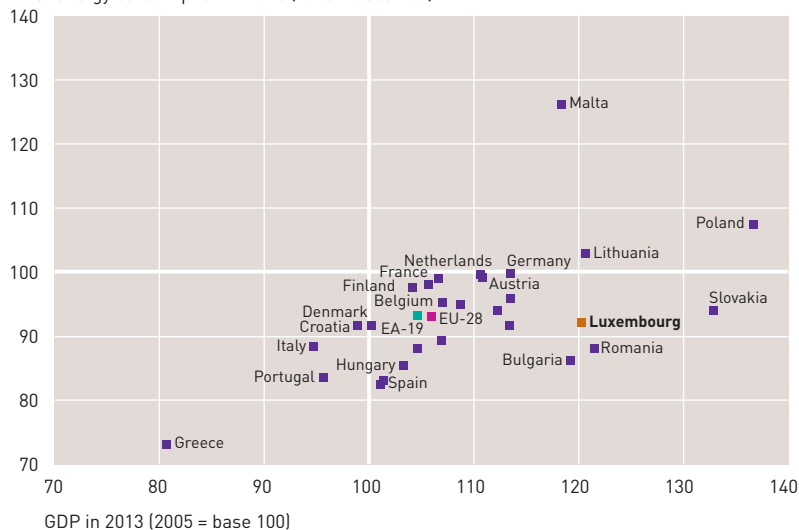
Analysis of the GDP of each Member State in 2013 together with their final energy consumption levels (using 2005 as the reference year for both cases) reveals that the Member States are located in three quadrants.

▼ The majority of the Member States, including Luxembourg, are in the group of countries whose GDP was higher in 2013 than in 2005 (>100 indicator) and where final energy consumption was lower in 2013 than in 2005 (<100 indicator). Luxembourg's GDP increased quite significantly in comparison with the EU average, at a rate of +20% between 2005-2013, while final energy consumption fell by around 8%.

▼ For some countries, including Poland and Lithuania, GDP was higher in 2013 than in 2005, but energy consumption was also greater.

▼ Some countries had a lower GDP in 2013 than in 2005, and also saw their energy consumption decrease over the same period. For example, Greece is by far the EU Member State with the greatest reduction in energy consumption since 2005, but it is also the country whose GDP and economic activity have decreased the most since that same year.

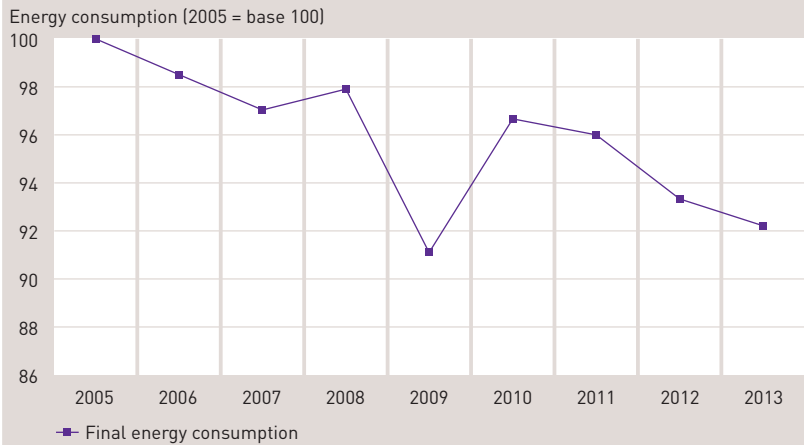
Final energy consumption in 2013 (2005 = base 100)



Source: Eurostat  
Calculation: ODC

Taking the 2005 figure as a reference point (100 points), final energy consumption decreased significantly in Luxembourg to around 92 points in 2013. This means that final energy consumption in Luxembourg had decreased by 8% in 2013 in comparison to 2005 levels.

Chart 18  
Energy consumption in Luxembourg (2005 = base 100)



Source: Eurostat

As part of its NRP, Luxembourg set an energy efficiency target of 14.06% by 2016. When its NRP was updated in April 2015, Luxembourg set an indicative final energy consumption target of 48,789 GWh by 2020, i.e. planned energy savings of 2,697 GWh in comparison to the initial forecasts of 51,486 GWh.

Table 5  
Energy consumption and energy savings planned for 2020 (GWh)

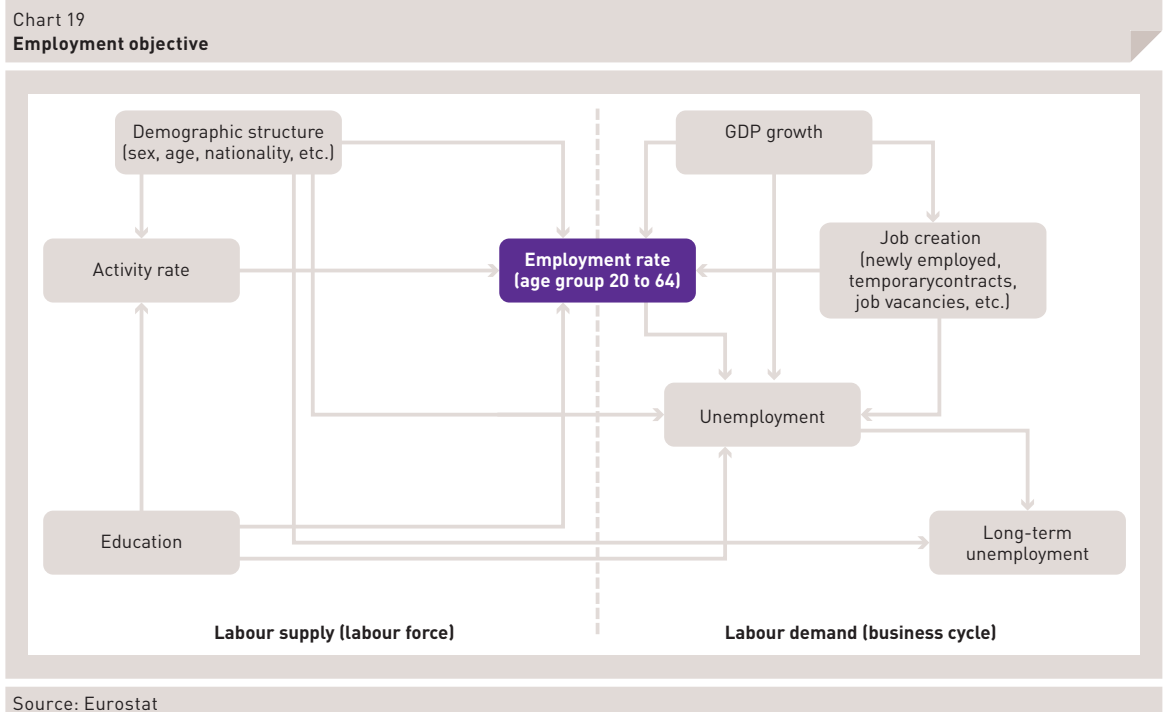
Sector	Initial forecast	Forecast including measures	Planned energy savings
Households	6,661	5,654	1,007
Craftsmanship, Trade, Services	7,395	6,542	853
Industry	7,048	6,363	685
Transport	30,297	30,145	152
<i>of which transport, not including national road transport</i>	24,321	24,321	0
Agriculture	85	85	0
<b>Total</b>	<b>51,486</b>	<b>48,789</b>	<b>2,697</b>

Source: Luxembourg NRP (April 2015)

## C. Inclusive growth

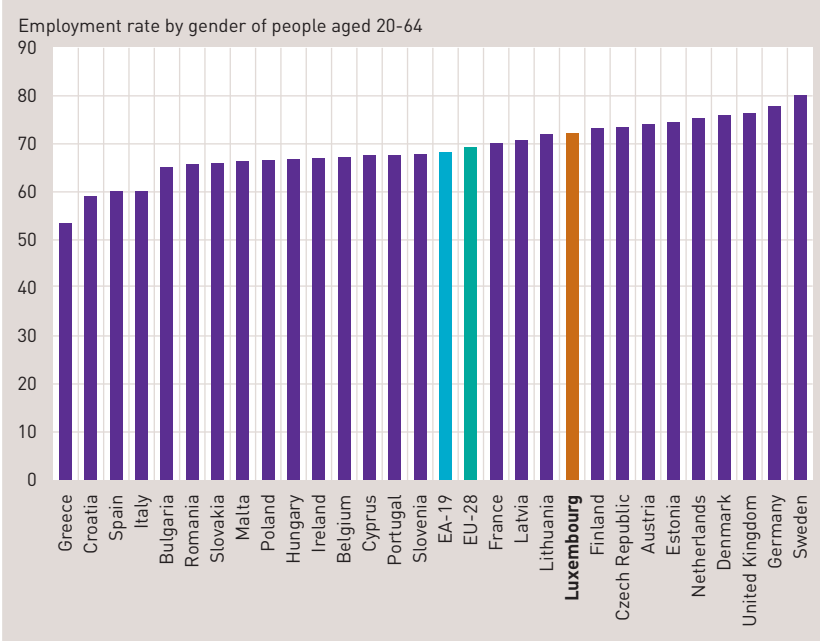
### c.1 Promoting employment

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. The actual exit date of the crisis will play a key role in the evolution of this indicator.



The average employment rate for the EU-28 stood at 69.2% in 2014. Sweden recorded the highest employment rate of around 80%. The national employment rate in Luxembourg stood at 72.1% in 2014, which is thus higher than the EU average for this indicator. When compared to its neighbouring countries, Luxembourg is behind Germany and the Netherlands, but ahead of France and Belgium.

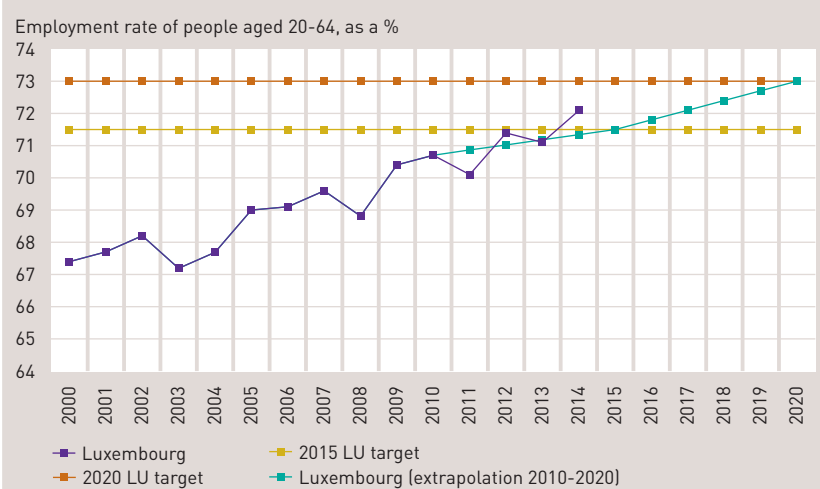
Chart 20  
Employment rate of people aged 20-64 (2014)



Source: Eurostat

Luxembourg set a national target of employment rate of 73% to be achieved by 2020, with an interim target of 71.5% in 2015. Since 2000 Luxembourg shows an upward trend regarding the employment rate. The employment rate has increased from 67.4% in 2000 to 72.1% in 2014. These performances are on the right way to achieve the national targets set for 2015 and 2020, and Luxembourg already surpasses in 2014 its 71.5% interim target set for 2015.

Chart 21  
Employment rate of people aged 20-64<sup>31</sup>



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 national target set for 2020.

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

The development of the total employment rate, which is an average for the resident workforce, does however hide considerable differences in the employment rate depending on the socio-economic category observed. By proceeding to a narrower segmentation of the employment rate, for example according to gender or age of the worker, we can see important fluctuations in the employment rate. For example, the employment rate of men is at around 78.4% in 2014 while the rate of women is at 65.5%. The employment rate of older people is at about 42.5% while the one of people aged 25-54 is at 83.7%.

The increase in the overall employment rate in Luxembourg since 2000 is mainly due to increases among women and older workers. 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. Labour supply in Luxembourg consists of 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 40% of domestic employment. As noted by the Economic and Social Council (ESC)<sup>32</sup>, 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;

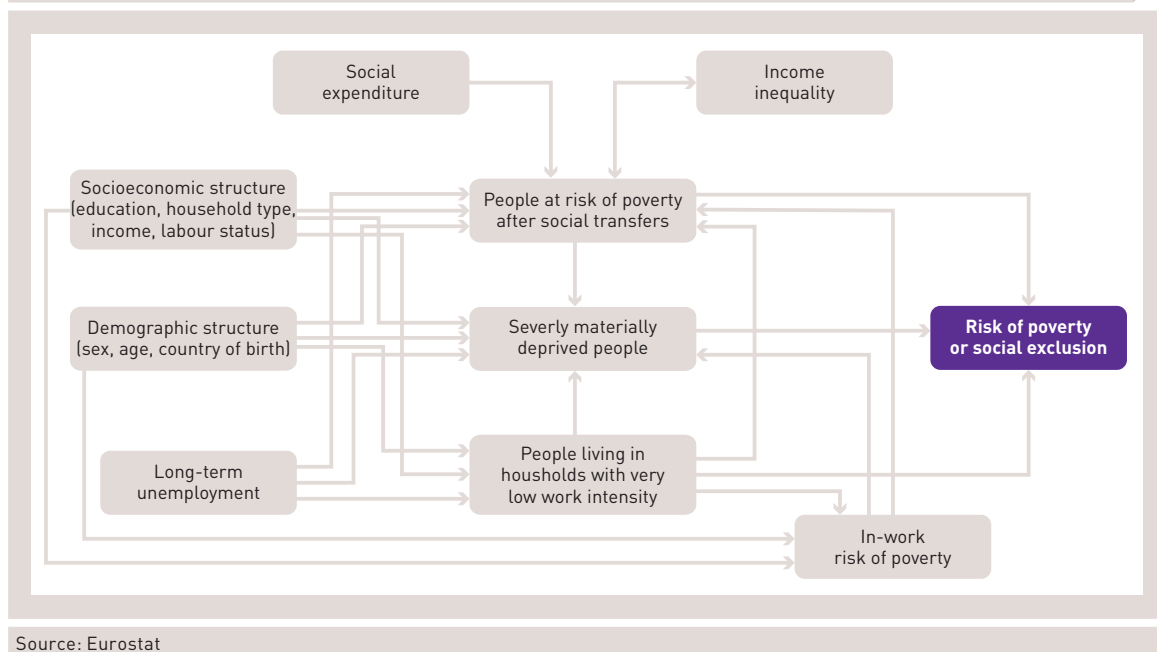
<sup>32</sup> ESC, Deuxième avis sur les Grandes Orientations des Politiques Économiques des États membres et de la Communauté (GOPE), Luxembourg, 2003. For additional information: <http://www.ces.public.lu/fr/avis/index.html>

- ▼ Material deprivation rate: people whose lives are severely limited by a lack of resources<sup>33</sup>. The material deprivation rate is a non-monetary measure of poverty, which also reflects the different levels of prosperity and quality of life in the EU, as it is based on a single European level;
- ▼ People living in jobless households: 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.

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 or the rate of material deprivation, are significantly limited. They do not take into account the many non-monetary public services that are available to citizens. In Luxembourg, among other things, we can mention in this context the service vouchers that are not taken into account.

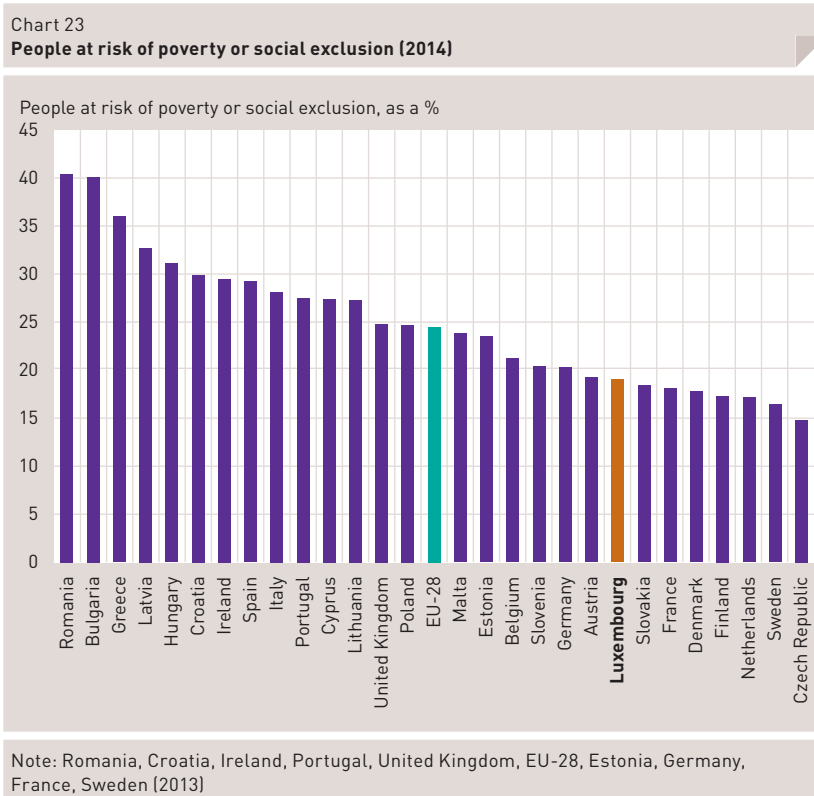
<sup>33</sup> Definition: Currently the agreed EU material deprivation indicator is defined as the share of people are concerned with at least 3 out of the 9 following situations: people cannot afford i) to pay their rent or utility bills, ii) keep their home adequately warm, iii) face unexpected expenses, 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.

Chart 22  
**Risk of poverty and social exclusion objective**



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.

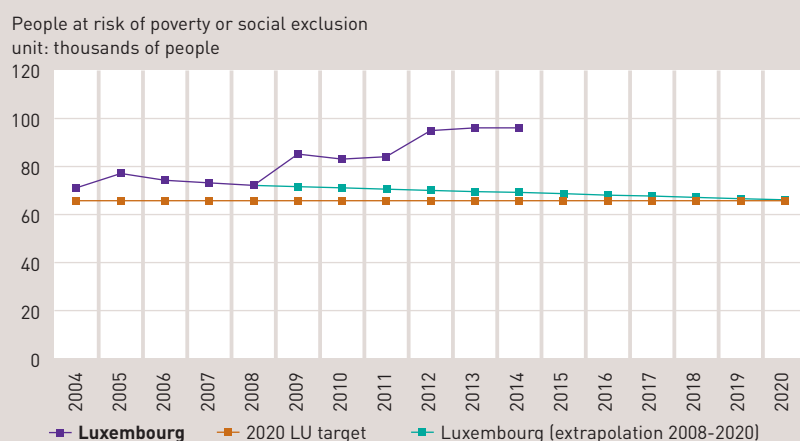
According to the indicator entitled 'people at risk of poverty or social exclusion', it appears that 24.5% of the population of the EU-28 were at risk in 2013. In Luxembourg, this figure was 19% in 2014, with no change from 2013 levels. In Luxembourg, this share is mainly made up of people who are at risk of poverty following social transfers, rather than people living in low work intensity households or suffering true material deprivation.



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'. With about 96,400 people in 2014, 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<sup>34</sup> half way to the Europe 2020 strategy (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.

<sup>34</sup> EUROPEAN COMMISSION, État des lieux de la stratégie Europe 2020 pour une croissance intelligente, durable et inclusive - ANNEXE 1, Bruxelles, March 2014

Chart 24  
Development of the at-risk-of-poverty or of social exclusion rate



Source: STATEC, Eurostat, PNR 2015

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.

### 4.2.3 Conclusions – Taking stock of the situation in Luxembourg

In its country report published in March 2015 as part of the European Semester<sup>35</sup>, the European Commission noted the following with regard to the various national targets for Luxembourg under the Europe 2020 strategy:

- ▼ R&D: Luxembourg is highly unlikely to meet its R&D intensity target by 2020, due to the sharp decline in R&D intensity in the private business sector. R&D intensity in the public sector, on the other hand, has risen continually, multiplying almost fourfold. This reflects Luxembourg's willingness to develop its public research capabilities, which were inexistent just 30 years ago;
- ▼ Early school leaving: the number of young people dropping out of school or giving up a course of training is still an issue for Luxembourg. Early school leaving is a particularly serious problem among the migrant population;
- ▼ Higher education: the higher education rate is above the target rate of 40% set by the EU. Nonetheless, it is lower for the resident national population than for the resident foreign population;
- ▼ Greenhouse gas emissions: according to the latest national forecasts and taking existing measures into account, Luxembourg is not likely to reach its national target for 2020;

<sup>35</sup> EUROPEAN COMMISSION, COMMISSION STAFF WORKING DOCUMENT – Country Report Luxembourg 2015, Brussels, 18 March

- ▼ Renewable energies: the share of renewable energies in final energy consumption has increased slightly, but the country has a long way to go if it is to reach its national target for 2020;
- ▼ Energy efficiency: if Luxembourg keeps up its current trend in terms of primary and final energy consumption, it should meet its 2020 targets;
- ▼ Employment: the employment rate has increased in almost all of the past few years, and Luxembourg is moving closer towards achieving its national target for 2020;
- ▼ Risk of poverty and social exclusion: the number of people at risk of poverty and social exclusion has increased in recent years. The situation of foreign residents remains a major issue for Luxembourg.

In the 2015 update of its analysis on EU and Member States achievements in implementing the Europe 2020 strategy, Eurostat made the following observation concerning Luxembourg<sup>36</sup>: 'Luxembourg has the most ambitious target on tertiary education across the EU, envisioning 66% of the population aged 30 to 34 to have attained tertiary education by 2020. Despite an almost continuous rise between 2009 and 2013 to 52.5, putting Luxembourg in second place across the EU, the country was still the farthest from its national target. In contrast, it has been exceeding its target on early leavers from education and training since 2009, and in 2013 was closer to its employment target than the EU average. In 2013, the country was below the EU average in terms of R&D expenditure and the gap to the national target has widened since 2009. The number of people at risk of poverty or social exclusion rose by one-third between 2008 and 2013, pushing Luxembourg farther from its poverty alleviation target. In relation to its climate change and energy targets, it has remained far behind the EU average in the uptake of renewable energies. In 2012 it also faced the largest gap to its GHG emissions target across the EU'.

Based on the update of the data of the Europe 2020 strategy indicators we have performed in this chapter, we may note the following observations. In the upcoming years Luxembourg:

- ▼ Must make significant efforts in R&D;
- ▼ Is generally on the right path in terms of education;
- ▼ Must make significant efforts on climate change/energy;
- ▼ Is on the right track in terms of employment;
- ▼ Must reduce the number of people at risk of poverty or exclusion.

<sup>36</sup> EUROSTAT, Smarter, greener, more inclusive? Indicators to support the Europe 2020 strategy - 2015 edition, Eurostat statistical books, Luxembourg, 2015

Table 6  
Summary table of the Europe 2020 strategy objectives (July 2014)

Priorities	Smart growth			Sustainable growth			Inclusive growth	
Objectives	Improving conditions for innovation and R&D	Improving education levels		Reaching the climate change/energy objectives			Promoting employment	Reducing poverty
Indicators	R&D	Early school-leaving rate	Higher education	GHG emissions	Renewable energy	Energy efficiency	Employment rate	Poverty
Unit	% of GDP	%	% of 30-34 years old	Mtoe	%	%	% of 20-64 years old	People
LU *	1.30	6.1***	52.7	9.85	3.6	/	72.1	96,400
Tendency **	-	+	+	-	+	+	+	-
2015 Objective	n.d.	n.d.	n.d.	n.d.	5.45%	-14.06%****	71.5%	n.d.
2020 Objective	2.3-2.6%	<10%	66%	8.085*****	11%	48,789 GWh*****	73.0%	-6,000

Source: Eurostat / PNR 2015

Notes: \* Update according to the most recent data available

\*\* Improvement (+), Deterioration (-), Stagnation (0)

\*\*\* National data (MENEJ): 11.6% (2012/2013)

\*\*\*\* 2016 Interim objective

\*\*\*\*\* -20% compared to 2005

\*\*\*\*\* Final energy consumption

## Frame 2

### Performance aggregation: Europe 2020 composite indicator

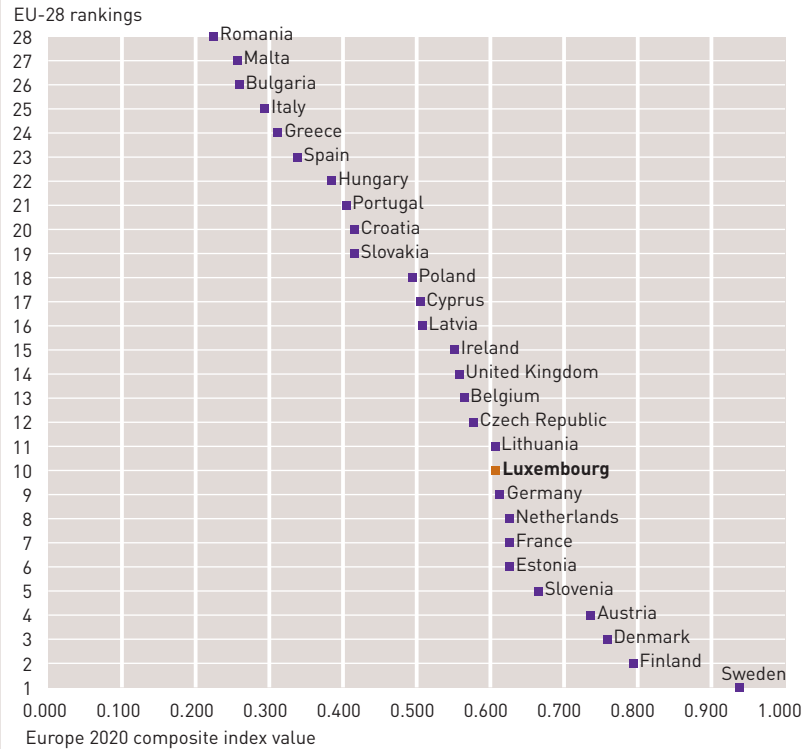
In order to acquire an overview of country performance in relation to the Europe 2020 strategy, a composite indicator is used which collates the performances of each country into a single numerical value based on the latest available data<sup>37</sup>. In this frame, the same methodology is used as that of the national competitiveness report<sup>38</sup>. Luxembourg was given a score of 0.606 out of a maximum 1.000

and is ranked 10th in the EU-28. Sweden is in first place (1st, maximum score achieved), followed by Finland and Denmark. France is in 7th place, the Netherlands 8th, Germany 9th and Belgium 10th. Nonetheless, as can be seen on the following chart, France (0.625), the Netherlands (0.625), Germany (0.611) and Luxembourg (0.606) all achieved similar overall results.

<sup>37</sup> In this framework, all of the Europe 2020 indicators are used except for greenhouse gas emissions and energy efficiency. Using these two indicators in their original form could engender misleading conclusions due to the effects of the economic crisis and the ensuing decline in activity.

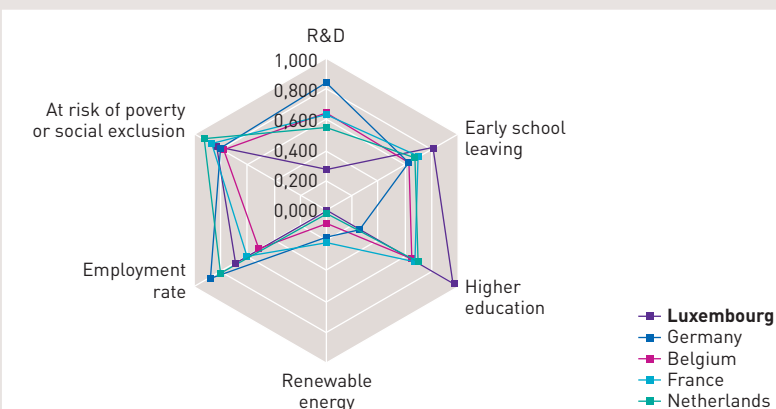
<sup>38</sup> See chapter 3 for more information on the methodology used for calculating the composite indicator.

### Europe 2020 composite index



When comparing the EU countries, the results for Luxembourg are particularly good in the field of education (0.823 and 0.980) as well as poverty and social exclusion (0.868). The results are also positive for the employment rate (0.704).

On the other hand, the results are relatively weak for R&D (0.264), and Luxembourg has the lowest score of all the EU Member States for performance in renewable energies (0.000).



Note: 0 = minimum performance and 1 = maximum performance in the EU.  
Source: Eurostat  
Calculation: ODC

## 4.2.4 Mid-term review of the Europe 2020 strategy

The Europe 2020 strategy, launched in 2010, has reached its mid-term in 2015. The European Commission suggested taking stock of the Europe 2020 strategy. Subsequently, early March, the Commission adopted a communication entitled 'Taking stock of the Europe 2020 strategy for smart, sustainable and inclusive growth'<sup>39</sup>, drawing several preliminary lessons from the first years of implementation of the strategy. The European Commission considers that the reasons for the implementation of the Europe 2020 strategy are just as important in 2014 than they were in 2010. Moving out of the worst economic and financial crisis of its history, the EU needs to strengthen its strategy for smart, sustainable and inclusive growth in order to ensure its position on the global stage. The analysis of the European Commission gives a mixed picture of the headline objectives and flagship initiatives. Although in terms of education, climate and energy, the EU is close to reach the objectives it adopted, this is not the case for employment, R&D or the reduction of poverty. The transposition of these objectives into national level targets has also pointed out several worrying trends, such as an increase in the differences between the best and worst performing Member States. In many ways, the 2010-2014 period served to lay the foundation for the results that should be obtained in years to come.

At this stage, the European Commission has not drawn any conclusion on policies being led, nor has it made any recommendation on policies to be led. The Commission considers that it is necessary to first launch, at EU level, a public consultation with all stakeholders on lessons to be learnt and on the main elements that should define the next stages of the EU post-crisis growth strategy. The Commission launched this public consultation<sup>40</sup> end of May 2014. After this consultation, the Commission has presented its preliminary conclusions in the first term<sup>41</sup>.

### Frame 3

#### State of play of the Europe 2020 Strategy by the IDEA Foundation (March 2015)<sup>42</sup>

According to the Luxembourgish IDEA Foundation, in order to achieve the ambitious Europe 2020 objectives, the European Commission will need to put forward practical proposals on the continuing development of the strategy during the mid-term review. IDEA has put forward four recommendations to help stimulate a debate:

- ▼ Use more qualitative targets;
- ▼ Increase visibility among European citizens;
- ▼ Aim for a holistic and binding strategy;
- ▼ Allocate more funds in order to boost efficiency.

IDEA is not suggesting that the objectives be called into question, nor the deadline for their achievement be modified. IDEA believes that the strategy is based on valid foundations: in fact, fulfilling the Europe 2020 strategy is an urgent matter, given the challenges of increased competitiveness due to globalisation, low productivity in comparison to that of the USA, the scarcity of resources and an ageing population. The objectives set by Europe remain highly ambitious – perhaps even too ambitious considering the current state of play – and the Europe 2020 Strategy is suffering from a lack of political will, which IDEA believes were the two major weaknesses paralyzing the Lisbon Strategy at this stage.

<sup>39</sup> For additional details: [http://ec.europa.eu/europe2020/pdf/europe2020stocktaking\\_fr.pdf](http://ec.europa.eu/europe2020/pdf/europe2020stocktaking_fr.pdf)

<sup>40</sup> For additional details: [http://ec.europa.eu/europe2020/public-consultation/index\\_en.htm](http://ec.europa.eu/europe2020/public-consultation/index_en.htm)

<sup>41</sup> For additional details: [http://ec.europa.eu/europe2020/pdf/europe2020\\_consultation\\_results\\_en.pdf](http://ec.europa.eu/europe2020/pdf/europe2020_consultation_results_en.pdf)

<sup>42</sup> For additional details: <http://www.fondation-idea.lu/2015/03/05/idee-du-mois-n7-europe-2020-quel-avenir-pour-la-strategie-europeenne/>

## 4.3 The macroeconomic surveillance

### 4.3.1 Implementation of the monitoring of macroeconomic imbalances

Macroeconomic imbalances can cause economic crises, particularly in a monetary union because of the limited number of tools available to policy makers. The years before the 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 competitiveness<sup>43</sup>. 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 States<sup>44</sup>. 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.

<sup>43</sup> MONETARY POLICY & THE ECONOMY, Prevention and Correction of Macroeconomic Imbalances: the Excessive Imbalances Procedure, Q4/2011

<sup>44</sup> Based on the two European regulations 1176/2011 and 1174/2011. For additional details:

<http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32011R1176>

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

## 4.3.2 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 first Alert Mechanism Report (AMR)<sup>45</sup> 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 adopted scoreboard includes 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; extreme changes in credit with a high increase in house prices. Statistics that are used annually in the scoreboard are available from the Commission<sup>46</sup> and Eurostat<sup>47</sup> publishes the data that are updated periodically during the year.

<sup>45</sup> 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

<sup>46</sup> For additional details: [http://ec.europa.eu/economy\\_finance/indicators/economic\\_reforms/eip/](http://ec.europa.eu/economy_finance/indicators/economic_reforms/eip/)

<sup>47</sup> For additional details: <http://ec.europa.eu/eurostat/web/macroeconomic-imbalances-procedure/indicators>

For each of these indicators, the Commission – in collaboration with Member States – also defined the thresholds at which performances can be regarded as potentially ‘at risk’ based on the historical statistical distribution of each indicator<sup>48</sup>. 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. However the thresholds should not be considered as political objectives to be reached, but should only be used to identify developments that may lead to imbalances<sup>49</sup>.

#### **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 imbalances 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 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 qualified majority.

### **4.3.3 The 2015 edition of the macroeconomic imbalance procedure**

The fourth edition of the scoreboard was published in the Alert Mechanism Report released in November 2014 as part of the European Semester. Although Luxembourg had exceeded four of the limits by November 2013 according to the previous edition (current account balance, nominal unit labour costs, private sector debt and development of market share in global exports), and consequently underwent an in-depth analysis as part of the preventive arm (2nd step), in the 2015 edition, Luxembourg is no longer on the list of countries for which the Commission has proposed an in-depth analysis in 2015.

In particular, in its examination of Luxembourg, the European Commission came to the following conclusion: ‘In March 2014, the Commission concluded that the macroeconomic challenges in Luxembourg did not constitute substantial macroeconomic risks that would qualify as imbalances in the sense of the MIP. In the updated scoreboard, a couple of indicators are beyond the indicative threshold, namely the unit labour costs, private sector credit growth and private sector debt. Luxembourg’s substantial current account surplus fell further in 2013 on the back of buoyant imports but also falling investments, implying that the three-year indicator has now moved within the threshold. Accumulated losses in Export market shares fell below the threshold after some substantial gains in 2013.

<sup>48</sup> For more details about the implementation methodology of the AMR scoreboard: EUROPEAN COMMISSION, Scoreboard for the surveillance of macroeconomic imbalances, European Economy. Occasional Papers 92, Brussels, February 2012. Source: [http://ec.europa.eu/economy\\_finance/publications/occasional\\_paper/2012/op92\\_en.htm](http://ec.europa.eu/economy_finance/publications/occasional_paper/2012/op92_en.htm)

<sup>49</sup> CENTRE FOR EUROPEAN POLICY STUDIES, Macroeconomic Imbalances in the Euro Area: symptom or cause of the crisis?, Policy Brief No. 266, April 2012

Unit labour costs remain relatively dynamic even if there has been a moderation of unit labour cost growth in 2013. The high level of private indebtedness in Luxembourg, mainly of non-financial corporations, broadly reflects large cross-border intra company loans that are counterbalanced by sizable assets. While general government debt is currently in a favourable position, high sustainability risks exist in the longer term due to mounting age-related liabilities.

Table 7  
AMR scoreboard indicator results (November 2014 edition)

	External imbalances and Competitiveness								
Year 2013	Current Account Balance as % of GDP		Net International Investment Position as % of GDP	Real Effective Exchange Rate (42 IC - HICP deflator)		Export Market Shares		Nominal ULC	
	3 year average	p.m.: level year		% Change (3 years)	p.m.: % y-o-y change	% change (5 years)	p.m.: % y-o-y chang	% change (3 years)	p.m.: % y-o-y change
Thresholds	-4/+6%	-	-35%	± 5% & ± 11%	-	-6%	-	9% & 12%	-
BE	-1.6	0.1	45.8	-0.3	1.5	-9.1	3.6	0.1	2.0
BG	0.4	2.6	-76.2	-1.0	0.1	5.7	6.3	14.8p	7.2p
CZ	-1.7	-1.4	-40.1	-3.1	-2.3	-7.7	-0.8	3.7	0.5
DK	6.1	7.1	39.7	-2.6	1.0	-17.9	2.3	3.4	1.4
DE	6.7	6.8	42.9	-1.9	2.2	-10.7	2.4	6.4	2.4
EE	-1.2	-1.4	-47.1	3.1	2.9	14.0	3.4	9.6	6.8
IE	1.1	4.4	-104.9	-3.9	1.6	-4.9	1.7	1.3	4.2
EL	-3.9	0.6	-121.1	-4.4	-0.6	-27.3	2.9	-10.3p	-7.0p
ES	-0.7	1.4	-92.6	-0.4	1.9	-7.1	4.4	-4.6p	-0.6p
FR	-1.3	-1.4	-15.6	-2.3	1.6	-13.0	2.4	3.9	1.1
HR	-0.1	0.8	-88.7	-4.0	1.2	-20.9	3.5	0.9	1.4
IT	-0.9	1.0	-30.7	0.0	1.9	-18.4	1.3	4.1	1.3
CY	-4.0	-3.1	-156.8	-0.8	1.1	-27.2	-3.9	-5.9p	-5.9p
LV	-2.8	-2.3	-65.1	-1.7	-0.9	8.4	3.1	10.5	7.3
LT	-1.2	1.6	-46.4	-0.6	0.9	22.1	8.9	6.0	3.0
LU	5.5	4.9	216.4	0.7	1.5	2.2	9.9	10.5	3.6
HU	2.2	4.1	-84.4	-4.0	-1.4	-19.2	4.1	5.9	0.8
MT	4.0	3.2	49.2	-1.3	1.4	-4.0	-0.2	9.5	0.9
NL	9.8	9.9	31.3	0.4	2.7	-9.2	2.1	6.3p	1.6p
AT	1.4	1.0	-0.2	0.7	2.1	-17.0	1.8	6.4	2.6
PL	-3.3	-1.3	-68.0	-4.3	0.2	-0.4	6.6	3.9p	0.9p
PT	-2.5	0.7	-116.2	-0.6	0.3	-5.3	7.7	-3.0e	1.9e
RO	-3.3	-0.8	-62.4	0.3	3.9	16.4	16.3	0.7p	4.2p
SI	2.8	5.6	-38.2	-0.7	1.3	-16.6	3.3	1.3	1.4
SK	0.2	2.1	-65.1	2.1	0.9	-2.2	3.9	2.5	0.3
FI	-1.7	-1.4	8.8	0.1	2.9	-32.2	-2.8	9.5	1.7
SE	6.1	6.6	-10.8	5.1	1.7	-15.0	0.1	8.1	1.1
UK	-3.2	-4.2	-15.6	3.4	-1.5	-11.7	-1.7	3.8	1.5

Flags: e: estimated, p: provisional.

