

## 2013 COMPETITIVENESS REPORT

Ten years of competitiveness scoreboard:  
A sawtooth evolution



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A sawtooth evolution

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# 2013 Competitiveness Report

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## Preface

In October STATEC revised its economic growth forecast upward for 2013, mainly because of the positive outlook that is arising. One swallow does not make a summer, but certain signs foretell that the economic situation will soon go through a brighter cycle. However, since 2008, and even today, growth prospects remain at levels well below the growth rate Luxembourg experienced in the past. And this decrease in growth has had a significant impact on employment and unemployment in Luxembourg which is currently around 7%. Public finances have recorded deficits since 2009 and, without any real economic recovery, the return to a balanced budget will be difficult.



The real challenge is the potential long-term growth, which results from the combination of available human resources, the use of production equipment and of technological progress. Both the OECD and the Commission have revised potential growth projections, that should only reach 2% annually. These long-term prospects are too low to finance our welfare state. If we want to avoid rushing into a cycle of reduction in benefits and the dismantling of public services and reduction in purchasing power, we must focus firmly on growth and consider the way to counteract the slowdown and increase our competitiveness. However, we must examine the kind of the desired growth. The Luxembourg 2020 strategy, which implements the European strategy for growth and jobs, has set the objective of an inclusive, sustainable and smart growth. Growth is not an end in itself but should increase the standard of living for all.

The *Observatoire de la compétitivité*, a permanent observation tool for competitiveness that the government set up ten years ago, following the 2003 discussions within the Tripartite Coordination Committee, monitors and produces annually its findings on structural competitiveness of Luxembourg in this Report. Our country is in 13th position among the EU Member States, in this tenth edition of the national competitiveness scoreboard, displaying a sawtooth evolution which still shows a trend to deterioration in recent years. However, it is important not to look only at the final rankings, but to analyse each indicator one by one in order to identify the strengths and weaknesses of Luxembourg. In this context it seems also appropriate to follow the cost competitiveness, at least in the short and medium terms. It appears that this cost competitiveness, measured in particular through the nominal unit labour costs, has deteriorated over the years.

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 conclusion, I invite social partners to a constructive discussion of the analyses provided by the *Observatoire*, presented in this new 2013 edition of the Competitiveness Report.

Let me finish by also congratulating the whole *Observatoire de la compétitivité* team for the tenth year of service as well as for the quality analyses they provide.

**Étienne SCHNEIDER**

Minister of the Economy and Foreign Trade

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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 and Foreign Trade 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 2011-2014. During the second European semester, a consultation debate took place in March 2012 in the Chamber of Deputies<sup>3</sup>. The third update of Luxembourg's finalized NRP was sent to the European Commission in April 2013, along with the SGP 2013-2016<sup>4</sup>. Based on the NRP and the SGP, the Council issued in July 2013 country-specific recommendations for Luxembourg<sup>5</sup>, for consideration during the national discussions to be conducted about the 2014 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.odc.public.lu/actualites/2012/03/debat\\_PNR\\_2012/index.html](http://www.odc.public.lu/actualites/2012/03/debat_PNR_2012/index.html)

<sup>4</sup> For additional details: [http://www.mf.public.lu/publications/programme/14e\\_prog\\_stabilite\\_croissance.pdf](http://www.mf.public.lu/publications/programme/14e_prog_stabilite_croissance.pdf)

<sup>5</sup> For additional details: <http://register.consilium.europa.eu/pdf/fr/12/st11/st11263.fr12.pdf>

## 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 are carried out among others by the *Observatoire de la compétitivité* in collaboration with STATEC.

For 2013, 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 2013 remains structured around the three pillars of applied research, namely growth and productivity; innovation and performance; entrepreneurship and profitability<sup>6</sup>.

## 1.4 Events and publications in 2012-2013

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 organizing public events (seminars, conferences, etc.) and publishing analytical documents relating to competitiveness. All information concerning events organized by the *Observatoire de la compétitivité* and its publications can be downloaded.

### 1.4.1 Seminars and Conferences

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

<sup>6</sup> For additional details: <http://www.statistiques.public.lu/en/actors/statec/organisation/epr/index.html>

## Seminar on productivity<sup>7</sup>

STATEC and the *Observatoire de la compétitivité* have published numerous analyses and studies on productivity. Over the last few years we notice a decrease in apparent labour productivity that is more pronounced in Luxembourg than in other European countries. Several factors may explain this evolution: a productivity level higher than that of other European countries, the relative dominance of the financial sector and the steel industry - two sectors that suffered in addition proportionally more from the crisis, or the measures regarding employment protection ("labour hoarding"). Given these factors, it is well worth contextualizing this development in relation to other European countries, Germany in particular. On 22 November 2012 a conference was held with Dr Georg Erber, an economist at the *Deutsches Institut für Wirtschaftsforschung* (DIW) in Berlin.

## Assessment of interdependent budgetary policies in Europe<sup>8</sup>

On 12 December 2012, the *Observatoire de la compétitivité* invited the public to a presentation called "The assessment of interdependent budgetary policies in Europe" by Gilbert Cette (associate professor at the *Université de la Méditerranée* and director of Microeconomic and Industry analysis at the *Banque de France*) and Mr Ian Gambini (lecturer at the *Université de la Méditerranée*). Recent years have been characterized by the adoption of simultaneous macroeconomic policies among the major industrialized countries, recovery policies first, then policies regarding the consolidation of public finances. The simulations undertaken show that i) coordinating fiscal stimuli helped to amplify their positive effects but did not lead, under reasonable assumptions, to multipliers higher than the unit ii) coordinating consolidation policies amplified in each country the recessive effects of these policies. The simulations also show that coordinating ambitious structural policies amplifies the positive effects of these policies.

## OECD - 2012 Report on the situation of the Luxembourg economy<sup>9</sup>

Every two years, the OECD publishes a report on the economic situation and the policies pursued by each of its member countries. The *Observatoire de la compétitivité* assisted the OECD in preparing the report and organized the necessary technical and political missions. The purpose of the study is to assess the Luxembourg economy's situation and to make recommendations. The OECD Secretariat is responsible for the contents of the study. The public presentation in Luxembourg by Mr Andrew Dean (Director - Country studies branch) and Mr Jean-Marc Fournier (Economist) was held on 13 December 2012, in the presence of the Minister of the Economy and Foreign Trade.

<sup>7</sup> For additional details:  
[http://www.odc.public.lu/actualites/2012/11/seminaire\\_productivite\\_Erber/index.html](http://www.odc.public.lu/actualites/2012/11/seminaire_productivite_Erber/index.html)

<sup>8</sup> For additional details:  
[http://www.odc.public.lu/actualites/2012/12/seminaire\\_politiques\\_budgetaires\\_gilbert\\_cette/index.html](http://www.odc.public.lu/actualites/2012/12/seminaire_politiques_budgetaires_gilbert_cette/index.html)

<sup>9</sup> For additional details:  
[http://www.odc.public.lu/actualites/2012/12/Rapport\\_OCDE\\_2012/index.html](http://www.odc.public.lu/actualites/2012/12/Rapport_OCDE_2012/index.html)

## *Les Journées de l'Économie 2013*<sup>10</sup>

On 6 and 7 February 2013, the Ministry of the Economy and Foreign Trade, the Chamber of Commerce and FEDIL in collaboration with PwC, held the 2013 edition of the *Journées de l'Économie* with the topic "The crisis in Europe and in Luxembourg: analysis and opportunities". Within the economic context that Europe is currently facing, this event was an opportunity to analyse in depth the challenges but also the opportunities that lie ahead. During the first half-day, entrepreneurs expressed in a panel discussion their views on the crisis as well as on the structural challenges that the Luxembourg economy is facing.

During the second half-day, the analyses by professors Hans-Werner Sinn and Christian de Boissieu showed the extent of the economic and financial crisis in the eurozone and the challenges faced by Member States to provide Europe with rules, institutions and resources to manage the common currency, to coordinate economic and budgetary policies and to revitalize an unevenly competitive industry across Europe.

## *LIS Conference "Who pays for austerity? The design and distributional effects of fiscal consolidation in the European Union"*<sup>11</sup>

On 2 July the *Observatoire de la compétitivité* and LIS held the "Who pays for austerity?" conference with Holly Sutherland from the Institute for Social and Economic Research at the University of Essex, who focused particularly on fiscal austerity policies (discretionary measures such as direct taxes, social security contributions, etc.) in 9 EU Member States (excluding Luxembourg) and their direct and quantifiable impact on the distribution of income. It is a topic on which there is generally very little information, since the literature on fiscal consolidation normally focuses more on macroeconomic analysis.