Note: Figures highlighted are the ones falling outside the threshold established by AMR. For REER and ULC, the first threshold concerns EA and the second one non-EA. (1) Figures in italic are according to ESA95/BPM5 standards. (2) IE Current Account Balance has been revised downwards following methodological changes in the treatment of FDI investment income. (3) MT Current Account Balance has been revised upwards following the incorporation of SPEs data extracted from administrative records and national account estimates. (4) CY International Investment Position has been revised downwards following the incorporation of ship-owning SPEs. (5) LU International Investment Position has been revised upwards following methodological changes in the treatment of intragroup loans of SPEs and information from a new collection survey in the financial sector. (6) MT International Investment Position has been revised upwards following the incorporation of SPEs data from administrative records and audited financial statements. (7) Total world export is based on BPM4. (8) Due to derogations for employment series according to ESA 2010, HR ULC is based on ESA 95. (9) House Price only: e = NSI estimates for PL; source NCB for EL, AT. (10) FR Unemployment Rate has been revised downwards. The revision is mainly due to methodological reasons.

Source: European Commission, Eurostat and DG ECFIN (for the indicators on REER)

Risks to domestic financial stability stemming from the country's large financial sector still exist, but they remain relatively contained as the sector is diversified and specialized at the same time. Domestic banks meanwhile, post sound capital and liquidity ratios. However, the dynamism of house prices represents a source of concern. Even if the risk of a sharp price correction appears low, there are supply side concerns and investment in residential construction is falling. Overall, the Commission will at this stage not carry out further in-depth analysis in the context of the MIP'.

	Internal imbalances						
	% y-to-y change in Deflated House Prices	Private Sector Credit Flow as % of GDP, consolidated	Private Sector Debt as % of GDP, consolidated	General Government Sector Debt as % of GDP	Unemployment rate		y-to-y % change in Total Financial Sector Liabilities, non-consoli- dated data
					3-year average	p.m.: level year	
	6%	14%	133%	60%	10%	-	16.5%
	0.0	1.1	163.0	104.5	7.7	8.4	-2.4
	-0.1	6.7	134.8	18.3	12.2	13.0	3.3
	-1.2	3.1p	73.7p	45.7	6.9	7.0	9.8p
	2.8	-1.4	222.6	45.0	7.4	7.0	-0.1
	1.8p	1.2p	103.5p	76.9	5.6	5.3	-6.3p
	7.3	5.4	119.4	10.1	10.3	8.6	8.9
	0.3	-5.7	266.3	123.3	14.2	13.1	1.0
	-9.3e	-1.1p	135.6p	174.9	23.3	27.5	-16.3
	-9.9	-10.7p	172.2p	92.1	24.1	26.1	-10.2
	-2.6	1.8e	137.3e	92.2	9.8	10.3	-0.6
	-18.1p	-0.2	121.4	75.7	15.8	17.3	3.4
	-6.9p	-3.0	118.8	127.9	10.4	12.2	-0.7
	-5.5	-11.2p	344.8p	102.2	11.9	15.9	-19.5
	6.6	0.8	90.9	38.2	14.4	11.9	5.2
	0.2	-0.2	56.4	39.0	13.5	11.8	-1.8
	4.9	27.7	356.2	23.6	5.3	5.9	8.8
	-5.0	-1.0	95.5	77.3	10.7	10.2	-0.3
	-2.1	0.4p	137.1	69.8	6.4	6.4	0.7
	-7.8	2.1p	229.7p	68.6	5.5	6.7	-3.2
	2.5e	0.2	125.5	81.2	4.5	4.9	-3.6
	-4.4e	2.9	74.9	55.7	10.0	10.3	7.6
	-2.5	-2.4e	202.8e	128.0	15.0	16.4	-5.3
	-4.6p	-1.5p	66.4p	37.9	7.0	7.1	3.1
	-5.8	-4.0	101.9	70.4	9.1	10.1	-10.5
	-0.5	5.4	74.8	54.6	14.0i	14.2	-0.3
	-1.3	0.7	146.6	56.0	7.9	8.2	-11.8
	4.7	3.7	201.1	38.6	7.9	8.0	9.1
	1.6	3.4p	164.5p	87.2	7.9	7.6	-7.4p

## 4.3.4 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. Therefore differences can occur between the present results in the 2015 Competitiveness Report and those of the last alert mechanism scoreboard (November 2014). The present data were downloaded in the end of July 2015, and are thus an update halfway between the last alert mechanism report and the one that the Commission will publish in November 2015 in the context of its annual growth survey, which will launch the 2016 European semester.

### 4.3.4.1 External and competitiveness imbalances

#### a. The current account balance<sup>50</sup>

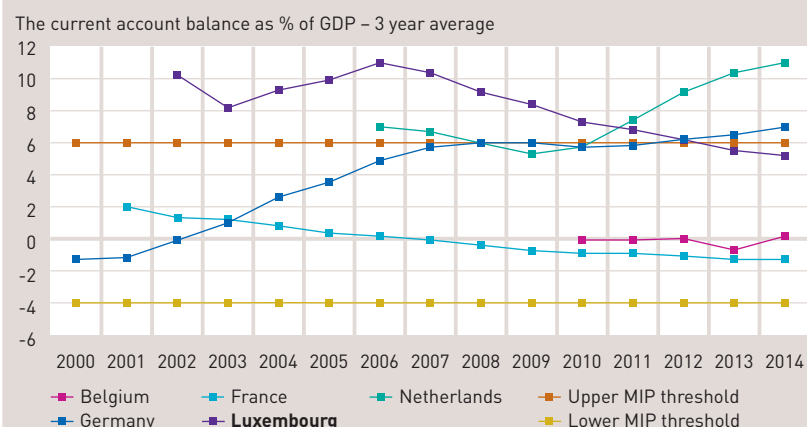
Regarding the current account balance, unlike a country financing need (negative balance), a financing capacity (positive balance) does not seem an evidence of imbalance since it doesn't threaten the sustainability of its external debt. For this indicator, it has been agreed under the MIP that a country 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.

The crisis has had a significant impact on the current account balance, both for Member States with surpluses and countries with deficit.

Between 2002 and 2012, Luxembourg's results were above the upper threshold established under the MIP. In theory, its current account balance is thus 'too high' according to MIP criteria. However, after this period (i.e. in 2013 and 2014) the country's account balance fell to below the upper threshold. In Luxembourg, the services balance is the only one to show a surplus. Financial services alone account for the large majority of this surplus, although other services e.g. business services, telecommunications, transport and insurance also recorded surpluses.

<sup>50</sup> 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 sub-balances: the current account, the capital account and the financial account. The current account is the main determinant of the financing capacity or need of an economy; it provides important information on the economic relations of a country with the rest of the world. It reports all transactions (other than those recorded under financial headings) in economic values that occur between resident and non-resident units.

Chart 25  
The current account balance, as % of GDP (3 year average)

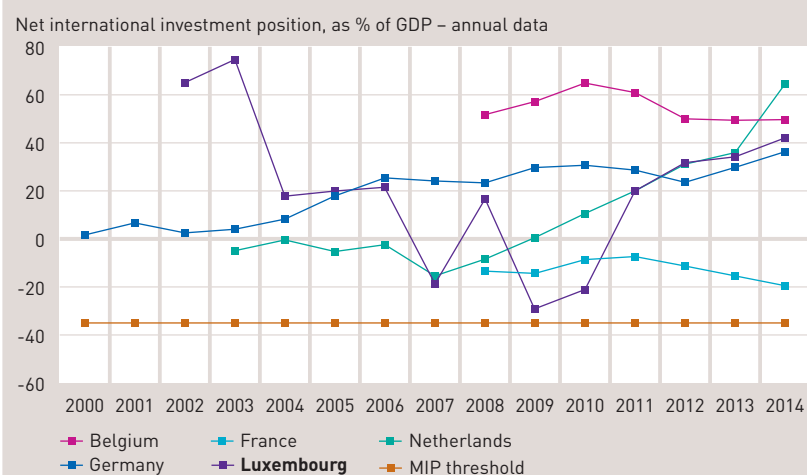


Source: Eurostat, yellow and orange lines = thresholds of -4%/+6% set by MIP  
Note: A Member State is considered to be at risk of imbalance if its balance surplus exceeds the +6% of GDP threshold or if the deficit of its balance is below -4% of GDP. If the current account balance is between those two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

## b. Net international investment position<sup>51</sup>

The indicator of the net external position provides information on the relationship between foreign assets and the external debt of a country. 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.

Chart 26  
Net international investment position, as % of GDP



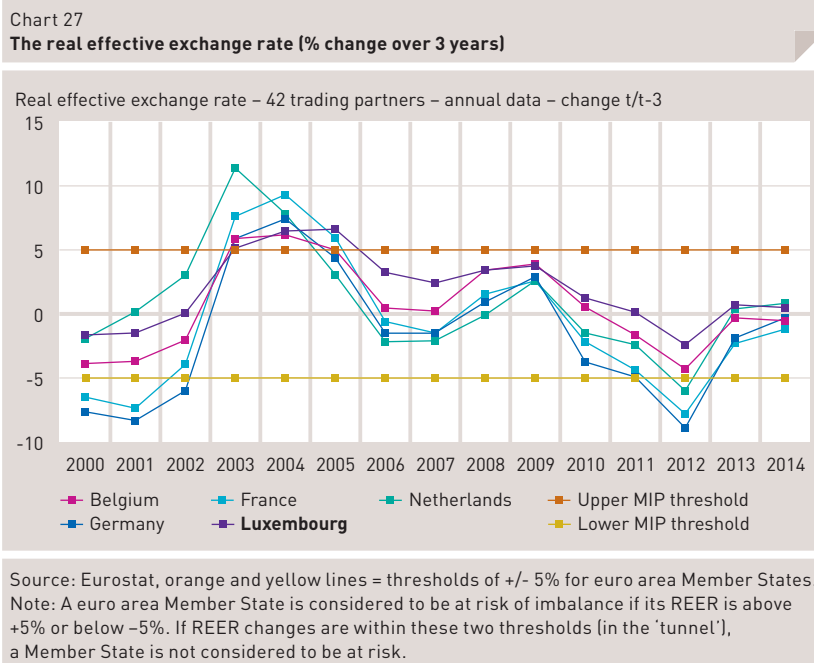
Source: Eurostat, orange line = threshold of -35% set by MIP  
Note: A Member State is considered to be at risk of imbalance if its net international position is below -35% of GDP. If the indicator is above this threshold, a Member State is not considered to be at risk.

<sup>51</sup> 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.

In line with a significant current account surplus, Luxembourg complies with set criteria regarding the balance of the net international investment position. Its foreign assets are much higher than its foreign liabilities. In this context, the situation of Luxembourg is particular within the EU because the size of the financial centre is very large compared to the size of the country.

### c. The real effective exchange rate (REER)<sup>52</sup>

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%. In 2003, 2004 and 2005 Luxembourg had exceeded the upper threshold. Between 2006 and 2014 Luxembourg is between the upper and lower thresholds and fulfils therefore the procedure criteria.

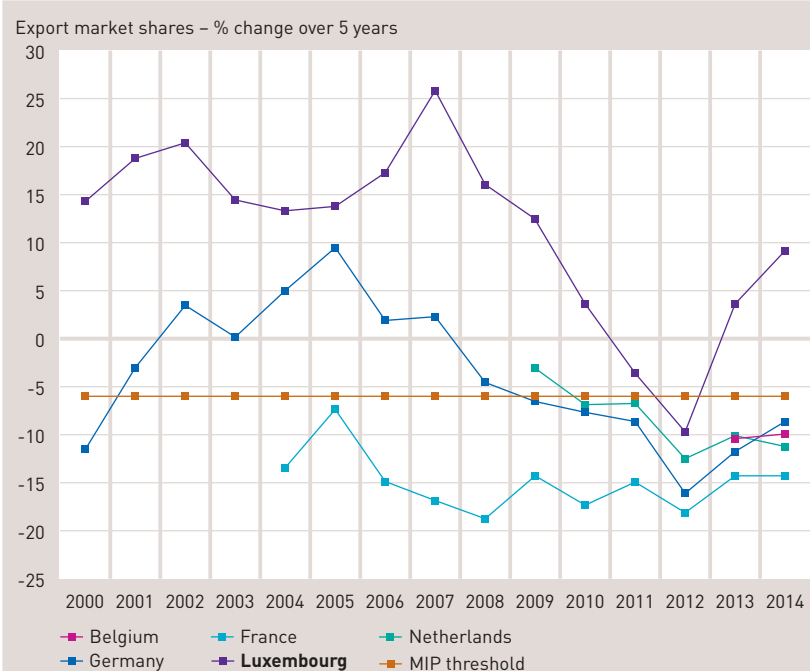
<sup>52</sup> The REER aims to assess the price competitiveness or the cost competitiveness of a country compared to its main competitors in international markets. Changes in cost competitiveness and price competitiveness depend not only on changes in the exchange rate, but also on the cost and price evolution. The REER that is specific to scoreboard indicators for excessive imbalance procedure is deflated with the price index (total economy) compared to a group of 37 countries (i.e. EU-28 and 9 other industrialized countries: Australia, Canada, USA, Japan, Norway, New Zealand, Mexico, Switzerland and Turkey). 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. An increase in the index indicates a loss of competitiveness.

#### d. Export market shares<sup>53</sup>

The AMR 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 from emerging economies. For this indicator, it has been agreed under the MIP that a country is potentially at risk if this indicator is less than -6%.

Chart 28

#### Export market shares (% change over 5 years)



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 of export market shares is below -6%. If the indicator is above this threshold, a Member State is not considered to be at risk.

Between 2000 and 2011, Luxembourg's results were within the established limits. However, in 2012 Luxembourg lost market shares at global level, and thus was unable to remain above the threshold during that year. Since 2013, the negative trend was halted and Luxembourg has once again risen above the lower limit.

<sup>53</sup> 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.

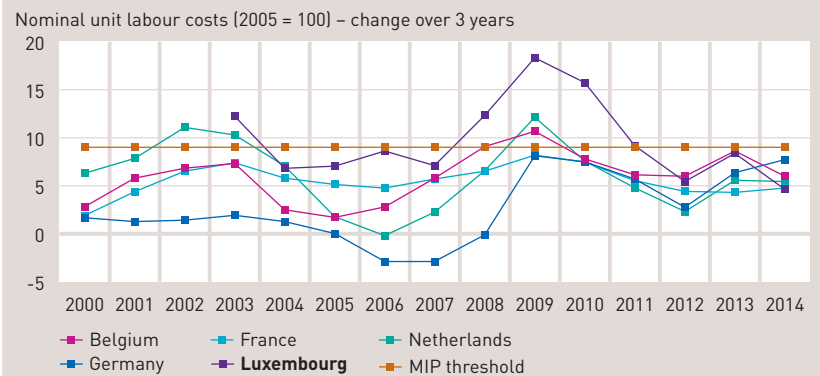
### e. Nominal unit labour costs<sup>54</sup>

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, or the cost of labour per unit of value added produced, is compared to those of the main trading partner countries. Thus 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%.

In 2003 Luxembourg exceeded the upper limit, but fell below it the following year and remained in this position until 2007. Between 2008 and 2011, Luxembourg exceeded the limit once again. The increase in 2008 was largely due to a decline in productivity which occurred in practically every sector. One factor which explains why Luxembourg suffered particularly from this trend is the important role of the financial sector in the Luxembourgish economy. The significant drop in productivity in this sector in recent years has contributed significantly to the increase in ULC in Luxembourg. This also applies to the development of the industry, which has enacted major job protection programmes during the last few years of crisis. Between 2012 and 2014, the ULC indicator fell to under the threshold once again.

Chart 29

#### Nominal CSU - % change over 3 years



Source: Eurostat, orange line = threshold of +9% for euro area Member States

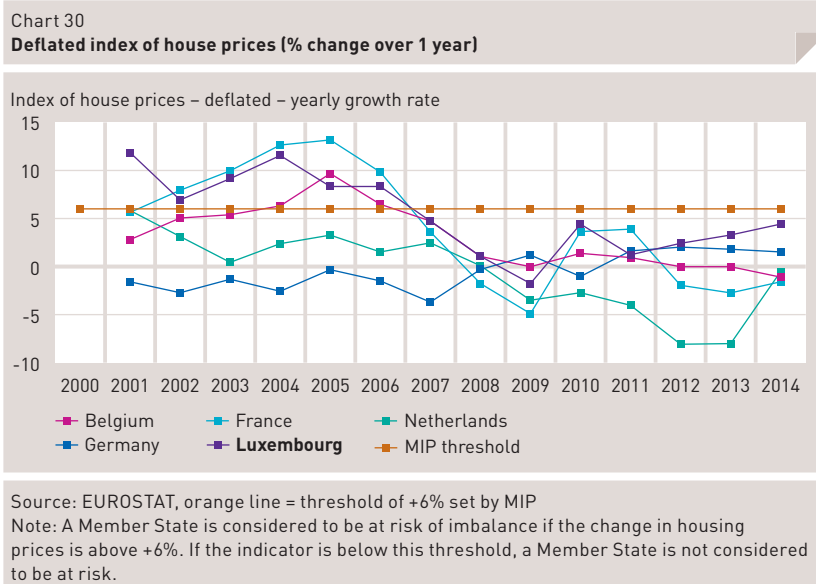
Note: A euro area Member State is considered to be at risk of imbalance if the change in its nominal ULC is above +9%. If the indicator is below this threshold, a Member State is not considered to be at risk.

<sup>54</sup> The nominal unit labour costs (NULC) are defined as the ratio of total employees 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.

## 4.3.4.2 Internal Imbalances

### a. House prices<sup>55</sup>

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%.



Regarding the change in real estate prices (housing) in Luxembourg, prices have risen almost without interruption since 2001, except in 2009. Between 2001 and 2006 Luxembourg has exceeded the set upper threshold every year but has not exceeded it since 2007. Since 2010 Luxembourg has displayed a positive real change in house prices, which is nevertheless below the set threshold but approaching again in 2014 the set threshold.

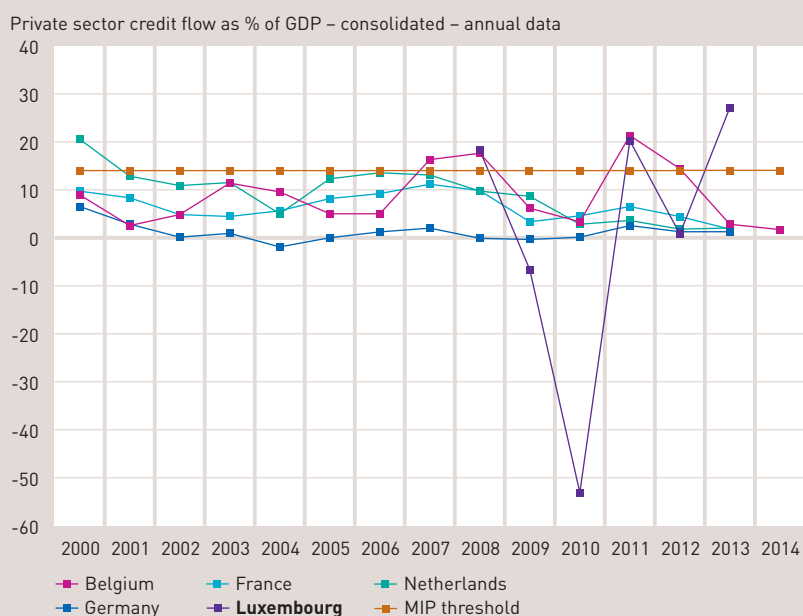
<sup>55</sup> The deflated index of house prices is the ratio between the housing price index and the deflator of private final consumption expenditure (households and non-profit institutions). Therefore this indicator measures inflation in the housing market compared to that of final consumption of 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 A compared to the year A-1.

## b. Private sector credit flow<sup>56</sup>

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 with regard to this indicator is very volatile, much more so than for its neighbouring countries. According to the latest available data for 2013, the country has exceeded the established limits.

Chart 31

### Private sector credit flow (as % of GDP)



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.

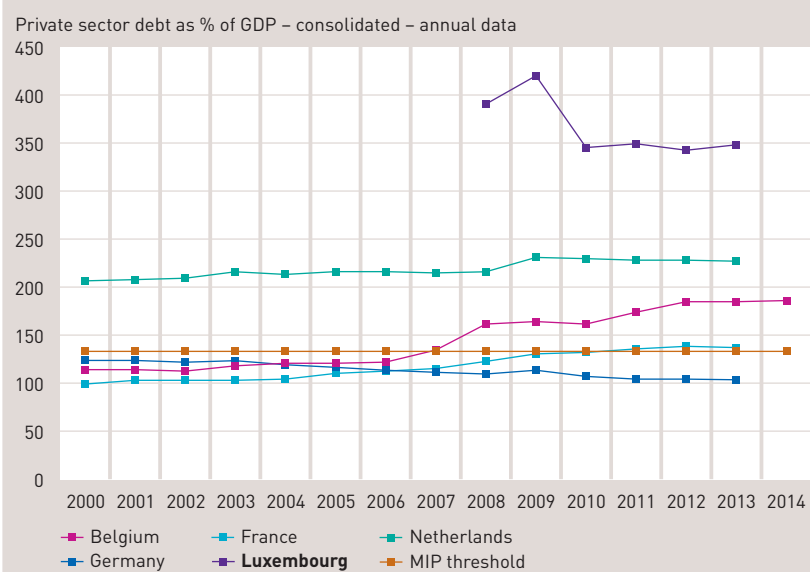
<sup>56</sup> The private sector credit flow corresponds to the net changes in liabilities of the non-financial corporate sectors (S.11), households and non-profit institutions serving households (S.14\_S.15) incurred during the year. The instruments included in the calculation of private sector credit 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 debt<sup>57</sup>

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 (as a % of GDP). 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.

<sup>57</sup> The private sector debt corresponds to the outstanding amount of liabilities of non-financial corporate sectors (S.11), households and non-profit institutions serving households (S.14\_S.15). 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 non-consolidated basis, i.e. excluding transactions among units of the same sector. The PDM indicator is calculated as a percentage of GDP.

Chart 32  
**Consolidated private sector debt (as a % of GDP)**



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.

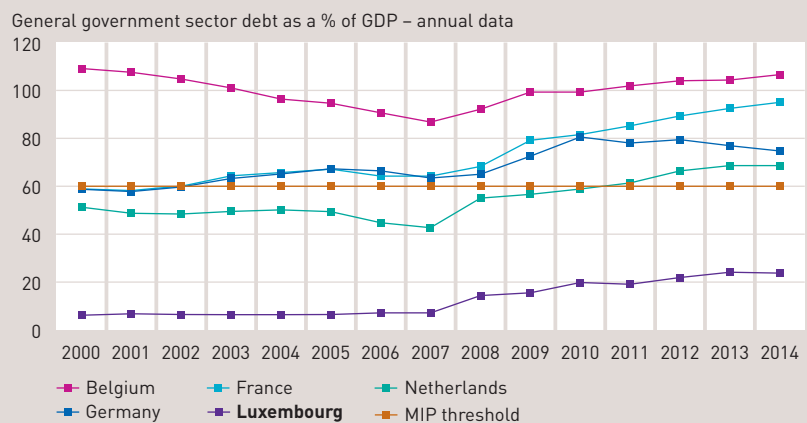
Since this indicator is available for Luxembourg (2006), it significantly overruns the threshold set by the MIP. However, in Luxembourg this indicator should be interpreted with caution because non-financial companies incur most of this private sector debt. Given the liquidity of financial markets and 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 private household debt, this debt results mainly from loans taken for housing acquisition, and is close to the euro area average.

#### d. General government sector debt<sup>58</sup>

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.

Luxembourg has a general government sector debt level well below the 'Maastricht' threshold (60% of GDP), and well below that of its neighbours, although since 2007 general government sector debt has also started to rise sharply in Luxembourg.

Chart 33  
General government sector debt (as a % of GDP)



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.

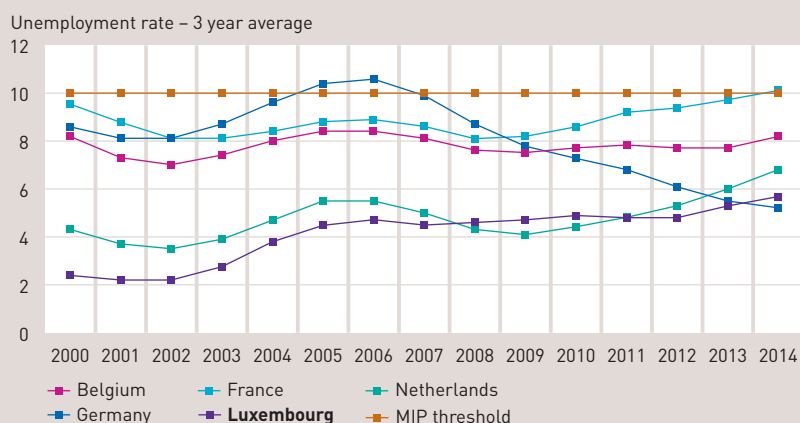
<sup>58</sup> General government gross debt is defined in the Maastricht Treaty as the consolidated gross debt of the whole general government sector in nominal value at the end of the year. The government sector includes the following subsectors: central government, State government, local government 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 are 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 score-board.

<sup>59</sup> 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. Unemployed 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 A data are the arithmetic mean of the years A, A -1, A -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 more details: [http://www.adem.public.lu/publications/communiques/Note\\_tech-nique\\_sur\\_les\\_DSM\\_-\\_ADEM\\_24\\_02\\_2012.pdf](http://www.adem.public.lu/publications/communiques/Note_tech-nique_sur_les_DSM_-_ADEM_24_02_2012.pdf)

#### e. Unemployment rate<sup>59</sup>

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 set by the MIP, although since 2000 unemployment has risen sharply in Luxembourg, in such a way that in 2014 the unemployment rate is for the first time higher in Luxembourg than in Germany.

Chart 34  
Unemployment rate (3 year average)



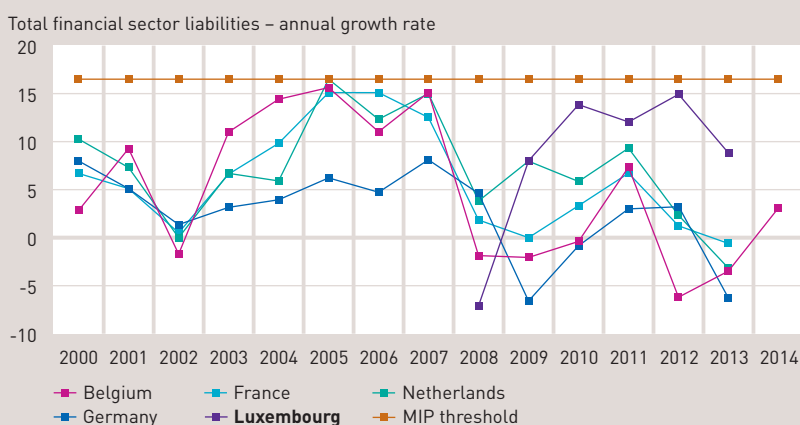
Source: Eurostat; orange line = threshold of 10% set by MIP

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.

#### f. Total financial sector liabilities<sup>60</sup>

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%. Since this indicator has been available, Luxembourg has been below the limit set by the MIP. However, Luxembourg has recorded significant annual variations since 2008, moving closer towards the allowed limit since 2010, but without exceeding it. According to the latest available data for 2013, the growth rate is nonetheless slowing down once again.

Chart 35  
Growth rate of the total financial sector liabilities



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.

<sup>60</sup> 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.

### 4.3.4.3 Interim conclusions

Based on the updated data used in this chapter, and pending the 2016 AMR report, we note that Luxembourg has exceeded 2 thresholds: the private sector credit flow and the private sector debt.

Table 8  
Summary table of the alert mechanism update (July 2015)

	External imbalances					Internal imbalances					
	Current account balance	Net international investment position	Real effective exchange rate	Export market share	Nominal ULC	Deflated house prices	Private sector credit flow	Private sector debt	General government sector debt	Unemployment rate	Total financial sector liabilities
LU *	5.2	42.0	0.5	9.1	4.6	4.4	27.1	348.3	23.6	5.7	8.8
Thresholds **	> -4% < +6%	> -35%	> -5% < +5%	> -6%	< +9%	< +6%	< +14%	< 133%	< 60%	< 10%	< +16.5 %

Source: European Commission, Eurostat

Notes: \* Situation according to the data available on 7 July 2014.

\*\* Conditions for not being considered imbalanced (for some indicators these thresholds are different for the euro area Member States and for other Member States).

In future editions of the AMR report used as part of the macroeconomic imbalance procedure, due in Autumn 2015, various changes may appear in comparison with the current version of the scoreboard which has been used for the past few years. Any modifications will be taken into account in future annual editions of the Competitiveness Report.

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<http://ec.europa.eu/eurostat/web/macroeconomic-imbalances-procedure/indicators>

## **5      The economic impact of the 5 new priority sectors**

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# 5.1 Introduction

This study was conducted to increase the pool of statistics pertaining to quantitative and qualitative indicators so as to better assess developments in the government’s five new priority sectors, namely information and communication technologies (ICT), space technologies, logistics, health sciences and technologies and eco-technologies. The aim is to analyse the economic impact of these sectors on productivity, economic growth and employment. Productivity is generally measured in terms of labour productivity (gross production or added value), economic growth in terms of change in gross domestic product (GDP) or added value and employment in terms of the number of jobs created by the impact of the new sectors<sup>1</sup>.

Following an in-depth analysis of the available studies and the proposal of a single definition for each of the five sectors in question (see 2014 Competitiveness Report<sup>2</sup>), it was possible to calculate some of the indicators initially proposed for each of the sectors under analysis.

This chapter presents the main data gleaned from the analysis of the government’s five new priority sectors.

# 5.2 Methodology

The data presented in this study were calculated on the basis of the data made available by STATEC. Where data could not be made available due to data confidentiality restrictions, the *Observatoire de la compétitivité* (ODC) calculated the data on the basis of reports submitted to the Trade and Companies Register. In order to estimate the size of the companies analysed in relation to the national economy as a whole, the value added at factor cost for each one was calculated in accordance with the International Accounting Standards (IAS) regulations, i.e. Regulation (CE) 1606/2002 of the European Parliament and the Council and Regulation (CE) 1725/2003 of the European Commission<sup>3</sup>.

<sup>1</sup> United Nations, Measuring the Impacts of Information and Communication Technology for Development, 2011

<sup>2</sup> [http://www.odc.public.lu/publications/perspectives/PPE\\_029.pdf](http://www.odc.public.lu/publications/perspectives/PPE_029.pdf)

<sup>3</sup> Value added at factor cost refers to ‘turnover, plus capitalised production, plus other operating income (including operating subsidies), plus or minus the changes in stocks, minus the purchases of goods and services, minus other taxes on products which are linked to turnover but not deductible, minus the duties and taxes linked to production’. Value added at factor cost can also be obtained by adding staff costs to the gross operating surplus. It can be directly obtained from the following accounting statistics: net turnover, changes in stocks of finished goods and work in progress, work performed by the undertaking for its own purposes and capitalised, costs of raw materials and consumables, other external costs, other operating costs, other operating revenues.

## 5.3 Private sector macroeconomic indicators

### 5.3.1 Information and communication technologies (ICT)

ICT is a cross-cutting tool for the economy. The sector, as defined in the 2014 Competitiveness Report<sup>4</sup>, is composed of three categories of stakeholders:

- ▼ ICT producers, according to the strict OECD or Eurostat definitions (electronic hardware and components, telecommunications, ICT services or software, etc.);
- ▼ Activities involving digital content, the existence of which is linked to the emergence of ICT (online services, video games, e-commerce, etc.);
- ▼ ICT users who use ICT to make productivity gains but whose activities pre-date the emergence of ICT (banks, insurance, automotive and aeronautics, distribution, administration and tourism, etc.).

This analysis draws upon two previously employed definitions:

- ▼ Strict definition: this definition includes the production of ICT hardware and software (manufacturing), the distribution of ICT products and services (commerce) and the provision of services to facilitate the use of ICT (service activities), on the basis of the OECD and Eurostat definitions of the ICT sector;
- ▼ Broad definition: this definition is more difficult to pinpoint as it comprises other activities indirectly linked to ICT use, such as activities which are dependent upon the emergence of ICT, e.g. e-commerce, media and digital content).

Statistical analysis of ICT in the private sector is based upon activities which fall under the strict and broad definitions of the sector.

<sup>4</sup> [http://www.odc.public.lu/actualites/2014/10/Bilan\\_Competitivite\\_2014/index.html](http://www.odc.public.lu/actualites/2014/10/Bilan_Competitivite_2014/index.html)

## a) ICT (strict definition)

The strict definition of the ICT sector is underpinned by the analysis of activities listed in the European nomenclature of economic activities, NACE Rev. 2, in accordance with the Eurostat definition (Table 1).

Activities	NACE Rev. 2 Code	Description
Manufacturing industries	26.110	Manufacture of electronic components
	26.120	Manufacture of loaded electronic boards
	26.200	Manufacture of computers and peripheral equipment
	26.300	Manufacture of communication equipment
	26.400	Manufacture of consumer electronics
	26.800	Manufacture of magnetic and optical media
Services industries	46.510	Wholesale of computers, computer peripheral equipment and software
	46.520	Wholesale of electronic and telecommunications equipment and parts
	58.210	Publishing of computer games
	58.290	Other software publishing
	61.100	Wired telecommunications activities
	61.200	Wireless telecommunications activities
	61.300	Satellite telecommunications activities
	61.900	Other telecommunications activities
	62.010	Computer programming activities
	62.020	Computer consultancy activities
	62.030	Computer facilities management activities
	62.090	Other information technology and computer service activities
	63.110	Data processing, hosting and related activities
	63.120	Web portals
	95.110	Repair of computers and peripheral equipment
	95.120	Repair of communication equipment

Table 2 lists several macroeconomic indicators showing how the sector has developed since 2005. Aside from the 'number of companies' variable, comprised of the number of companies active in the ICT manufacturing sector and ICT services sector, the indicators refer only to the ICT services industry. The reason for this is that the number of companies active in the ICT manufacturing sector is very small (3 in 2008, 2011 and 2012 and only 2 in 2009 and 2010) and, as the numbers are so small, there are data confidentiality issues pertaining to companies in this sector.

Table 2  
Indicators relating to the ICT services sector (private sector)

ICT (strict definition)	2005	2006	2007	2008	2009	2010	2011	2012
<b>Number of companies</b>	1,357	1,429	1,497	1,554	1,618	1,694	1,755	1,838
	5.1%	5.2%	5.3%	5.3%	5.3%	5.4%	5.4%	5.5%
<b>Number of people employed</b>	10,467	11,298	12,458	13,515	13,888	14,372	15,022	15,353
	3.4%	3.5%	3.7%	3.9%	3.9%	4.0%	4.1%	4.1%
<b>Number of salaried workers</b>	10,303	11,155	12,309	13,338	13,722	14,184	14,816	15,169
		3.7%	3.9%	4.0%	4.1%	4.2%	4.2%	4.2%
<b>Value added at factor cost</b> (in € millions)	1,593.4	1,739.3	1,887.2	2,101.2	2,186.1	2,542.2	2,766.1	2,853.3
	6.1%	5.9%	5.9%	6.3%	6.8%	7.2%	7.3%	7.3%
<b>Turnover</b> (in € millions)	5,398.0	6,460.3	6,064.7	6,107.6	6,635.9	8,800.7	9,694.2	11,448.7*
<b>Staff costs</b> (in € millions)	629.6	713.4	802.3	874.3	920.1	982.1	1,074.1	1,079.1
<b>Gross investment in tangible goods</b> (in € millions)	125.7	320.5	340.8	202.0	454.6	613.7	649.3	628.7
<b>Turnover per employee</b> (in € millions)	515.7	571.8	486.8	451.9	477.8	612.3	645.3	745.7*
<b>Apparent labour productivity</b> (gross added value per employee)	152.2	153.9	151.5	155.5	157.4	176.9	184.1	185.8
<b>Investment rate</b> (investment/value added at factor cost)	7.9%	18.4%	18.1%	9.6%	20.8%	24.1%	23.5%	22.0%

Note: Aside from the 'number of companies' variable, which refers to the whole of the ICT industry (manufacturing and service providers), all other indicators refer only to ICT services due to the confidential nature of data relating to ICT manufacturing activities (3 companies).

The percentages shown in italics represent the sector's share of the total indicator figure for Luxembourg.

\*Break in the series due to the reclassification of certain companies.

Source: STATEC ([http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=9917&IF\\_Language=eng&MainTheme=4&FldrName=1&RFPPath=9796](http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=9917&IF_Language=eng&MainTheme=4&FldrName=1&RFPPath=9796))

The ICT sector has undergone significant developments during the past few years. Whilst in 2005 there were only 1,357 companies in the ICT sector, 7 years later the figure stands at 1,838, an increase of 35.4% (an annual increase of 5.1%). The number of employees equates to 15,353, an increase of 46.7% (annual growth rate: 5.6%), whereas there has been a 71.4% increase in staff costs over the same period (an annual growth rate of 8%). It can also be concluded that the ICT sector does not seem to have been particularly affected by the economic and financial crisis. In fact, the number of companies, the number of employees and turnover have all significantly increased (Chart 1).

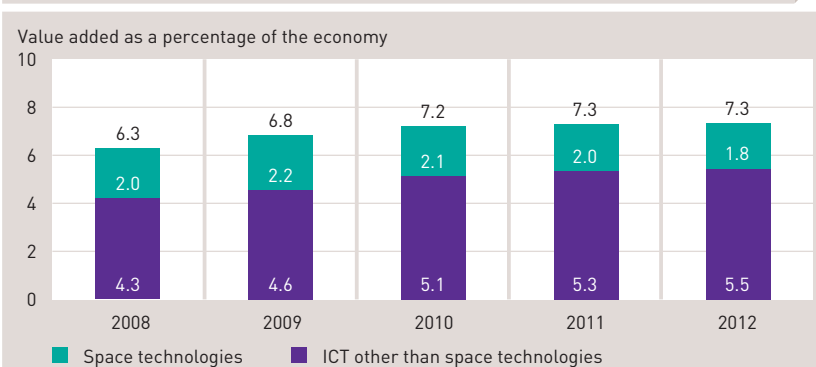
Chart 1  
Variation in number of employees and companies in the ICT sector (strict definition)



Source: STATEC ([http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=9917&IF\\_Language=eng&MainTheme=4&FldrName=1&RFPath=9796](http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=9917&IF_Language=eng&MainTheme=4&FldrName=1&RFPath=9796))

At the end of 2012, the added value generated by ICT companies accounted for 7.3% of Luxembourg's economy, i.e. over €2.8 billion (a 79.1% increase on 2005 figures and a 35.8% increase on 2008-2012 data). However, it should be mentioned that around 2% of the ICT sector's added value was generated by companies active in the space technologies sector, which is also included in the ICT category used by Eurostat (see Chapter 3.2) (Chart 2).

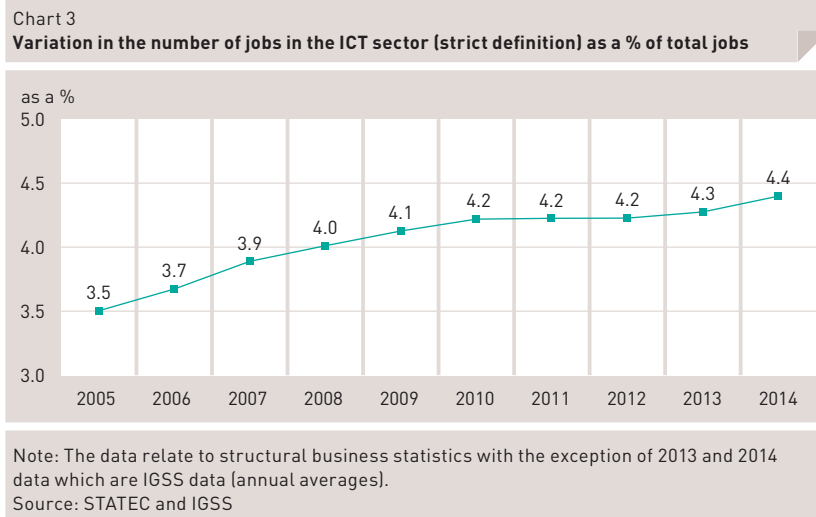
Chart 2  
Breakdown of value added at factor cost in the ICT sector (strict definition)



Source: Statistiques structurelles sur les entreprises (STATEC), bilans des entreprises déposés au RCS, Calculation: ODC

In 2012, telecommunications activities (of which space technologies make up the lion's share) generated the majority of added value in the ICT sector (57%), followed by programming activities, consultancy and other ICT activities (21.3%), the publishing of video games and other software (3.4%) and information services (1.3%). The ICT sector (strict definition) represented a gross added value of €2.9 billion and a turnover of €11.5 billion in 2012.

As regards employment, the number of people employed in the ICT sector as a percentage of the number of jobs in Luxembourg has constantly increased. In 2005, the sector accounted for 3.5% of all jobs whereas in 2014, it represented 4.4% of all jobs in Luxembourg, i.e. 16,365 jobs in 2014 (Chart 3).



The recently published Note de conjoncture<sup>5</sup> states that ICT employment is heavily concentrated in the field of ICT services (90%) and ICT trade (10%) whilst employment in ICT manufacturing represents only 0.2% of total employees in the sector. Furthermore, there were over 4,541 employees in telecommunications (NACE code 61) in 2014 compared with only 3,744 in 2005, an increase of 29.3% over a 9-year period. The Post Luxembourg group, which employs almost 4,000 people, features amongst the companies in this sector<sup>6</sup>. However, over half of the ICT jobs in Luxembourg (over 8,000 jobs) are in programming, consultancy and other ICT activities (NACE code 62). This category features companies such as Sogeti Luxembourg SA, which has more than 500 employees, Telindus SA and Computer Task Group Luxembourg PSF SA. However, these activities only account for one fifth of the sector's gross added value, i.e. €660 million and a turnover of approximately €2 billion<sup>7</sup>. The most significant sectors of growth in the period between 2012 and 2014 were data processing, hosting and related activities (NACE 63.110) and computer programming activities (NACE 62.010) which registered an increase in job numbers of 403 and 280 respectively over the two years. The increase in jobs in the NACE 62.010 category is due, amongst other things, to the creation of two new legal entities in the Amazon group and the reclassification, compared with 2012, of several legal entities which are also considered e-commerce companies under our definition (see paragraph entitled 'ICT (broad definition)').

<sup>5</sup> STATEC, Note de conjoncture No 1-15, 2015

<sup>6</sup> It should be noted that this figure accounts for the whole of the Post Luxembourg group as the NACE for a company's, or group's, primary activity code is allocated by STATEC on the basis of the activities which generate over 50% of the company's added value (STATEC, NACE LUX Rev. 2, Luxembourg version of NACE Rev. 2, statistical nomenclature of economic activities in the European Community. Introduction, structure and explanatory notes, 2008).

<sup>7</sup> Source: Statistiques structurelles sur les entreprises (STATEC)

The 51 companies which produce video games and other software (NACE 58.200) generate 3.4% of the sector's added value, i.e. €98 million<sup>8</sup>. The three video game producers have made a significant contribution to growing the sector's added value since their arrival in Luxembourg in 2012 (including Kabam which has since left Luxembourg). When new data becomes available it will be possible to analyse the impact for e-commerce of the change in the VAT system which was introduced in 2015, and see the tax shift from the country of the service provider to the country of the consumer.

Table 3 lists the main employers in the ICT sector on the basis of the primary activity of the group.

Table 3 Main employers in the ICT sector	
Name	Approx. number of employees
Group Post Luxembourg	4,230
Sogeti Luxembourg SA	540
Telindus SA	390
Computer Task Group Luxembourg PSF SA	260
Vodafone Procurement Company SARL	240
Dimension Data Luxembourg PSF SA	190
CGI Luxembourg SA	170
Comptoir Électrotechnique Luxembourgeois SARL	150
Eltrona-Interdiffusion SA	150
Champ Cargosystems SA	130
Tango SA	130
Innovative Solutions for Finance SARL	120
Rovi International Solutions SARL	120
Groupe Fujitsu Technology Solutions SA	120
Csc Computer Sciences Luxembourg SA	110
Aubay SA	100
Source: Liste des principaux employeurs au Luxembourg, June 2015 (STATEC)	

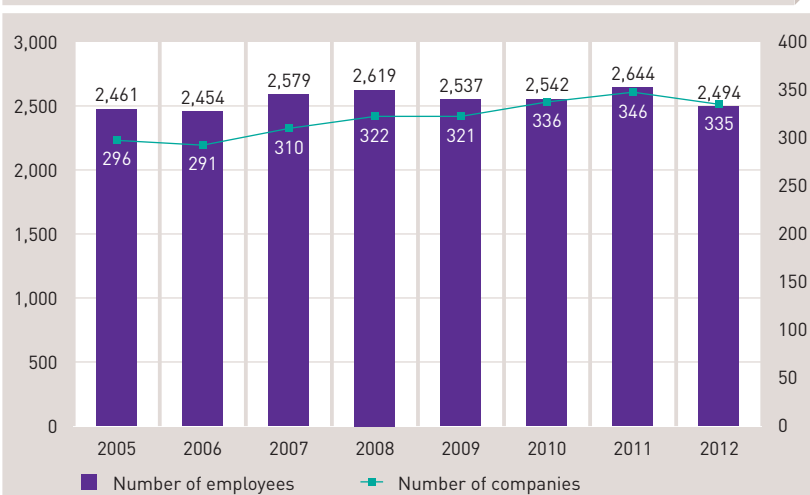
## b) ICT (broad definition)

In addition to Eurostat's definition of the ICT sector, the *Observatoire de la compétitivité* carried out analysis of ICT-related activities in a bid to broaden the definition of the sector and include activities whose existence is dependent upon ICT. Therefore, the sector which the OECD refers to as 'content and media' and Eurostat calls 'information services'<sup>9</sup> was analysed. At the end of 2012, this sector featured 335 companies employing 2,494 staff in Luxembourg (Chart 4). These figures had remained largely unchanged since 2005 in spite of the fact that the size of these activities as a percentage of the gross added value of the country's economy had reduced from 0.7% in 2005 to 0.5% in 2012 with turnover dropping from €620 million to €444 million, i.e. a reduction of 28.4%, over the period in question.

<sup>8</sup> Source: Statistiques structurelles sur les entreprises (STATEC)

<sup>9</sup> Definition of the 'information services' sector: NACE code 58.1 – Publishing of books, periodicals and other publishing activities, 59.1 – Motion picture, video and television programme activities, 59.2 – Sound recording and music publishing activities, 60.1 – Radio broadcasting, 60.2 – Television programming and broadcasting activities, 63.9 – Other information service activities.

Chart 4  
Development of the content and media sector



Source: Statistiques structurelles sur les entreprises (STATEC)  
[[http://www.statistiques.public.lu/stat/TableView/tableView.aspx?ReportId=9917&IF\\_Language=fra&MainTheme=4&FldrName=1&RFPPath=9796](http://www.statistiques.public.lu/stat/TableView/tableView.aspx?ReportId=9917&IF_Language=fra&MainTheme=4&FldrName=1&RFPPath=9796)]

In addition to these activities, remote sales (e-commerce) should also be considered as it is an activity which is dependent upon traditional ICT infrastructure. Furthermore, such activities are very significant in Luxembourg's ICT landscape and so need to be included in order to present the as complete snapshot as possible of the ICT sector. The e-commerce sector has grown exponentially since its arrival in Luxembourg, a country which, for several years, has been very attractive for e-commerce companies in spite of the recent departure of some of the largest companies in the sector, e.g. Netflix, Kabam and Zynga.

In 2012, 187 companies in the STATEC corporate register were classed under the NACE 47.910 code (remote sales). However, due to data confidentiality, STATEC is not in a position to release data for this aggregate. Therefore, in order to establish a series of indicators to measure the economic characteristics of this sector, the Ministry of the Economy worked with the Media and Communications Service to develop a list of key players in the sector. The list is based on a definition of e-commerce featuring several activities such as remote sales, online gaming and financing (predominantly mobile payment) which are dependent upon e-commerce and could not exist without it. The indicators shown in the table below only apply to the shortlist of companies which is representative of the sector as it constitutes almost all of the added value and jobs created in this sector.

In 2013, the list comprised of 47 legal entities making up the large e-commerce companies based in Luxembourg. The 2005 list had a mere 7 entries and those 7 companies only accounted for 58 jobs. Eight years later, the figure had increased more than twenty-fold and the number of salaried workers had reached 1,396 (Table 4). The most impressive leap forward occurred between 2012 and 2013 when the number of salaried workers rose by 58% in the space of one year to represent 0.4% of all salaried workers in Luxembourg (Chart 5).

Table 4

**E-commerce indicators**

E-commerce	2005	2006	2007	2008	2009	2010	2011	2012	2013
<b>Number of legal entities<sup>10</sup></b>	7	11	12	13	15	18	25	38	47
<b>Number of salaried workers</b>	58	101	145	221	294	396	662	883	1,396
	0,0%	0,0%	0,0%	0,1%	0,1%	0,1%	0,2%	0,2%	0,4%
<b>Value added at factor cost</b> (in € millions)	-153.4	-31.9	203.9	373.7	539.9	585.2	503.3	611.7	1,080.8
	-0.6%	-0.1%	0.6%	1.1%	1.7%	1.7%	1.3%	1.6%	2.7%
Sample size:	6	9	10	11	14	16	23	33	31
<b>Turnover</b> (in € millions)	116.7	2,337.3	4,184.6	5,121.5	6,772.1	9,272.4	12,495.7	16,708.6	19,754.3

Note: As the number of employees is unavailable, the number of salaried workers is indicated. The percentages in italics refer to the sector's share of the total indicator value for Luxembourg. Information on the sector's added value are only available for companies included in the 'sample size' figure.

Source: Company balance sheets submitted to the Trade and Companies Register, STATEC and IGSS. Calculations: ODC

Chart 5

**Development of the e-commerce sector (key players)**



Note: The number of salaried workers registered with IGSS was used to analyse these activities as the data are more precise than data pertaining to jobs held.

Source: STATEC and IGSS, Calculations: ODC

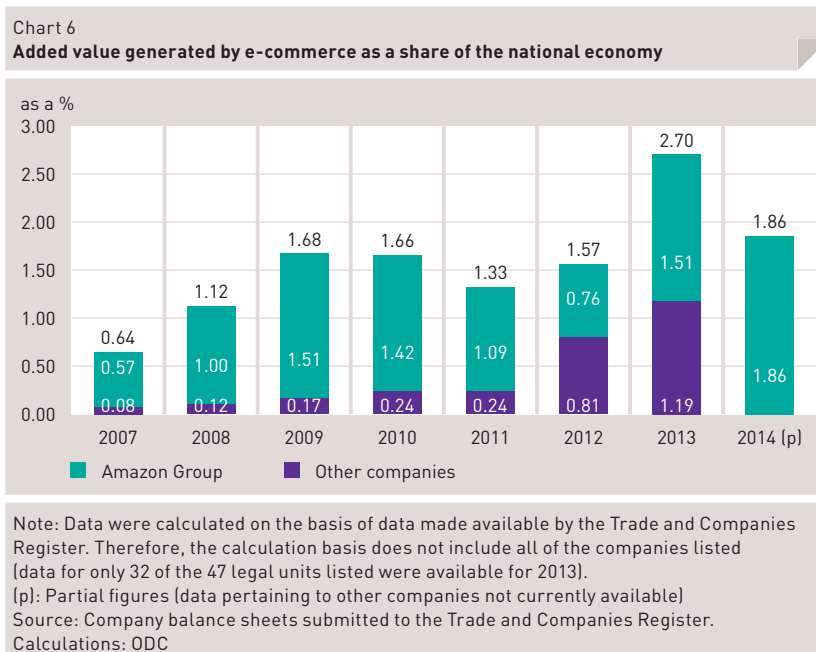
<sup>10</sup> The concept of a legal unit is different from that of a company (INSEE definitions):

1. A legal unit is a legal entity governed by public or private law. A legal entity may be a legal person, whose existence is recognised by law regardless of the persons or institutions who own it or who are members thereof, or a natural person who, as a self-employed individual, can exercise an economic activity;

2. A company is the smallest combination of legal entities forming an organisational unit producing goods and services which can enjoy a certain independence in decision-making, especially in terms of allocating current resources.

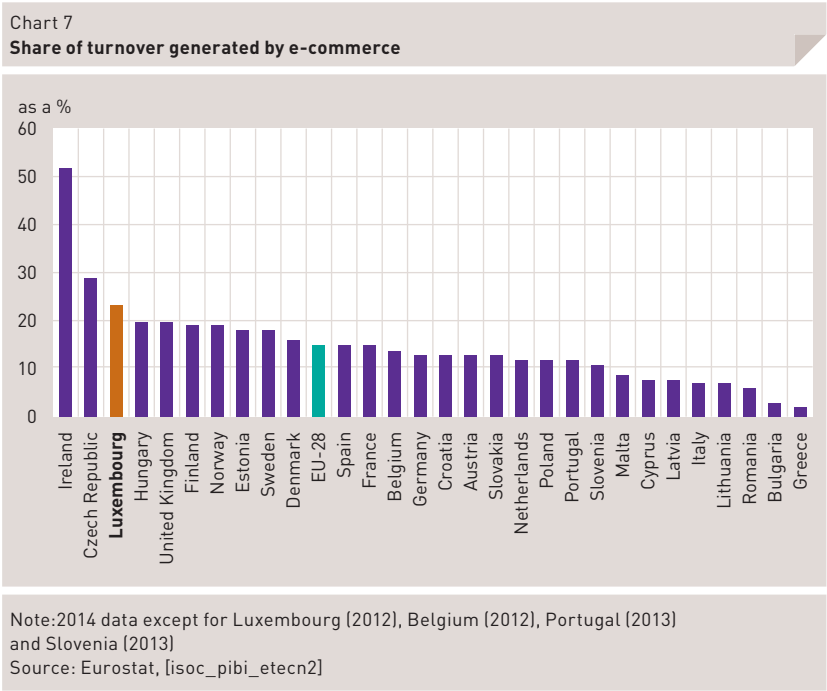
Data from these companies can be used to estimate the impact of e-commerce on the national economy. In 2013, e-commerce accounted for 2.7% of the gross added value for the Luxembourg economy (Chart 6) and these companies registered a turnover of €19.8 billion, an increase of over 380% on the 2007 figure of €4.1 billion. According to the public data and the calculations performed by the *Observatoire de la compétitivité*, the Amazon group is the key player in the sector and accounts for over half of the added value generated by such activities in Luxembourg (1.51% in 2013). The first data which became available for 2014 consolidated the significance of the group for the national economy, with Amazon representing 1.86% of Luxembourg's added value for that year. However, it was not possible to calculate the percentage share ascribable to other companies whose principle concern is e-commerce as the data were not yet available.

Over the next few years, it will be useful to measure the impact of the change in regulations regarding remote sales (e-VAT), which came into force on 1 January 2015.



Aside from companies whose main activity is e-commerce, there are, of course, numerous other companies who enable their customers to purchase goods and services online. Unfortunately, it is currently impossible to measure this activity amongst Luxembourg-based companies which currently fall under NACE codes other than those which appear in the definition of ICT. Therefore, only past studies can be used to estimate the size of such activities performed by companies other than those analysed above.

According to a STATEC survey carried out in 2010, 15% of respondent companies stated that they had received orders electronically in 2009, 59% of which were submitted online. The study reveals that, in 2010, 28% of turnover was generated by sales via computer systems. Across all sectors, orders from Luxembourg accounted for 57% of the total value, the rest of the European Union represented 38% and orders from outside of the EU 5%<sup>11</sup>. According to Eurostat data for 2014, 15% of the turnover of companies in the 28 Member States of the EU was generated via e-commerce. In the country rankings, Luxembourg placed 3rd behind Ireland (29%) and the Czech Republic (29%) with 23% of turnover generated by e-commerce (Chart 7).

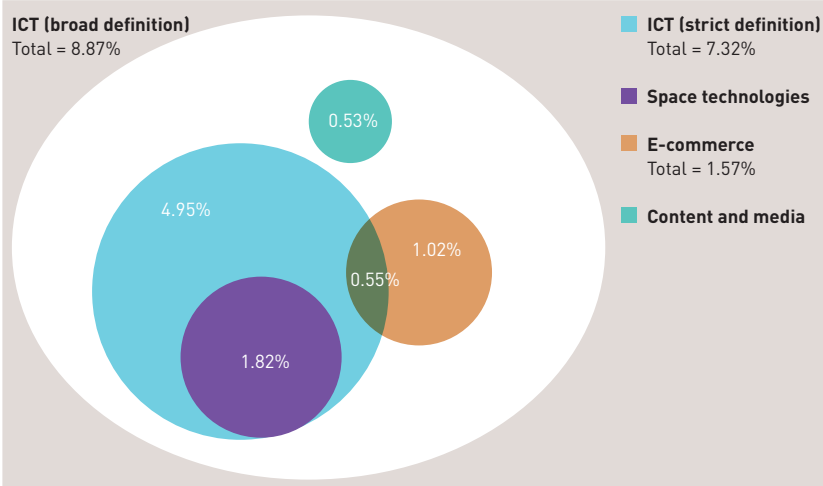


The results obtained under the different definitions of ICT mentioned above, i.e. the strict definition and the inclusion of data concerning activities related to the sector on the basis of the companies selected for analysis, reveal that the ICT sector employs over 18,000 people (5.1% of all salaried workers) and comprises over 2,200 companies in Luxembourg (6.6% of all companies). In the space of just 7 years, the number of companies analysed and salaried workers have increased from 23.1% and 34.1% respectively, i.e. an annual growth rate of 3% and 4.3%.

Thus, it can be concluded that the added value generated by the ICT sector can be sub-divided into different sub-sectors on the basis of the different NACE codes assigned to each company under analysis. This reflects how complex it is to define the sector in question (Chart 8). In 2012, the gross added value of ICT according to the Eurostat definition (including space technologies) was 7.3% (see Chapter 3.2). However, by also including related activities such as e-commerce and the content and media sector, which are dependent on ICT, the figure equates to 8.9% of Luxembourg's economy.

<sup>11</sup> STATEC, Enquête relative à l'usage des technologies de l'information et de la communication dans les entreprises, 2010. Entreprises occupant 10 personnes ou plus (hors secteur financier) ayant fait des ventes via des réseaux informatiques.

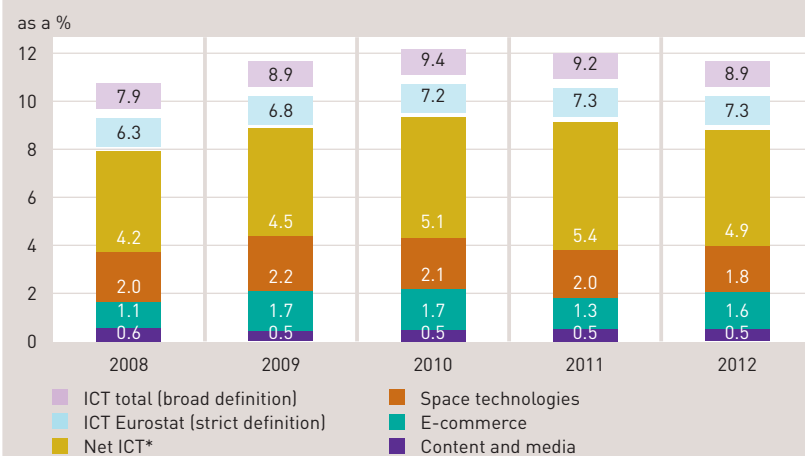
Chart 8

**Simplified diagram of ICT (broad definition) added value per NACE code - 2012**

Calculations: ODC

Following an increase between 2008 and 2010, the latter being the year in which the sector, under the broad definition, reached 9.4%, the gross added value to the Luxembourg economy decreased slightly to 8.9% in 2012 (Chart 9). The share of space technologies and e-commerce as a percentage of the economy as a whole remained reasonably stable in spite of the consistent increase in turnover.

Chart 9

**Variation in the share of ICT (broad definition) added value as a % of the economy as a whole**

Note: Data unavailable for 2013 and 2014 as ICT (strict definition) data are missing

\* Net ICT = Eurostat ICT – Space technologies – Share of e-commerce activities already included in the Eurostat ICT definition

Calculations: ODC

However, the ICT sector is not limited to the definitions above. Many jobs linked to ICT are created in other areas of business but do not necessarily feature in this study due to the absence of a validated methodology allowing the indirect impact of the sector to be measured. According to the most recent statistics, *“jobs in ICT have seen the greatest increase (job adverts up 25%) in Luxembourg in 2014, mainly thanks to the financial sector”*<sup>12</sup>. This proves the impact of ICT, especially in the financial sector but also in many others which are dependent upon it to a greater or lesser degree.

## International comparisons

Given that there is a precise definition of the ICT sector provided by Eurostat, the performance of the sector in Luxembourg can be compared with that of other EU Member States.

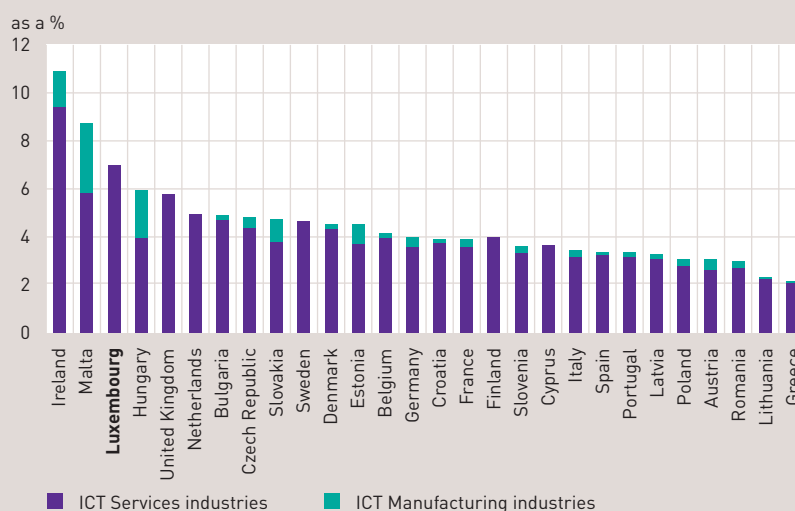
In 2012, Hungary, Ireland and Slovakia had the highest levels of ICT manufacturing activities. There are only three companies active in this area in Luxembourg and so the sector consists almost exclusively of ICT service providers, which account for 7.3% of total added value in Luxembourg, i.e. €2.85 billion. In the ICT services standings, Luxembourg placed 3rd in the European Union behind Ireland (home to such large groups as Google, Microsoft et al.), with 10.9% of gross added value to the national economy (9.5% of which is thanks to ICT services), and Malta, with 8.7% of the national economy (2.8% of which is accounted for by ICT manufacturing services owing to the presence of ST Microelectronics – formerly known as SGS-Thomson – which employed 1,500 individuals at its assembly plant<sup>13</sup> in 2010, although this only accounts for €177 million in absolute terms). Whilst Ireland remains the key player in the EU in terms of ICT, Luxembourg is one of the best European countries with regard to added value generated by ICT, and this in spite of the small size of the country<sup>14</sup> [Charts 10 and 11].

<sup>12</sup> La finance a dopé les recrutements IT en 2014, Paperjam, 2015

<sup>13</sup> ST Microelectronics announces investment in Malta, Times of Malta, 2010

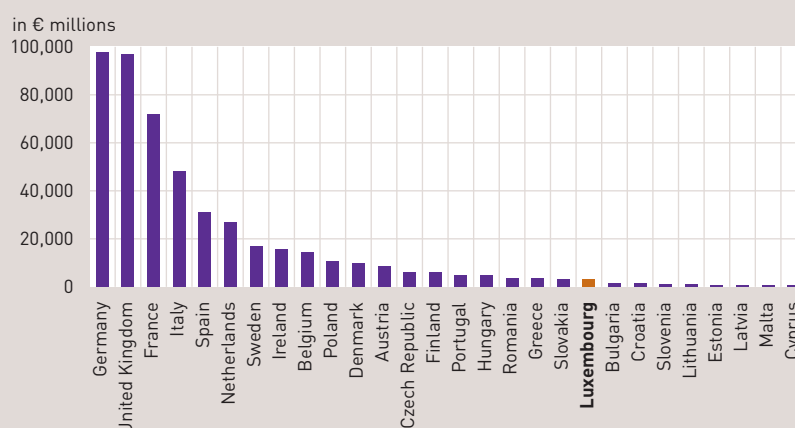
<sup>14</sup> Eurostat, Pourcentage du secteur des TIC dans le PIB [isoc\_bde15ag], 2010

Chart 10  
Share of ICT sector added value in the national economy - 2012



Note: Data on ICT manufacturing in Luxembourg, the United Kingdom and Sweden are not available for confidentiality reasons. Sector totals were calculated by the author on the basis of the figures available. Given that the GDP at factor cost is not available for EU countries, the share of the ICT sector was calculated by dividing the sector's value added at factor cost by the total gross value added at basic prices. 2011 data were used for Denmark to provide an estimate of the size of the ICT sector  
Source: Eurostat, [sbs\_na\_sca\_r2], Calculations: ODC

Chart 11  
ICT sector added value - 2012 (in € millions)



Note: 2011 data were used for Denmark to provide an estimate of the size of the ICT sector. Figures for Cyprus, Luxembourg, the Netherlands, Sweden and the United Kingdom only refer to ICT services activities.  
Source: Eurostat, [sbs\_na\_sca\_r2]

An analysis of the sector's growth rates since 2008 reveals that the sector has grown rapidly in Ireland (+63.5%) but also in Malta (+30.1%), Lithuania (+15.3%) and Luxembourg (+10.1%). However, Finland has seen its ICT sector shrink by 45.7%, accounting for only 3.9% of GDP as opposed to 7.1% four years before. This significant drop can be explained primarily by the decline of Nokia and the considerable impact this has had on the added value in the industrial sector in Finland, which has fallen 25% on 2007<sup>15</sup> levels (Chart 12).

<sup>15</sup> <http://www.bloomberg.com/news/2014-05-28/nokia-party-is-over-as-finnish-industry-loses-value-added.html>

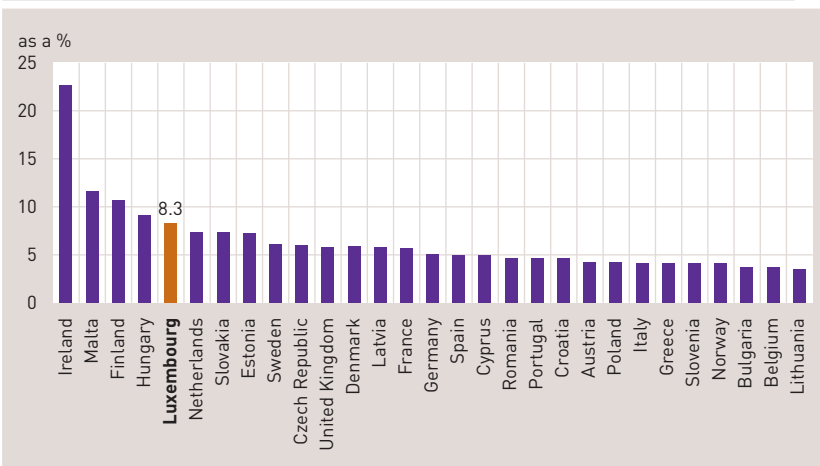
Chart 12  
Share and development of ICT in the national economy (EU countries)



Note: 2011 data were used for Denmark to provide an estimate of the size of the ICT sector. Given the absence of 2008 data for Ireland, the 2009-2012 growth rate was calculated.  
Source: Eurostat, [sbs\_na\_sca\_r2], Calculations: ODC

With a turnover of €75 billion generated by almost 7,000 ICT companies, Ireland stands head and shoulders above the rest in the European rankings of countries with the highest share of turnover related to ICT across all industry and commercial services (Chart 13).

Chart 13  
Share of turnover linked to ICT - 2012



Note: 2011 data were used for Denmark to provide an estimate of the size of the ICT sector. Share of turnover linked to ICT across all industry and market services; computer repairs, personal and household goods repairs, not including financial and insurance activities.  
Source: Eurostat, [sbs\_na\_sca\_r2]

This is due to the presence in Ireland of significant players in the field of ICT (Table 5)<sup>16</sup>. In fact, the five main players in the ICT sector account for €50 billion, i.e. over 2/3 of the sector's total turnover in Ireland, and 9,500 jobs.

Table 5  
**Key data for the five main ICT players present in Ireland**

Company	2012 turnover (in € billions)	No. of employees in 2012
Google	15.5	2,199
Microsoft	13.7	1,200
Dell	9.9	953
Oracle	7.0	1,094
Apple	3.5	4,000

Source: <http://www.top1000.ie/industries/technology>

As regards the share of ICT jobs as a percentage of total jobs (domestic concept), Luxembourg ranked 3rd in the European Union in 2012 with 4% of all employed persons working in the ICT sector. The rankings were led by Ireland (4.3%) and Malta (4.1%). However, if only ICT services are considered, Luxembourg tops the rankings, with 4% of total jobs in the ICT sector, closely followed by Ireland (3.8%) and Sweden (3.7%) of jobs in the ICT sector.

## 5.3.2 Space technologies

The definition of the space sector which has been used in this study is an adaptation of the OECD definition and is as follows: 'all activities and resources used which create and offer value and advantages to human beings in space exploration, management and use. Consequently, [the space economy] includes all public and private sector players 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, meteorological services, etc.) and scientific knowledge generated by these activities. Hence, the space economy goes far beyond the space sector itself to encompass the ever increasing impact, and constant development, of space-related products, services and knowledge on the economy and society.' The areas of application for space technologies are satellite communication, satellite navigation, satellite earth observation, space exploration and space science.

<sup>16</sup> <http://www.top1000.ie/industries/technology>

A 2011 study conducted by Euroconsult presented an initial estimate of the sector and was able to identify the main actors in the space sector in Luxembourg. However, the approach used by this study to estimate the sector's size overestimated the impact of space activities on the national economy as it factored in the global revenue of the SES group as supposed to only focussing on the revenue the group had generated nationally. In order to analyse the sector's impact on the national economy, only data relating to the Luxembourg branches of the SES group have been collected.

Amongst the 14 companies analysed in 2011, 11 declared that they had generated turnover from space activities, with such activities accounting for an average of 37% of total turnover across all of the companies. Only two companies (SES and LuxSpace) reported that all of their revenue was ascribable to this sector.

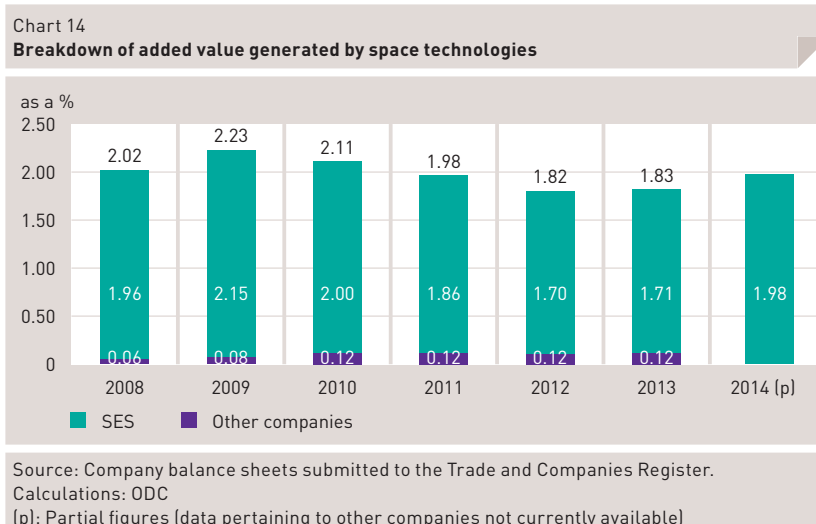
Given that turnover overestimates the real impact as it does not factor in the various corporate costs, a proxy value was required to calculate the sector's share of the national economy. Therefore, the value added at factor cost was calculated for each legal entity.

In 2012, the sector consisted of 16 companies employing 667 individuals (Table 6). The nation's largest employer in the sector, SES, employed 459 staff in Luxembourg, i.e. 68.8% of employees in the sector. In 2013, two new companies entered the sector.