## 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 Economy and Foreign Trade 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>12</sup>.

<sup>10</sup> For additional details:  
[http://www.odc.public.lu/actualites/2013/02/Journees\\_economie\\_2013/index.html](http://www.odc.public.lu/actualites/2013/02/Journees_economie_2013/index.html)

<sup>11</sup> For additional details:  
[http://www.odc.public.lu/actualites/2013/07/Conference\\_Who\\_Pays\\_for\\_Austerity/index.html](http://www.odc.public.lu/actualites/2013/07/Conference_Who_Pays_for_Austerity/index.html)

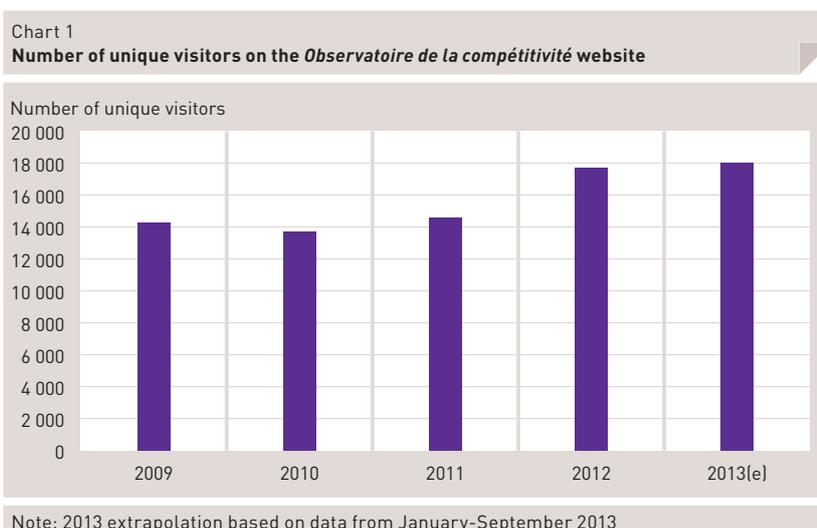
<sup>12</sup> All editions of "*Perspectives de Politique Économique*" can be downloaded from the website:  
<http://www.odc.public.lu/publications/perspectives/index.html>

### 1.4.3 Information summary: The *Observatoire de la compétitivité* Newsletter

Whilst the purpose of the “Perspectives de Politique Économique” publication is a detailed analysis of scientific issues, the newsletter’s purpose is to inform the general public about the work undertaken in the *Observatoire de la compétitivité*. This publication is intended both for economic players and for a wider audience<sup>13</sup>.

### 1.4.4 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, with almost 18.000 unique visits and an estimated total of 30.000 visits for 2013.



<sup>13</sup> The *Observatoire de la compétitivité* newsletters can be downloaded from the website: [http://www.odc.public.lu/publications/lettre\\_observatoire/index.html](http://www.odc.public.lu/publications/lettre_observatoire/index.html).

## 1.5 An overview of the 2013 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 "Macroeconomic imbalances procedure" (MIP), before the publication of the new edition by the end of 2013 by the European Commission.

**Chapter 5** is intended to provide an initial inventory of the four priority sectors whose development is actively promoted by the Ministry of Economy and Foreign Trade: ICT, logistics, biotechnology and ecotechnologies.

**Chapter 6** discusses the pricing policy of Luxembourg companies at the microeconomic level, specifically the price adjustments made by the companies as a result of external shocks and anticipated changes. This chapter is based on the one hand on a survey on access to finance by STATEC, and on the other hand on the results of a study by the consulting firm Deloitte, conducted as part of *Observatoire de la formation des prix's* work.

Finally, **chapter 7** summarizes the main results of studies commissioned as part of the research agreement between ANEC, STATEC, and the *Observatoire de la compétitivité*. A contribution analyses labour productivity, total factor productivity (TFP), efficiency and technological progress in Luxembourg from 1995 to 2011. This chapter also includes a contribution which aims to identify the characteristics of companies that engage in a standardization process through an econometric analysis conducted on a sample of companies, representative of the Luxembourg economy as a whole. A final contribution reviews the main results found in different analyses of population well-being and the political implications thereof.

**Chapter 8** presents an overview of the project *PIBien-être* (“GDP Prosperity”) launched in 2009 in Luxembourg to measure societal progress and well-being in a long-term perspective. This chapter addresses in particular the proposed indicators for monitoring the well-being, that were developed by the Economic and Social Council (ESC) and the Higher Council for Sustainable Development (CSDD).

**Chapter 9**, relating to the Luxembourg structural model (LSM) project, a Dynamic Stochastic General Equilibrium (DSGE) model, developed by professors Fontagné and Marcellino for the *Observatoire de la compétitivité*, finally closes the 2013 report. A simulated shock looks at the impact of a decline in foreign deposits in the international banking sector of the country on the banking sector and Luxembourg economy. This exercise is particularly illustrative given Luxembourg’s strong financial specialization.

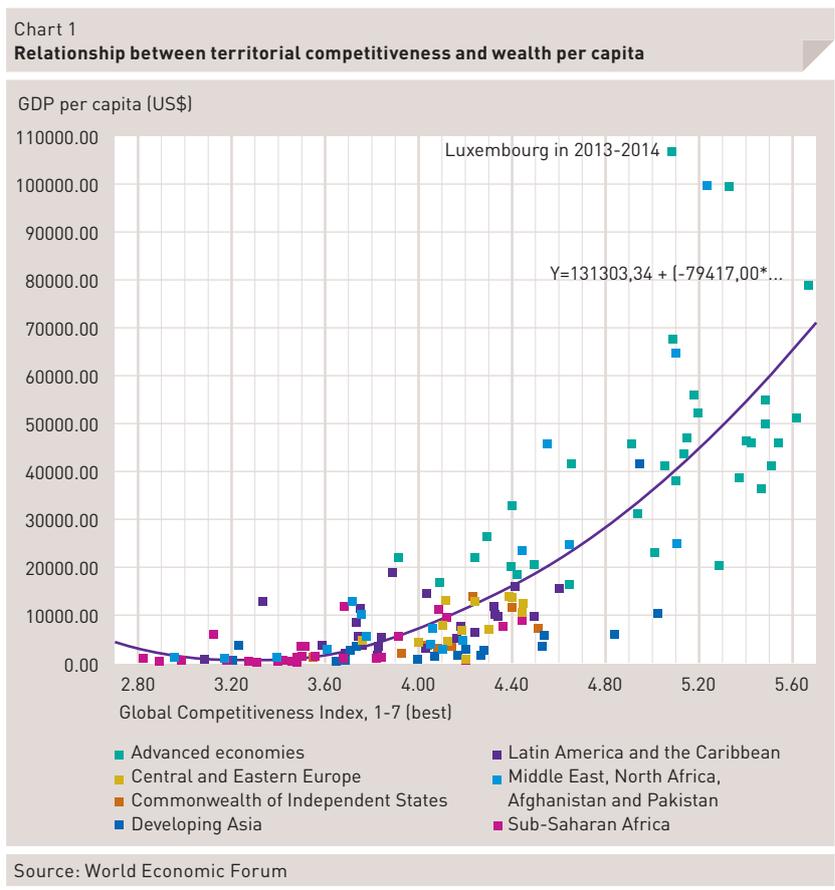
## **2 Benchmarks and comparative competitiveness analysis**

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# 2.1 Benchmarks and comparative competitiveness analysis

We live in an age of international comparisons where it has become easy to compare how territories have managed to define and ensure their growth potential. This debate is regularly revived through the publication of rankings, although, since September 2008, “crisis rankings” which bring together the countries most affected by the weakening outlook for growth and the fragility of public finances have taken over.

It is important for governments to bring public deficits and public debt under control but this must not be the one and only purpose of economic policy. The current account imbalances in some countries remind us of the importance of the concept of “cost competitiveness”. The debt level decreases sufficiently only if growth resumes. Supply-side policies and structural issues are therefore essential in the long term to increase sustainable growth and employment, and particularly in a world economy that is becoming increasingly globalized and integrated.



The concept of territorial competitiveness is in fact the result of a world that is constantly changing. In this context composite indicators such as benchmarks allow to compare international best practices, and to consolidate various data in a single value figure<sup>1</sup> that aggregates a variety of characteristics and provides a rough overall image of complex themes. These benchmarks provide thus useful information to both public authorities and investors, and are also helpful to better understand why some countries are doing better than others in a globalized environment.

This chapter aims at providing a descriptive overview of a series of these benchmarks published since the previous edition of the Report in the fall of 2012<sup>2</sup>.

## 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<sup>3</sup>.

### 2.2.1 WEF, IMD, Heritage foundation and the European Commission

#### a. Growth Competitiveness Index

The World Economic Forum (WEF) has published its 2013-2014 comparative study of competitiveness of countries around the world, the "Global competitiveness report", which assesses the world's economies potential to achieve sustainable growth in 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."

<sup>1</sup> For additional details 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 can 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)

<sup>3</sup> See Chapter 2.2.2

The study measures the competitiveness level of 148 countries worldwide using about hundred indicators with a scale of 1 (the less competitive) to 7 (the most competitive). These indicators are split into three fundamental growth and competitiveness “pillars”: the basic requirements of competitiveness (through the subcategories: institutions, infrastructure, macroeconomic environment, health and primary education), efficiency enhancers (through the subcategories: higher education and vocational training, product market efficiency, labour market efficiency, financial market development, technological readiness, market size) and innovation and sophistication factors (through the subcategories: level of business environment sophistication and innovation). The study takes into account the fact that countries are not at the same level of economic development, and therefore that the relative importance of the various factors of competitiveness is dependent on initial conditions. The composite index Growth Competitiveness Index (GCI), calculated to rank countries, is established using a mix of statistical data and survey results, including the annual survey of business leaders, conducted in collaboration with its network of partner institutes.

Table 1  
Luxembourg’s position according to the GCI (2013-2014)

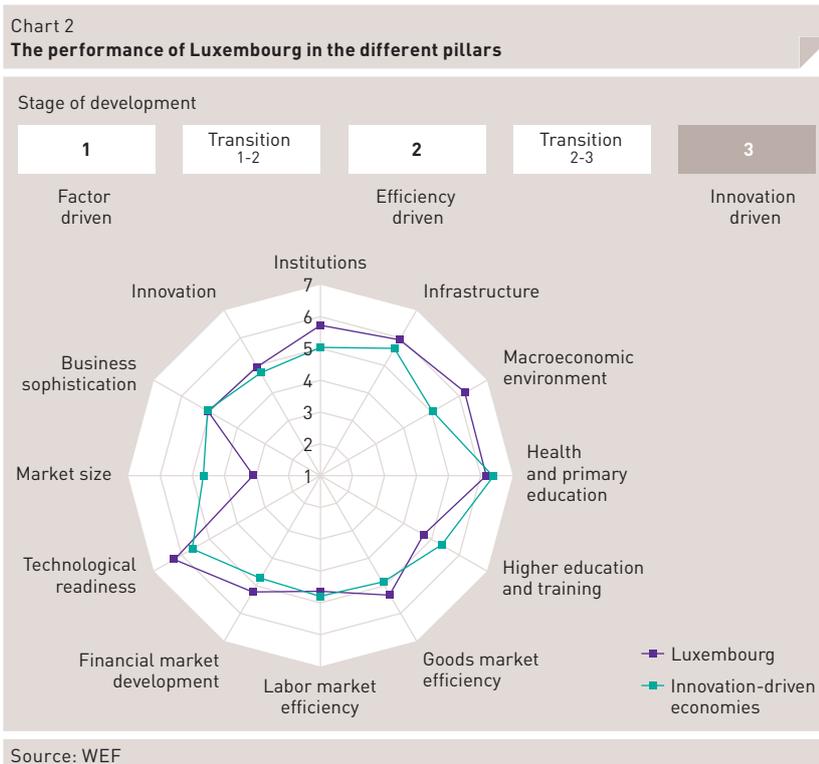
Country/Economy	Overall index		Subindexes					
	Rank	Score	Basic requirements		Efficiency enhancers		Innovation and sophistication factors	
			Rank	Score	Rank	Score	Rank	Score
Switzerland	1	5.67	3	6.15	5	5.44	1	5.72
Singapore	2	5.61	1	6.30	2	5.63	13	5.14
Finland	3	5.54	7	5.97	9	5.30	2	5.65
Germany	4	5.51	9	5.90	8	5.31	4	5.59
United States	5	5.48	36	5.12	1	5.66	6	5.43
Sweden	6	5.48	8	5.95	7	5.31	5	5.46
Hong-Kong SAR	7	5.47	2	6.15	3	5.57	19	4.83
Netherlands	8	5.42	10	5.89	11	5.27	7	5.36
Japan	9	5.40	28	5.37	10	5.27	3	5.62
United Kingdom	10	5.37	24	5.48	4	5.45	10	5.15
Norway	11	5.33	6	5.98	12	5.22	16	5.07
Taiwan, China	12	5.29	16	5.70	15	5.16	9	5.22
Qatar	13	5.24	5	6.01	18	5.02	14	5.08
Canada	14	5.20	15	5.71	6	5.33	25	4.64
Denmark	15	5.18	21	5.55	16	5.05	11	5.14
Austria	16	5.15	19	5.63	21	4.97	12	5.14
Belgium	17	5.13	22	5.51	17	5.03	15	5.07
New Zealand	18	5.11	12	5.78	14	5.17	27	4.55
United Arab Emirates	19	5.11	4	6.04	20	5.00	24	4.67
Saudi Arabia	20	5.10	14	5.73	27	4.69	29	4.33
Australia	21	5.09	17	5.69	13	5.18	26	4.56
<b>Luxembourg</b>	<b>22</b>	<b>5.09</b>	<b>11</b>	<b>5.87</b>	<b>22</b>	<b>4.92</b>	<b>17</b>	<b>4.84</b>
France	23	5.05	23	5.50	19	5.00	18	4.84
Malaysia	24	5.03	27	5.37	25	4.86	23	4.70

Source: WEF

In this new 2013-2014 edition, the global ranking is led by Switzerland, Singapore and Finland. Luxembourg is ranked 22nd in the world ranking (same position as last year). Germany is in the 4th position worldwide, the Netherlands occupy the 8th position, Belgium ranks 17th and France 23rd. In this edition the EU ranking is led by Finland, and Luxembourg is 9th in this sub-ranking.

Regarding the rankings for the three fundamental pillars:

- ▼ Luxembourg is in the 11th place with regards to the basic requirements of competitiveness: within this pillar, Luxembourg is ranked 10th in terms of institutions, 13th for infrastructure, 15th for macroeconomic environment and 36th in terms of health and primary education;
- ▼ Luxembourg is in the 22nd rank for efficiency enhancers: within this pillar, Luxembourg is 36th for higher education and training, 5th for product market efficiency, 22nd for labour market efficiency, 14th for financial market development, 2nd for technological readiness and 97th for market size;
- ▼ Luxembourg is ranked 17th for the innovation and sophistication factors: within this pillar, the country is 22nd for the level of business sophistication and, finally, 18th in terms of innovation.



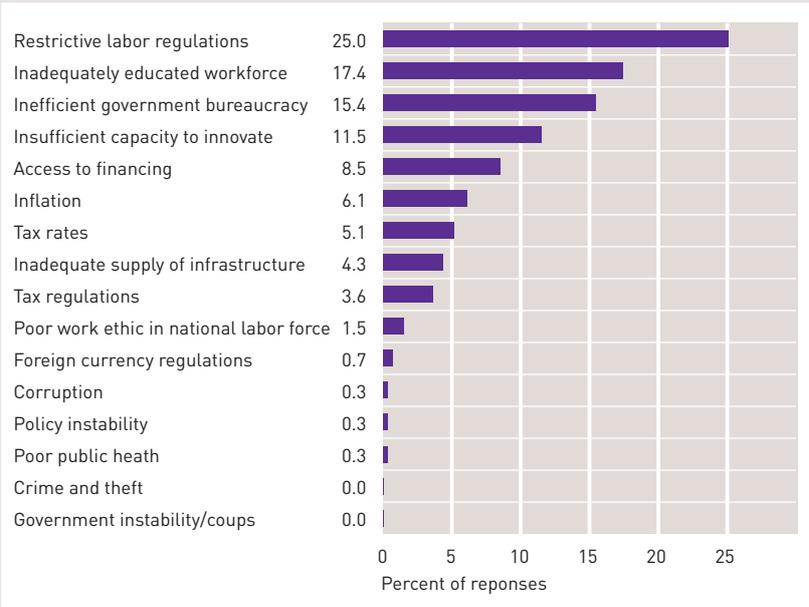
Frame 1

**Results of the survey made in Luxembourg (WEF survey)**

A Survey is conducted annually among business leaders to identify the main factors that hamper national competitiveness. More particularly, with regards to Luxembourg's survey results, it appears that restrictive labour regulations,

an inadequately educated workforce, inefficient bureaucracy and an insufficient capacity to innovate are considered as the five most problematic factors for doing business in Luxembourg.