Table 6 Space technologies sector indicators – Private sector						
Space technologies	2008	2009	2010	2011	2012	2013
Number of companies	14	14	16	16	16	18
	<i>0.05%</i>	<i>0.05%</i>	<i>0.05%</i>	<i>0.05%</i>	<i>0.05%</i>	<i>0.05%</i>
Number of employees	N.D.	N.D.	623	624	667	N.D.
	-	-	<i>0.2%</i>	<i>0.2%</i>	<i>0.2%</i>	-
Value added at factor cost (in € millions)	676.9	717.5	743.4	748.8	709.1	732.2
	<i>2.0%</i>	<i>2.2%</i>	<i>2.1%</i>	<i>2.0%</i>	<i>1.8%</i>	<i>1.8%</i>
Sample size:	8	10	10	10	11	12
Turnover (in € millions)	1,103.4	1,200.5	1,370.4	1,413.8	1,414.5	1,496.2

Note: Percentages shown in italics represent the sector's share of the total indicator figure for Luxembourg. Employment data was not made available for 2008 and 2009. Information on the sector's added value is only available for companies included under 'sample size'. Data calculated on the basis of the balance sheets of companies active in the space technologies sector, information gathered by Luxinnovation and company statements. The share of jobs and added value was weighted on the basis of estimates provided by companies in the 2011 Euroconsult study in order to obtain an estimate of the share of space technologies activities within the companies.  
Source: Company balance sheets submitted to the Trade and Companies Register.  
Calculations: ODC

The 16 companies active in 2012 generated 1.82% of the nation's added value, with over 93% of that figure ascribable to the SES group (Chart 14). In absolute terms, the sector grew 4.8% between 2008 and 2012, i.e. an annual growth rate of 1.2%. However, mention should be made of the fact that, notwithstanding the presence of one of the sector's biggest names, the contribution provided by other companies in the sector doubled over the 4-year period, even though the figure is smaller in absolute terms. The sector's turnover increased by 28.4% during the period (6.4% annual growth rate) from €1.1 billion to €1.5 billion in 2013. The most recent data, from 2014, reveal an increase in added value generated by the SES group, which is responsible for 1.98% of the gross added value to the national economy. Available data for the sector is only partially complete given that other companies have not yet submitted their balance sheets to the Registry of Commerce and Companies. However, even without these data, it is clear that the sector is growing faster than in the previous three years.



## International comparisons

Although the space technologies sector in Luxembourg has grown ever larger over the past twenty years, there are still no international benchmarks which feature Luxembourg amongst the main players in the sector. The United States is the world leader in the sector, largely thanks to NASA<sup>17</sup>.

However, in the latest OECD report on the sector, Luxembourg is mentioned several times in figures regarding contributions to the sector. In 2013, Luxembourg contributed \$17 million, in purchasing power parity (PPP) terms, i.e. \$34.5 per capita. In Europe, only France spends more per capita. The world leaders are the United States and Russia (Table 7).

<sup>17</sup> NASA: National Aeronautics and Space Administration

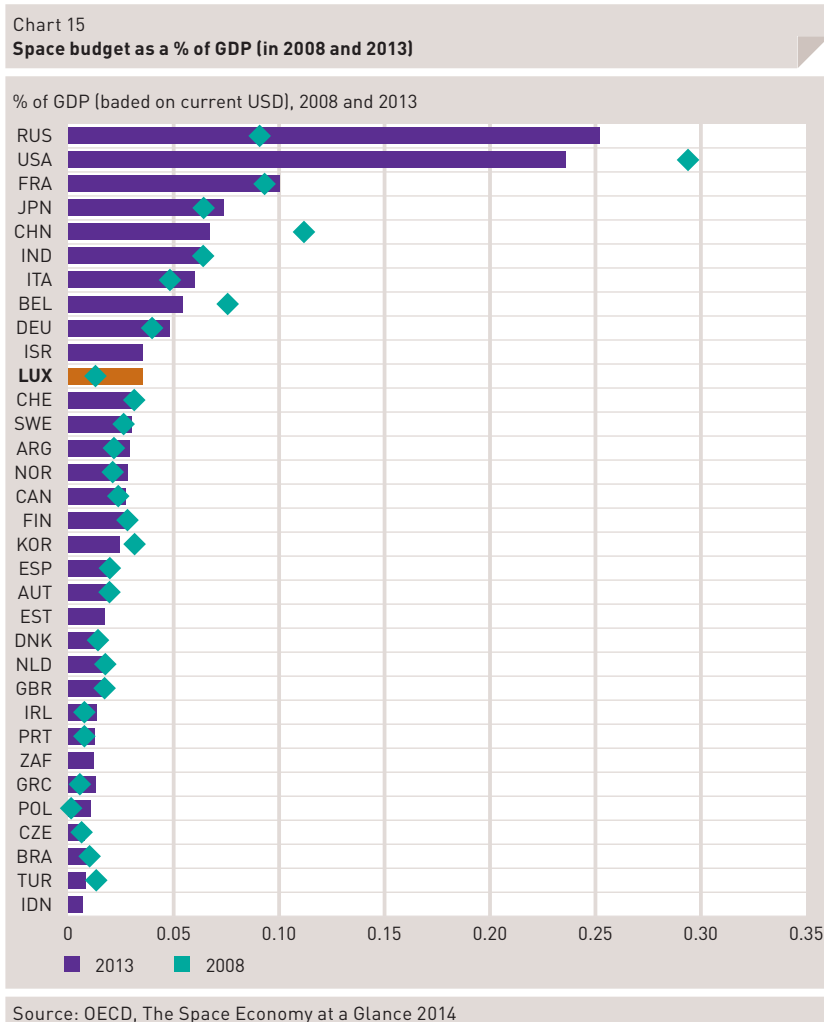
Table 7

**Space budget expressed in PPP and per capita**

	Space budget in USD millions (PPP), 2013	Budget per capita
USA	39 332.2	123.2
CHN	10 774.6	7.9
RUS	8 691.6	61.0
IND	4 267.7	3.3
JPN	3 421.8	26.9
FRA	2 430.8	38.0
DEU	1 626.6	20.1
ITA	1 223.3	20.7
KOR	411.5	8.2
CAN	395.9	11.5
GBR	338.9	5.3
ESP	302.9	6.7
BRA	259.2	1.3
BEL	244.8	21.9
IDN	142.0	0.6
CHE	133.0	16.6
SWE	122.0	12.7
NDL	110.5	6.6
TUR	104.3	1.4
NOR	89.6	18.5
ISR	89.3	11.1
POL	80.7	2.1
ZAF	76.4	1.5
AUT	73.0	8.6
FIN	53.9	9.9
DNK	38.2	6.9
PRT	32.2	3.0
GRC	30.3	2.7
CZE	25.4	2.5
IRL	25.3	5.6
AUS	24.9	1.1
<b>LUX</b>	<b>17.0</b>	<b>34.5</b>
HUN	8.9	0.9
MEX	8.5	0.1
EST	5.4	4.0
SVK	4.8	0.9
SVN	2.9	1.4

Source: OECD, The Space Economy at a Glance 2014

In every country, the State plays an essential role in financing the space sector. Luxembourg's space budget rose from 0.0118% of GDP in 2008 to 0.034% in 2013, i.e. a three-fold increase equating to \$20.7 million. (Chart 15).



The ESA refers to Luxembourg as one of the main contributors in the group in proportion to the size of the country:

- In 2011, Luxembourg ranked 4th among ESA Member States in terms of budget allocation as a percentage of GDP (0.03%, European average 0.025%) with a contribution of €11.3 million. Luxembourg placed just behind France, Germany and Italy. In 2014, the budget rose to €18.3 million (0.04%<sup>18</sup>);
- In 2011, Luxembourg contributed the most per capita to the ESA space programme (€30) ahead of France (€28). The average amongst member countries was €9. Luxembourg's contribution rose to €33 per capita in 2014.

<sup>18</sup> Estimate based on the 2013 GDP, i.e. €45,478.2 million.

In order to more effectively compare Luxembourg with other countries in terms of the development of the space sector at corporate level, reports published by some of the most active EU Member States in the sector were assessed. Analysis of the reports shows that there are currently no representative data which are analysed in a uniform fashion across different European countries. Each country analyses its data on the basis of the characteristics of its space sector and the definitions it deems to be relevant to the structure of its economy. Therefore, the figures shown below give an idea of the size of the space sector in some European countries but results may vary significantly on the basis of the approach adopted.

The 2012 Eurospace study states that the space industry represents 35,679 direct jobs and a turnover of €6.56 billion in Europe. The six main contributors to ESA (Germany, Belgium, Spain, France, Italy and the United Kingdom) account for 90% of jobs<sup>19</sup>.

A 2006 Eurostat study<sup>20</sup> placed the United Kingdom and France at the top of the rankings in terms of the size of their aerospace sectors as a share of the non-financial market economy, in terms of added value and jobs, on the basis of data submitted under NACE code 35.3 Rev 1.1.

In France, a report drawn up by the Ministry of Higher Education and Research on the French space strategy<sup>21</sup> estimated the consolidated turnover of the sector at €2.7 billion in 2009 (with 20% of the turnover ascribable to the commercial market, i.e. downstream), which accounts for half of the turnover of the European space industry. The concentration of aircraft assembly activities, including Airbus (one of the two biggest civil aircraft manufacturers in the world) explains why France is the main contributor to the sector in terms of turnover generated. In 2010, the sector employed 12,000 salaried workers, i.e. 0.05% of total salaried workers. However, other sources provide rather different data: some sources claim that in 2012, the aeronautics industry generated 170,000 jobs (over 310,000 including sub-contractors) and a turnover of €42.5 billion<sup>22</sup>. The French national statistics office, INSEE, makes a distinction between aeronautics and space activities and ascribes turnovers of €10 billion and €615 million respectively with 62,878 jobs registered in 1,008 companies, all of which are located in the south-western area of the country, which is home to Airbus, Boeing, Dassault/ATR, Eurocopter, Bombardier and Embraer amongst others<sup>23</sup>.

<sup>19</sup> The European space industry in 2012, Eurospace Facts & Figures, 2013. This study does not include SES as one of the companies surveyed.

<sup>20</sup> L'industrie aérospatiale dans l'Union européenne, Statistiques en bref, Eurostat, 2006

<sup>21</sup> Stratégie spatiale française, Ministère de l'Enseignement supérieur et de la Recherche, 2012

<sup>22</sup> <http://www.france.fr/entreprendre-et-reussir-en-france/lindustrie-aeronautique-et-spatiale-aujourd'hui-un-secteur-cle.html>

<sup>23</sup> Insee, Enquête Filière aéronautique et spatiale 2013

In spite of its very broad definition of the sector, the UK space agency<sup>24</sup> published a report in 2012 which estimated that 234 companies were active in the sector representing a turnover of £9.1 billion (approx. €10.5 billion<sup>25</sup>) in 2010/2011, with 89% of turnover generated downstream. However, this figure is very different from the one put forward by Euro-space. Whilst the turnover figures give a good impression of the size of the sector, the added value generated enables the sector's impact on the economy to be measured. The sector's contribution to the UK GDP (added value at current prices) in 2011/2012 was £4.2 billion (approx. €4.8 billion). This means that the sector represented 0.29% of the UK economy<sup>26</sup>. There were 28,943 jobs in the sector in 2011/2012, of which 21,825 were generated downstream (75%). A growth rate of 3.7% was expected for the year 2011/2012, which would push the number of jobs over 30,000.

A report from the Italian Senate reveals that the space sector in Italy currently consists of over 120 companies employing around 6,000 individuals. The total turnover reported is €1.45 billion<sup>27</sup> (0.09% of GDP).

In 2012, the sector represented 1.82% of total added value in Luxembourg (including 1.81% already accounted for in the ICT sector) and 0.18% of the nation's jobs. In spite of country's small size, the Luxembourg space sector is of considerable size and is proportionally larger than those of all of the other large European countries in terms of the impact on national GDP.

An analysis of the studies shows the lack of uniformity in the methodologies adopted in a bid to estimate the economic impact of space technologies in different countries. To enable better comparisons to be drawn between different EU countries, ESA is currently setting up a project with a view to developing a common methodology that each country will have to adopt in the future. Luxembourg is one of the key participants in the development of this new project.

<sup>24</sup> The Size and Health of the UK Space Industry, UK Space Agency, 2012

<sup>25</sup> 2011 average exchange rate: €1 = £0.86788 (Eurostat: [tec00033])

<sup>26</sup> £4.2 bn/£1,433.77 bn (Source: Eurostat – GDP at market price (GDP at factor cost was unavailable).

<sup>27</sup> Legislatura 17<sup>a</sup> - 10<sup>a</sup> Commissione permanente - Resoconto sommario n. 94 del 31/07/2014

### 5.3.3 Logistics

As part of the analysis of the economic impact of the logistics sector on the national economy, a decision was taken to only focus on aspects linked to freight transport, thus excluding passenger transport and removal activities. Therefore, the indicators shown below are based on activities falling under the NACE codes listed in Table 7, which refer to a company's main activity. However, in the future, it would be propitious to include companies with important activities linked to the logistics sector even if they fall under a different NACE code. For example, Champ Cargosystems and CTI Systems are major players offering a range of solutions to logistics companies based in Luxembourg and abroad. FANUC and RAK Porcelain also perform significant logistics and supply chain activities in Luxembourg. Furthermore, Amazon manages its 'European Fulfilment Network' from Luxembourg and POST (Luxembourg Post Office) delivers packages which have been purchased from cyber-traders (for whom logistics lies at the heart of their business model). These are just a few examples which illustrate the fact that the logistics sector is much larger than a definition of the sector based on the concept of principal activity. In conclusion, it should be stressed that the figures do not include the activities of the NATO Support and Purchase Agency (NSPA) which employs over 1,000 individuals in Luxembourg and provides logistics support services to NATO member countries and other NATO agencies.

Table 8  
Overview of logistics sector activities

NACE Rev. 2 Code	Description
49.200	Freight rail transport
49.410	Freight transport by road
50.200	Sea and coastal freight water transport
50.400	Inland freight water transport
51.210	Freight air transport
52.100	Warehousing and storage
52.210	Service activities incidental to land transportation
52.220	Service activities incidental to water transportation
52.230	Service activities incidental to air transportation
52.240	Cargo handling
52.290	Other transportation support activities
53.200	Other postal and courier activities

There are two sources of indicators which can be used to estimate the size of the logistics, i.e. freight transport, within the Luxembourg economy: national accounts and structural business statistics (SBS) pertaining to companies. In order to better compare the different sectors under analysis, the decision was taken to focus on the second source which takes information from a survey and was used to assess the size of the ICT sector. Furthermore, it is possible to obtain more detailed data relating only to freight transport. Table 9 shows the selection of macroeconomic indicators which were analysed.

Table 9 Logistics sector indicators – Private sector								
Logistics	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	675	664	700	719	739	725	746	741
	2.5%	2.4%	2.5%	2.4%	2.4%	2.3%	2.3%	2.2%
Number of employees	11,162	11,589	12,591	13,834	13,492	13,652	13,256	12,812
	3.6%	3.6%	3.8%	4.0%	3.8%	3.8%	3.6%	3.4%
Number of salaried workers	10,995	11,448	12,454	13,651	13,285	12,913	12,975	12,635
	3.8%	3.8%	3.9%	4.1%	4.0%	3.8%	3.7%	3.5%
Value added at factor cost (in € millions)	765.8	799.7	817.3	852.7	673.1	863.4	800.0	824.3
	2.9%	2.7%	2.6%	2.6%	2.1%	2.5%	2.2%	2.1%
Turnover (in € millions)	2,696.8	2,945.9	3,434.3	3,772.6	3,048.8	3,568.7	3,850.8	3,742.9
Staff costs (in € millions)	485.1	523.8	564.0	626.2	623.3	635.7	653.3	653.8
Gross investment in tangible goods (in € millions)	80.7	131.6	185.2	273.8	85.9	89.6	67.0	567.3
Turnover per employee (in € millions)	241.6	254.2	272.8	272.7	226.0	261.4	290.5	292.1
Apparent labour productivity (Gross added value per employee)	68.6	69.0	64.9	61.6	49.9	63.2	60.4	64.3
Investment rate (investment/added value at factor cost)	10.5%	16.5%	22.7%	32.1%	12.8%	10.4%	8.4%	68.8%
Note: Percentages in <i>italics</i> refer to the sector's share of the total indicator figure for Luxembourg. Source: STATEC ( <a href="http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=9917&amp;IF_Language=fra&amp;MainTheme=4&amp;FldrName=1&amp;RFPPath=9796">http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx?ReportId=9917&amp;IF_Language=fra&amp;MainTheme=4&amp;FldrName=1&amp;RFPPath=9796</a> )								

The number of companies featuring freight transport as their principal activity increased slightly between 2005 and 2012 (+9.8%; 1.3% annual growth rate). However, the number of employees, after having increased between 2005 and 2008 (i.e. up to the beginning of the crisis), fell by 7.4%, with the 2012 figure standing at 12,812. The economic and financial crisis led to a reduction in apparent labour productivity in 2009. In addition, 2009 saw activity levels and the added value of the sector plummet. However, the fact that employment levels remained stable meant that the indicator level only fell slightly.

However, over a period of 7 years, employee numbers increased by 14.8%, i.e. a 2% annual growth rate (Chart 16), with staff costs reaching €653.8 million, i.e. an increase of 34.8% (4.4% annual growth rate over the 7-year period).

Chart 16  
Trends in employee and company numbers in the logistics sector



Source: Statistiques structurelles sur les entreprises (STATEC)

However, the sector's share of total jobs has been falling consistently since 2008, primarily due to the loss of 20% of jobs linked to road freight transport (job numbers have fallen from 8,700 in 2008 to 6,900 six years later). Foreign competition is the main reason for these job losses. Whilst road freight transport accounted for 65% of jobs in 2005, this category now only represents 57%, with other freight activities having experienced constant growth since 2005, with significant increases in post and courier activities (+160 jobs), air transport (+150 jobs) and rail freight (+128 jobs) recorded between 2008 and 2012. In spite of the reduction in jobs in road transport, there has been an increase in jobs linked to added value services and other related services, as outlined in the logistics sector strategy.

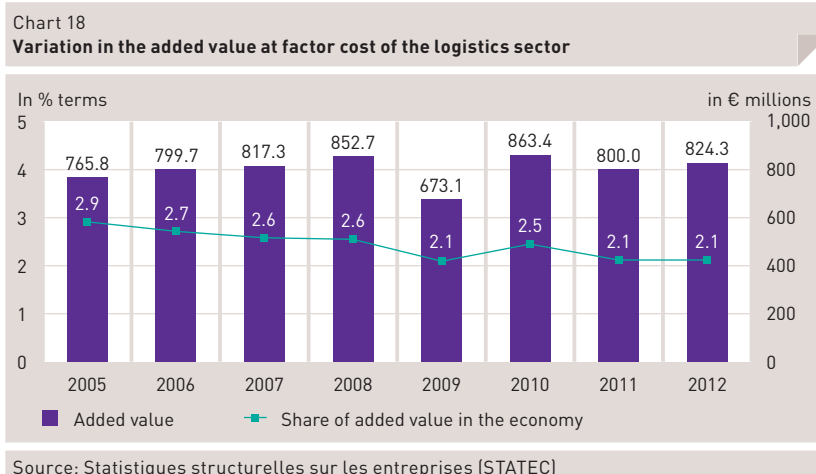
Chart 17  
Variation in the share of logistics sector jobs as a % of total jobs



Note: Data relating to structural business statistics apart from 2013 and 2014 figures which refer to IGSS data (annual averages).

Source : Statistiques structurelles sur les entreprises, STATEC and IGSS, Calculations: ODC

As regards added value, the sector's share of the national economy has fallen from 2.9% in 2005 to 2.1% in 2012, i.e. a reduction of 4.5% which, in absolute terms, equates to €824 million in 2012 (1.1% annual growth rate) (Chart 18). However, despite a slight reduction on 2011 levels, the total turnover generated by the sector in 2012 was €3.74 billion, a 38.8% increase on the 2005 figure, i.e. an annual growth rate of 4.8%. Mention should also be made of the fact that investment in the logistics sector appears to have been on the rise since 2012.



In 2012, the logistics sector consisted of 468 road freight transport companies (63% of the sector's companies producing 45% of the sector's added value), 187 others providing auxiliary transport services and a further 52 companies engaged in postal and courier activities. In addition, there were six air transport companies and one firm providing rail freight services (CFL Cargo). Cargolux Airlines International SA, the leader in air freight, accounted for one third of the sector's turnover and employed almost 1,300 salaried workers on 1 January 2014.

The added value generated by road freight companies has been on the rise since 2010, following a blip in the wake of the 2008 crisis, and totalled €368 million in 2012. These companies accounted for 2% of total jobs in 2012, employing 7,647 individuals (Table 10). However, over 500 jobs have been lost since 2012, whilst the number of companies providing auxiliary transport services increased by 12 between 2011 and 2012 to total 187 in 2012.

Table 10 Road freight transport indicators								
Road freight transport	2005	2006	2007	2008	2009	2010	2011	2012
Number of companies	433	430	453	468	483	467	482	468
Number of employees	7,141	7,381	8,066	8,789	8,416	8,614	7,991	7,647
Number of salaried workers	7,030	7,287	7,976	8,657	8,260	7,923	7,761	7,520
Value added at factor cost (in € millions)	338.8	356.4	379.8	389.3	358.9	349.6	366.7	367.5
Turnover (in € millions)	898.1	948.5	1,077.8	1,174.0	1,037.2	1,095.2	1,209.5	1,187.3
Source: Statistiques structurelles sur les entreprises (STATEC) ( <a href="http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx">http://www.statistiques.public.lu/stat/TableViewer/tableView.aspx</a> )								

Table 11 shows some of the main employers, listed in order of employee numbers, in the logistics sector.

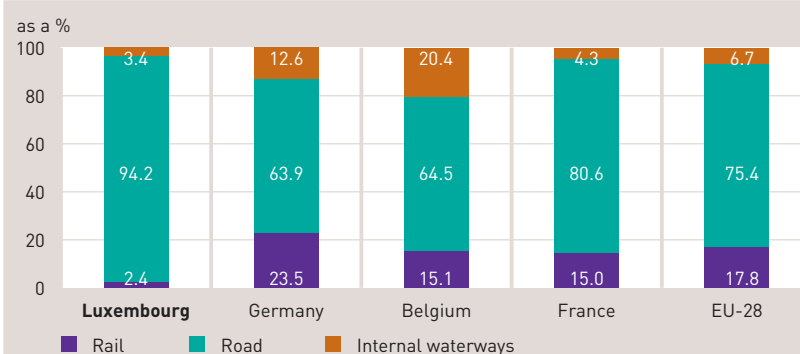
Table 11 Main employers in the logistics sector	
Name	Staff numbers (approx.)
Cargolux Airlines International SA	1,320
Luxair Cargo	N.C.
CFL Multimodal SA	N.C.
Kuehne + Nagel SARL	560
Groupe Arthur Welter Transports	390
Imperial Shipping SARL	320
Jost Group SA	280
Wallenborn Transports SA	260
Lehnkering Shipping Lux SA	240
Panalpina Luxembourg SA	220
W.S.A. SARL	180
Champ Cargosystems SA	130
DHL Express (Luxembourg) SA	110
Bas Shipping SARL	110
Source: Ministère de l'Économie et Liste des principaux employeurs au Luxembourg, June 2015 (STATEC)	

## International comparisons

Chart 19 shows the breakdown of freight transport in Luxembourg by mode of transport (road freight, rail freight and river freight) on the basis of Eurostat's 'principle of territoriality': *"The principle of territoriality includes all freight movements via rail or inland waterways within the national territory. However, for road freight, all movements of vehicles registered in a country are considered"*<sup>28</sup>. The dominance of road freight in Luxembourg (an estimated 94.2%) in 2013 can be explained by the definition of the indicator and the small size of the country. 'Petrol pump tourism' is an additional incentive for HGV drivers to take a detour through Luxembourg to benefit from more attractive fuel prices.

<sup>28</sup> European Commission, Modal split of freight transport, tran\_hv\_frmod

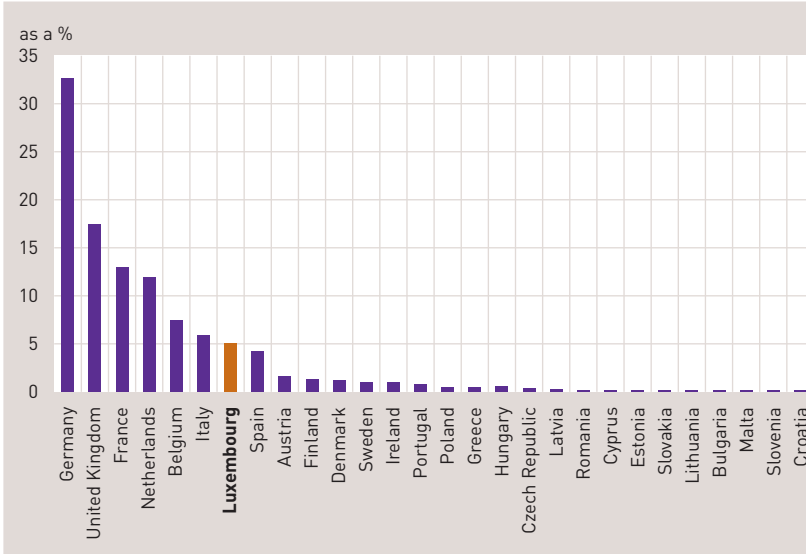
Chart 19  
**Freight transport breakdown by mode - 2013**



Source: Eurostat, [tran\_hv\_frmod]

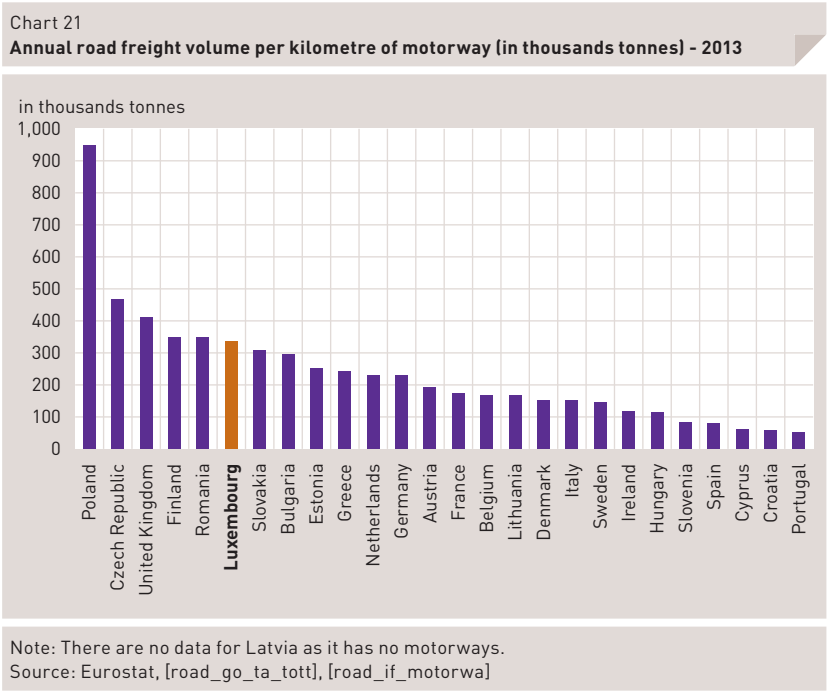
For air transport, 673,445 tonnes of freight and mail were transported in Luxembourg in 2013, i.e. 5% of all EU air freight. Luxembourg placed 7th in the EU rankings, which is no small feat considering the size of the country (Chart 20).

Chart 20  
**Share of air freight and air courier services in the EU - 2013**



Source: Eurostat, [avia\_gooc]

As regards annual road freight, 60,687 thousand tonnes of goods were transported in Luxembourg in 2011, whilst in 2013 the figure only reached 51,480 thousand tonnes. These figures accounted for 0.40% (2011) and 0.37% (2013) of the total road freight in the EU-28. Given the small size of the Luxembourg road network, dividing the figure by the number of kilometres of motorway in each country was deemed to be a more effective way to estimate freight transport levels. Taking this factor into account, Luxembourg ranked 6th in the EU with 339,000 tonnes transported per kilometre of motorway. Poland topped the rankings with 952,000 tonnes per kilometre of motorway, ahead of the Czech Republic, the United Kingdom and Finland (Chart 21).



The rankings shown above are heavily dependent on the share of motorway kilometres as a percentage of the total number of kilometres of a nation's road network (Table 12). The higher the proportion of motorway roads a country has, the lower it will be ranked in the standings (shown below) for the same volume of goods transported. Therefore, taking into consideration the whole of the road network in each country, Luxembourg would rank 1st in the 2013 standings with 9.8 million tonnes of goods transported per kilometre, ahead of Bulgaria (8.2 million), Portugal (6.7 million) and Germany (4.6 million).

Table 12  
Share of motorway kilometres on national road networks - 2012

Countries	Motorways (in km <sup>2</sup> )	Road network (in km <sup>2</sup> )	Share of motorways on national road network as a %
Portugal	2,988	22,161	13.48%
Croatia	1,254	29,410	4.26%
<b>Luxembourg</b>	<b>152</b>	<b>5,227</b>	<b>2.91%</b>
Bulgaria	541	19,512	2.77%
Spain	14,701	666,837	2.20%
Germany	12,879	643,702	2.00%
Cyprus	257	13,006	1.98%
Slovenia	769	39,042	1.97%
Netherlands	2,631	137,692	1.91%
Greece	2,005	116,960	1.71%
Denmark	1,128	73,929	1.53%
Austria	1,719	114,590	1.50%
Italy	6,668	487,700	1.37%
Belgium	1,763	154,012	1.14%
France	11,465	1,052,380	1.09%
Finland	780	78,138	1.00%
Slovakia	419	43,366	0.97%
Ireland	900	96,002	0.94%
United Kingdom	3,686	419,671	0.88%
Hungary	1,515	200,961	0.75%
Czech Republic	751	130,661	0.57%
Romania	550	111,584	0.49%
Lithuania	309	82,911	0.37%
Poland	1,365	412,264	0.33%
Sweden	1,891	580,140	0.33%
Estonia	124	58,487	0.21%
Latvia	-	69,537	-

Source: Eurostat, [road\_if\_motorwa][ road\_if\_roads], Calculation: ODC

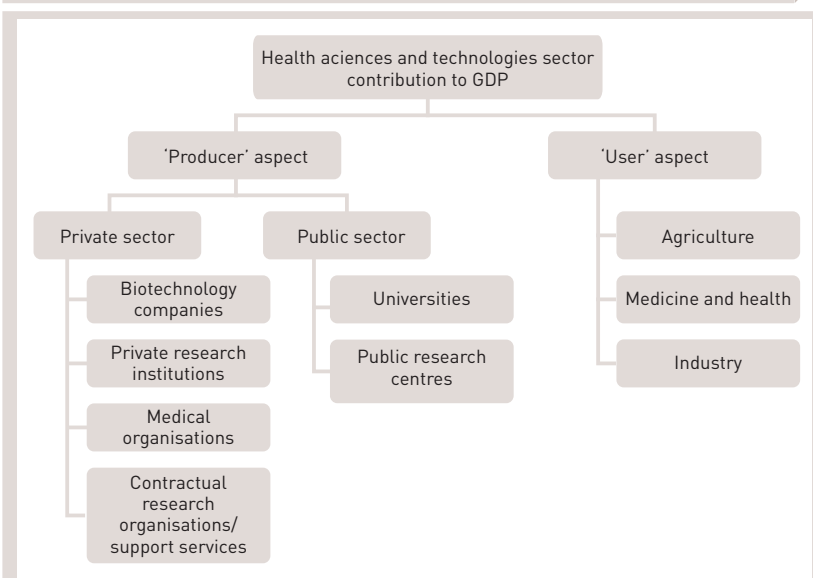
### 5.3.4 Health sciences and technologies

This sector was initially restricted to 'health technologies', but has since been enlarged to include 'new life technologies and sciences'. As such, in addition to the biomedical domain, the term now covers synergies and relationships between sectors as well as technologies. Although for communication purposes the term 'health sciences and technologies' is employed, it was deemed more relevant to expand the definition of the sector to 'life technologies and sciences' in order to encompass all of the activities in the sector present in Luxembourg. The activities in the health sciences and technologies sector in Luxembourg can be grouped into two categories:

- ▼ Red biotechnologies (health), including medicinal, diagnostic and therapeutic interactions (e.g. stem cell therapy, gene therapy etc.) developed on the basis of recombinant technology (i.e. combining DNA sequences which would not otherwise combine). These technologies have their main applications in the health domain, using genomics and proteomics;
- ▼ Green biotechnologies (agriculture): this category includes plant selection using specific techniques such as genetic modification and marker-assisted selection, which improve efficiency in comparison to traditional methods. These technologies use plant organisms and cells to produce foodstuffs, biomaterials and energy.

Just as for the other sectors, the contribution of this sector should be assessed taking into account both the 'producer' and 'user' aspects of these technologies (Chart 22), but it is extremely difficult to assess the 'user' aspect for this sector. This analysis therefore focuses on the left hand side of the chart, which details the macroeconomic impact of private companies active in the sector, and is followed by an evaluation of the action plan for the health sciences and technologies sector published by the OECD a few months ago.

Chart 22

**Size of the contribution of activities, processes and products in the health sciences and technologies sector**

Source: Inspired by 'Measuring the Contribution of Modern Biotechnology to the Canadian Economy', Centre for the Study of Living Standards, 2011

In absolute terms, the health sciences and technologies sector is still somewhat small, as in 2012 there were only 30 companies in this sector according to the accepted definition, and only 22 of those companies had employees. However, these other companies cannot be excluded entirely for various reasons, as they are either active members of the BioHealth Cluster which do not have employees but use a different form of employment, or they are SPEs (*special purpose entities*) which are not posted but which nonetheless are part of the sector. This increases the number of employees to 523 for 2012, a figure which has more than tripled since 2008 mainly due to the creation of new biotechnology companies and private research institutions. The added value generated has also increased in absolute terms, but still remains below 0.1% of the gross added value to the economy of the country. However, it is important to stress that this data is only available for around half of the companies in the sector because it is made up of numerous small companies which are not obliged to submit company balance sheets to the RCS or draw up profit and loss statements. Such documents would be necessary for calculating the added value of the sector. The size of the sector is therefore underestimated, although an initial estimate of its size in terms of companies can at least be made (Table 13). The number of private companies in the health sciences and technologies sector in Luxembourg remains very small for the moment, in spite of considerable growth between 2008 and 2012.

Table 13  
Indicators for the health sciences and technologies sector - private sector

Health sciences and technologies	2008	2009	2010	2011	2012
Number of companies	15	18	22	29	30
	<i>0.05%</i>	<i>0.06%</i>	<i>0.07%</i>	<i>0.09%</i>	<i>0.09%</i>
Number of salaried workers	168	202	233	448	523
	<i>0.05%</i>	<i>0.06%</i>	<i>0.07%</i>	<i>0.13%</i>	<i>0.15%</i>
Sample size:	12	13	16	19	22
Value added at factor cost (in € millions)	2.6	3.1	3.8	12.6	26.9
	<i>0.01%</i>	<i>0.01%</i>	<i>0.01%</i>	<i>0.03%</i>	<i>0.07%</i>
Sample size:	7	7	7	15	17

Note: The percentages in italics denote the share of the sector in the total value of the indicator for Luxembourg. Information on numbers of employees and the added value of the sector is only available for the number of companies listed in the 'sample size' row. Numbers of employees were not available.

Source: Company balance sheets submitted to Trade and Companies Register, STATEC and IGSS, Calculations: ODC

The government's economic diversification strategy has thus far primarily affected the public sector. In 2008, Luxembourg established a strategic partnership with three world-renowned American research institutions. This key initiative aimed to inject dynamism into the sector. Under this partnership, three flagship projects have been set up: the foundation of the Integrated BioBank of Luxembourg (IBBL), the setting up of the Luxembourg Centre for Systems Biomedicine (LCSB) at the University of Luxembourg, as well as a lung cancer project based in the CRP-Santé headquarters. In 2010, the leaders of these three flagship projects created the 'Personalized medicine consortium', a virtual structure which aims to pool expertise and create synergies. The expertise of the various stakeholders was brought together in 2008 through the creation of the Luxembourg BioHealth Cluster. These public sector stakeholders have since gained international recognition.

### OECD evaluation of the Health Sciences and Technologies action plan

The recently published OECD report on innovation in Luxembourg listed a number of points for improvement to strengthen this still fledgling sector, which will need several years to carve out a place for itself in the country's economy. Despite the small number of companies in the sector which are based in Luxembourg, there are still several points requiring close attention according to the OECD in order to boost Luxembourg's position in the sector. However, whilst the sector has enjoyed limited success among private companies, the greatest successes are to be found in the public sector (see chapter 5).

Although investment and stronger institutions which can develop cutting-edge research techniques are a prerequisite for the continuation of the diversification policy, they will not ensure success on their own. Several of the framework conditions necessary for success seem to be under-developed in Luxembourg, which is hampering the development of the sector according to the OECD:

- ▼ Firstly, Luxembourg's industrial base and power of attraction in the field of biomedicine remain weak. Although new infrastructures such as the House of BioHealth in Belval could help to attract businesses, the government may need to offer further incentives in order to attract more businesses to the sector in Luxembourg.
- ▼ Secondly, a lack of attention seems to have been paid to the regulatory framework governing health technologies, such as genetic tests for example. Innovations in the health and life sciences domain are usually heavily governed by ethical, legal and regulatory conditions. The Ministry of Health has thus far played a relatively minor role in this area, but it now needs to take the initiative.
- ▼ Thirdly, the lack of tradition and history in the area has made links between the government, industry, clinical practice and research weak and under-developed. This is in all likelihood the biggest barrier to innovation in the health sector and the adoption of new techniques in clinical practice.

The OECD has therefore compiled a list of recommendations for the health sciences and technologies sector:

- ▼ *As biomedical innovation is still in its early stages, maintain realistic expectations pertaining to returns on investment.* Although research should be ambitious and aim to make a socioeconomic contribution, this takes time, and many of the contributions from such investments are indirect and difficult to gauge.
- ▼ *Introduce a regulatory framework which is favourable to biomedical innovation as a matter of urgency,* in order to make use of the potential of biomedical innovation. For this purpose, the Ministry of Health will need to participate more actively in the initiative.
- ▼ *Further develop clinical research in Luxembourgish hospitals,* in order to be able to offer new treatments to local patients and – in future – international markets. In this context, the Ministry of Health must work together with the Ministry of Higher Education to develop new professional partnerships between hospitals and research centres, in order to improve cooperation and knowledge-sharing.
- ▼ *Consider launching similar- but cheaper- initiatives in a few other areas,* bearing in mind the lessons learned in the field of biomedicine. Such initiatives must be developed more openly and transparently than in the past and should involve all stakeholders.

Finally, according to the OECD: “The economic advantages and health benefits of the biomedical initiative are yet to be seen. It is not realistic to expect businesses to be created or attracted rapidly. Moreover, scientific research suggests that only a small number of ‘spin-offs’ are successful, as they tend to become small or medium enterprises (SMEs) instead of large companies, and are more frequently targeted for acquisition by other companies. ‘Failures’ are part of the process. Equally, a long period of time and close cooperation between researchers and clinicians is required before health benefits can occur. Luxembourg’s historical development suggests that a significant period of time must elapse before a reasonable judgement can be made about whether something is a ‘success’ or ‘failure’, or indeed what the ‘results’ of the initiative are”<sup>29</sup>.

## International comparison

It is difficult to compare the performance of this sector with other countries, as there are no standard methods for calculating the macroeconomic indicators. According to the European Commission, the biotechnology industry employed 96,500 people in the European Union in 2006, mainly in SMEs. It was considered a high technology intensity industry, as 44% of its employees were involved in research and development<sup>30</sup>. The report also stresses that the biotechnologies industry is, in itself, very small in Europe, but that its inventions (both new products and improved production methods) have a significant impact on several other industries, including the pharmaceutical, chemical, plastic, pulp and paper, textiles, manufacturing and agricultural industries. There are three broad categories of applications for biotechnologies in the EU economy<sup>31</sup>:

- a) In healthcare and pharmaceutical applications, biotechnology has led to the discovery and development of cutting-edge drugs, therapies, diagnoses and vaccines;
- b) In agriculture, livestock breeding, veterinary products and aquaculture, animal feed has been improved, vaccines for cattle produced, and diagnostic methods for certain diseases improved. Enzymes can now be used to process feed more efficiently in order to improve plant reproduction and acquire plants with the desired characteristics;
- c) In industrial processes and manufacturing, enzymes are now used to produce detergents, pulp and paper, textiles and biomass. By using fermentation enzymes and bio-catalysts instead of traditional, synthetic chemicals, the effectiveness of the treatment can be improved, reducing energy and water consumption as well as toxic waste.

<sup>29</sup> Extract from OECD report, Reviews of Innovation Policy, Luxembourg 2015, page 28

<sup>30</sup> Competitiveness of the European biotechnology industry, European Commission, 2007

<sup>31</sup> [http://ec.europa.eu/growth/sectors/biotechnology/index\\_en.htm](http://ec.europa.eu/growth/sectors/biotechnology/index_en.htm)

According to the figures published by the OECD, the United Kingdom reported 9,644 employees in R&D and biotechnology in the same year, and Germany 8,024, compared to 73,520 in the United States. However, these figures do not include the employees of major pharmaceutical and chemical companies and are not therefore fully representative. To try to flesh out this data, the OECD factored in all activities linked to biotechnology and reported, for the years 2003 and 2004, 24,131 employees in Germany and 22,405 in the United Kingdom, compared to 172,391 in the United States. Although these statistics are no longer up-to-date, they demonstrate nonetheless that figures can vary substantially depending on the definition used.

According to the latest available data, the biotechnology sector in Germany had 17,430 employees in 565 companies devoted entirely to this sector in 2012. These companies, whose combined annual turnover amounted to €2,9 billion, spent €934 million on R&D<sup>32</sup>.

A report published in 2011 in Canada shows that in absolute terms, biotechnologies only accounted for 1.2% of the country's GDP, but although their share of the economy was small, the sector grew by 10.7% between 1999 and 2005<sup>33</sup>.

In addition, the composite indicator developed by the European Commission's Joint Research Centre<sup>34</sup> gives an indication of Luxembourg's position in the European panorama with regard to R&D. Although the data is slightly out of date, the indicator measures scientific and technological research excellence<sup>35</sup>, defined as the result of creative, high quality work carried out with a view to increasing knowledge and developing new applications. The analysis takes into account four variables which measure the national levels of scientific and technological research in 40 countries (33 of which are in the ERA<sup>36</sup>- the 28 EU Member States, Turkey, Switzerland, Iceland, Norway and Israel, as well as Brazil, Russia, India, China, South Korea and the United States):

- a) Number of frequently quoted publications;
- b) Number of requests for high quality patents;
- c) Number of universities and research institutions with worldwide recognition;
- d) Number of prestigious grants awarded.

In 2010, Luxembourg ranked 27th out of the 33 ERA countries, falling 2 places in comparison with 2005 results.

<sup>32</sup> <http://www.biotechnologie.de>

<sup>33</sup> Measuring the Contribution of Modern Biotechnology to the Canadian Economy, Centre for the Study of Living Standards, 2011

<sup>34</sup> JRC: Joint Research Centre – European Commission

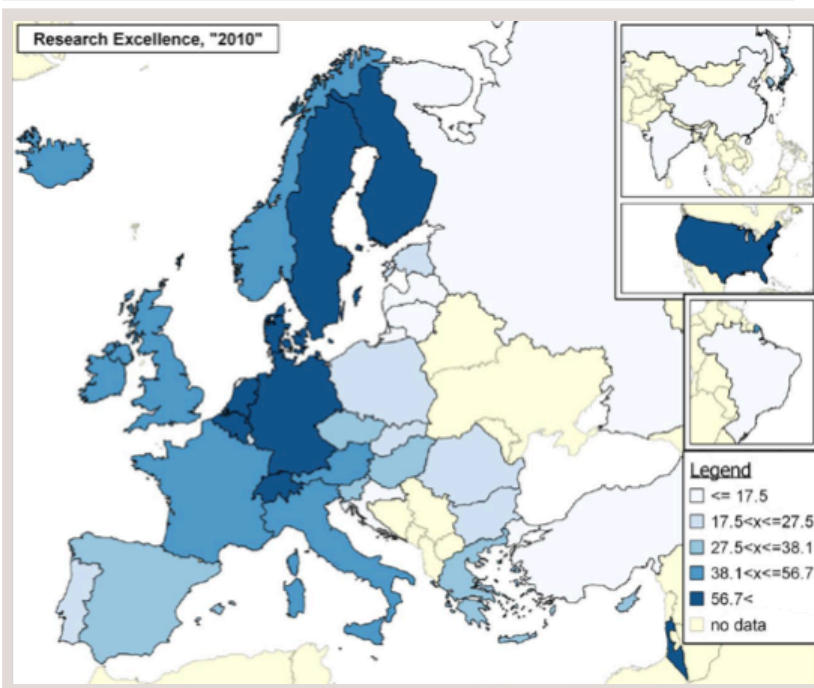
<sup>35</sup> JRC, An analysis of national research systems (II): A Composite Indicator for Scientific and Technological Research Excellence, 2013

<sup>36</sup> ERA: European Research Area

In a possible range of 10 to 100, Luxembourg scored a total of 19.8. Switzerland came 1st with 97.6 and Latvia was at the bottom of the table with just 11.5 (Chart 23). Luxembourg's scores for the four variables analysed are listed below in greater detail:

- ▼ Number of frequently quoted publications: 53/100;
- ▼ Number of requests for high quality patents: 29/100;
- ▼ Number of universities and research institutions with worldwide recognition: 10/100;
- ▼ Number of prestigious grants awarded: 10/100.

Chart 23  
Graphical representation of scores for "Research Excellence, 2010"

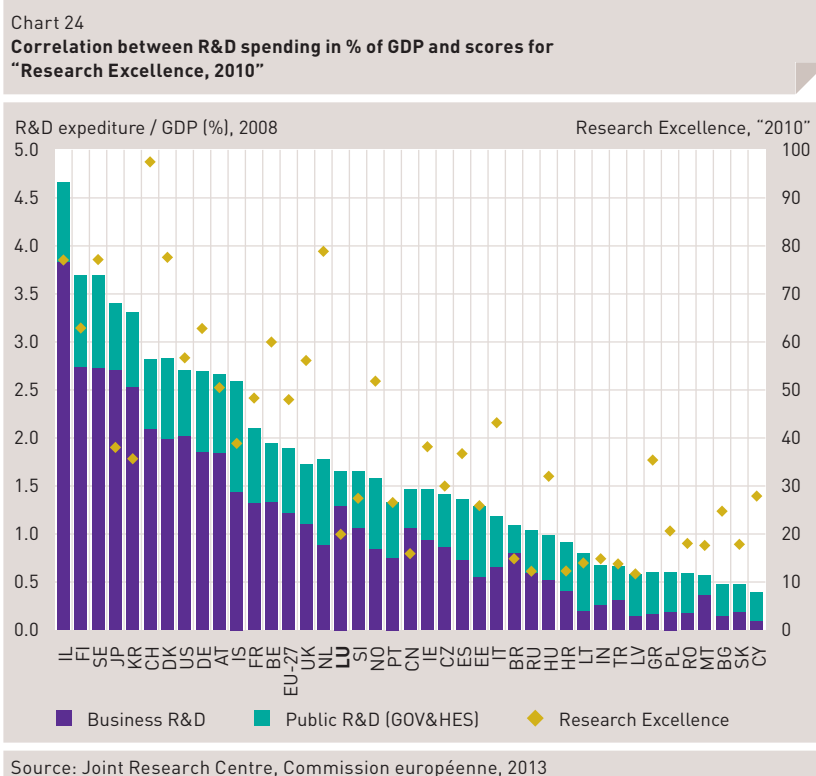


Source: Joint Research Centre, European Commission, 2013

In this study, the composite research excellence indicator was then linked to public spending on R&D in % of GDP (*public R&D per GDP*) and business spending on R&D in % of GDP (*business R&D per GDP*) in 2008. Several results emerge (Chart 24):

- a) In countries with relatively low research excellence scores, most R&D investment takes place in the public sector;
- b) Conversely, in countries with medium to high research excellence scores, most R&D spending in % of GDP takes place in the private sector. At the same time, many leaders in research excellence are also leaders in R&D spending in % of GDP (e.g. Sweden, Finland, Israel and the Netherlands);

- c) Moreover, despite certain countries investing large sums into R&D (public and private spending), this does not guarantee a high level of research excellence (e.g. Japan and Korea);
- d) Finally, there is no meaningful positive correlation between research excellence and public spending on company-funded R&D. The level of research excellence is not therefore linked to this type of financing<sup>37</sup>.



This indicator shows that the degree of scientific and technological research in Luxembourg was still below the European average, both in terms of excellence and investment in % of GDP. However, the composite indicator for Luxembourg shows that it has 'caught up' to other ERA countries in terms of performance between 2005 and 2009, but remains a 'laggard' at global level<sup>38</sup>.

Nevertheless, it is important to stress that this classification does not only cover the biotechnologies sector, but also analyses productivity levels for activities linked to research in all sectors, based on data from 2008. Thus, given the greater importance now accorded to R&D and the government's financial input into the area, Luxembourg's score has probably improved in the meantime.

<sup>37</sup> JRC, An analysis of national research systems (I): A Composite Indicator for Scientific and Technological Research Excellence, 2013

<sup>38</sup> JRC, Composite Indicators of Research Excellence, 2012

## 5.3.5 Eco-technologies

According to the new list of companies active in the eco-technologies sector drawn up by national experts in 2012, the 134 companies 'producing' eco-technologies were involved in the sector in varying degrees of intensity:

- a) The eco-technologies sector, under the strict definition of the term, consisted of 30 companies. The main activity of these companies was oriented towards developing and selling products and services aimed at measuring, preventing, limiting or redressing environmental impacts and reducing the consumption of natural resources whilst still meeting the same needs as traditional techniques;
- b) 104 companies were developing eco-technologies focussed on clean production, without necessarily being part of the eco-technologies sector (e.g. Bétons Feidt, Goodyear, Paul Wurth, etc.). These eco-activities cover all goods and services production tasks which support environmental protection and rational management of natural resources.

In addition to these two categories, it should be mentioned that many companies in Luxembourg may be considered 'environmentally responsible' as considerable efforts have been made to protect the environment through strict regulations. Furthermore, SuperDrecksKëscht, an initiative with almost 3,600 affiliate companies directly involved in the optimal management of waste (and which can thus be considered 'environmentally responsible'), has been recognised as an example of 'best practice' in Europe<sup>39</sup>.

Just like the health science and technology sector, the eco-technologies sector *strictu sensu* remains rather limited in size. In 2012, there were 30 companies focusing on the development of eco-technologies as their main activity (i.e. a 36.4% increase on 2008). The number of employees stood at 579, a 16.5% increase over the period. The level of added value generated remained relatively stable across the period at under 0.1% of the gross added value of the country's economy. However, it should be mentioned that the sector consists of several small companies which are not obliged to submit profit and loss statements to the Trade and Companies Register, the data source used to calculate the added value generated. At present, data are only available for half of the selected companies. Therefore, it can be deduced that the size of the sector is slightly under-estimated, although the companies for whom data are missing are of limited size and thus the estimate does cover the lion's share of the sector (Table 14).

<sup>39</sup> <http://www.superdreckskescht.lu/fr/News-Best-practice.html>

Table 14

**Indicators relating to the eco-technologies sector (strict definition) – Private sector**

Eco-technologies	2008	2009	2010	2011	2012
<b>Number of companies</b>	22	22	23	27	30
	<i>0.07%</i>	<i>0.07%</i>	<i>0.07%</i>	<i>0.08%</i>	<i>0.09%</i>
<b>Number of salaried workers</b>	497	543	535	569	579
	<i>0.15%</i>	<i>0.16%</i>	<i>0.16%</i>	<i>0.16%</i>	<i>0.16%</i>
<b>Value added at factor cost</b> (in € millions)	28.8	23.9	18.7	35.5	31.2
	<i>0.09%</i>	<i>0.07%</i>	<i>0.05%</i>	<i>0.09%</i>	<i>0.08%</i>
Sample size:	10	10	11	15	16

Note: Percentages shown in italics represent the sector's share of the total indicator figure for Luxembourg. Information pertaining to the number of salaried workers and the sector's added value was only available for the companies included in the 'sample size'. Data on employee numbers were not available.

Source: Company balance sheets submitted to the Trade and Companies Register, STATEC and IGSS. Calculations: ODC

There are several other companies, such as Goodyear and Arcelor to name but two of the largest in Luxembourg, who are developing eco-innovative products but are not included in the eco-technologies sector as this is not their primary activity. Consequently, these companies are listed in other sectors of the economy.

In order to paint a more complete picture of the sector, it is necessary to include companies which use eco-technologies in order to analyse the concept of eco-innovation. The community innovation survey (CIS 2008) revealed that between 2006 and 2008, 69% of the surveyed companies in Luxembourg declared that they were innovative, i.e. they had introduced at least one product, process, organisational or marketing innovation<sup>40</sup>. Of these companies, 47% had introduced at least one product or process eco-innovation which had led to a positive environmental impact. According to the study, companies were seeking to introduce more green innovation in the production phase (42%) than in the 'finished product' phase (32%). In addition, it was revealed that eco-innovation is more present in larger companies, i.e. with over 250 employees, and that industrial companies introduced proportionally more eco-innovation than their service sector counterparts. Four years later, the results of the 2012 CIS study showed that 64% of companies in Luxembourg were innovative, on a par with the previous study, but only 24% are developing eco-innovation. However, this low figure is probably due to companies having adopted eco-innovation at the time of the first study and continuing to benefit from it. Therefore, they did not need to subsequently introduce new environmental innovation measures. Whilst it would be interesting to analyse the impact of eco-innovation on the economic performance of companies, this appears to be a complicated undertaking, as demonstrated by several studies including those penned by Mazzanti and Zoboli<sup>41</sup>. Unfortunately, at this juncture it is not possible to gather such information.

<sup>40</sup> Motivations à l'éco-innovation : une comparaison sectorielle sur les entreprises au Luxembourg, Working Paper No. 2012-11, CEPS

<sup>41</sup> Mazzanti et Zoboli, Embedding environmental innovation in local production Systems: SME strategies, networking and industrial relations: evidence on innovation drivers in industrial districts, 2009

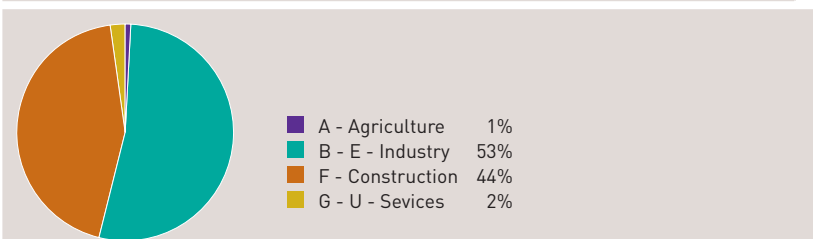
Whilst the first part of the analysis only covers companies whose principal activity is the development of new technologies with a view to fulfilling sustainable development goals, several other companies make use of these technologies. In addition to the concept of eco-technologies, it should be borne in mind that, given the growing importance of the development of environmentally friendly processes and products, several companies in a wide range of different sectors are developing innovative products or processes which have a positive impact on the environment whilst also improving the efficiency and productivity of the company's internal processes. Such activities were recently analysed by STATEC<sup>42</sup> through a study of the environmental goods and services sector (EGSS), i.e. the production of goods and services seeking to prevent, measure, control, limit, minimise or redress environmental damage and the depletion of natural resources. The study reveals that such activities represent 2% of the Luxembourg's gross added value across all sectors of the nation's economy and account for almost 9,800 jobs. The industrial sector produces the lion's share (53%) of the gross added value of the EGSS. In particular, 'waste collection, treatment and disposal' and, to a lesser extent, 'waste water management' contribute to the gross added value of environmental goods and services (Table 15).

Table 15 EGSS data					
Environmental goods and services (EGSS)	2008	2009	2010	2011	2012
<b>Production</b> (in € millions)	1,723	1,405	1,599	1,726	1,722
	<i>1.6%</i>	<i>1.4%</i>	<i>1.6%</i>	<i>1.5%</i>	<i>1.5%</i>
<b>Employees</b> (full-time equivalents)	10,028	8,800	9,918	9,735	9,757
	<i>2.5%</i>	<i>2.3%</i>	<i>2.7%</i>	<i>2.5%</i>	<i>2.5%</i>
<b>Gross added value</b> (in € millions)	659	593	703	746	744
	<i>1.9%</i>	<i>1.9%</i>	<i>2.1%</i>	<i>2.1%</i>	<i>2.0%</i>
Note: Percentages shown in italics represent the sector's share of the total indicator value for Luxembourg. Source: STATEC					

The construction sector is the main contributor, accounting for 44% of gross added value in terms of environmental goods and services (Chart 25).

<sup>42</sup> Study to be published soon: Environmental Goods and Services Sectors - A statistical guide, 2014

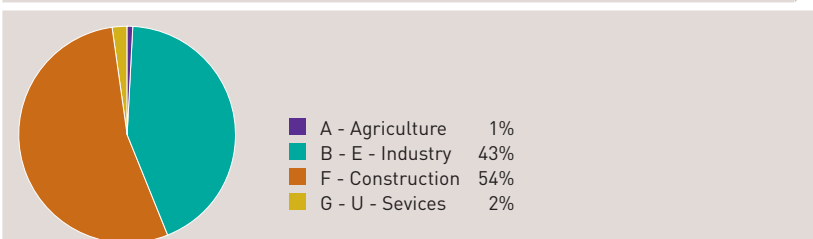
Chart 25  
**Breakdown of gross added value linked to environmental goods and services by branch - 2012**



Source: STATEC

However, as regards employment, the roles are reversed with industry and construction accounting for 54% and 43% of EGSS jobs respectively in 2012. This demonstrates the intensity of EGSS jobs in the construction sector (Chart 26).

Chart 26  
**Share of jobs linked to EGSS per branch - 2012**

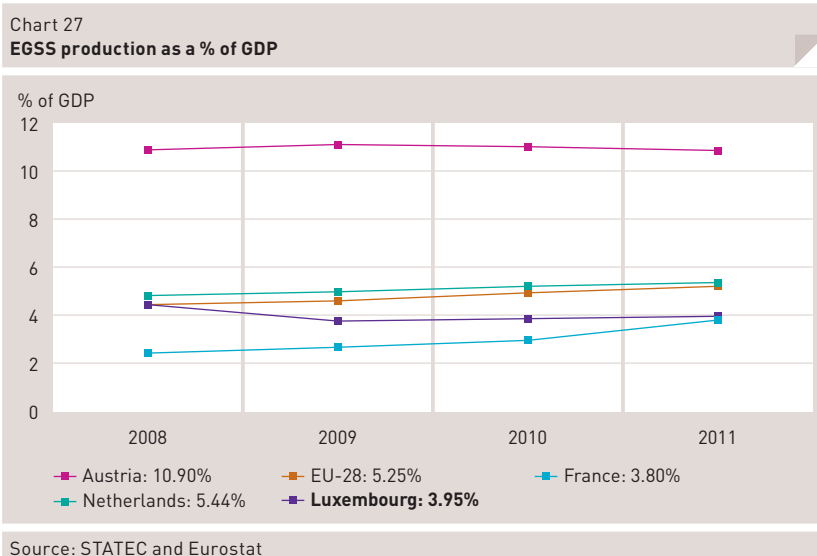


Source: STATEC

The Luxembourg government acknowledged eco-technologies as a strategic sector for the diversification of the national economy. In addition to the development of the sector, eco-innovation enables greater competitiveness in all sectors, especially via a circular economy approach aiming to decouple growth from the use of raw materials and thereby reduce companies' exposure to price volatility. In a 2014 study, the Ministry of the Economy concluded that at least 7,000 jobs in Luxembourg are dependent upon the circular economy. By further developing the circular economy, Luxembourg could create numerous jobs in the years to come and make substantial savings on the cost of raw materials.

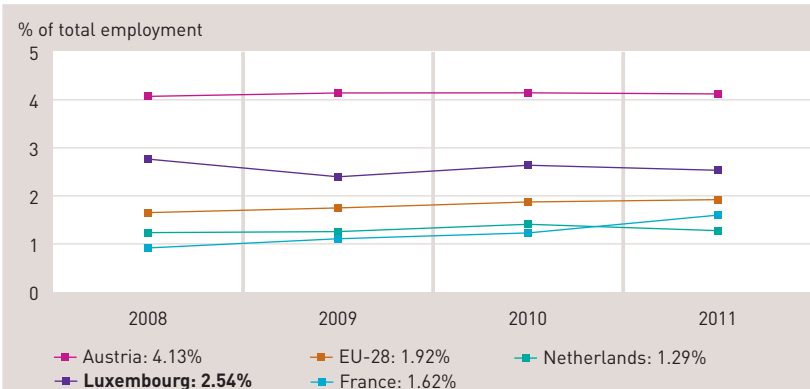
## International comparisons

Currently, the only data which can be compared internationally are EGSS data. They may be compared to those of other countries. In 2008, Luxembourg's EGSS production, in terms of percentage of GDP, stood at 4.5%, on a par with the EU-28 average. However, in 2011, the EU-28 average rose to 5.3% whilst the figure for Luxembourg fell to 4.0%. Between 2008 and 2011, EGSS production in the Netherlands kept pace with the EU-28 average whilst France raised its game to almost catch up with Luxembourg in 2011. In Austria EGSS production remained stable at around 11%, over twice that of the other countries mentioned (Chart 27).



With regard to jobs, the trend in the EU-28, France and Austria is similar to that observed for production levels, whereas the situation is different in Luxembourg and the Netherlands. In the Netherlands, there are far fewer EGSS jobs as a percentage of total jobs than in the other countries under analysis. In Luxembourg, the share of EGSS jobs as a percentage of total jobs is well above the European average (despite the use of employment figures which include the particularly high number of non-residents working in Luxembourg) whilst EGSS production as a percentage of GDP is below the EU-28 average. Although there is a significant number of EGSS jobs in Luxembourg, production linked to these jobs is relatively low when compared to other countries (Chart 28). This could be seen as confirmation of EGSS specialisation in Luxembourg.

Chart 28  
EGSS jobs as a % of total employment



Source: STATEC and Eurostat

However, even after consulting the various studies it is impossible to find comparisons of the macroeconomic impacts of eco-technologies (strict definition). Some countries analyse the sector at cluster level and so the data are not comparable with those currently available for Luxembourg.

However, comparative analysis of eco-innovation in different European countries does exist. Eco-innovation is innovation which reduces the use of natural resources and thus diminishes the emission of toxic substances throughout a product's lifecycle. In an age characterised by the ever-increasing scarcity of natural resources, eco-innovation constitutes an opportunity to reduce natural resource consumption levels and increase the competitiveness of companies. Eco-innovation enables the emergence of a 'dematerialised' economy thanks to an increase in companies' efficiency (cost reduction) and the development of new products and services. Measuring eco-innovation on the scale of national economies enables strengths and weaknesses to be identified and the performance of national systems to be compared. To this end, the Eco-Innovation Observatory (EIO) set up an 'Eco-innovation Scoreboard' to present eco-innovation inputs (e.g. R&D) and outputs (e.g. patents). On the basis of the scoreboard indicators, the EIO calculates a composite index which provides an overview of countries' performances<sup>43</sup>. In the 2013 standings, Luxembourg ranked 7th, behind Finland, Sweden, Germany, Denmark, the United Kingdom and Spain (Table 16).

<sup>43</sup> Website of the Luxembourg  
Observatoire de la compétitivité

Table 16  
Luxembourg's ranking in the 'Eco-Innovation Scoreboard'

Year	Luxembourg's ranking	Number of countries analysed
2013	7	28
2012	11	27
2011	4	27
2010	11	27

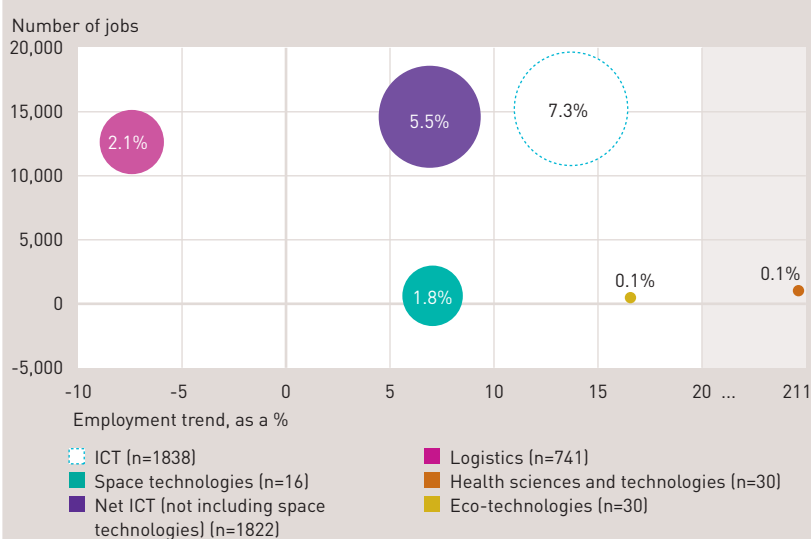
Luxembourg placed above the EU average for eco-innovation inputs, eco-innovation outputs and resource efficiency outcomes. It ranked below the EU average for eco-innovation activities and socioeconomic outcomes. Luxembourg shared 1st place with Finland for the number of employees in R&D and number of researchers, with Malta for material productivity and with Denmark for eco-industry product exports as a percentage of total exports. According to the same source, eco-innovation industries in Luxembourg accounted for 0.48% of total GDP in 2008 (the figure was 1.16% in 2004), with only around 0.53% of the total workforce employed in eco-industries. In addition, eco-industry exports accounted for 1.4% of total exports (approximately double the EU average), a significant increase on the 2007 figure which stood at a mere 0.23%<sup>44</sup>.

## 5.4 Conclusions

In 2012, the five new priority sectors in their *strictu sensu* definitions accounted for 9.6% of the added value of the country and close to 30,000 jobs in over 2,600 companies. Of these sectors, ICT was responsible for the greatest share of added value created in the economy, followed by logistics and space technologies. The biggest rise in employment occurred in the health sciences and technologies sector, despite this sector only representing 523 jobs in the private sector. Conversely, the number of jobs in the logistics sector has shrunk since 2008, mainly due to the decline in road freight transport as a result of fierce competition in this area of activity. Nonetheless, the sector still accounted for over 12,000 jobs (3.4% of total employment) in 2012 (Chart 29).

<sup>44</sup> Eco-innovation observatory, Luxembourg country report

Chart 29  
**Economic impact of the five new priority sectors (private sector)**  
**2008-2012 development**



Note: The size of the bubble represents the share of the sector in the economy. The ICT sector includes Space technologies and Net ICT (not including space). The added value of the Health sciences and technologies sectors is calculated based on just 17 and 16 (respectively) of the 30 companies in the sector, due to a lack of available data for the remaining companies.  
n= number of companies  
Calculations: ODC

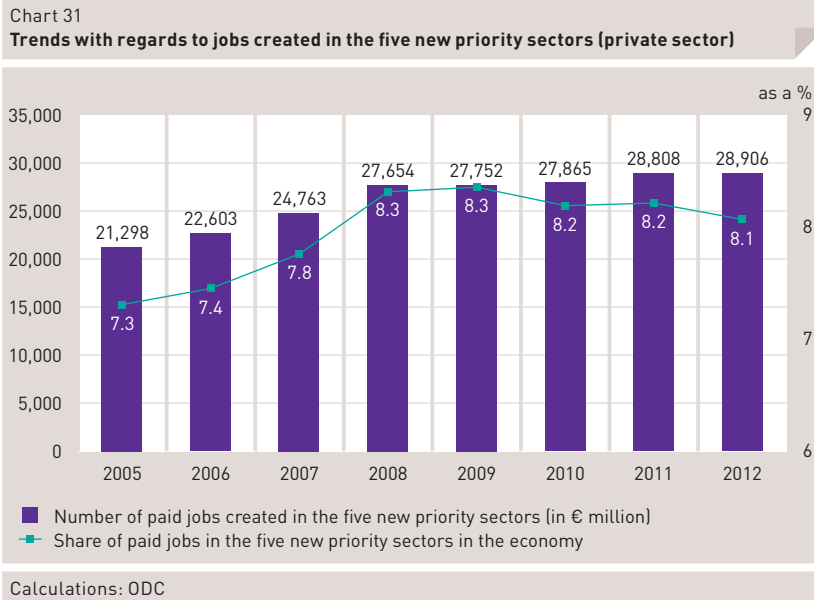
Although the share of gross added value for the five new priority sectors in the economy varied between 8.5% and 9.7% between 2005 and 2012, the added value in absolute terms has increased consistently since 2005, except for the year 2009 as a result of the economic and financial crisis (Chart 30).

Chart 30  
**Trends in added value created by the five new priority sectors (private sector)**



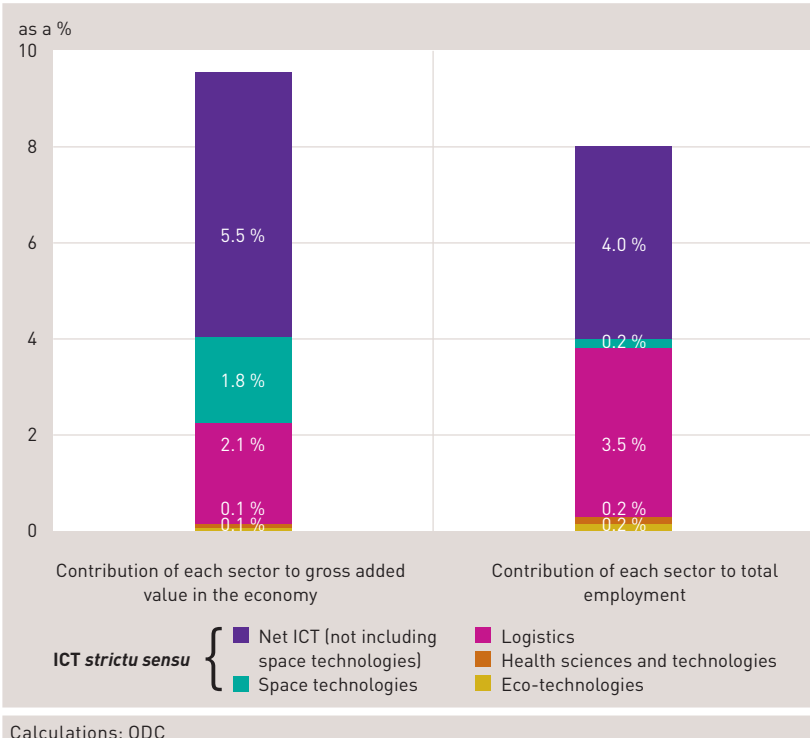
Calculations: ODC

A similar trend can be observed in employment figures, which have increased continually since 2005 to nearly 29,000 jobs in 2012 in the five priority sectors analysed. This is equal to 8.1% of the country's total paid workforce (Chart 31).



The ICT sector, in its *strictu sensu* definition which notably includes space technologies, was the main contributor to added value and to the number of paid jobs created in the five new priority sectors in 2012. In fact, ICT accounted for 7.3% of the gross added value in the national economy and 4.2% of the total number of paid jobs (in the private sector) in the country. The logistics sector came in at a close second with 3.5% of the total national workforce. It accounted for 2.1% of the gross added value in the economy. The health sciences and technologies and eco-technologies sectors, on the other hand, made only minor contributions to these macroeconomic indicators (Chart 32).

Chart 32  
**Contribution of each priority sector to gross added value and employment (private sector) - 2012**



The main conclusions of the sector-by-sector analytical study can be summed up as follows:

- ▼ The **ICT** sector is currently the best-established of the five new priority sectors identified by the government and represents 7.3% of gross added value in the economy and 4.2% of the national workforce. From the perspective of both producers and users of ICT, the sector has been experiencing clear growth in Luxembourg for several years now. The number of jobs and ICT production companies based in Luxembourg and active in this sector, according to the *strictu sensu* definition, has grown continuously since 2005, mainly due to a favourable business environment and advantages which allow companies to benefit from an attractive regulatory and fiscal framework. This is also true for certain “e-commerce” companies, which create numerous jobs in Luxembourg and generate a great deal of added value. This positive development in the sector is also reflected in the numbers of ICT users which continues to rise, throughout all sectors of the economy. Electronic trade activities based in Luxembourg have in fact been growing considerably for several years now, and represented 2.7% of the gross added value in the economy in 2013, in addition to the gross value added mentioned previously. This is mainly thanks to the Amazon group, which alone accounted for over half of the gross value added generated by companies with trade as their main activity. This activity has grown considerably since 2009, and Luxembourg now lists several major names in the sector which run their activities from the country.

- ▼ The **space technologies** sector, which is an integral part of the ICT sector according to the definition, is dominated by a major international group, SES. Since 2008, the government has sought to strengthen its position in the sector by supporting space research, particularly the research carried out by the smaller companies which also populate the Luxembourgish space sector.
- ▼ The number of jobs in the **logistics** sector has fallen slightly since 2008 following an increase in competition from Eastern European countries in the road freight transport sector. Conversely, however, postal services grew between 2008 and 2012 (+160 jobs), as did air transport (+150 jobs) and rail freight transport (+128 jobs). The sector counts over 12,000 jobs and provides employment for a low-skilled or unskilled workforce, which has the advantage of helping to reduce unemployment among this category of the population.
- ▼ Activities in the domain of **health sciences and technologies** are still very limited in the private sector. The number of active companies is small and the value added created remains small too, in spite of significant growth in employment in the sector. However, there is a great deal of research and development activity in this sector in the public domain, which has developed along very positive lines during the past few years. The activities of LCSB, CRP-Santé and the IBBL have strengthened Luxembourg's position in this sector at international level. Nonetheless, a great deal of progress still needs to be made in adapting the regulatory framework to promote dynamism in the sector and attract more companies to the sector.
- ▼ The impact of the **eco-technologies** sector remains difficult to assess, as innovations in this sector are often subject to increasingly strict regulations. Although the number of companies producing eco-technologies remains very small, the environment is becoming an increasingly important issue for both companies and households. As such, the number of companies using eco-technologies has been increasing consistently for several years.

Nonetheless, it remains difficult to compare these five sectors because of their numerous different characteristics. For example, levels of maturity vary widely depending on the sector. While the ICT and logistics sectors have been priority sectors for over a decade, other sectors which depend heavily on research and development such as space technologies, health sciences and technologies and eco-technologies became priorities at a much later stage. Therefore, while the health sciences and technologies sector has mainly developed in the public domain, the eco-technologies sector has developed along rather different lines. Although the number of companies producing eco-technologies based in Luxembourg remains very small, Luxembourgish companies are experiencing a change in mind-set in terms of the attention they pay to the environment. They are trying to reduce the environmental footprint caused by their operations by developing production methods for goods and services which use of eco-technologies to prevent, measure, check, restrict, minimize or counteract environmental damage and the using up of natural resources. The macroeconomic impact is therefore indirect rather than direct, as more efficient production is ensured. Moreover, other factors such as research and development activities or the current regulatory framework have bolstered or hampered the development of certain sectors in comparison to others in relation to the macroeconomic indicators taken into consideration in this analysis.

In conclusion, a review of the government strategy which has now been in place for several years could be a useful exercise for assessing whether the current sectors of specialization are still relevant. This would enable to determine the sectors requiring greater or lesser investment, the areas which are the most promising and the action which needs to be carried out. This exercise, which has already been carried out in France for example as part of the 'France Stratégie' action plan<sup>45</sup>, served notably to evaluate French public policies in order to better anticipate future economic challenges.