**The most problematic factors for doing business**



Source: IMD

Note: From the list of factors above, respondents were asked to select the 5 most problematic for doing business in their country and to rank them between 1 (most problematic) and 5. The figures in this chart show the responses weighted according to their ranking.

## b. Global Competitiveness Index

In May 2013 the Swiss institute IMD published a new edition of its annual report on competitiveness, which is issued annually since 1989. In this edition 60 countries are analysed through more than 300 criteria. These criteria are both quantitative and qualitative, taken from a survey of corporate decision makers. The analysis is based on four main categories of criteria: economic performance, government efficiency, business environment and infrastructure. Then, each of these factors is divided into sub-factors to enhance every facet of the sectors taken into account.

The world ranking is led by the United States, Switzerland and Hong Kong. Luxembourg is 13th in the overall ranking and Luxembourg's neighbouring countries are ranked 9th (Germany), 26th (Belgium) and 28th (France). In a time perspective, Luxembourg has lost one position in comparison with the 2012 report. The European ranking is led by Switzerland, followed by Sweden and Norway. Luxembourg ranks 6th in Europe. Within the European Union, the ranking is led by Sweden, followed by Germany and Denmark. Luxembourg is ranked 4th within the EU.



The IMD has also carried out an analysis of the evolution of rankings since the establishment in 1997 of the current methodology. In 2013 Luxembourg is ranked 13th and has lost 5 positions compared to 1997 when the country was still 8th.

Regarding the four categories that make up the composite GCI index, Luxembourg is ranked as follows:

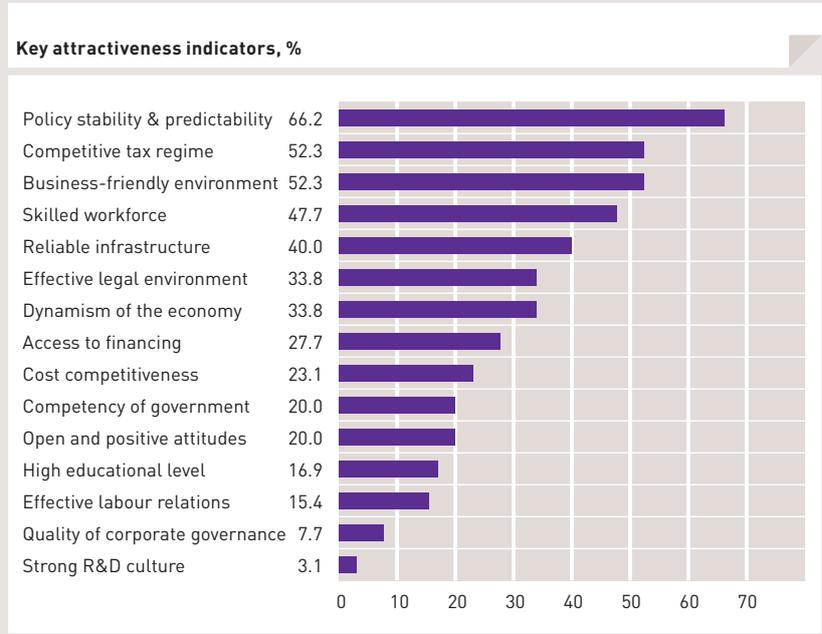
- ▼ For the first pillar of macroeconomic performance, Luxembourg is 5th;
- ▼ For the second pillar, the government efficiency, Luxembourg moves to the 18th position;
- ▼ For the third pillar, the business environment, Luxembourg moves to the 16th position;
- ▼ For the fourth pillar, infrastructure, Luxembourg is 23rd in 2013.

As challenges for the coming years, the IMD advises Luxembourg to improve its cost competitiveness, to reindustrialize its economy, to facilitate access to credit for SMEs and reduce the administrative burdens, to restore fiscal balance, in particular through more targeted social spending and, finally, to take measures on pension and population aging expenditures.

**Frame 2**  
**Key attractiveness indicators for Luxembourg (IMD Survey)**

From a list of fifteen indicators, respondents in the annual survey conducted by the IMD had to select the five they perceived as the key attractiveness indicators of the domestic economy of Luxembourg.

The five most frequently mentioned responses are policy stability and predictability (66%), the tax regime (52%), the business environment (52%), a skilled workforce (48%) and infrastructure (40%).



Source: IMD

## c. Index of Economic Freedom

In January 2013 the American Heritage Foundation, in collaboration with *The Wall Street Journal*, published a new edition of the composite "Index of Economic Freedom" for 185 countries around the world. Economic freedom is defined as the absence of any government ability to coerce or constrain production, supply or consumption of goods and services beyond the level necessary to protect and maintain the citizens' freedom. It is measured through a composite index based on indicators divided into four categories ("rule of law", "limited government", "regulatory efficiency" and "open markets"). This economic liberalism is supposed to promote productivity, and thus growth, by encouraging entrepreneurship and thus the creation of added value. The more open the economy (the closer the composite index is to 100), the fewer the barriers to free trade and the better the country is ranked in the index. The underlying data used in this year's report are mainly from 2011.

The 2013 world ranking is led by Hong Kong, Singapore and Australia. Luxembourg is in 15th position worldwide and is considered so to be "mostly free". The Netherlands ranks 17th, Germany 19th, Belgium 40th and France 62nd in the world ranking. Within Europe, Luxembourg is in 6th position. This European ranking is led by Switzerland, Denmark and Ireland.

Table 2  
European Top 20 in world ranking

World Rank	Country	Overall Score	Change from 2012	Property Rights	Freedom from Corruption	Fiscal Freedom	Government Spending	Business Freedom	Labor Freedom	Monetary Freedom	Trade Freedom	Investment Freedom	Financial Freedom
1	Hong-Kong	89.3	-0.6	90	84	92.9	88.9	98.9	86.2	82.1	90.0	90	90
2	Singapore	88.0	0.5	90	92	91.1	91.3	97.1	91.4	82.0	90.0	75	80
3	Australia	82.6	-0.5	90	88	66.4	62.8	95.5	83.5	83.8	86.2	80	90
4	New Zealand	81.4	-0.7	95	95	71.5	33.2	99.9	89.5	83.3	86.8	80	80
5	Switzerland	81.0	-0.1	90	88	68.1	63.8	75.8	87.9	86.2	90.0	80	80
6	Canada	79.4	-0.5	90	87	79.8	44.8	91.7	82.3	75.2	88.2	75	80
7	Chile	79.0	0.7	90	72	77.6	83.7	70.5	74.2	84.6	82.0	85	70
8	Mauritius	76.9	-0.1	70	51	92.1	81.9	78.2	72.3	75.4	87.9	90	70
9	Denmark	76.1	-0.1	90	94	39.8	5.6	98.4	91.1	80.0	86.8	85	90
10	United States	76.0	-0.3	85	71	69.3	47.8	90.5	95.5	75.0	86.4	70	70
11	Ireland	75.7	-1.2	90	75	73.8	28.8	83.4	76.6	82.8	86.8	90	70
12	Bahrain	75.5	0.3	55	51	99.9	72.4	75.8	90.4	72.5	82.8	75	80
13	Estonia	75.3	2.1	85	64	79.7	56.2	78.2	56.0	77.1	86.8	90	80
14	United Kingdom	74.8	0.7	90	78	57.0	27.7	94.1	71.6	72.4	86.8	90	80
<b>15</b>	<b>Luxembourg</b>	<b>74.2</b>	<b>-0.3</b>	<b>90</b>	<b>85</b>	<b>65.0</b>	<b>47.1</b>	<b>74.8</b>	<b>39.0</b>	<b>79.3</b>	<b>86.8</b>	<b>95</b>	<b>80</b>
16	Finland	74.0	1.7	90	94	66.9	12.2	94.8	45.3	79.5	86.8	90	80
17	Netherlands	73.5	0.2	90	89	52.1	24.7	83.0	58.6	81.1	86.8	90	80
18	Sweden	72.9	1.2	90	93	39.6	21.0	93.2	53.6	82.1	86.8	90	80
19	Germany	72.8	1.8	90	80	61.8	37.3	92.1	43.8	81.2	86.8	85	70
20	Taiwan	72.7	0.8	70	61	80.5	84.9	94.3	53.3	82.9	85.0	65	50