<sup>45</sup> <http://www.strategie.gouv.fr/>

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## 6 Thematic studies

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## 6.1 Introduction

Luxembourg 2020 is a programme of reforms aimed at fostering economic growth by focusing on the inclusiveness and competitiveness of Luxembourg's economy. The competitiveness of the economy, however, is deeply linked to the competitiveness of firms, while private and public social initiatives contribute to inclusiveness. Productivity provides a synthetic measurement of what matters for countries' competitiveness, such as innovation, efficiency, entrepreneurship, and is relevant at national, industry and firm level.

The need of better understanding factors that promote or hinder competitiveness and inclusiveness motivates the research of *ANEC Connaissance*. The team contributes to understanding the factors driving Luxembourg's economic growth and productivity performance. The research is carried out on individual, firm, industry and national-level data produced at STATEC; whenever possible, Luxembourg's data are compared to those available for other countries to better interpret results. This chapter overviews the research topics investigated by the team and presents its main findings.

The efficient allocation of resources across firms and industries is an important source of aggregate productivity gains. The process of 'creative-destruction', observed especially during crisis periods, improves allocative efficiency. As a result, the role of start-ups and young firms for employment and productivity growth has become an important topic in the economic policy debate. Based on business register data, Section 1 documents that small and young firms play a crucial role in employment creation in Luxembourg. Namely, small and young firms create a disproportionate number of jobs in comparison to both older SMEs<sup>1</sup> and larger firms.

Aggregate productivity also increases when firms' productivity increases, which depends on technological improvements and innovation activities, entrepreneurship, and the use of people's skills.

Entrepreneurship is a source of dynamism in the economy, leading to firms' creation and spurring innovation. The participation to the GEM project, an international research programme seeking to collect comparable data on entrepreneurship, provides ANEC researchers with valuable information on residents' entrepreneurial efforts and attitudes, as well as Luxembourg's framework conditions. Section 2 investigates the relationship between immigration background and engagement in entrepreneurship using GEM data, contributing to shaping knowledge on the economic relevance of Luxembourg's population structure.

<sup>1</sup> Small and Medium enterprises.

Firms' productivity is also linked to the skills of workers and, more generally, to the characteristics of a country's labour market. Using administrative records and labour force survey data, Sections 3 and 4 depict salient features of Luxembourg's labour market, focusing on the evolution of workers' skills and the impact of employee turnover on wage dynamics. The analysis shows that Luxembourg experienced a substantial growth in the quality of its labour force in the last decade. Such development, together with a high employee turnover, has led to considerable changes in the wage structure.

In recent years, policy making has been increasingly focused on promoting inclusiveness and social cohesion to make economic growth sustainable. One possible way of achieving this goal is to support social firms. Little is known, however, on the economic and non-economic impact of social enterprises in Luxembourg. This topic is the subject of Section 5 which shows that the presence of social enterprises in Luxembourg mitigates social exclusion and inequalities, and has a lasting positive effect on residents' well-being.

As people's well-being and quality of life have recently entered policy agendas, new indicators of welfare that go beyond traditional income-based measure such as GDP are required. Luxembourg is also engaged in one such initiative, with the project *PIBbien-etre* implemented by STATEC. The pursuit of well-being is not only relevant per se, but it matters also at firm level. Several studies suggest that people's well-being and job satisfaction, a component of people's well-being, have a positive impact on workers' productivity, and ultimately on firms' value and performance. This evidence, however, rests primarily on experimental data while focus on economic outcomes is limited by data availability. The ANEC team is active in this field, and conducts state-of-the-art studies on quality of life and its link with economic outcomes. Section 6 presents one such study showing that people's subjective well-being matters to countries' productivity.

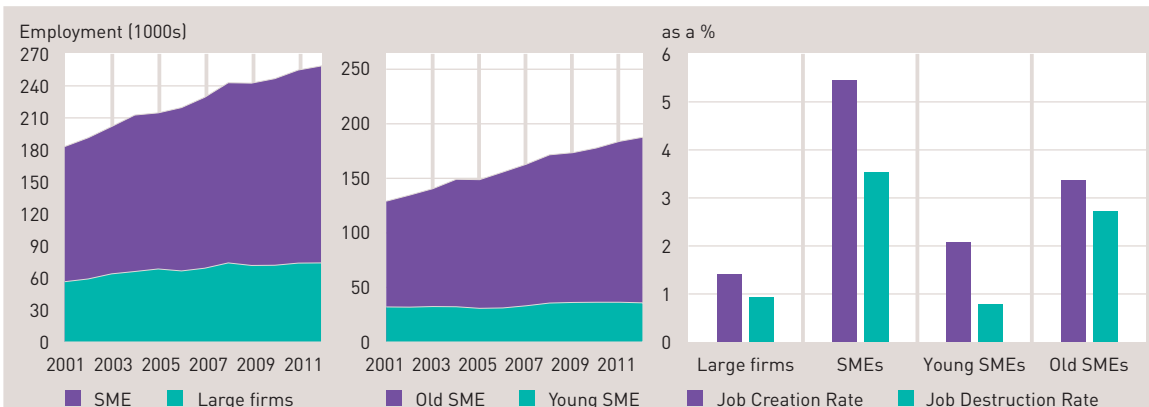
## 6.2 Dynamics of Net Job Creation, Firm Entry and Exit in Luxembourg's Main Sectors<sup>2</sup>

The DYNEMP project aims to provide empirical evidence on the role of creative destruction, start-ups and young firms for employment and productivity growth based on confidential firm level data from national business registers. Determinants of employment growth are at the core of the policy debate. The project attempts to contribute into this discussion by providing answers to two main questions. What role do small and young firms play in employment creation? What policies should governments adopt to harness the potential of small and young firms and encourage employment and productivity growth? This short note focuses on two particular aspects of the project that are the role of small and young firms in contributing to employment creation and the employment dynamics of entrant and exiting establishments.

The DYNEMP project defines the SMEs as the firms with less than 250 employees, where the young SMEs are the establishments that are at most 5 years old. The first two panels of Chart 1 display the employment levels of SMEs and large firms as well as old and young SMEs. Accordingly, the employment share of the SMEs is two times larger than the large firms in Luxembourg's main sectors. Among the group of SMEs, the firms over 5 years old have a larger share than the younger counterparts. Moreover, the SMEs exhibit higher employment growth than the large firms within the sample period. The older SMEs have higher employment growth rates than the younger ones, which implies that the establishments do not significantly expand in size within their first five years. This is somewhat expectable, since starting up a business requires certain level of fixed costs that are often financed by middle or long-term loans. Therefore, it is no surprise that the start-ups tend to pay their debts rather than investing in new projects during their initial years. There is also some empirical evidence that new firms tend to receive negative idiosyncratic demand shocks more often than the old firms, which restricts the growth and raises exit rates for new businesses.

<sup>2</sup> This note, authored by Leila Ben-Aoun and Umut Kilinc, is a summary of the results generated by the STATEC's research team for the DYNEMP project of the OECD Directorate for Science, Technology and Innovation. The firm classifications and sample coverage are based on the requirements of the project. All the figures in this note are the authors' own calculations based on the Business Register of Luxembourg.

Chart 1  
Total Employment, Job Creation and Destruction by Firm Size and Age



The last panel of Chart 1 displays time-averaged job creation and destruction rates for firm size and age groups. In the chart, the creation and destruction rates are not within-group ratios; namely that the change in each group's employment level is divided by the total employment of the entire sample that covers manufacturing, construction and non-financial business services firms. The job creation rate is the lowest in largest firm's group that includes establishments with more than 250 employees. Conversely, the SMEs are more dynamic and exhibit higher job creation and destruction rates than the large firms. The SMEs' net job creation (the difference between creation and destruction) is also significantly higher than those of large firms, indicating that the contribution of the SMEs to the overall employment rate is higher. The last two column sets in Chart 2 show that the creation and destruction rates are higher for older SMEs that are more than 5 years old. The net job creation, however, is the highest in the youngest group which supports previous empirical findings that young firms are the engines of job creation. Moreover, the employment-weighted exit rates within the group of new firms that are at most 2 years old are on average larger than 4%, while the employment-weighted exit rate for the overall sample is less than 2%.

Chart 2  
Firm Entry and Exit Rates in Broad Sectors

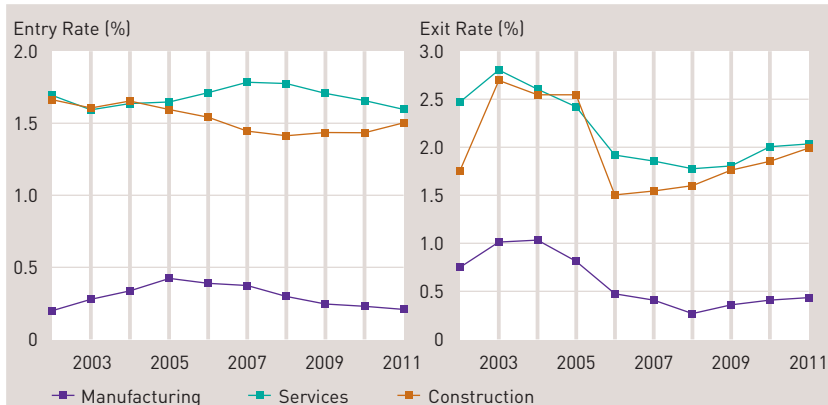


Chart 2 displays the time paths of the entry and exit rates in the main sectors of Luxembourg. The entry rate is the lowest in the manufacturing sector that is on average less than 0.5% throughout the sample period. The exit rate is also the lowest in manufacturing indicating firm turnover rate is low in manufacturing sectors. The entry and exit rates are the highest in the service sector, and the exit rates are on average higher than entry rates in general. The exit rates, however, are higher in the first half of the sample period until 2006. This is possibly because of the local economic crisis in 2002 which increases firm-level exit rates simultaneously in all sectors. The patterns of exit rates seem to be altered and follow an increasing trend after 2008 that corresponds to the 2008 global crisis. Conversely, the firm entry rates tend to decrease in the manufacturing and business service sectors after 2008.

Chart 3  
Net Job Creation by Entrant and Exiting Firms

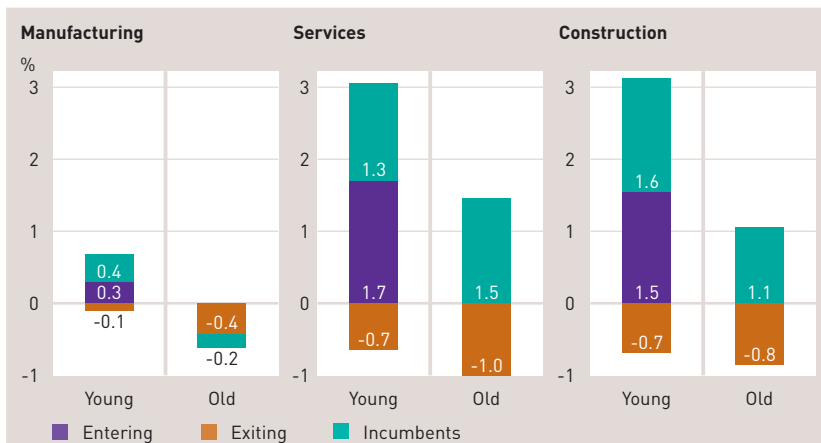


Chart 3 shows the net job creation rates for the 3-groups of firms that are entrants, exiters and incumbents for every sector separately. Each firm group is further divided into two as old and young where the old firms are more than 5 years old.

According to the chart, the net job creation rates are the smallest in manufacturing. This is partially a consequence of the transformation in Luxembourg's economy for the last two decades, during which an important amount of resources moves from traditional manufacturing and mining industries towards less mature and rapidly growing sectors such as business services and construction. This can also be seen in the net job creation rates of entrants and young incumbents in the services and construction, the sum of which exceeds 3% for both sectors. The net job creation of older incumbents as well as the absolute value of the exiters' net job creation is the highest in service industries which constitute the most dynamic sector in Luxembourg in terms of labor turnover.

The discussions in previous parts show that in Luxembourg young firms create a disproportionate number of jobs. When we divide the SMEs into two groups as young and old, the results further display that not all but young SMEs have higher net job creation (for instance see Chart 1). Thus, the contribution of young firms is vital to sustain positive net job creation rates. Younger firms, however, are also known to be the most fragile ones when exposed to negative shocks. As a consequence, analyzing their survival conditions and post-entry performance of young establishments would provide valuable inputs to policy considerations.

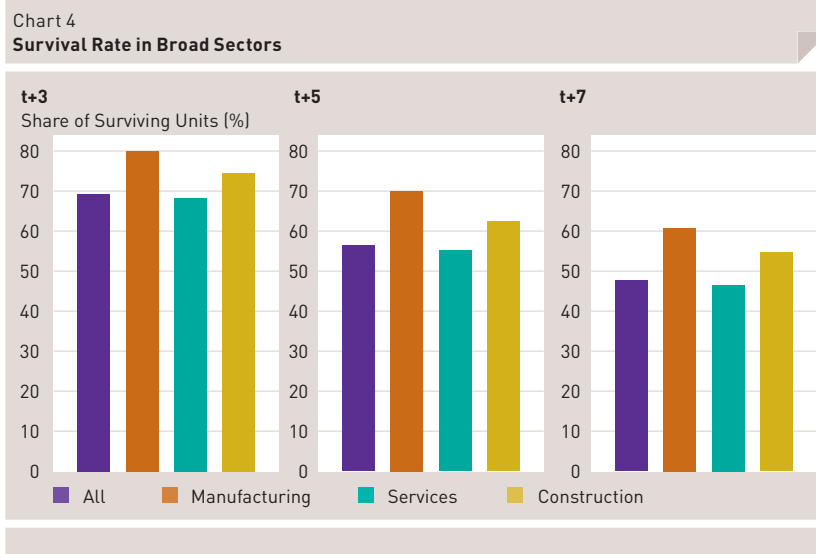


Chart 4 presents the ratio of the number of the surviving firms after 3, 5 and 7 years to the total number of entrants of the same year. 80% of all entrants in the manufacturing sector survive within their first 3 years in the market. This ratio drops down to 60%, 7 years after the entry. The entrant manufacturers exhibit the highest survival rate in the sample. This is possibly because the entry into manufacturing requires higher initial investments in the form of capital installations or infrastructure which can be considered as sunk entry costs. Higher sunk costs of entry reduce the flexibility to exit the market as well as induce potential firms to make the entry decision more carefully due to the higher expected cost of failure. Conversely, firms in non-financial service sectors, largely populated by firms in the wholesale and retail trade, are more flexible when exiting. This is possibly due to lower degrees of sunk-investment requirements, factor specificity or lower liquidation costs in the less capital-intensive service sectors.

Chart 5  
Post-Entry Employment Growth in Broad Sectors

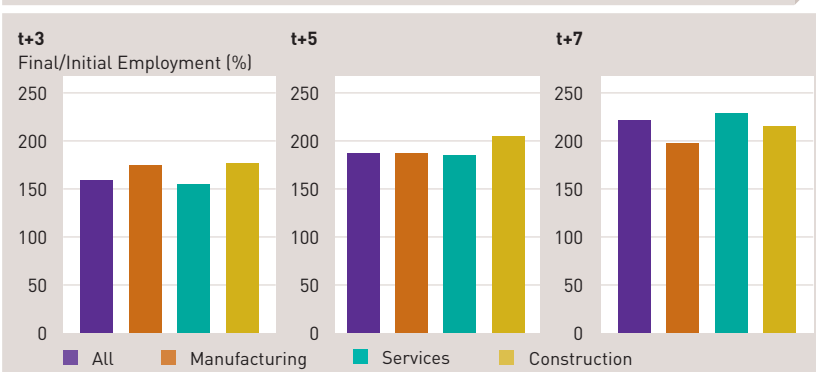


Chart 5 displays the post-entry employment growth performance of new firms. An average manufacturer experiences around 75% growth within its first 3 years. The post-entry growth performance of manufacturing firms appears to be fast within the first 3 years in comparison to the entrants in other sectors. When we consider the growth performance for the first 7 years, entrant manufacturing firms have the lowest average employment growth that is around 100%. On the contrary, the service producing firms' employment growth performance within the first 3 years is the worst, but their employment growth for the first 7 years is the highest with a growth rate of 130%. This is in line with our previous discussion that the entrant service-producing firms' survival rate is the lowest. The service firms that survive the difficult start-up period are possibly the most successful establishments which can also exhibit a rapid employment growth after their first 5 years in the market. The employment growth of manufacturers, however, also depends on their capital accumulation rate, so that manufacturing firms' post-entry growth performances are slow, although their survival rate is the highest.

The DYNEMP project is designed for generating empirical results based on confidential micro-level data which are later used in cross-country comparisons of firm dynamics, job creation and destruction. In this report, however, we summarize the results only for Luxembourg's economy which restricts the implications derived from the analysis. Nevertheless, the results show some clear patterns in Luxembourg's firm-level data. The SME's have larger contribution to net job creation in Luxembourg's main sectors. Among the group of SMEs, young firms create disproportionately more number of jobs in comparison to both older SMEs and large firms. The older SMEs' net job creation performance, however, is not significantly better than large firms, although worker turnover rates are higher for older SMEs. The entry rates as well as the contribution of entrants to the overall job creation rates are the highest in non-financial service sectors and the second highest in construction. In manufacturing sector, the firm entry and exit as well as worker turnover rates are significantly low, but the survival rate of entrant manufacturing firms is the highest. Manufacturing firms' post-entry growth rates are the highest in the short term (max. 3 years), while in the long run (7 years or more), the service producing firms' have the highest post-entry growth rates in Luxembourg.

## 6.3 Entrepreneurship and immigration: evidence from GEM Luxembourg<sup>3</sup>

This note summarises results from research on entrepreneurship and immigration conducted on Global Entrepreneurship Monitor (GEM) data for Luxembourg. STATEC, with the support of the Chamber of Commerce of Luxembourg and the Ministry of the Economy, participates to GEM, an international research programme aimed at understanding the impact of entrepreneurship on economic performances, as well as to shed light on individual determinants of entrepreneurship (Alvarez et al., 2014). GEM also permits to study the overall conditions that may favour or hinder entrepreneurship at the national level. Such 'framework' conditions range from governmental policies to public perception of entrepreneurs. Recent GEM waves have also focus on special topics such as the role of job satisfaction and well-being on entrepreneurial efforts, and the entrepreneurial attitudes of migrants. GEM data for Luxembourg are collected by surveying a sample of residents, which provides information on their individual characteristics (gender, age, education) as well as their entrepreneurial attitudes and activities. In addition, interviews to a panel of country experts provide an assessment of Luxembourg's framework conditions. This effort has allowed us to collect novel information on Luxembourg entrepreneurship, and has led to the publication of two country reports.<sup>4</sup>

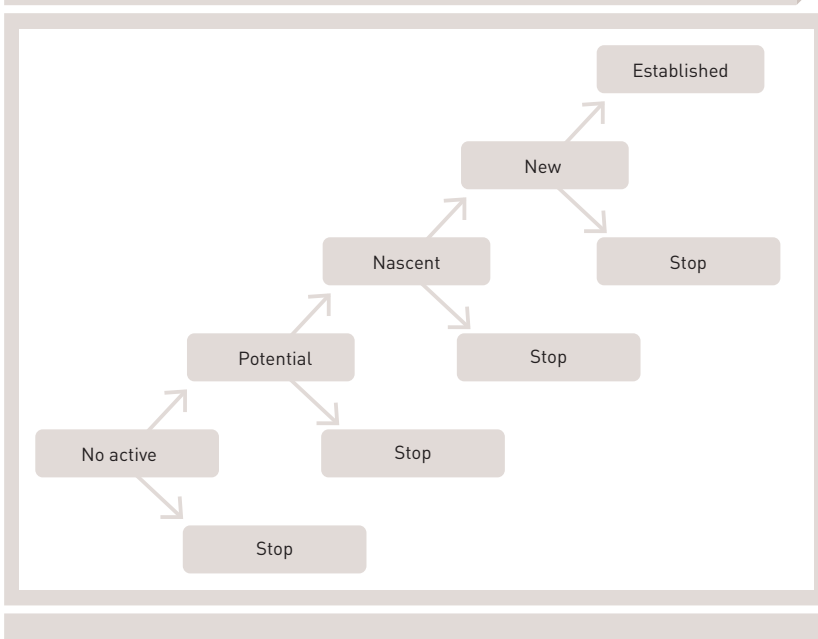
This research constitutes the first attempt to exploit the new information to study the link between the unique Luxembourg's population structure and entrepreneurship. Namely, this study analyses the role of immigration background and education in creating new business initiatives in Luxembourg, a country where 44% of the resident population is immigrant.

Population movements and entrepreneurship are regarded as drivers of economic growth, but so far have been mainly analysed separately. Economists have recently turned to investigate the economic consequences of migration, suggesting a positive impact of migrants on innovation activities and productivity. Empirical studies conducted at the national level find that immigration increases total factor productivity (Peri, 2012). The analysis of firm level data shows that skilled migrants have a beneficial effect on the overall quality of the labour force of hosting establishments and ultimately boost firm's innovation rates (Kerr et al., 2013). Some authors have suggested that the positive impact of migrants on innovation activities may be due to migrants' provision of management and entrepreneurial skills, which is also supported by anecdotal evidence on migrant entrepreneurs. Empirical evidence on the link between immigration and entrepreneurship, however, is scarce. This is because immigrants' direct contribution to entrepreneurial activities is typically difficult to observe.

<sup>3</sup> The working paper 'Entrepreneurship and immigration: evidence from GEM Luxembourg' by Chiara Peroni, Cesare Riillo, and Francesco Sarracino, appeared in the working paper series of STATEC Economie et Statistiques n. 81 available at <http://www.statistiques.public.lu/catalogue-publications/economie-statistiques/2015/81-2015.pdf>

<sup>4</sup> The 2014 Luxembourg GEM country report is available at <http://www.statistiques.public.lu/catalogue-publications/LuxGEM/2015/PDF-GEM-2014.pdf>. The report was a collaborative effort of Leïla Ben Aoun-Peltier, Peter R. Höck, Chiara Peroni, and Cesare A. F. Riillo. The 2013 Luxembourg GEM country report is available at <http://www.gemconsortium.org/report/48866>. The report was a collaborative effort of Denise Elaine Fletcher, Olivier Giacomini, Peter R. Höck.

Chart 6  
Sequential entrepreneurship model



This study aims to investigate features of entrepreneurs by implementing a sequential logit model on data from the Luxembourg GEM Adult Population Surveys 2013 and 2014. Our empirical strategy allows us to model entrepreneurship as a process which comprises a sequence of stages, from the interest in starting a new business, to effectively starting, running a new business, and managing an established business. (The structure of the model is depicted in Chart 6.) The model tests whether the immigration background and the skills of the potential entrepreneur have a statistically significant impact on the chances of becoming a successful entrepreneur. The analysis also accounts for individual aspects such as previous experiences, attitudes towards risk, income, and relational networks, gender and age.

Results show that a considerable proportion of first-generation immigrants is willing to engage, or is already engaged, in entrepreneurial activities. In fact, 9% of immigrants are engaged in entrepreneurial initiatives against only 6% for non-immigrants. Highly skilled first generation immigrants are more motivated to start a business than non-immigrants (13.6%). However, at subsequent stages of the entrepreneurial process, the immigration effect disappears. In other words, immigrants do not have higher chances to succeed in starting a business and running a start-up or an established business than nationals.

These findings suggest that there is a large potential of entrepreneurship among first generation immigrants, and especially among highly educated people. This is relevant to policy as it suggests a positive link between the presence of skilled immigrant entrepreneurs and the creation of start-ups in knowledge intensive sectors. Thus, policies aiming to attract highly educated immigrants, as well as immigrants willing to create new businesses are desirable. Furthermore, while policies for entrepreneurship and for immigration are often considered separately, our study suggests that smart policies for immigration could promote entrepreneurship, and ultimately benefit growth and development.

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## 6.4 Workers' turnover and wage dispersion in Luxembourg<sup>5</sup>

Earlier research of Luxembourg labour market pointed out that the intensity of the movement of workers between firms is considerably high. This phenomenon, referred to as labour churning, has profound implications for labour market policies. In the present study, we analyse the pattern of labour movement and wage effects using a micro-level data set.

Economists often emphasise the balance between costs and benefits of labour movements. From the employee's side, the costs associated with the job change are instability, search costs and the loss of seniority advantages. But job change often results in better working conditions, higher wages and new career opportunities. Economic theory suggests that some labour turnover can improve the quality of employee-employer match, thus leading to productivity gains and therefore higher wages. In this study, we are looking for the empirical evidence that may support two working hypotheses: (i) there is a trade-off between job mobility and performance, which implies the existence of an optimal mobility rate; (ii) the uncertainty associated with the job change increases the dispersion in the wage distribution.

Our study focuses on young workers (workers that were between 25 and 30 years old in 2002) employed in two key industries of Luxembourg economy: the financial intermediation and the business services (the activities related to legal affairs, accounting and consultancy). The targeted population is a relatively homogeneous group of individuals that have similar characteristics in the initial period. We explore a micro-level administrative data set recorded by Inspection Générale de la Sécurité Sociale (IGSS, the Luxembourg social security authority), which contains workers' personal information, job description and wages. We follow these people until 2012, and count how many times each of them changed jobs. We also record their hourly wages.

Table 1  
Job change rate (as a %)

Job changes	Finance industry		Business service industry	
	male	female	male	female
0	18	23	40	46
1	33	31	29	30
2	25	23	17	13
3	14	13	10	7
4	6	6	3	2
5	2	3	1	1
6	1	1	0	0
7	0	1	0	0
>7	0	0	0	0
Number of individuals	2635	2489	597	744

Note: In order to guarantee the traceability of individuals, we only select workers who appear both in 2002 and 2012, and have at least eight observation points during the eleven periods of interest.

<sup>5</sup> This note was drafted by Xi Chen and Tatiana Plotnikova. The study is a part of the research project 'Labour market frictions in a small open economy: the case of Luxembourg' supported by the Luxembourg National Research Fund (FNR).

Table 1 summarises the percentage of workers according to the number of job changes. For instance, in the finance industry 18% of male workers stayed in the same job and 33% of male workers changed their job once during the period of observation. The findings in this table invite at least three comments:

- ▼ Female workers are less mobile than their male counterparts;
- ▼ Very few workers changed their job more than six times during the period of study, and the majority of workers in our sample changed at most two times;
- ▼ The business service industry has higher rates of job mobility.

Does the change of job pay off? Chart 7 illustrates the relationship between the number of job changes and the hourly wage growth for the two industries of interest. On average, the workers employed in the financial industry change their employer one time during the period of 2002-2012. In contrast, the mobility is significantly higher in the business service industry with an average rate of 1.6 job changes. The 11-years wage increase is also larger in the business service industry. The average hourly wage in the business service industry increased from 16.3 to 40 euros during 2002-2012, with a growth rate of 140% of the initial wage. The average hourly wage in the financial industry increased from 20.2 to 43.1 euros with a growth rate of 120%.

Chart 7 suggests that there is a bell-shape relationship between job mobility and wage increase. The turning point of this bell-shape can be interpreted as an optimal mobility rate that maximises the wage increase. The optimal rate is five times in the business service industry and three times in the finance industry. The bell-shape is more pronounced for male workers in the business service industry. This finding supports the idea of a trade-off between costs and benefits of job mobility.

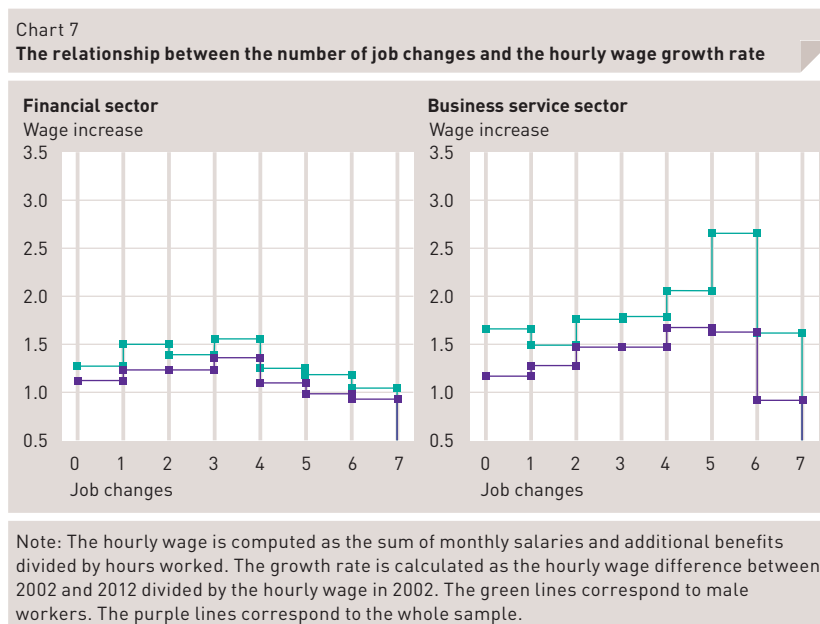
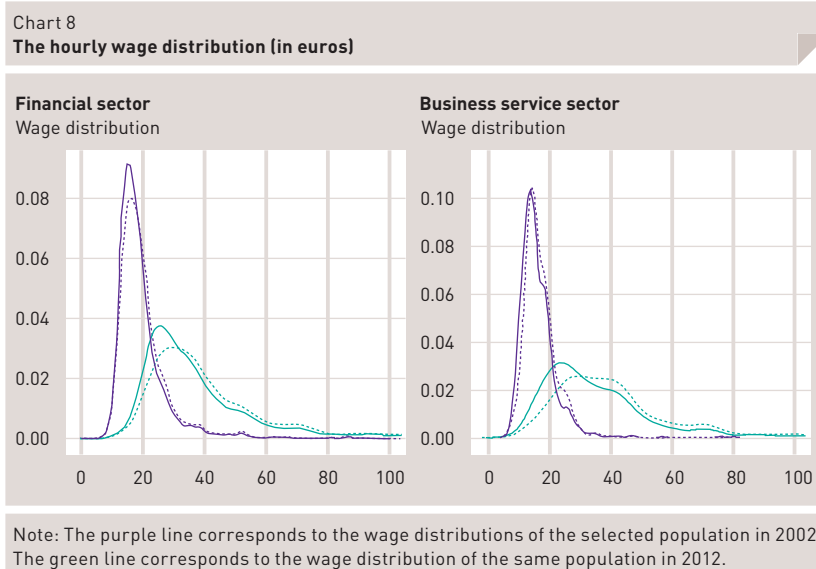


Chart 8 depicts wage distributions, each of which reveals the share of individuals receiving a certain hourly wage in the sample. For both industries, wages become more dispersed and have a right heavy tailed distribution in 2012 (green lines) compared to 2002 (purple lines). Indeed, the variance of wage in the finance industry in 2012 is 6.3 times larger than in 2002. In the business service industry, the dispersion of wage in 2012 is strikingly higher: the variance of wage in 2012 is 42.2 times larger than in 2002. The increase of dispersion is even stronger for male workers in this industry. The increase in the share of workers receiving very high hourly wages (fat-right tail of wage distribution in 2012) suggests that some individuals in our selected group have experienced tremendous wage increases. The data also reveal that there is an earnings gender gap in both industries. In 2002, the male workers' wage distribution (plotted as dash lines) is not significantly different from the whole sample (solid purple curves). 11 years later, we can see that the solid and dash curves are diverged (the green curves), and the male workers earn significantly higher wage.



This analysis provides some hints on the relationship between job mobility and wage distribution. When the mobility is low, a job change yields a higher wage (job changing premium). However, the wage decreases when the number of changes is too large (job changing discount). We also find significant differences between industries in the dynamics of wage and the probability of job change. Higher job mobility in the business services industry is associated with larger dispersion in wages.

The issues related to job mobility and wage inequality are of increasing importance to policy makers. Therefore, our investigation will be extended to a more comprehensive analysis in a FNR funded research project (AFR PostDoc 9202874). This project will put job mobility and wage inequality in an open economy perspective, and investigate the labour market implications of globalization on both empirical and theoretical fronts. This project will extend the current theory to address the following labour market issues: Why homogeneous workers are paid differently within an industry? How does globalization affect labour market outcomes? Moreover, this project will contribute to the methodological development of theoretical framework and of estimation strategy.

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## 6.5 Skilled workers in Luxembourg: exploration of the Labour Force Survey<sup>6</sup>

Skilled labour is a crucial component of production, economic growth, innovation and technological progress. From the businesses perspective, skilled workers are more productive. From the perspective of individuals, higher level of skills increases employability and is associated with greater income. At the level of economy, more skilled labour may mean higher aggregate productivity and growth. It is therefore important to understand the trends in the development and structure of skilled labour as well as the outcome of the education for individuals. In this note the author explores the Labour Force Survey (LFS) for the period of 2002-2013 to learn about the features of the Luxembourg labour force. The data was received from Eurostat and includes information on people who work in Luxembourg, including those residing in other countries. The analysis refers only to the sample of the population which was surveyed.

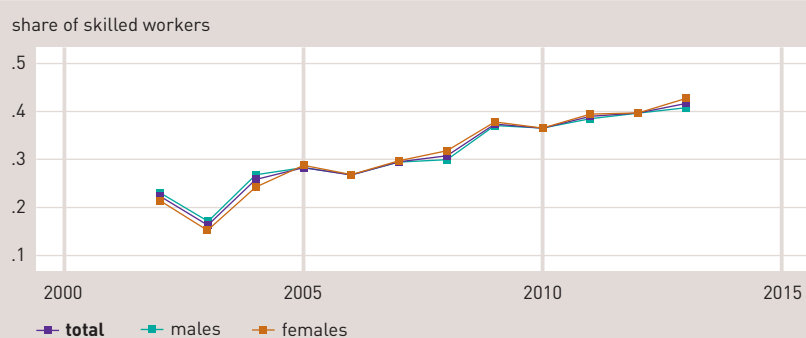
Luxembourg experienced a substantial growth in the quality of its labour in the period 2002-2013. If the share of workers with higher than secondary education in 2002 accounted for about 22%, it was almost 42% in 2013. Skilled workers are on average as likely to be males as females (see Chart 9): in 2013 the share of females with high education was 43% against 41% of males. While males and females experienced almost identical increase in their educational level, there are differences in the growth in skills among the groups of commuters, immigrants and nationals of Luxembourg. Skilled workers are most likely to be immigrant, although this is only true for the last three years of the sample: before 2010 commuters were on average the most educated group. As Chart 10 demonstrates, the percentage of educated workers increased overall; however, the group of immigrants experienced the most dramatic growth. In 2002 the shares of educated workers were 19%, 22% and 33% for immigrants, natives and commuters respectively. In 2013 these shares became 52%, 35% and 41% respectively.

Some sectors are more likely to employ skilled workers than others. Education, extra-territorial, business services and financial sector are the sectors with above 40% of highly educated employees (Chart 10). Over time, the relative numbers of skilled workers increased in every sector, however, the highest increase was experienced by transport and communication (increase by more than 18 percentage points), extra-territorial (increase by 16 percentage points) and financial services (increase by 15 percentage points).

For the last 5 years of the survey a measure of income is available. This variable identifies to which decile of a country's household income distribution a person belongs to. Using this variable for years 2009-2013, the author is able to see that skilled workers are more likely to be in a higher income category than their less-skilled counterparts.

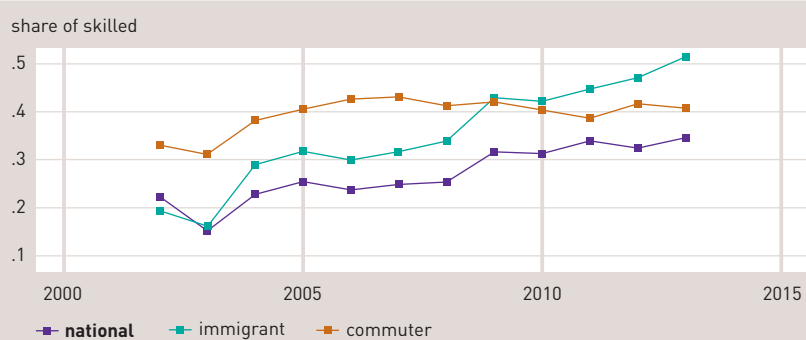
<sup>6</sup> This note was drafted by Tatiana Plotnikova, and is part of the project supported by the National Research Fund, Luxembourg, and co-funded under the Marie-Curie Actions of the European Commission (FP7-COFUND). The project deals with the contribution of foreign labour to the economic performance of businesses in Luxembourg.

Chart 9  
Shares of skilled workers over time



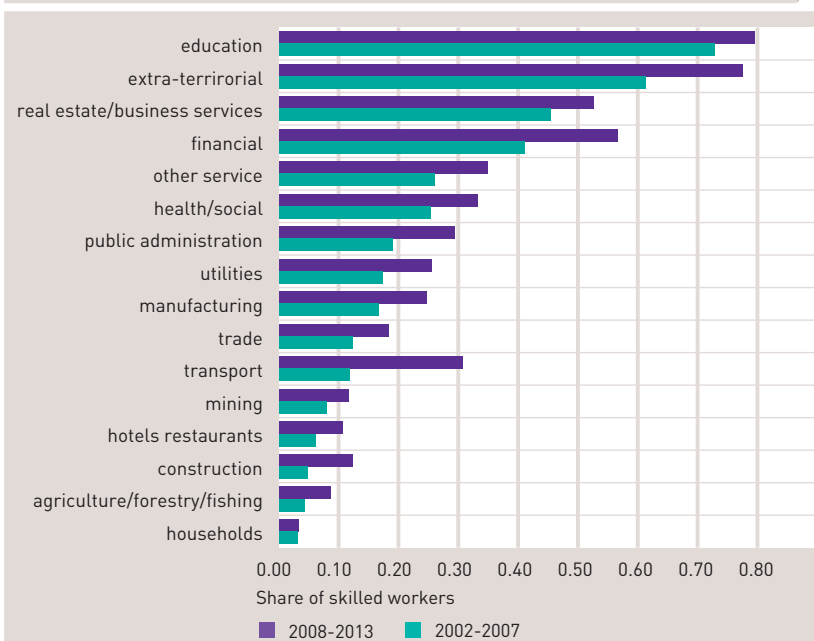
Note: Graphs are prepared using LFS data 2002-2013. Skilled workers are those with tertiary education.