Source: The Heritage Foundation

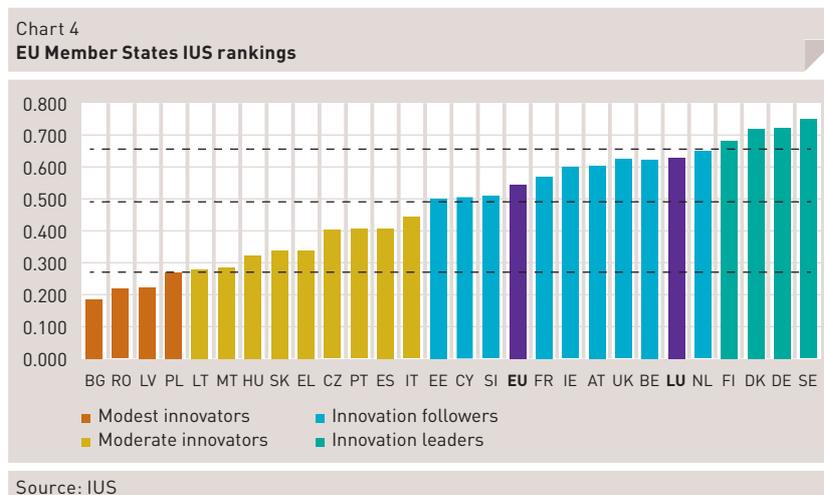
For the 4 indicator subcategories, Luxembourg is characterized by:

- ▼ A very good performance in the “rule of law” category (2nd position for the “property” sub-category and 11th in “absence of corruption”);
- ▼ Much more modest performances for the “limited government” category (154th for “tax regime” and 132nd for “public expenditure”);
- ▼ Average performances for the category “regulatory efficiency” (51st for “business environment”, 162nd for “labour market” and 45th for “monetary system”);
- ▼ Very good performances in the “open markets” category (11th for trade, 1st for investment and 4th for the financial system).

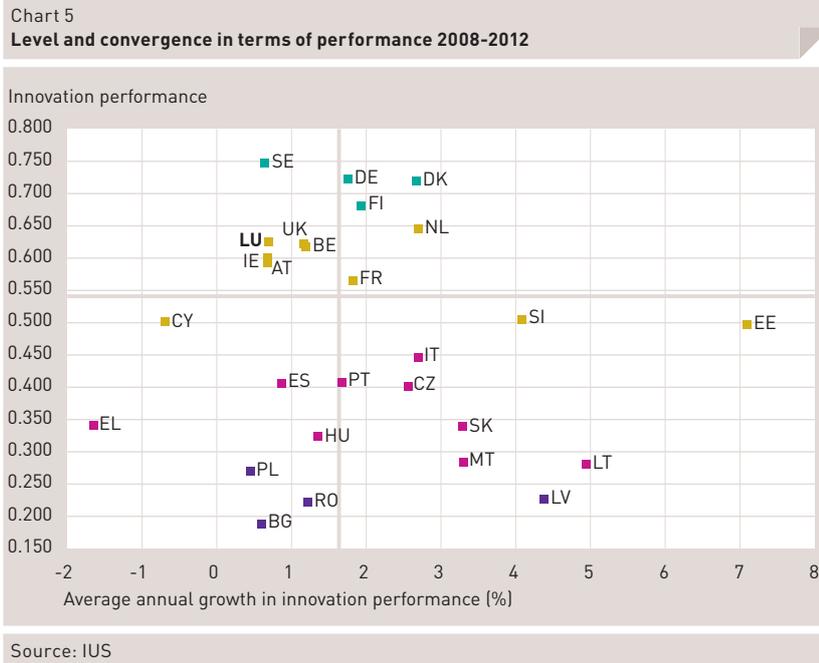
#### d. European innovation union scoreboard

In March 2013 the European Commission published the third edition of the European scoreboard “Innovation Union Scoreboard” (IUS). This scoreboard is the successor to the European Innovation scoreboard, which had been introduced under the Lisbon strategy (2000-2010). The purpose of this statistical tool, which is based on 25 indicators divided into three sub-categories, is to monitor the implementation of the Europe 2020 strategy, in particular through a composite index. Several methodological changes were made in this new edition compared to the previous edition of the report, which implies that the results are not directly comparable.

In this 2013 edition, EU Member States ranking is led by Sweden, followed by Germany and Denmark. Luxembourg is in the 6th position, Belgium in the 7th position and France in the 11th position. Luxembourg is among the countries considered as “innovation followers”, displaying a better performance than the EU-27 average level, but not sufficiently effective to be among the “innovation leaders” category (reserved for countries which display innovation performances at least 20% higher than that of the EU-27 average).



The IUS scoreboard also analyses the evolution of the Member States' performances over the years. In this edition, Luxembourg is considered as part of the "moderate growers", i.e. Member States with an average growth performance.



The relative strengths of Luxembourg are considered to be in the sub-categories relating to the innovation capacity within enterprises and the research system. Its relative weaknesses are on company investments. Luxembourg is regarded as the country with the largest growth in international co-publications and R&D expenditure among all EU Member States. In addition, the quotations of publications have grown significantly. On the other hand, a sharp decline has been observed in innovation expenditures not related to R&D. The growth of the research system is considered to be well above the EU average, but the growth of business investment is far below average.

## e. Ranking comparison and correlation analysis

For illustrative purposes, the table below shows an excerpt of the rankings of the four major composite indicators analysed, in which Luxembourg is included<sup>4</sup>.

For these four major rankings, it is possible to make an analysis of Luxembourg's evolution. In the WEF world ranking, Luxembourg is ranked 22nd and has remained constant in relation to last year; in the IMD world ranking it is 13th with the loss of 1 position, in the Heritage Foundation's world ranking it is 15th and has lost 2 positions, and finally, in the IUS ranking it is ranked 7th and has climbed 5 positions.

By extracting only the European countries from these top 25 world countries, it appears for example that Luxembourg ranks 11th in the WEF European rankings (9th within the EU), 6th in the IMD ranking (4th within the EU), 6th in The Heritage Foundation ranking (5th within the EU) and 7th in the ranking of the European Commission (6th within the EU).

Table 3  
Four major rankings (reports published in 2013)

	N°	World Economic Forum	IMD	Heritage Foundation	Commission européenne
		GCI	GCI	Economic freedom	SII
+	1.	Switzerland	United States	Hong Kong	Switzerland
	2.	Singapore	Switzerland	Singapore	Sweden
	3.	Finland	Hong Kong	Australia	Germany
	4.	Germany	Sweden	New Zealand	Denmark
	5.	United States	Singapore	Switzerland	Finland
	6.	Sweden	Norway	Canada	Netherlands
	7.	Hong Kong	Canada	Chile	Luxembourg (+5)
	8.	Netherlands	United Arab Emirates	Mauritius	Belgium
	9.	Japan	Germany	Denmark	Iceland
	10.	United Kingdom	Qatar	United States	United Kingdom
	11.	Norway	Taiwan	Ireland	Austria
	12.	Taiwan	Denmark	Bahrain	Ireland
	13.	Qatar	Luxembourg (-1)	Estonia	France
	14.	Canada	Netherlands	United Kingdom	Slovenia
	15.	Denmark	Malaysia	Luxembourg (-2)	Cyprus
	16.	Austria	Australia	Finland	Estonia
	17.	Belgium	Ireland	Netherlands	Norway
	18.	New Zealand	United Kingdom	Sweden	Italy
	19.	United Arab Emirates	Iceland	Germany	Spain
	20.	Saudi Arabia	Finland	Taiwan	Portugal
	21.	Australia	China	Georgia	Czech Republic
	22.	Luxembourg (0)	Korea	Lithuania	Serbia
	23.	France	Austria	Iceland	Greece
	24.	Malaysia	Japan	Japan	Slovakia
-	25.	Korea	New Zealand	Austria	Hungary

Figures in brackets describe the evolution of Luxembourg compared to the previous year. A plus or minus sign refers to a favourable or unfavourable evolution, and the number 0 indicates the same rank.

Luxembourg's neighbouring countries (Belgium, France and Germany), and the Netherlands as a member of the Benelux countries, are marked in green when their ranking is better than that of Luxembourg, and in red in the opposite case.

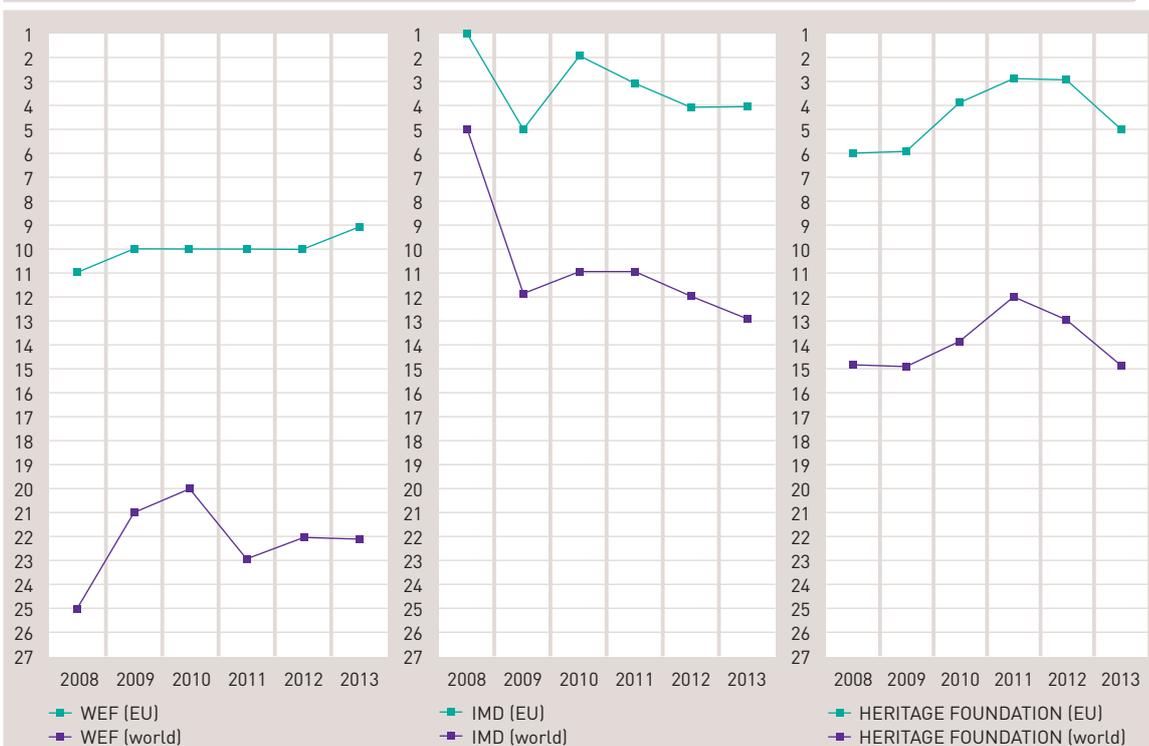
<sup>4</sup> Annual changes in country rankings should be consulted with a certain caution, because over the years methodological changes in the calculation of the index may have occurred without a recalculation of the ranks for all the years.

Table 4  
Extracts from the European ranking

	N°	World Economic Forum	IMD	Heritage Foundation	Commission européenne
+	1.	Switzerland	Switzerland	Switzerland	Switzerland
	2.	Finland	Sweden	Denmark	Sweden
	3.	Germany	Norway	Ireland	Germany
	4.	Sweden	Germany	Estonia	Denmark
	5.	Netherlands	Denmark	United Kingdom	Finland
	6.	United Kingdom	Luxembourg	Luxembourg	Netherlands
	7.	Norway	Netherlands	Finland	Luxembourg
	8.	Denmark	Ireland	Netherlands	Belgium
	9.	Austria	United Kingdom	Sweden	Iceland
	10.	Belgium	Finland	Germany	United Kingdom
	11.	Luxembourg	Austria	Georgia	Austria
	12.	France	Belgium	Lithuania	Ireland

Source: *Observatoire de la compétitivité*

Chart 6  
Luxembourg's evolution within world and EU-27 rankings (2008-2013)



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

It also is interesting to analyse the correlation between these four major rankings. Kendall's coefficient lends itself to this type of analysis because it measures the degree of agreement between the rankings (in this case four). This correlation was calculated using the available EU countries<sup>5</sup>. Kendall's coefficient takes a value between 0 (when there is no relationship between the rankings) and 1 (when there is a perfect correlation between rankings and judges). In the previous Reports a strong correlation between the rankings was recorded.

Table 5  
Adjusted ranking of EU Member States included in the four studies

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

Source: *Observatoire de la compétitivité*

In this 2013 edition, Kendall's coefficient is 0.83. So there is, as in previous years, a strong correlation between the four rankings made within the Member States of the EU<sup>6</sup>.

<sup>5</sup> EU-27 excluding Cyprus and Malta.  
Note: it is not the same list of countries as the one used in the previous Competitiveness Reports. Since the 2011 edition, only EU Member States are taken into account.

<sup>6</sup> Kendall's coefficient for the same countries (27) was 0.86 for 2006, 0.83 for 2007, 0.86 for 2008, 0.87 for 2009, 0.84 for 2010, 0.83 in 2011 and 0.83 in 2012. However comparability between the results from 2011 and those from previous editions is limited. On the one hand, another list of countries was used (only countries belonging to the EU), and on the other one the SII indicator calculated by the European Commission from 2011 comes from the European Innovation Union Scoreboard (EIU) and not from the European Innovation Scoreboard (EIS).

## 2.2.2 Other benchmarks

Besides these four major composite indicators, there are a multitude of other composite indices and rankings. Some of these indices and rankings will be reviewed below.

### a. General indicators of competitiveness

#### a.1 Euro Monitor

In November 2012 the company Allianz published a new edition of its study on the ability of the 17 eurozone Member States to develop sustainable growth, without macroeconomic imbalances, in order to contribute to the stability of the eurozone as a whole. The study is based on a scoreboard which is made of fourteen quantitative indicators, split into four categories: public finances sustainability; competitiveness and domestic demand; employment, productivity and resource efficiency; private debt and foreign debt. The final score assigned to a country varies between 1 and 10. For each indicator, a score ranging from 1 to 4 is given to bad performances, a score between 5 and 7 for average performances and a score between 8 and 10 for good performances. A good national performance in these four categories is essential for a country to earn the confidence of financial markets and ensure a degree of prosperity to its citizens.

Germany leads the overall ranking of this 2012 edition (overall score of 7.7), followed by Luxembourg (7.0) and Austria (7.0). Luxembourg maintains the same level as in the 2011 edition of the study. As in the previous edition (2011), no country in the eurozone is really on the way to a fully sustainable, growth, devoid of imbalances (need of a score higher than 8.0 according to Allianz).

Regarding the four indicator categories:

- ▼ Luxembourg has demonstrated a good performance in terms of public finance sustainability (1st place, score of 9.3 together with Estonia);
- ▼ In terms of competitiveness and domestic demand, Luxembourg is in 7th position (with an overall score of 5.8). Luxembourg could do better in terms of unit labour costs, for which the country is at the bottom of the table;
- ▼ Luxembourg is in 4th position overall (with a score of 5.8) for the category of employment, productivity and resource efficiency. Luxembourg has a relatively good performance for this category, with the exception of labour productivity growth, for which the country ranks last (annual average over the past five years);
- ▼ Luxembourg is not included in the overall ranking of the study for the category of private debt and foreign debt, due to lack of sufficient data on the national level.

Table 6  
Euro Monitor 2012 ranking

Rank 2012	EMU Member State	Average Rating 2012	Rank 2011	Average Rating 2011	Rank 2007	Average Rating 2007
1	Germany	7.7	1	7.7	2	8.0
2	Austria	7.0	3	7.1	4	7.9
3	Luxembourg	7.0	2	7.5	1	8.9
4	Netherlands	6.6	4	7.0	2	8.0
5	Belgium	5.9	9	5.8	7	7.2
6	Estonia	5.9	6	6.0		
7	Malta	5.8	8	5.9	12	6.1
8	Finland	5.8	5	6.1	6	7.8
9	Slovakia	5.6	6	6.0	8	6.9
10	France	5.6	10	5.6	10	6.6
11	Slovenia	5.4	10	5.6	4	7.9
12	Spain	5.0	13	4.6	13	5.9
13	Italy	4.5	12	4.7	11	6.1
14	Portugal	4.1	15	3.7	15	5.0
15	Ireland	3.9	14	3.9	9	6.9
16	Greece	3.4	17	2.7	16	4.9
17	Cyprus	3.0	16	3.6	6	5.9

Source: Allianz

## a.2 Euro plus monitor

German bank Berenberg Bank and the Brussels based think tank The Lisbon Council have published the second edition of their study on the health status and adjustment of economies of the 17 eurozone countries, as well as Sweden, Poland, and the United Kingdom. This paper analyses and classifies eurozone Member States according to two criteria:

- ▼ On one hand according to the overall health of their economy (using the fundamental health indicator, FHI), through indicators related to the development of the budgetary situation, the foreign trade, the development of unit labour costs and supply policy reforms;
- ▼ On the other hand according to the adjustment to challenges (adjustment progress indicator, API) through indicators related to growth potential, competitiveness, financial sustainability and resilience to financial shocks.