Chart 10  
Shares of skilled workers among nationals, immigrants and commuters over time



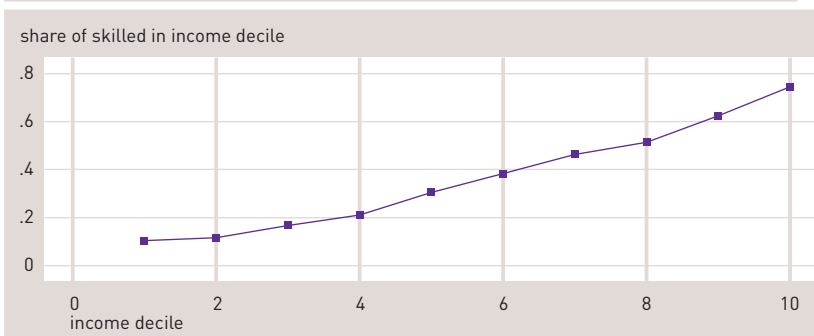
Note: Graphs are prepared using LFS data 2002-2013. Skilled workers are those with tertiary education.

Chart 11  
Shares of skilled workers by sector, averages over 6-year periods, 2002-2007  
and 2008-2013



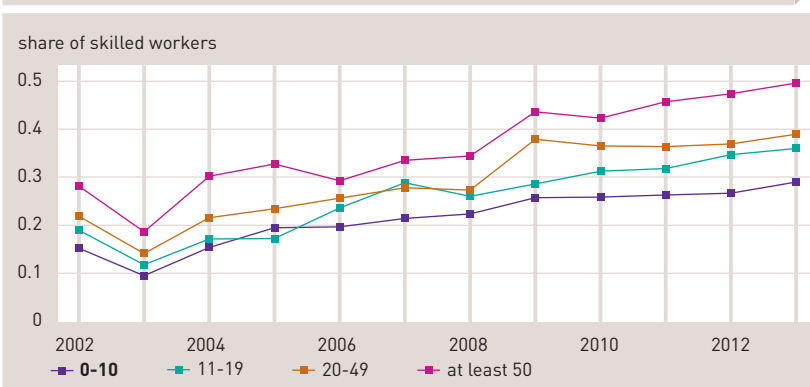
Note: Graphs are prepared using LFS data 2002-2013. Skilled workers are those with tertiary education. Sectors are classified according to NACE classification. The classifications for years before and after 2008 are harmonized at 1-digit level according to Eurostat methodological guidelines, (<http://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF>).

Chart 12  
Share of skilled workers in income decile



Note: Graphs are prepared using LFS data 2002-2013. Skilled workers are those with tertiary education.

Chart 13  
Share of skilled workers by firm size\*



Note: Graphs are prepared using LFS data 2002-2013. Skilled workers are those with tertiary education.

\* Firm size is measured by the number of employees. Firms are grouped in four categories according to the number of employees: 0 to 10 employees, 11 to 19 employees, 20 to 49 employees and at least 50 employees.

Chart 12 demonstrates that the share of skilled workers in the highest, 10<sup>th</sup>, decile is more than 70% and is almost as low as 10% of the workers in the 1<sup>st</sup> decile of income distribution. Chart 13 reports the proportion of skilled workers among the employees of firms of different sizes. Firms with at least 50 employees have higher proportion of skilled workers in their labour force than smaller firms. This proportion reaches 50% in year 2013. The share of skilled workers in 2013 is 39%, 36% and 29% among firms with 20 to 49 employees, 10 to 19 employees and at most 10 employees respectively.

As a next step, the author estimates the contribution of factors that can be measured using LFS data in explaining income variation. For years 2011-2013, the author is able to focus on personal characteristics, such as age, gender and education, immigration background, occupation, household composition as well as characteristics of the employer, such as sector and firm size. The author constructs a variable *high income* which is equal to one if the income of a worker is above the median of the income distribution, i.e. it falls into deciles 6 to 10, and zero otherwise.

The results of this analysis show that skilled workers are more likely to have higher income than workers with lower than tertiary education. However, the return to education is the lowest for the group of workers with immigrant background. The log-odds of being in a high-income category are higher for skilled workers by 1.02 for commuters and by 0.92 for natives as compared to their less educated counterparts. Being male is correlated with higher income as well as having a full-time contract, being older and working more hours. Workers employed by small firms have a lower probability to fall above the median of income distribution. The estimated effect of occupation allows ranking the returns to occupation. All occupations are associated with the higher probability of higher income as compared to elementary occupation, with the exception of skilled agricultural, forestry and fishery workers in the case of commuters and immigrants. Two most rewarding occupations are managers and professionals, which usually employ skilled workers. There is a significant variation in explaining higher income between sectors. It is apparent that commuters, nationals and immigrants benefit from being employed in different sectors, suggesting specialization of these groups.

The reported results represent a very simple framework to assess some of the determinants of the income variation. This analysis will strongly benefit from a structural approach where selection and labour demand will be taken into account.

## 6.6 Social and solidarity economy for a better quality of life in Luxembourg<sup>7</sup>

Policy-makers, scholars and operators view the social economy as a key to build sustainable and inclusive growth, that is, an innovation-based growth compatible with social cohesion and job creation (Rosenblatt, 2013). Despite the increasing recognition and promotion of the social economy, empirical studies evaluating its non-economic outcomes are scarce. As social enterprises aim to address social issues rather than maximising profits, a way to test whether they meet their objectives is looking at their non-economic outcomes such as their impact on well-being, an encompassing measure of people's satisfaction with their own life. This study evaluates the impact of the social and solidarity economy on the well-being of Luxembourg residents.

### Frame

The social and solidarity economy includes companies, associations, cooperatives and foundations whose aim is to address social and/or environmental problems. In 2013 STATEC, with the support of the Ministry of Labour and the Ministry of the Economy, started a research programme to identify and monitor social enterprises in Luxembourg. This resulted in the publication of two reports describing the main features of the social enterprises operating in Luxembourg (Rückert and Sarracino, 2014; Sarracino and Peroni, 2015). In 2012, the Business Register recorded 1,064 social enterprises operating in Luxembourg: 66.45% were 'Associations sans but lucratif', 14.47% were 'Société à responsabilité limitée de droit luxembourgeois', and 7.24% were 'Société coopérative de droit luxembourgeois'. On average in 2012 there were 3.2 social enterprises every 100 firms employing a total of 27,751 wage earners, including full- and part-time contracts; 55.5% (i.e. 15,399.3 wage-earners) of these jobs were created by associations, 23.78% (i.e. 6,599.33 wage-earners) by charitable organisations, 10.59% (i.e. 2,941 wage-earners) by cooperatives and mutual foundations, and the remaining 10.13% (i.e. 2,811.5 wage-earners) by private for profit social enterprises.

To assess whether social enterprises contribute to people's well-being, this study combines information from the Business Registry with data on individuals' well-being from the Global Entrepreneurship Monitor (GEM). Observations on social enterprises and individual data have been merged at the city-level, i.e. individuals living in a specific town were attributed the share of social enterprises (on the total number of enterprises) present in the same town. In this way, it is possible to study the relationship between people's well-being and the share of social enterprises controlling for a set of individual and city-level variables.

Thus, this research explores a possible application of data on subjective well-being, namely evaluating the non-economic outcomes of the social economy. Well-being data have been used in numerous ways in the scientific literature, from analysing the determinants of well-being, to evaluating the impact of policies, and to estimating shadow prices, as well as estimating the impact of various social, environmental and institutional conditions for well-being. In contrast, the literature on the social economy has focused either on typology and definition issues, or on the economic impacts of the sector, for example its impact on employment, whereas the evidence of the non-economic role of social enterprises remains anecdotal.

<sup>7</sup> This note summarises results from research on social entrepreneurship and well-being conducted on Global Entrepreneurship Monitor (GEM) and Business Register data for Luxembourg. Results have appeared on the working paper series *Economies et Statistiques* n° 84/2015, 'Assessing the non-economic outcomes of social entrepreneurship in Luxembourg', authored by F. Sarracino and A. Gosset. The paper is available at <http://www.statistiques.public.lu/catalogue-publications/economie-statistiques/2015/84-2015.pdf>

## Frame Continued

Present study tests the role of social enterprises for people's well-being estimating a happiness equation where the share of social enterprises on total companies by town predicts life satisfaction, along with a set of standard control variables.<sup>8</sup>

Results document that social and solidarity enterprises improve the quality of life of residents in Luxembourg and, in particular, of the most vulnerable people, such as the unemployed. The two charts in Chart 14 document that the higher is the share of social enterprises, the higher are the predicted probabilities to be very satisfied with life, while lower are the predicted probabilities to be very dissatisfied with own life. The strong decline of the upper curve in the right panel suggests that the share of social enterprises decreases the probabilities that unemployed people are very dissatisfied with their life. In particular, when the share of social enterprises is high, the differences in the probabilities of being very dissatisfied by occupational status are smaller than when the share is low.

In sum, the study documents that the activity of social enterprises has an effective and lasting positive correlation with people's well-being. Whether these are companies to recycle and reuse waste, consumer associations, health and mutual insurance foundations, associations to learn foreign languages, or cooperatives of farmers, the activity of social enterprises as a whole has a public impact. In particular, they contribute to significantly alleviating the bad-being of most vulnerable people, such as unemployed, poor people and immigrants, whose integration within the society might be challenging. According to this study, a higher presence of social enterprises reduces the bad-being of socio-economically disadvantaged people and it constitutes an important factor of well-being. Hence, promoting social economy contributes to improving Luxembourg residents' quality of life.

<sup>8</sup> The regression equation is estimated via ordered probit with canton fixed-effects and clustered standard errors. Its robustness has been checked by mean of a multilevel ordered probit model with random intercept, and an alternative proxy of well-being.

Chart 14



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## 6.7 Happiness matters: the role of well-being in productivity<sup>9</sup>

This work, conducted on national-level data, tests the hypothesis that people's subjective well-being matters to countries' productivity.

Researchers and policy makers are increasingly active in developing novel ways of measuring countries' social and economic development that go beyond income-based measures of living standards, such as GDP. Many studies, seeking to establish well-being determinants and its relation with social and economic facts, support this view. Despite these efforts, however, the relation between well-being and economic performance remains an open issue. In particular, evidence on the link between productivity and well-being is scarce. At the national level, the current debate focuses on the relation between economic growth and well-being, asking whether growth leads to greater happiness (Stevenson and Wolfers, 2008; Easterlin et al., 2010; Veenhoven and Vergunst, 2013). At the individual level, studies suggest that happier people are more committed to their work, earn more money, have better relationships with colleagues and clients, all aspects that enhance workers' productivity (Proto et al., 2010). Nonetheless, empirical evidence on the direct and causal link between firms' productivity and increased well-being is limited, mainly due to data difficulties.

This study aims to contribute to the knowledge gap on the link between productivity and well-being at the aggregate level. The study is conducted on national-level data and relies on computational techniques to derive reliable measures of productivity that account for traditional output and input to production as well as for life satisfaction.

The two main variables of interest are subjective well-being, as measured by life satisfaction, and total factor productivity (TFP). The latter is a key indicator of the economic performance of firms and industries and, at the national level, it is regarded as a source of economic growth and of improvements in living standards. Increases in TFP reflect the ability to expand output by using inputs more efficiently and by adopting new technologies. For this reason TFP is sometimes also referred to as productive efficiency.

Subjective well-being, measured using statistical surveys that report people's own evaluations of their lives, is an easy to collect, widely available, and reliable source of information on people's welfare. This research uses measures of subjective well-being from the European Social Survey (ESS) and from the Eurobarometer, a survey administered for the European Commission to inform about people's perceptions about the state of the European Union. Our main finding is that well-being does matter to countries' productivity. Chart 15 illustrates this result. The chart ranks countries according to the average percent productivity gain per unit of subjective well-being.

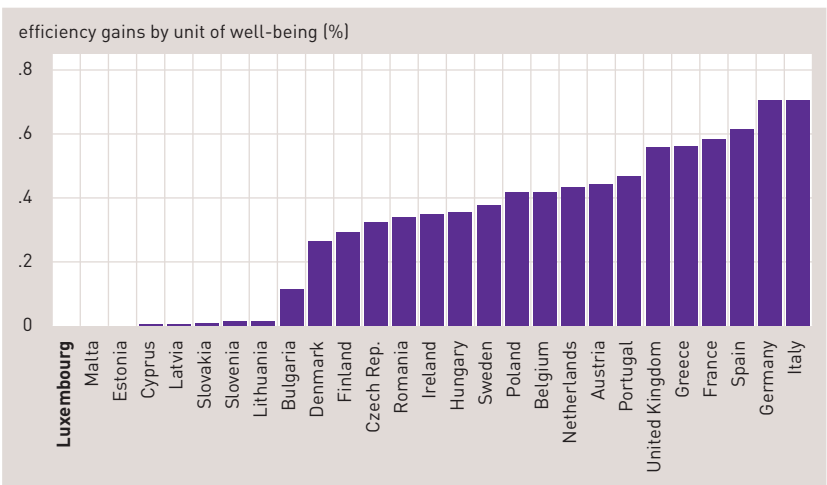
<sup>9</sup> This article draws from the analysis of the relation between subjective well-being and productivity conducted by several STATEC and ANEC researchers. Main results from this analysis are summarised in 'Happiness matters: the role of well-being in productivity', authored by Charles-Henri di Maria, Francesco Sarracino and Chiara Peroni, forthcoming in the STATEC working paper series.

The histogram shows for each country how much gain in efficiency can be attained if average subjective well-being increases by one unit. (For instance, productivity in Italy and Germany would increase by 7% if the average subjective well-being increases by one point.) The countries where subjective well-being contributes the most to efficiency gains are Italy, Germany, and Spain. In Luxembourg, there are no significant productivity gains stemming from well-being, because the country is already an efficient economy that fully uses its resources even when accounting for well-being. Possible improvements in technological processes could lead to more substantial contribution of people's well-being to the aggregate output.

Importantly, this finding is robust to reverse causation: we show that productivity gains – and therefore economic growth – do not lead necessarily to higher well-being. Our results hold also after substituting people's life satisfaction with the one of individuals of working age. Thus, this analysis suggests that subjective well-being can be regarded, along with other economic variables, as one of the determinants of TFP, and possibly regarded as one of economies' intangible assets (Edmans, 2012). The policy implication is that promoting people's well-being can be a valuable option to achieve economic growth and prosperity. Contrary to the common belief of a trade-off between people's well-being and the achievement of economic objectives, our findings suggest that policy makers may foster economic growth by taking actions to promote life satisfaction (Bartolini, 2013).

These are encouraging findings, but the analysis has data and scope limitations that require further research. The results illustrate aggregate outcomes, which, albeit important to policy makers, often mask within-country heterogeneity. For example, the relevance of well-being to productivity may depend on the industry or the characteristics of firms and workers. A wider research project aims to contribute new knowledge on the relation between productivity and life and job satisfaction using STATEC's statistical sources, which provide rich information at industry, firm- and individual-level.

Chart 15  
Efficiency gains from subjective well-being in a sample of 27 European countries



Source: authors' computation on Eurobarometer and AMECO data.

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## **7      Appendix Competitiveness Scoreboard Definitions**

## A Macroeconomic performance

A stable macroeconomic environment is a guarantee for high economic performance. The principal role of the State in establishing this type of environment is to guarantee superior and stable levels of economic growth and employment. An economic policy is adequate when it encourages companies to invest in the short and medium term and, if productivity and economic growth are stimulated, over the long term. An unstable economic environment dissuades private investment and limits economic growth, thus restricting well-being of a country's population. A stable macroeconomic setting is a necessary condition for good productivity trends, and consequently for competitiveness. Macroeconomic performance indicators are the key indicators for determining the role of economic policy with relation to the competitiveness of a nation.

### A1 Gross National Income per inhabitant

Gross National Income (GNI) is the Gross Domestic Product (GDP) plus net receipts of primary incomes, less income paid out. The level of GDP per inhabitant is often absorbed into a standard of living indicator. However, in the case of Luxembourg, which is largely open to cross-border flows of factors and corresponding incomes, this notion leads to biased comparisons. For this reason, it is preferable to base comparisons on GNI per inhabitant, which take into account the remuneration of labour and capital of all others. Comparisons are made in PPS to account for the different pricing between countries. The principal role of the State is to increase the well-being of the population. GNI is one measure of well-being and is used in comparisons over time and among countries.

### A2 Real growth rate of GDP

GDP is a measure of economic activity. It is defined as the sum of added values, meaning the value of all goods and services produced from which are deducted the value of goods and services used to create them. Growth rates are calculated at constant prices because this way it is possible to identify high volume movements and thus obtain an indication of real growth. Calculating yearly rates of GDP growth at constant prices is intended to allow comparisons of economic development dynamics both over time and between different sized economies.

### A3 Growth in domestic employment

National employment represents the labour force used by companies established in Luxembourg to produce their range of goods and services. As such, it includes cross-border workers' production and excludes that of residents who work abroad. This indicator reflects utilization of labour. National employment includes all persons working on Luxembourg territory regardless of country of residence. Its growth rate reflects the capacity of a country to utilize additional resource to meet increases in the demand of goods and services. GDP potential of a country can be impacted if there is a structural increase in employment, which can reflect an economy's gains in competitiveness.

#### **A4 Unemployment rate**

The unemployment rate is the percentage of unemployed persons with relation to the entire labour force. The labour force is comprised of employed and unemployed persons. Unemployed persons are 'those persons aged between 15 and 64 who, during a reference week had no employment, who were available to start work as a salaried or unsalaried employee within the next two weeks and had actively sought employment through specific steps to find a salaried or unsalaried position within four weeks ending at the end of the reference week. It also includes those who had no job but who had found one to start later, meaning within a period of no greater than three months.' Social consequences of high unemployment aside, the rate of unemployment is a measure of unutilized labour potential of a country. A distinction is commonly drawn between two major categories of unemployment. The first arises from a deficiency of overall demand and the second is a result of features in the way the labour market functions. While the first type of unemployment may be reduced by recovery in the economy, the second is due to structural factors, such as inadequate skills of the workforce or the cost of labour. The unemployment rate is an important measure of the efficiency of the labour market, and is telling of the adequacy of supply to the demand for work.

#### **A5 Inflation rate**

The Harmonized Consumer Price Index (HCPI) was conceived as a means of international comparison of inflation in consumer prices. Inflation reflects tensions between supply and demand. Inflation can have its origins in salaries that reflect the tensions between supply and demand on the labour market, but it is often imported. This imported component is an extremely important aspect because Luxembourg has a very open economy. Thus imported inflation can have an impact on consumer prices, either directly via the importing of consumer goods or indirectly via the production chain. In the area of competitiveness, all inflationary trends have a repercussion on the terms of trade.

#### **A6 Public balance**

The requirement or capacity for financing, i.e. a deficit or surplus in public administrations, is the difference between income and expenditures of public administrations. The public administration sector includes sub segments of the central administration, the administrations of Federated States, local municipality administrations and social security administrations. For purposes of international comparisons, public balances are expressed with relation to GDP at market prices. Successive deficits have a significant impact on public debt and therefore on a nation's budgetary margin of manoeuvre.

#### **A7 Public debt**

The public sector includes sub segments of the central administration, the administrations of Federated States, local municipality administrations and social security administrations. GDP used as the denominator is gross domestic product at market prices. Debt is evaluated at nominal face value and debt in foreign currency is converted into the national currency using end of year commercial exchange rates. National data for the public sector is consolidated among sub segments. Base data are in the national currency, converted into Euros by using the end of year exchange rate for the euro. The debt ratio gives an estimate of public debt as a whole with relation to gross domestic product, as well as debt servicing capacity and the repayment capacity of public administrations. This indicator plays an important role in the area of competitiveness since it determines the budgetary margin of manoeuvre of the State in its operations.

#### **A8 Gross fixed capital formation**

In the European System of Accounts SEC 95, gross fixed capital formation is equal to acquisitions less sales of fixed assets by resident producers over a reference period, augmented by capital gains of non-produced assets arising from production activities of production or institutional entities. Public investments are used to create, enlarge and modernize infrastructure necessary to growth. High quality public infrastructure promotes growth and productivity of companies and bolsters their competitive positions.

#### **A9 Terms of trade**

The terms of trade indicator relates the export price index of a country to its import price index. Terms of trade improve over time from  $T > 100$  if an economy exports a lesser quantity of merchandise to procure the same quantity of imported goods—in other words, a like quantity of exported goods can procure a larger quantity of imported goods. In the opposite case, terms of trade deteriorate to  $T < 100$ .

#### **A10 Real effective exchange rate**

Calculations of the real effective exchange rate use a weighting system based on a double weighting principle that accounts for relative market share held by a given country's competitors on shared markets, including the domestic market of the given country, as well as the significance of these markets to that given country. A decrease in the real effective exchange rate indicates an improvement in a country's competitive position. Real effective exchange rates are chain indices with the base year as 1995. Percent change in the index is calculated by comparing changes in the index based on consumer prices in a given country, expressed in US dollars at the market exchange rate, to a weighted average of changes in indices of competitor countries, also expressed in US dollars, using the weighting matrix for the current year. Real effective exchange rate indices are then calculated from an initial period by cumulating percentages of change. This produces a group of real effective exchange rate indices based on mobile weightings. The base year used for these calculations is 1995. A drop in REER indicates that domestic goods and services have become more competitive in relation to foreign goods and services, while an increase indicates that they are less competitive.

#### **A11 Diversification**

The entropy indicator used here refers to the level of an economy's diversification through its weight of diverse branches in gross added value. The branches are those in the NACE-10 classification system as follows: Agriculture, forestry and fishing; Manufacturing (except Construction); Construction; Wholesale and retail trade, transportation, accommodation and food service activities; Information and communication; Financial and insurance activities; Real estate activities; Professional, scientific and technical activities; Administrative and support service activities; Public administration, defence, compulsory social security, education, human health and social work activities; Arts, entertainment and recreation; Other services activities; Activities of households and of extraterritorial organisations and bodies. Where distribution is uniform, the entropy coefficient has a maximum value of 1, whereas if everything is concentrated on one point, the entropy coefficient has a value of 0. The closer a value nears 0, the less diversified is the economy. The more an economy is diversified, meaning the lower its dependence on a specific sector, the more sheltered it is from asymmetrical shock. Thus, all things else being equal, the advantage of a diversified economy is that it reduces vulnerability to specific sector-related shocks that could put the entire macroeconomic system's stability at risk.

## **A12 FDI inflows and outflows**

Foreign direct investment (FDI) designates those investments by a resident entity of a given economy, a direct investor, made with the objective of acquiring a lasting stake in a company that is established in another economy. FDI flows are the sum of the following elements: capital contributions by the direct investor through purchases of stock, shares, capital increases or company start-ups, loans between the direct investor and the company targeted by the direct investment and income re-invested to or from abroad. While direct investment inflows can create new jobs, investment outflows eliminate them, especially in the case of relocations to take advantage of lower production costs. Yet these flows can indicate the expertise of Luxembourg's companies. The net balance of jobs lost or created cannot be determined in such a simplistic manner. One must take account of the indirect repercussions of FDI on employment, especially via international exchanges. The complementary nature between FDI and international exchanges that has come to light through certain studies foreshadows indirect impacts on jobs. FDI inflows and outflows can impact Luxembourg imports of finished products originating with a foreign subsidiary or from a third country or company, and exert an impact on Luxembourg exports of primary or intermediate goods to a foreign subsidiary or a third country or company. Implications on domestic employment or on the economy as a whole must then be evaluated. However, Luxembourg must be considered from the perspective of an economy that acts as a platform for international financial intermediation services. FDI statistics for Luxembourg show that the essential feature of its economy is that surplus funds are collected from non-resident entities, which are then distributed, to non-resident entities in deficit or that are seeking financing. In other words, Luxembourg's FDI inflows are reinvested abroad, with the greater majority passing through specialized financial institutions such as holding companies or SOPARFI, financial auxiliaries or other financial intermediaries (see BCL, 2004). This choice place for Luxembourg among the international FDI flows is immediately apparent through the preponderance of SPE transactions. In addition, the FDI flows in terms of SPE are part of multinational corporations' strategic plans that aim to optimally utilize the differences between countries in the areas of financial infrastructure, institutional vehicles and fiscal regimes. As a result, FDI statistics for Luxembourg must be approached with care when compared to international statistics. EURO-STAT calculated a 'Market integration' indicator that measures the intensity of direct foreign investments by taking the average of direct foreign investment inflows and outflows divided by GDP, then multiplied by 100.

## B Employment

Employment is a determinant of the efficiency of a socio-economic system and therefore can be considered an important indicator for competitiveness. Some indicators from the Employment category are already present in the Macroeconomic Performance category. Indeed, employment and unemployment are macroeconomic indicators. However, under-utilization of human resources, especially in the long term, is not only a formula for unfavourable economic consequences but can also sap the vitality of social cohesion, for example, by increasing the risk of poverty. This category of indicators is particularly important in view of the high rate of unemployment in Europe and the structural difficulties of European countries in achieving full employment. A growing part of unemployment is arising from structural problems in the labour market, such as inadequate qualifications for jobs or long periods of inactivity.

### **B1 B2 B3 Employment rate (T, H, F)**

The employment rate is defined as the relationship between the population with a job and the entire working age population of persons between the ages of 15-64. Since this is a national concept, it takes into account only the resident population. The employment rate is an important indicator for measuring the gap between the performances of an economy in relation to its potential. It provides a good explanation for the growth differential between one country and another. A rising employment rate is a key factor in achieving improvements in standards of living. In the same way, an increase in the employment rate means new job creation, vitality within the economy and flexibility in its labour market. Furthermore, the employment rate is an important factor in maintaining social protection systems in the long term. This indicator has been integrated into the Lisbon strategy (target of 70% in 2010 and an employment rate of 60% for women). Since then, in the Europe 2020 strategy, the age range of 20-64 is considered in order to reduce potential conflicts between employment policies and education policies. The Luxembourg target is 73% by 2020 (71.5% by 2015).

### **B4 B5 B6 Employment rate of persons aged 55-64 (T, H, F)**

The rate of employment of persons aged 55-64 is obtained by comparing the number of persons employed in that age group to the overall population of people of this segment. The working population of this age group includes persons who, during a reference week, performed work for remuneration or profit for at least one hour, or who did not work but had a job from which they were temporarily absent. A high employment rate of persons aged 55-64 is an important factor of competitiveness in many domains. Notably, it is a determinant for the viability of general pension insurance schemes in the long term, especially given the aging of Europe's population. According to the Lisbon Strategy, the objective is to achieve an employment rate of 50% among persons aged 55-64 by 2010.

**B7 Unemployment rate of persons under 25**

The unemployment rate of persons under 25, unadjusted for seasonal variations, represents the percentage of unemployed persons between the ages of 15 and 24 with relation to the active reference population, this being the total number of persons with a job and the number of unemployed persons in this age range. During the Luxembourg Employment Summit of November 1997, from which emerged the European employment strategy, the EU decided that each young European should have the opportunity to work, to complete a training program or retrain for a new job before being unemployed for a period of six months. In addition, it was stated that young people should learn and develop a culture of entrepreneurship and develop the ability to adapt more rapidly to changing realities in the labour market. The unemployment rate of persons under 25 is a means of evaluating the results of efforts undertaken to date in achieving the objectives of the 1997 Summit. It is among young people that unemployment, and chiefly long-term unemployment, can produce harmful consequences that can cause them to be excluded from the labour market permanently, thus depriving the country of human resources.

**B8 Long-term unemployment rate**

EUROSTAT deems that a long-term unemployed person is one who has been without work for more than twelve months, is at least fifteen years old, does not live in a collective household, has not been employed for two weeks following the reference period, is available to begin work in the next two weeks and is actively seeking a job, meaning that the person has actively sought work over the four previous weeks or is not seeking work because he or she has found it and will begin to work later. Social consequence of high unemployment rates aside, the unemployment rate is a measure of unutilized labour potential of a country. Long-term unemployment depends above all on structural factors, such as inadequate skills of the workforce or the cost of labour. In addition, long-term inactivity not only gives rise to unfavourable economic consequences but it risks weakening social cohesion.

**B9 Persons holding a part-time job**

The definition of persons with jobs designates those persons who, during a reference week, performed work for remuneration or profit during at least one hour, or who did not work but had a job from which they were temporarily absent. Family workers are included under this heading. A distinction is drawn between full time and part time work based on spontaneous responses of persons surveyed. It is impossible to make a more precise distinction between full and part time work because of differences in working hours among Member States and the professional sectors. The choice of whether work is part time may be decided on the initiative of an employer or an employee. Part time work is supposed to render work schedules more flexible. Working time will be more flexible if it varies as a function of company requirements and the wishes of workers. Improving flexibility of working hours can contribute greatly to lowering unemployment and, more generally, to improving the employment rate. Nevertheless, when workers are obliged to take part time work it may be considered an indicator of under-utilization of available resources.

## C Productivity and labor costs

The cost of the factors of production, especially the cost of labour, is a key component of nation competitiveness. The cost competitiveness component is the one most readily cited in comparisons of national economies because of its size and simplicity. Nevertheless, costs should not be considered separate from productivity. Increasing domestic productivity is one of the areas in which economic policies can influence the macroeconomic competitiveness of a country by stimulating economic growth in the medium and long term.

### C1 Trends in total factor productivity

Total factor productivity (TFP) is defined as the overall efficiency with which the factors of production, work and capital, are transformed into products. Changes in this indicator are measured over time by the average annual rate of change. An increase in TFP can spark increased competitiveness and may be interpreted in two ways; either in terms of an increase in production for a given utilization of factors, or in terms of lowered costs for a given production operation. A drop in TFP does indicate a loss of competitiveness.

### C2 Trends in apparent work productivity

The average annual rate of change in apparent work productivity links changes in volumes of gross added value production of a given year for the preceding year with changes over the same period in the number of hours worked. Changes in the productivity of work measure the change of production per worker over successive units of time. When progress is achieved in this area, it results either from more intensive use of capital, the introduction of technology or an improvement in an entity's work plan. Productivity is an essential factor in standard of living as evinced through GNI per inhabitant, and by cost competitiveness through its influence on unit labour costs. Changes in labour productivity provide a standard of measurement for evaluating possible changes in the cost of labour. Increases in the apparent productivity of work can bring on an improvement in competitiveness, while a drop in this indicator could result in a loss of competitiveness.

### C3 Productivity per hour worked as a percentage of US figures

This indicator measures the hourly productivity of work with relation to the levels achieved in the United States, which is the benchmark having a nominal value of 100. The differences among countries in the area of hourly productivity reflect existing structural differences such as part time work, standard number of hours worked weekly and the number of paid holidays per year. Over recent years, the United States has been considered the benchmark for numerous macroeconomic indicators in view of the high performance that has been achieved in numerous domains. Nonetheless, this indicator should be compared using like conditions in terms of employment and unemployment rates. Indeed, by eliminating the least productive workers from the labour market, hourly productivity will increase. The United States has an employment rate much higher Europe's leaders—who moreover have high unemployment rates shorter work hours—thus avoiding losing the benefit of economies of scale.

#### **C4 Changes in unit labour costs**

The unit labour cost (ULC) represents the cost of labour per unit of added value produced. It is determined by the relationship between payroll costs and added value at market prices. It should be noted that the indicator for unit labour costs includes two different aspects of competitiveness to be distinguished between: cost of wages and apparent work productivity. Thus, an increase in ULC can result in higher wages or a drop in productivity. In order to evaluate cost competitiveness, it is not sufficient to compare salaries and payroll deductions; changes in these elements must be monitored over time. Thus comparing increases in labour costs over time provides a supplementary indication of changes in the competitive position of an economy. If changes in wages are not compensated by a change in levels of productivity, unit labour costs rise, causing competitiveness to fall.

#### **C5 Costs/Revenue ratio in the banking sector (removed from Competitiveness Scoreboard)**

This indicator is defined as the relationship between total costs incurred in the banking sector—to include personnel costs, administrative costs and depreciation—and banking income, including income from interest charges, commissions and financial transactions. Taxes on banking sector operations are included in this ratio that is also linked to consolidated revenue. This indicator gives information about the relationship between expenses and income in the banking sector, i.e. operating expenses as a percentage of operating income. It is useful to monitor this ratio over time in order to analyze profitability of the banking sector. This is especially the case for Luxembourg's economy, which is dominated by the banking sector. Thus, this sector indicator can be considered as a competitiveness indicator for the Luxembourg economy.

## D Market operations

The purpose of this category is to illustrate the potential rigidities and constraints that could still exist in some markets. Indeed, many opportunities remain to be exploited in various domains of the economy that can make companies more competitive, especially involving markets for intermediate consumer products, that thus directly influence cost competitiveness of companies. Studies on the determinants of productivity growth underscore the role of market operations. Improvements in the way markets function generally lead to increases in the quality of goods and services, to economic growth and to competitiveness and job creation. In this respect, implementing the Lisbon agenda is of primordial importance. In fact, it is a means of liberating the full potential of growth and job creation.

### D1 Percentage of full-time workers on minimum wage (removed from Competitiveness Scoreboard)

The minimum wage in effect is the social minimum monthly wage for labour and it is based on legal figures published monthly on the national level. Minimum wages apply to the majority of full-time salaries throughout each nation's territorial holdings. Other minimum wages may be applicable to certain categories that take into account a recipient's age, seniority, skill set and physical/mental capabilities or the economic situation of the company. The minimum wage is a gross sum, meaning the amount paid before deducting income tax and social charges. These deductions vary from country to country. Comparisons based on net wages can change the relative position of a country, depending on what family situation is considered. A rather high portion of employment at the minimum wage level in a country may indicate a weakness in the system with relation to its objectives of redistribution to low productivity employees—redistribution is effective when it is targeted—in may also infer that disadvantages outweigh advantages.

### D2 Price of electricity for industrial users

This indicator provides information on electricity prices invoiced to industrial end users as follows: annual usage of 2,000 MWh, maximum power of 500 kW and annual load of 4,000 hours. Prices are in Euros, ex-VAT, per 100 kW and are applicable as from 1 January of each year. Production costs are a competitive factor par excellence for all companies. Energy consumption is one of the intermediary consumption items used by companies in their production processes. Electricity used by companies in their manufacturing processes is entered as a cost factor in final prices for their goods or services. All other things being equal, a reduction in electricity prices will improve competitiveness, while price increases will lower it.

### D3 Price of gas for industrial users

This indicator provides information on gas prices as invoiced to industrial end users as follows: annual usage of 41,860 GJ and a load charge of 200 days or 1,600 hours. Prices are in Euros, ex-VAT, per GJ and are applicable as from 1 January of each year. Together with electricity prices, gas prices are a second basic variable that have a significant impact on costs of industrial companies. Natural gas used by companies in their manufacturing processes is entered as a cost factor in final prices for their goods or services. All other things being equal, a reduction in gas prices will improve competitiveness, while price increases will lower it.

**D4 Market share of the primary operator in the cellular telephone market**

This indicator measures market share of the main mobile telephone operator with relation to the total number of subscribers. The objective of this indicator is to determine to what degree the process of liberalization has advanced in the mobile telecommunications market and how extensive competition is in this market. A dominating position by the primary telephony operator can put a brake on the spread of new communications technologies, its involvement in the new economy and achieving gains in productivity. In the same manner, there could be an impact on the price of services offered, which could also have an impact on companies' production costs.

**D5 (removed from Competitiveness Scoreboard)**

**D6 Composite basket of fixed and cellular telecommunications**

The composite basket of fixed and mobile telecommunications contains two individual indicators calculated by the OECD: the 'Composite OECD basket of telephone charges for professional subscribers, excluding VAT, in USD' and the 'OECD basket of mobile telephone charges for large-scale users, VAT included, in USD'. The composition of the baskets is regularly adjusted to reflect the changing means of communication. The first indicator is calculated to compare professional rates in different countries and includes local calls, international calls and calls to mobile networks. The second indicator provides a breakdown for mobile communications at different times of the day and over the entire week, for a total of 900 calls per month. The indicator also shows them by destinations: calls to fixed lines, calls to other subscribers using the same network and calls to users on other mobile networks. Several short text message services and 2 GB of data transfer are also included for each subscriber. Surveys were carried out comparing several mobile networks in every country, with the lowest cost option selected as the most appropriate usage method. Prices of telecommunications services that are used by companies in their manufacturing or services processes are cost factors in the end user price for their products and services. This cost competitiveness indicator has growing importance with relation to costs of other intermediate consumption items, especially for companies operating in the services sector.

**D7 Broad band internet access rates in US \$ PPP/MB**

Many applications in the information society are dependent on high-speed data transfer. A market that is receptive to broadband connectivity promotes the dissemination of information, and allows both consumers and businesses (especially SMEs) to benefit from an increase in the supply of services. Prices are in USD (excl. VAT).

**D8 Basket of domestic royalties for 2Mbit leased lines**

This indicator presents annual prices for a basket of domestic fees charged for 2Mbit leased lines with 100 circuits, broken down on a distance basis. Prices are expressed in USD, excluding tax. Leased or private lines are key factor in business to business electronic trade. They can be used by large companies that need to send large volumes of data at rates lower than those of public switched telephone networks. These companies can also better manage their telecommunications equipment and traffic on these types of lines. This is therefore an important price competitiveness indicator that has repercussions on production costs of companies.