Countries are then ranked by category and by underlying indicator on a virtue scale from 0 (bad performance) to 10 (best performance). Luxembourg is much better placed in terms of the overall health of the economy (2nd, score 7.2) than for its adjustment, that is to say, measures implemented to deal with the current crisis and future challenges (17th, score 1.6).

Overall, most countries with scores above average in regard to the health of the economy make relatively little effort to improve their budgetary positions or increase their external competitiveness, and thus receive relatively low scores for the adjustment indicator. Therefore a low score for this adjustment indicator can mean two things: either that countries concerned simply do not want to implement adjustments, or they simply do not need them.

With specific regard to the FHI:

- ▼ For growth potential, Luxembourg is ranked 3rd (score of 6.8);
- ▼ In terms of competitiveness, Luxembourg is ranked 6th (score of 6.8);
- ▼ In terms of public finance sustainability, Luxembourg is ranked 1st (score of 9.5);
- ▼ For recovery ability, Luxembourg ranks 10th (score of 5.5).

Regarding the API:

- ▼ Luxembourg ranks 19th in terms of external adjustment (score of 1.);
- ▼ Luxembourg ranks 19th (score of 0.2) in its capacity for budgetary adjustment;
- ▼ Luxembourg ranks 8th (score of 3.7) in labour costs;
- ▼ Luxembourg ranks 15th (1.3) in terms of commitment to reform.

Luxembourg's success is attributed to its openness (export %) and to its important financial centre, two factors that allow the country to afford a high level of regulation (including in the labour market). The strength of the public finances, the strong growth potential and healthy public balances are regarded as being Luxembourg's strengths. The strong regulation of markets (products, services, labour market), private debt and the sharp increase in labour unit costs are regarded as the main weaknesses.

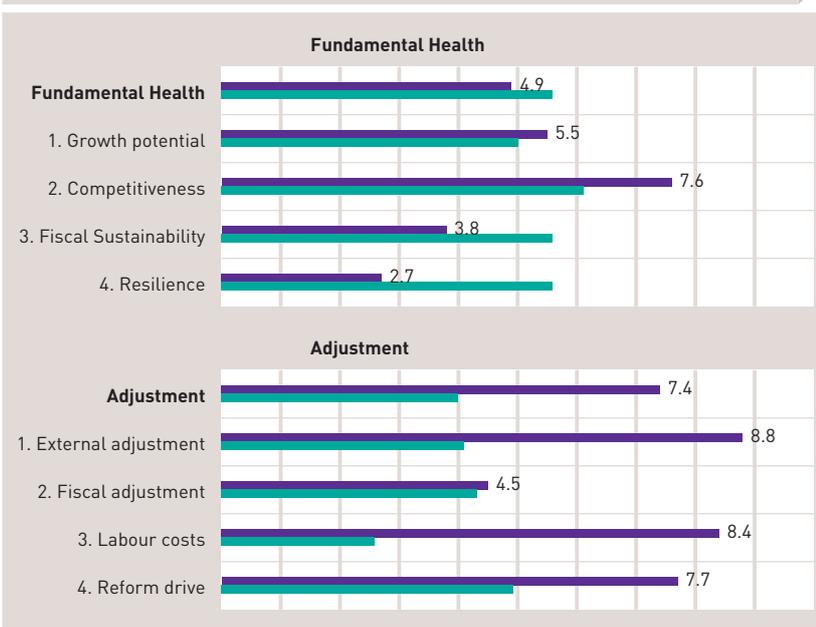
Table 7  
Ranking of countries according to the API and the FHI

Rank		Country	Total Score		External Adj.		Fiscal Adj.		Labour Cost Adj.		Reform drive	
2012	2011		2012	Change	2012	Change	2012	Change	2012	Change	2012	Change
1	2	Greece	8.2	1.6	6.6	0.2	8.6	0.3	7.7	2.5	10.0	-
2	3	Ireland	7.4	0.9	8.8	1.7	4.5	0.1	8.4	0.5	7.7	-
3	1	Estonia	6.5	-1.9	8.9	-1.0	2.4	-3.2	8.3	-1.4	n.a.	-
4	5	Spain	6.5	0.8	7.1	0.6	4.2	-3.3	5.7	2.5	9.0	-
5	7	Portugal	6.5	1.6	6.7	1.6	6.5	0.2	5.7	2.6	7.0	-
6	6	Slovakia	5.0	-0.1	6.2	1.2	4.5	-1.2	6.4	2.0	2.8	-
7	12	Italy	4.6	1.3	3.8	1.5	7.2	2.5	2.9	0.0	4.7	-
8	4	Malta	4.4	-2.0	6.4	-1.5	2.1	-2.3	4.8	-2.2	n.a.	-
9	13	Cyprus	4.3	1.4	5.5	1.4	4.1	0.7	3.4	2.1	n.a.	-
10	11	Slovenia	4.3	0.7	5.8	1.2	4.4	0.8	2.7	0.1	n.a.	-
-	-	<b>Euro 17</b>	<b>4.0</b>	<b>0.7</b>	<b>4.1</b>	<b>1.1</b>	<b>4.3</b>	<b>-0.2</b>	<b>2.6</b>	<b>0.4</b>	<b>4.9</b>	-
11	8	Netherlands	3.6	-0.4	4.8	1.6	2.8	-2.3	2.5	-1.3	4.3	-
12	15	France	3.2	0.7	2.9	0.5	4.3	0.4	2.0	0.8	3.6	-
13	10	Finland	2.7	-1.1	1.0	0.5	0.2	-3.3	3.6	-4.0	6.1	-
14	17	Austria	2.5	0.4	2.6	-0.5	0.9	-0.7	1.8	0.2	4.7	-
15	14	Belgium	2.3	-0.3	3.0	0.2	2.0	0.4	1.8	-1.5	2.3	-
16	16	Germany	2.0	-0.2	3.4	1.8	3.6	-0.1	1.0	-0.2	0.0	-
<b>17</b>	<b>9</b>	<b>Luxembourg</b>	<b>1.6</b>	<b>-2.4</b>	<b>1.1</b>	<b>-2.1</b>	<b>0.2</b>	<b>-1.7</b>	<b>3.7</b>	<b>-3.1</b>	<b>1.3</b>	-
[6]		Poland	5.4		4.5		8.3		1.8		6.9	
[9]		United Kingdom	4.4		3.8		4.5		2.6		6.9	
[14]		Sweden	3.5		2.9		3.7		1.7		5.8	