#### **D9 Value of public contracts using open procedure procurement**

Data on public contracts are based on the information contained in bid tenders and procurement notices published in Supplement S to the Official Journal of the European Union. The numerator for this indicator is the value of public contracts awarded using the open procedure. For each of the sectors 'Works', 'Supplies' and 'Services' the number of tender bids published is multiplied by an average based in general on the gamut of prices provided in the awards notices for public contracts published in the Official journal for the year concerned. The denominator in the equation is GDP. 'Public contracts' is one of the areas of the domestic market where liberalization has not yet taken root as extensively as had been hoped. Improving the functioning of public contracts cannot only potentially lead to increases in the quality of public services, economic growth, competitiveness and job creations, but could also spark an increase in transparency. An increase in competition via the open procedure can be beneficial from the competitiveness of local companies and can also assist these in taking advantage of public contracts in other European regions. It should be noted that in Luxembourg, public contracts awarded are often lower in value than the thresholds set in the Official Journal.

#### **D10 Total State aid excluding horizontal objectives**

The numerator in this equation is the total of all State aid to specific sectors such as agriculture, fishing, manufacturing, coal, non-rail transportation and other services, as well as State aid granted on an ad hoc basis to individual companies, for example in the event of a bail out or restructuring. These types of aid are deemed potentially the most likely to distort the free play of competition. The denominator is GDP. A State subsidy is a form of state intervention that is used to promote a set economic activity. The granting of state aid can be perceived as favouritism for certain sectors or economic activities and distorts competition through discrimination among the companies that receive aid. It is appropriate to keep in mind the distinction between State aid and general economic support measures such as employment or training. From the perspective of competitiveness, a large portion of State aid to companies leaves the way open to conclude that the economy is working on less than perfect levels within the domestic market.

#### **D11 Market share of the former primary operator in the fixed telephone market (removed from Competitiveness Scoreboard)**

The former primary operator is the company operating on the market just prior to liberalization of telecommunications markets. This operator's share in the market corresponds to income generated by retail sales in the market throughout the entire marketplace, including internet connections. In fixed telephony, the operator's market share is calculated by means of telecommunications minutes this operator controls as a part of all connection minutes. The objective of this indicator is to determine to what degree the process of liberalization has advanced in the fixed and local telecommunications market and how extensive competition is in this market. A dominating position by the former primary telephony operator can put a brake on the spread of new communications technologies, its involvement in the new economy and achieving gains in productivity. In the same manner, there could be an impact on the price of services offered, which could also have an impact on companies' production costs.

## E Institutional and regulatory framework

The institutional and regulatory framework within which economic activities are carried out affects the way in which resources are distributed, investments decisions are guided and creativity and innovation are stimulated. Among the framework conditions brought to the forefront is taxation. On one hand, this affects investment and on the other hand, it affects consumption. The regulatory framework also influences the proper operation of markets for goods, services, capital and labour. The regulatory quality of these markets influences allocation of resources and productivity. The institutional framework also contributes to the stability and security of decisions taken by economic agents. The more stable the institutional framework is the more consequences of economic decisions are quantifiable.

### E1 Corporate taxes

Corporate taxes are direct taxes calculated on the basis of net income of companies. This basis is set with relation to what is considered taxable. An advantageous tax policy in the area of corporate taxation can stimulate investment in the private sector. For example, low tax rates result in better margins for companies, which can in turn incite them to reinvest profits. Foreign investors are also attracted to establishing operations in countries with a favourable tax regime.

### E2 Taxes on physical persons

Income tax on physical persons is a direct tax calculated on income earned by households. This tax is progressive, meaning that the rate of taxation increases parallel to income. Taxable income includes income from transferable securities, real estate income, professional income and income from miscellaneous sources. An advantageous physical persons income tax scheme can stimulate demand. For example, low withholding tax rates give households more net disposable income that they can use for consumer goods.

### E3 VAT rate

The value added tax (VAT) is an indirect tax on consumer goods. VAT is collected by companies that invoice their customers for a VAT amount as an integral part of the price for products and services. The difference between VAT rates in various countries can benefit companies and consumers, because all other things being equal, the final price paid for a product or service will be lower in a country that uses lower VAT rates. Lower prices also increase purchasing power. This influences a consumer's choice to spend income in one country rather than in another, especially in border regions. A company's choice of location can also be influenced by a favourable VAT rate for cross-border commercial transactions. This is the case in the domain of electronic commerce where the principle of country of origin applies.

### E4 E5 Tax wedge (unmarried, no children; married, two children, one wage-earner)

The tax wedge measures the rate of social security and tax contributions that bear on labour input through the difference between total employer costs and employees' net salary. This indicator is defined as income taxes plus employer and employee social contributions as a percentage of labour costs, less benefits paid, by family category and salary.

#### **E6 Administration efficiency index**

This aggregate indicator gathers information on the quality of public services and the bureaucracy, the skill level of government service and its independence with relation to political pressure, as well as on the degree of credibility of governmental policies. A high index level denotes a high degree of efficiency in a government. The institutional framework exerts a strong influence on companies, so a stable and consistent institutional framework imparts confidence to companies in engaging in long term investments. An efficient administration is an important determinant of economic growth.

#### **E7 Rule of law index**

This aggregate index measures the efficiency and predictability of a country's legal system as well as the perceptions prevalent concerning the degree of personal security in the country. A high index score denotes a high degree of observance for the law. A predictable legal system is an important determinant of economic growth.

#### **E8 Regulation quality index**

This aggregate indicator measures prevalence of unfavourable policies such as price controls, inadequate supervision of the financial sector, or the perception of charges levied through excessive regulations in areas like foreign trade and business development. A high index ranking denotes high quality regulatory structures. Proper market operation plays a fundamental role in increasing productivity. Markets that operate under competitive pressure are among the most innovative and dynamic. Competition is reflected in the lowering of prices and a large choice of products for consumers. The State plays an important role in ensuring the proper functioning of markets.

#### **E9 Degree of sophistication of online public services**

This indicator measures the degree of sophistication of basic public services that can be accessed on line. These public services are divided into two categories, for individuals and companies, and some twenty sub-categories. Services extended to individuals should include information about income taxes, job searches, social security benefits, personal documentation, registering vehicles, construction permits, declarations to the police, public libraries, birth and marriage certificates, enrolment in universities, moving announcements and health services. Companies should be able to receive services in the areas of social security contributions, corporate taxes, VAT, registering start ups, providing national statistics data, customs declarations, environmental permits and public procurement. There is a five-level assessment grille. Stage A0, 0-24% indicates that a site is non-existent or useless on the practical level, Stage A1, 25-49%, offers a purely informational site, Stage A2, 50-74%, indicates a one-way information flow, Stage A3, 75-99%, for a bilateral interactive site and Stage A4 at 100% indicating a fully interactive site with no supplementary off-line interaction required. Electronic administration is a means for public administrations to improve its efficiency in providing public services. Through information and communications technologies, public administrations can both reduce operating costs considerably and improve the quality of its services.

**E10 Public services fully available online**

This indicator measures the percentage of public services that are fully available online with relation to all services analyzed in CAD 09 above. It is comprised of two sub-categories, the first containing the number of number of public services that are completely unavailable online, i.e. the first four Stages A0-A3 mentioned in CAD 09, and the second containing those public services that are fully available on line, or the last Stage A4. The aggregate indicator of public services fully available online is then calculated by means of a ratio between the number of public services fully available online and the total of public services online that were analyzed. Having public services entirely available online allows administrations to both optimize their operating costs and increase the quality of their services. In addition, these services also make it possible for companies and individuals to benefit from the information society and to render their interaction time with public administrations more efficient.

**E11 Public sector payroll costs  
(removed form Competitiveness Scoreboard)**

This indicator represents labour costs in the public sector as a percentage of domestic GDP. According to the OECD, the concept of public sector varies depending on country. The public sector is defined on the basis of employees paid using public funds, either directly by the Government or on the basis of Government allocated budgets to departments or agencies.

## F Entrepreneurship

Developing entrepreneurialism is currently a major preoccupation of the social, political and economic agenda in many countries. Indeed, empirical data has shown that a significant relationship exists between entrepreneurial activities and productivity and growth in an economy. Analyses of company policies should therefore be carried out along the lines of a continuous analysis of competitiveness. Both the European Commission and the OECD believe that entrepreneurial activities are fundamental for the proper functioning of market economies and that these make up one of the key components in generating, applying and disseminating new ideas. Neither heightened levels of knowledge nor a functioning domestic market can alone provide the environment for exploiting the full potential for innovation capacities and driving competitiveness and economic growth. From these entrepreneurial activities emanate new economic activities, producing new products and services that require investment, thus constituting a motor for job creation.

### F1 Propensity for entrepreneurialism

This indicator was derived from a qualitative public opinion survey on professional status, for which the key sampling question was: 'If you could choose from among a variety of professions, would you prefer to be a salaried employee or a self-employed worker?' This indicator provides us with information of the attitudes of people regarding entrepreneurial activities. The propensity of people for Entrepreneurship reflects attitudes shaped by tradition, the image of a CEO and economic opportunity as well as the way that the advantages of working as a self-employed contractor are perceived.

### F2 Self-employed jobs as a percentage of total employment

This indicator records self-employed jobs as a percentage of the workforce in all economic activities. Self-employed workers are persons who are sole proprietors or co-proprietors of companies that have no legal personality in which they work, except for companies without a legal personality that are classified as quasi-corporate enterprises. Self-employed persons are classified as such if they do not simultaneously hold a salaried job as their principal source of income, which would classify them as 'employees'. Self-employed persons also include the following categories of persons: unsalaried family workers, persons who work at home and persons who engage individually or collectively in production activities exclusively for own final consumption or capital formation. A high proportion of self-employed persons in a work force can constitute an important determinant for the generation, application and dissemination of new ideas.

**F3 Net change in the number of companies**

The net change in the number of companies is calculated by taking the number of start-ups less the number of companies winding up with relation to the overall population of companies. A positive figure indicates that start-ups in a given year outnumber wind-ups, and therefore the total number of companies increases. This type of increase can be the source of optimized reallocation of resources and a supplementary increase in jobs.

**F4 Volatility among companies**

The volatility rate among companies adds the start-up rate of companies to the rate of companies winding up their affairs in relation to the overall population of companies. A high rate of volatility in a given year indicates that the population of companies in a country is subject to significant fluctuations and therefore to a constant turnover of employees. If many companies are formed and many go out of business, there is a high degree of renewal among the global population of companies. A high degree of renewal of the fabric of companies can signify a certain extent of flexibility in the economy of a country and can indicate a high level of destructive creation, which results in reallocation of resources to more competitive sectors. A dynamic population of companies, reflected by a high volatility level, is a feature of economic activities linked to clusters.

## G Education and training

Changes in economic and social conditions have progressively conferred a foremost role to education in the success of individuals and nations. While it has been firmly established that developing human capital must be the focal point of an effective struggle against unemployment and low salaries, there is conclusive proof that this development is also a determining factor in economic growth. Knowledge and expertise are the raw materials for a knowledge-based economy and they play a fundamental role in engendering and maintaining knowledge. The concepts present in the new or knowledge economy are difficult to precisely define, but they underscore the fact that the overall dynamic of an economy resides more and more in knowledge and learning skills. Education, or in a more all-encompassing manner, training, is a key dimension of the crucial factor that immaterial investment has become for the level of competitiveness of a company or a country. For training programs to be adequately linked, skills must be developed and maintained up to date. It is necessary to both mobilize all available human resources and increase their potential by stimulating creativity and ensuring that skills are renewed and improved.

### **G1 Annual cost per student in public educational facilities**

Costs per student at public educational facilities assess amounts spent per student by central, regional and municipal governments, private households, religious institutions and companies. These include personnel costs, costs for equipment and other expenditures. In order to perform well, schools must be able to count on qualified and high quality teachers, proper establishments, updated equipment and motivated students who are pre-disposed to learning. Annual costs per student therefore comprise a representative indicator of the effort expended to train students under proper conditions. The effectiveness of the use of resources, in particular in terms of academic results and educational attainment, must provide further information on the resources allocated.

### **G2 Portion of the population aged 25–64 with a secondary education**

This indicator shows the percentage of the adult population between the ages of 25 and 64 that completed secondary school. It aims to measure the portion of the population that has the minimum qualifications necessary for taking an active part in social and economic life. To take advantage of the opportunities available through globalization and new technologies, companies need skilled employees that are capable of initiating and managing new ideas and that know how to adapt to new production methods and management practices. Skills acquired during secondary education cycles are high factors of productivity and facilitate learning and adaptation to new market requirements.

**G3 Portion of the population aged 25-34 with a university education  
(removed from Competitiveness Scoreboard)**

The ratio of persons that have earned a degree shows the current rate that advanced knowledge is produced by each country's educational system. Countries with the highest rate of university degrees have great potential for comprising and maintaining a highly qualified working population. Statistics on how much education persons have gives an insight to how much advanced knowledge a population possesses. The ratio of university degrees in a working population is an important indicator of innovation potential of the labour market. The requirement for higher levels of qualification on the labour market, the increase in unemployment rates over recent years and higher expectations on the part of both individuals and society have resulted in more young people earning at least one university degree. This evolution indicates an across the board increase in the number of high level skills in the adult population. It should be noted that the rate of university degrees depends both on the access rate to this level of studies and the increase of qualifications sought on the labour market.

**G4 Percentage of human resources in scientific  
and technological fields (HRST) in the labour force**

Human resources in science and technology are defined according to the Canberra Manual (OECD and Eurostat, 1995) as persons having graduated at the tertiary level of education, or persons employed in an S&T occupation without having obtained such degrees, for which a high qualification is normally required and the innovation potential is high. Data relating to scientific and technological human resources that is reported here concern professionals and technicians as defined in the International Standard Classification of Occupations (ISCO 88) or 'Technicians and Associate Professionals'. A high percentage of human resources in scientific and technological fields results in increasing the creation and dissemination of knowledge and innovation in technologies.

**G5 Life-long learning**

Life-long learning refers to persons aged between 25 and 64 who stated that they were enrolled in an educational program or training course during the four weeks immediately preceding the survey. The denominator here is total population of the same age group, excluding all who did not respond to the 'Training or educational program' question of the survey. Data collected relates to all the forms of training or education, regardless of whether they were pertinent to a current or future job held by the respondent. Continuing education is essential if the population is to acquire or maintain skills in such areas as information technologies, technological knowledge, entrepreneurialism or even certain social skills. Updating and continued development of skills and knowledge are factors of growth and productivity. They make it possible to strengthen the dynamic innovation processes of a company. Life-long learning may be considered not only as an essential course for ensuring long-term employability but also as a short-term option for training qualified personnel in areas where skills are required.

## **G6 Secondary school dropouts**

Young people who drop out of school early are persons aged 18-24 that meet two conditions. They are persons whose highest level of education reached was the lower cycle of secondary school and who declare not being enrolled in any learning or training program during the four weeks preceding the survey. The denominator here is total population of the same age group, excluding all who did not respond to the 'Level of learning or training achieved' and 'Educational or training program enrolled in' questions of the survey. A high percentage of young people who leave school early is worrisome, because this harms their capacity to adapt to structural changes and to integrate into society. In order to participate in the knowledge society, one must possess a minimum knowledge base. In consequence, young people without any certificate or diploma will have fewer chances of efficiently deriving benefits from life-long learning programs. They risk becoming cast-offs in today's society, which is moreover becoming increasingly competitive. For this reason, it is essential to decrease the number of young people leaving school early if full employment and subsequent social cohesion is to be achieved.

## **G7 Percentage of foreign nationals in scientific and technological fields (removed from Competitiveness Scoreboard)**

This indicator shows the percentage of foreign national human resources in scientific and technological fields. This proportion is determined using Major Groups 2 (Scientific and Intellectual Professionals) and 3 (Technicians and Associate Professionals) of the International Standard Classification of Occupations, ISCO-88. Over recent years, international mobility and highly qualified labour has come under the increasing attention of public policy makers and the media. Foreign skills are suitable for filling vacant positions. This labour base should allow host countries to catch up on lagging progress and pursue their development by means of this contribution of human capital. Nevertheless, major differences between countries may become apparent. Luxembourg is concerned in terms of percentages of human resources in scientific and technological fields because of the size of its banking sector, the tightness of its labour market and the presence of numerous European institutions.

## **G8 Percentage of highly qualified workers (ICT) in total employment figures (removed from Competitiveness Scoreboard)**

In general, only several sections of the ISCO-88 nomenclature refer to highly skilled workers in the area of ICT since the correlation of nomenclature with the United States has not yet been formally established. Some that may be cited include IT specialists such as systems designers and analysts, computer operators and other computer equipment operators including computer assistants, computer equipment technicians and industrial robot technicians, and optic or electronic technicians such as photographers, imagery equipment technicians, radio, television and telecommunications emissions equipment technicians, medical equipment technicians, etc. The role played by highly qualified labour in the performance of a company, a sector or a country is an established fact and is recognized by a number of observers. Activities related to these persons' knowledge, transmission, production, interpretation and utilization are highly important in the very functioning of economic activity and the structure of employment. In order to maintain and improve a company's well-being it is imperative to continue along this path, ensuring that the large number of highly qualified workers is regenerated in every field.

## H Knowledge economy

In recent years, there has been upheaval in the industrial landscape of the developed world. Free trade principles have transformed telecommunications, the spectacular development of the Internet and the progressive accessing of companies and individuals to the communications network are telling of one unique and uniform phenomenon, the advent of the information age. The success of the information society is an essential element for achieving the Lisbon objective of making the European Union the most competitive and vital economy in the world by 2010. Knowledge is the base ingredient of the innovation business. Innovation is principally the result of complex and interactive processes, through which companies access complementary knowledge originating with other organizations and institutions. In addition, innovation is often supported by new managerial and organizational methods based on ICT and on investment in new equipment and new skills. Innovation therefore constitutes one of the principle drivers of economic growth in the long term. The decisive impact of technology on industrial performance and on international competitiveness signifies that this continuous improvement of the innovation process is essential in order to achieve gains in productivity, job creation, economic growth and standards of well-being.

### H1 Internal R & D expenditure

The internal R & D expenditure, DIRD, quantifies R & D expenditures carried out within a statistical unit and within a nation's borders during a given year. As such, it includes all R & D related work performed in each organization within a country's borders. It includes R & D expenditures financed by other countries but does not account for payments in exchange for work performed abroad or outside of an organization, as in the case of sub-contracted work. According to the Frascati manual methodological reference, 'Experimental R & D encompasses creative work undertaken in a systematic manner that is expected to increase the sum of knowledge, including the knowledge of men, culture and society and the use of this store of knowledge for new applications'. R & D activities are characterized by massive transfers of resources between units, organizations and sectors that it is important to observe. R & D expenditures by companies are an ex-ante indicator of their propensity for innovation. A high propensity for innovation is a factor of competitiveness through its improvement of productive process, i.e. cost competitiveness as well as through the introduction of new or improved products that will win new markets. According to the Europe 2020 strategy, the Luxembourg target is from 2.3 to 2.6% by 2020.

## **H2 Public R & D budget credits**

Public R & D budget credits are all R & D credits entered in the budgets of all governments. They correspond to R & D budget allocations by central or federal administrations. Unless otherwise indicated, they include operating expenses and cost of equipment. They include not only R & D financed by public funds that is carried out in public institutions, but also that financed by public administrations in the private business sector, private non-profit organizations and higher education institutions, as well as R & D done abroad, meaning in international organizations whose activities are solely or principally dedicated to R & D. In summary, the credits cover R & D financed by the State but carried out in all sectors, including abroad and in international organizations. The Governments is a key investor in R & D and maintains a major role in upholding the scientific and technological acumen of a country. Its action consists in financing research in public institutions and not for profit research in the private sector. This indicator is used to concisely take into consideration policies conducted or to be conducted in the area of scientific research. Public budgetary credits can be considered a State-originated support measure for R & D activities and serve to specify what priorities governments place on public financing. It is an indicator of long-term public commitment.

## **H3 Portion of public research financed by the private sector**

Public research is an important complement to the R & D effort of the private sector. It generally covers areas where short-term profitability is not assured and in which private investment cannot be justified. Public research expenditures have inherent external influences of a significant nature, so a substantial public R & D effort will stimulate transfers of technology and innovation to the private sector. To the extent that work of government laboratories jibes with market requirements, these entities offer a potential for ideas and discoveries that companies can profit from in a concrete manner. How closely these R & D installations function with industry is traditionally measured by the proportion of the contribution of companies to financing research carried out in the State DIRDET sector. R & D performed in public laboratories contributes to increased knowledge and can result in major industrial advances.

## **H4 Percentage of sales allocated to the introduction of new products on the market (removed from Competitiveness Scoreboard)**

This indicator measures the portion of sales allocated to new or significantly improved products that are new to the market. The portion of sales of new or significantly improved products is an important indicator of the success of innovation. While patent applications are proof of the intensity of research and innovation efforts, conversion of discoveries to marketable units is far from automatic. Although innovation is often cited as an important element in increasing competitiveness, the lion's share of revenue of the great majority of companies is derived from products that have undergone no or only slight modifications. Companies that introduce a relatively high number of new products can do so because of the rapid rate of development in the markets in which they operate. Companies that derive a high portion of revenue from new products are probably those that are the most flexible in adapting their manufacturing processes to changing requirements, or those that concentrate their attention on changing demand of consumers. The lack of innovation and new products is reflected over time by a lowering of market share.

**H5 Number of researchers per 1,000 employed persons  
(public and private sectors taken together)**

Researchers, from the perspective of the OECD, may be defined as professionals engaged in the design and creation of new knowledge, products, processes, methods and systems that are directly associated with the management of projects. Titles and categories may vary from one research institution to another, but the work undertaken by such laboratory personnel is not fundamentally different. Changes in numbers of researchers in an economy are closely linked with its capacity for research and efforts in innovation. This indicator measures the percentage of researchers in a working economy. Through this indicator, the number of researchers is expressed in terms of R & D full-time equivalents (FTE), meaning that a person that works one half the time of a full-time worker is counted as a half person working full time. The indicator refers to teams working over the course of one year. FTE data give an indication of the research programs in a country and is different from the count of researchers that shows the pool of researchers in jobs.

**H6 Scientific publications per million inhabitants  
(removed from Competitiveness Scoreboard)**

The count of scientific research articles is based on scientific and technical articles in around 5,000 major scientific and technical journals published the world over. Articles are counted in fractions when they authored by two persons from different countries. In this case, an article is worth one-half an article for each of the countries involved. In-depth fundamental scientific research is essential in developed economies, both as a source of research and expertise and as a testing ground for scientific and technical personnel of the future. Fundamental science is consequently a key resource for shoring up innovations, which is the foundation for creating wealth and new jobs. Scientific publications are the principal vehicles for disseminating results of research activities and are one of the forms through which the work of researchers can be validated. The ratio of publication volumes to a given population is therefore an indicator of the vitality and performance of scientific research in a given country.

**H7 H8 Number of patent applications (OEB)  
and patents awarded (USPTO) per million inhabitants**

Patents are the means of protecting intellectual property of a discovery that has commercial potential. In an economy that is based on innovation, the number of patents awarded may be considered an index of the robustness of R & D work and of the country's overall technological innovation potential, which is a key element of competitiveness. The two indicators used in this category provide information both on patent applications submitted to the European Patent Office (EPO) and on patents awarded by the U.S. Patent and Trademark Office (USPTO). With regard to applications submitted to EPO, that data refers to applications registered directly under the European Patent Convention or to applications registered under the Patent Cooperation Treaty in the area of patents that designate the EPO. Patent applications are counted according to the year in which they were registered at EPO and are distributed according the International Patent Classification system (IPC). Fractional units are used in the event of shared patents or of patents in several IPC categories to avoid double counting. With patents awarded by the USPTO, data refers to patents awarded as opposed to applications submitted, as deemed by EPO patent data. Data are registered according the year of publication as opposed to the year in which the patent was actually registered, as considered by EPO data. Patents are broken down according to country of inventor, using the fractional method where several inventors from different countries are involved.

#### **H9 Use of broad band internet by companies**

The indicator used here states an estimate of the number of companies in member countries that are connected to and use broad band connections. Broad band service or connections are used for transmitting significant volumes of data. According to EUROSTAT the definition of broad band involves the xDSL technology, with its ADSL and SDSL types of subscriber lines, or services that provide speeds in excess of 2Mbits, which allows more rapid data transmission than telephone lines. Internet and electronic business linked practices are strongly associated with the new economy. They allow companies to carry out information searches rapidly, monitor the competition, carry out financial transactions, perform targeted marketing operation, broaden the customer base, etc. These new business practices are at the centre of a genuine revolution in the business world. Individual and business users must have an offer of broad band access to the Internet if they are to develop new applications and take part in economic activities.

#### **H10 Investment in public communications as a percentage of GFCF**

The International Telecommunications Union, (ITU) defines the public telecommunications sector as the infrastructure and telecommunications services available to the general public through this infrastructure. This includes telecommunications networks for telephone, telex, telegraph and data services that are made up of exchanges between which transmission circuits connect domestic subscribers with each other and subscribers abroad. Since everyone can access the network, the term 'public' denotes the provisions for accessing the network rather than ownership of the network. The public telecommunications sector does not include private networks, which are not automatically connected to the public network or to which admission is subject to certain restrictions. The public telecommunications sector also excludes manufacturing of equipment for telecommunications or broadcasting use. The internet, electronic trade and requesting internet access at prices allowing for permanent connections play a primary role in changes to telecommunications policies. The potential contribution of telecommunications to economic growth in the light of developing electronic commerce is appearing increasingly important with the passage of time.

#### **H11 Percentage of households that have Internet access at home**

Information and Communications Technologies provide a massive flow of information. Use of internet by households illustrates the access private individuals enjoy to the multiple potential offered by ICT and reflects, after a fashion, the entry of civilians into the new economy. In the future, these consumers will regularly use the internet to take advantage of goods and services available through it. Simultaneously, the existence of a network like internet is in itself a creator of products of a new type, online products, which engender new needs. Even non-commercial uses of the medium by households can result in indirect effects on their consumption through changes in their habits and lifestyles.

**H12 Number of cell phones per 100 inhabitants**

This indicator shows the access per 100 inhabitants to telecommunications. These include subscribers to cell phone networks. In the past, landline penetration provided a reasonable indication of the number of basic telecommunications connections that were available to consumers. Now, the use of landlines gives flawed information about the development of a network. To evaluate the overall telecommunications penetration throughout the OECD zone it is increasingly necessary to account for the development of mobile transmission networks.

**H13 Percentage of households that have broad band Internet access**

Broad band internet access used as a reference includes xDSL, ADSL, SDSL and other all connections that offer bands over 2Mbit/s. The degree of use of internet services, the quality of the use and the functionalities of online services depend on band width available. For this reason there is growing interest in arraying broad band access networks and the rate of spreading of broad band access technologies. It is important to provide broad band internet access if new applications and their associated economic activities are to be developed.

**H14 Number of secure web servers**

Servers are computers that host content of the worldwide web, in other words, web sites. A secure server is a server that has secure socket layer software, which protects information during business transactions carried out over the internet. In order to complete purchases and sales on the internet and other networks, electronic business infrastructure requires secure paths. Secure servers make up some of the infrastructure used to carry out secure electronic transactions. They support available content intended for sales and other business uses. As such they can be considered indicators of access to electronic commerce and of the offer of this type of service, in other words an indicator of supply and demand of commercial content on line. This indicator is furnished via the SSL survey carried out by Netcraft and published by the OECD. The number of secure servers is in ratio to the population of the country, per 100,000 inhabitants.

**H15 Percentage of total employment in medium or high technology sectors**

The percentage of employment in medium-high and high technology manufacturing sectors is an indicator of the part of the manufacturing economy based on continuous innovation through creative and inventive activities. The indicator used takes into account the percentage of jobs in high and medium-high technology sectors as a part of all jobs. The high and medium-high technologies sectors are defined as those sectors requiring a relatively high degree of R & D intensity. They included a certain number of sectors including aircraft and aerospace construction, the pharmaceutical industry, manufacturing of office and computer equipment, electronics and communication and scientific instruments for high technology. Medium-high technology includes the manufacture of machines, electrical equipment, the automobile industry, the chemical industry—except for the pharmaceutical industry, the manufacture of other transportation equipment and the manufacture of non-electrical machinery and equipment.

# I Social cohesion

There are numerous dimensions to the degree of competitiveness displayed by an economy, of which social cohesion is one of the pillars. Social cohesion is an important feature because it provides underlying social stability by fostering a feeling of security and belonging and because it can improve the development potential of a country. In addition to the quantitative and monetary aspects of competitiveness, a country's capacity for growth depends largely on the motivation of its human capital, which requires a proper working environment and a feeling of strong cohesion that is itself dependent on the efficient functioning of the country's social system. Competitiveness should not be considered as an end in itself, but rather one of several ways to achieve the shared objective of well-being in the population.

## I1 Gini coefficient

The Gini coefficient measures inequality of household incomes. The values of the coefficient move from 0, representing full equality, to 1 for the maximum degree of inequality. Moreover, full equality of incomes can be damaging to the efficiency of an economy, because if no private benefits exist and differences among salaries are minimal, individuals are not motivated to perform better at work or to take up an entrepreneurial path. In contrast, excessive disparities tend to exert a negative effect on individuals' lives. Very inequitable differences in income can have repercussions on certain essential factors of economic growth such as the political stability of a country, educational levels of labour, or adherence to certain rules of conduct on the part of economic agents. All of these factors have the effect of slowing the economy and putting the brakes on growth.

## I2 At risk of poverty rate after social transfers

The 'At risk of poverty rate after social transfers' measures the proportion of persons whose equivalised disposable income is below the 'at risk of poverty line,' which is set at 60% of the median equivalised disposable income of a country, after social transfers. A high rate in this indicator reveals inefficiency in the social protection system that could have damaging repercussions throughout the economy. As an example, the impact of poverty can be such as to hobble education levels or contribute to crime, which in turn increases the level of social instability in a country, thus causing its development potential to shrink.

## I3 At persistent risk of poverty rate

The 'At persistent risk of poverty rate' measures the proportion of persons whose equivalised disposable income is below the 'at risk of poverty line' during the current year and has been for at least two of the previous three years. Persistent poverty can indicate inefficiency in the social protection system that could have damaging repercussions throughout the economy. As an example, the impact of poverty can be such as to hobble education levels or contribute to crime, which in turn increases the level of social instability in a country, thus causing its development potential to shrink.

#### **14 Life expectancy of a child less than one year old**

The life expectancy indicator measures the number of years that a child younger than one year can expect to live assuming, at each age of its life, its chances of survival were consistent with those prevalent in its corresponding age group at the year of its birth. Changes in this indicator reflect the onset of changes in the general state of health of a country's population, living conditions and the quality of health care. Because of this, life expectancy may be considered as an overall indicator of social cohesion that takes into account all the measures implemented to ensure a high degree of social cohesion.

#### **15 Wage gap between men and women**

The wage gap between men and women is the gap in average gross hourly wages between male and female employees as a percentage of the average gross hourly wage of male employees. The survey population includes all salaried workers between the ages of 16 and 64 who work a minimum of 15 hours per week. The wage gap between women and men may discourage women from entering the labour market, thus depriving the economy of human capital. This inequality in the breakdown of incomes goes against the principle of equal opportunities, which is an important factor in maintaining social cohesion.

#### **16 Serious work accidents (removed from Competitiveness Scoreboard)**

This index shows changes in the rate of serious accidents at work since 1998. The rate of occurrence is the number of non-fatal work accidents involving more than three working days of absence in the survey population. A work accident is an 'event of short duration occurring during the course of a professional activity that causes physical or psychological harm to a person'. Included in this figure are accidents occurring away from a company's premises during a victim's working hours, even those caused by third parties or severe poisoning. Excluded from this figure are accidents occurring on the way to and from work, solely medical causes and occupational illnesses. A high rate of serious work accidents can indicate improper working conditions, which can hinder the productivity of employees.

## J Environment

Another requirement for making an economy more competitive is that all economic agents commit to progress in the area of improving the environment, in line with a framework supporting sustainable development. It is important to promote growth while simultaneously guaranteeing a viable economic, social and ecological environment for future generations. The fundamental concept used to evaluate environmental performance is eco-efficiency or environmental productivity of industry. Eco-efficiency is the relationship between economic production and environmental pressures—expressed in terms of pollutants releases or resources consumed—that result from such production. It also furnishes information on the efforts expended by companies to promote productivity while operating in a manner intended to respect the environment.

### **J1 J2 Number of ISO 14001 and 90001 certificates per million inhabitants**

The indicators of ISO 14001 and 90001 certification give us information on the involvement of companies in environmentally responsible activities. ISO standard 14001 is an international standard for managing the environment. ISO standard 90001 is the environmental management and audit system. In order to render European data comparable, the data have been weighted by number of inhabitants of each Member state, in light of the lack of statistics relative to the number of companies.

### **J3 Total greenhouse gas emissions (Kyoto)**

The Kyoto protocol sets limits of greenhouse gas emissions for countries that signed the international agreement. As a part of this protocol, Europe accepted a reduction of 8% in its greenhouse gas emissions using 1990 as a base year with a benchmark figure of 100 in 2008-2012. Emissions of six greenhouse gases specified in the protocol are weighted by overall warming potential and added together to give total CO<sub>2</sub> emissions. Total emissions appear in indices with the year 1990 as the benchmark. The fact that the Kyoto protocol compels nations to reduce quotas of greenhouse gas emissions risks harming the cost-competitiveness situation of European companies with relation to other competitor countries that are not subject to limits, through increased labour costs. These costs could cause some companies to no longer be profitable, thus leading to loss of jobs. This indicator is also an important factor in the choice of policies intended to achieve targeted objectives and the objectives subscribed to in the Kyoto protocol. According to the Lisbon strategy, the EU has agreed to reduce greenhouse gas emissions by 8% below base year 1990 levels in 2008-2012.

### **J4 Percentage of renewable energy sources**

The share of renewable energy is the ratio between electricity produced from renewable energy sources and gross national consumption of electricity figured over a calendar year. This indicator measures the contribution of electricity produced from renewable energy sources in national electricity consumption. Electricity produced using renewable sources includes that produced by hydraulic plants, exclusive of pumping, wind energy, solar energy, geothermic energy and gases derived from biomass waste. Gross domestic consumption of electricity includes total gross domestic production of electricity generated by fuels, including self generation and also including imports of electricity, less exports of electricity. This indicator measures the will of an economy to commit itself to a sustainable development program with environmental concerns to the forefront.

**J5 Volume of municipal waste collected per person per year**

This indicator shows the quantity of waste generated. It includes waste collected by or for municipal authorities that are subsequently eliminated by the waste management system for these entities. The greater part of these waste flows comes from households, although it also includes similar waste sources such as from stores, offices and public institutions. In areas not benefiting from where no municipal waste management system exists, estimates of waste quantities have been made. The quantity generated is expressed in kg per inhabitant per year.

**J6 Energy intensity of the economy**

Energy intensity of the economy is the ratio between gross domestic consumption of energy and the gross domestic product calculated over a given calendar year. This indicator measures the consumption of energy in an economy and its overall energy efficiency. Gross domestic consumption of energy is calculated as the sum of gross domestic consumption of five energy types, including coal, electricity, oil, natural gas and renewable energy sources. GDP figures are considered at like prices to avoid the effect of inflation, and the base year used is 1995. The rate of energy intensity is the result of dividing gross domestic consumption by GDP. Since gross domestic consumption is measured in kilograms of oil equivalent and GDP in millions of Euros, this rate is measured in kilograms of oil equivalent per thousand Euros. Energy intensity reflects the degree of dependence an economy has with relation to the energy factor as well as the productivity of this factor and its efficiency of use. A high energy intensity score shows that an economy is more vulnerable to an increase in energy prices. Energy intensity is also an important factor in selecting policies intended to achieve objective commitments in the Kyoto framework.

**J7 Modal split in transportation choice – percentage of car users as transportation method**

The modal split in transportation methods of travellers is defined as the ratio between domestic passenger traffic and GDP at like prices of 1995. The unit used is passenger kilometre to represent the transport of one passenger over the distance of one kilometre. The indicator covers transportation in automobiles, buses, cars and trains. All data must be based on movements within national borders, regardless of nationality of a vehicle. However, the collection of data is not harmonized for countries within the EU. In accordance with the strategy of sustainable development, the share of movements by transportation mode must be reduced if we are to efficiently and ecologically master the problem of mobility. Moreover, this type of re-balancing will contribute to the diminishing of CO<sub>2</sub> released into the air through road traffic.

#### New Objectives and Indicators for the Europe 2020 Strategy

EU2020-1	Employment rate by gender, age group 20-64
EU2020-2	Gross domestic expenditure on R&D (GERD)
EU2020-3	Greenhouse gas emissions, base year 1990
EU2020-4	Share of renewable energy in gross final energy consumption
EU2020-5	Primary energy consumption (Mtoe)
EU2020-6	Early leavers from education and training by gender
EU2020-7	Tertiary educational attainment by gender, age group 30-34
EU2020-8	Population at risk of poverty or exclusion
EU2020-9	Persons living in households with very low work intensity
EU2020-10	Persons at risk of poverty after social transfers
EU2020-11	Severely materially deprived persons

Source: [http://epp.eurostat.ec.europa.eu/portal/page/portal/europe\\_2020\\_indicators/headline\\_indicators](http://epp.eurostat.ec.europa.eu/portal/page/portal/europe_2020_indicators/headline_indicators)