Rank		Country	Total Score		Growth		Competitiveness		Fiscal sustainability		Resilience	
2012	2011		2012	Change	2012	Change	2012	Change	2012	Change	2012	Change
1	1	Estonia	7.4	0.1	6.5	0.9	6.6	0.2	9.2	0.0	7.4	-0.9
<b>2</b>	<b>2</b>	<b>Luxembourg</b>	<b>7.2</b>	<b>-0.1</b>	<b>6.8</b>	<b>-0.2</b>	<b>6.8</b>	<b>0.4</b>	<b>9.5</b>	<b>0.3</b>	<b>5.5</b>	<b>-1.0</b>
3	3	Germany	7.0	0.1	6.3	-0.4	7.9	0.0	6.9	0.8	6.8	0.0
4	4	Netherlands	6.6	-0.2	7.3	-0.1	8.0	-0.2	5.2	-0.6	6.0	0.2
5	6	Slovakia	6.5	0.2	5.6	0.4	6.9	0.2	6.3	-0.4	7.2	0.4
6	5	Slovenia	6.1	-0.4	6.0	-0.2	5.6	-1.0	5.6	0.0	7.3	-0.4
7	8	Austria	5.9	0.3	6.0	-0.1	5.8	0.5	6.1	1.1	5.8	-0.3
-	-	<b>Euro 17</b>	<b>5.6</b>	<b>0.1</b>	<b>5.0</b>	<b>0.0</b>	<b>6.1</b>	<b>0.0</b>	<b>5.6</b>	<b>0.1</b>	<b>5.6</b>	<b>0.3</b>
8	7	Finland	5.5	-0.7	5.9	-0.3	4.3	-0.2	6.4	-0.7	5.5	-1.7
9	9	Belgium	5.5	-0.1	5.4	-0.1	6.6	0.0	4.8	-0.2	5.0	-0.2
10	11	Malta	5.0	0.4	4.1	-0.1	6.8	0.4	6.0	0.6	3.2	0.8
11	10	Ireland	4.9	0.2	5.5	0.7	7.6	0.7	3.8	0.3	2.7	-1.0
12	12	Spain	4.6	0.1	3.9	0.5	4.7	0.9	4.4	-1.4	5.3	0.2
13	14	Italy	4.5	0.1	3.3	0.1	3.9	-0.2	5.3	0.5	5.4	0.1
14	13	France	4.5	0.0	4.7	0.0	4.0	0.3	3.9	-0.2	5.3	0.0
15	15	Portugal	3.9	0.1	3.6	0.4	5.1	0.3	3.7	-0.1	3.4	-0.2
16	16	Cyprus	3.6	-0.2	3.9	0.1	2.7	0.3	5.6	-0.6	2.4	-0.4
17	17	Greece	3.6	0.6	4.0	0.0	3.7	1.0	2.8	0.6	4.0	1.0
[4]		Sweden	7.		7.2		6.3		7.4		6.9	
[7]		Poland	6.4		5.9		6.9		6.1		6.7	
[12]		United Kingdom	5.1		5.4		6.5		3.8		4.9	

Continued on next page

Table 7  
Continued



Source: Berenberg Bank / The Lisbon Council

## b. Attractiveness and tax competitiveness indicators

### b.1 Tax freedom day 2013

In June 2013 PwC published the new edition of its report on the national tax burden. In this study PwC estimates the total tax burden of a country, especially the burden for the average citizen. PwC transforms this tax burden in a symbolic day of the year called "Tax Freedom Day" (TFD), i.e. the day of the year from which taxpayers start working on his behalf.

This symbolic day is established on the basis of the total tax burden as a percentage of total income, and it is estimated by dividing the total tax revenue by the GDP. All taxes collected by the government are taken into account (central and local government), as well as social welfare contributions. Direct taxes consist of taxes on personal income, tax on corporate income and taxes related to property. VAT and excise duties are indirect taxes. In the current economic and financial crisis, many governments have taken fiscal decisions in order to balance their budgets, which generally resulted in an increase in the national tax burden.

Table 8  
Ranking of countries according to the TFD date

Country	2009	2010	2011	2012	2013
Slovakia	27 April	20 April	20 April	10 April	12 April
Cyprus		30 April	28 April	1 May	13 April
USA	13 April	9 April	12 April	17 April	18 April
Hungary	2 June	18 May	9 May	17 May	20 May
<b>Luxembourg</b>	<b>14 May</b>	<b>16 May</b>	<b>10 May</b>	<b>20 May</b>	<b>21 May</b>
Netherlands	24 May	19 May	23 May	23 May	27 May
United Kingdom	14 May	30 May	30 May	30 May	30 May
Germany	8 June	27 May	28 May	3 June	4 June
Italy	10 June	6 June	5 June	8 June	7 June
Austria	1 June	2 June	2 June	2 June	9 June
Greece	20 May	25 May	30 May	7 June	13 June
Belgium	8 June	8 June	10 June	14 June	14 June
Norway	16 June	17 June	16 June	17 June	15 June
France	11 June	31 May	6 June	12 June	19 June
Denmark	25 June	25 June	20 June	20 June	27 June
Sweden	5 July	12 July	2 July	30 June	4 July

Source: PwC

In Luxembourg, calculations result in a rate of 38.33% for 2013 regarding the total tax burden to GDP ratio, which is equivalent to the date of 21 May for the year 2013. The estimated TFD is thus slightly later from 2009 (14 May 2009). In 2013 Luxembourg is thus 5th among the countries analysed, and ahead of the Netherlands (39.90%, 27 May), Germany (42.10%, 4 June), Belgium (44.90%, 14 June) and France (46.30%, 19 June).

Concerning the methodology used to calculate the Tax freedom day, PwC points out that one must consider that taxes levied in an organized civil society are used to pay for public services (education, health, infrastructure, etc.). The right balance must therefore be found between a reasonable tax burden and the provision of quality public services (efficiency of public spending)..

## b.2 Total Tax Contribution 2013

In June 2013 PwC Luxembourg published the second edition of its survey on the tax contribution of companies, called "Total Tax Contribution." This survey is based on a standardized method allowing to estimate the average tax burden of Luxembourg companies. In Luxembourg, this survey was conducted with 30 companies from various sectors (financial sector, industry and commerce & services) using the financial data of the 2010 accounting year. The calculation for the total contribution of companies is based on a preliminary census of all taxes and contributions paid by them. According to the survey, it appears that a Luxembourg company may be subject to 31 taxes, 18 of which are "borne" taxes and 13 of which are "collected" taxes. The survey shows that, on average, a Luxembourg company was submitted in 2010 to 8.5 borne taxes and 4.4 collected taxes. With an average of 12.9 tax payments per year, Luxembourg is among the countries with the lowest tax administrative burdens.

The bulk of collected and borne taxes for the participating companies corresponds on average to 14% of the turnover of these companies. This percentage, which reflects in some way how much a company contributes to the work of the tax authorities, is measured by an indicator called "Total Tax Contribution" (TTC). This 14% figure put Luxembourg among the countries with a relatively low proportion of tax compared to turnover. The "Total Tax Rate" indicator (TTR) provides an even clearer picture of the share of taxes paid by companies in relation to their pre-tax profits. Luxembourg entities pay on average 24% tax on their profits. In comparison with the rate of other countries that participated in this study, we observe that Luxembourg is the country with the lowest TTR rate, closely followed by other countries such as the Netherlands, Switzerland or Canada.

Table 9  
International comparison of the TTC survey results

	L	CH	CA (1)	NL (2)	IN (3)	SA (4)	AU (5)	US (6)	UK (7)	J (8)	B (9)
N. of Taxes	31	49	67	31	23	22	53	200	24	57	92
Av. taxes borne	8.2	18.0	14.0	10.5	8.0	6.9	6.0	16.3	9.1	15.9	11.8
Av. Taxes coll.	4.4	10.0	6.0	4.1	3.0	3.3	3.0	9.6	4.3	6.9	5.1
Av. N. of Taxes	12.9	28.0	20.0	14.6	11.0	10.2	9.0	25.9	13.5	22.8	16.9
TTC/Turn. (%)	14	11	15	23	15	15	14	11	16	5	16
Av. TTR (%)	24.00	25.80	27.60	31.00	35.06	36.30	40.28	42.78	45.28	48.00	52.10

(1) Canada's data pertain to financial year 2006  
(2) NL's data pertain to calendar year 2007  
(3) India's data pertain to years to 31 March 2007 & 31 March 2008  
(4) South Africa's data pertain to year to 31 March 2010  
(5) Australia's data pertain to year to 30 September 2010  
(6) US's data pertain to financial year 2007  
(7) UK's data pertain to year to 31 March 2011  
(8) Japan's data pertain to year to 30 March 2011  
(9) Belgium's data pertain to calendar year 2006  
Source: PwC Luxembourg

According to PwC these indicators provide further information with regards to nominal tax rates for company revenues, which are often used in international comparisons that analyse corporate tax levels, but which do not provide information about the tax rate actually borne by companies.

## c. Financial sector attractiveness and competitiveness indicators

### c.1 Global Financial Centres Index

In March 2013, the Z/Yen consultancy bureau and the Long Finance initiative published the 13th edition of the biannual competitiveness index of 79 financial centres around the world, the "Global financial centres index". In a world that is increasingly globalized and interconnected through information technology and communication, financial centres face more intense competition than other sectors. Financial services are indeed at the heart of the global economy, acting as international trade and foreign investment facilitators.

The study uses two types of sources in order to assess the competitiveness of financial centres. On the one hand, the study uses 96 quantitative determinants (e.g. the cost of office space), and on the other hand, it resorts to an appreciation barometer taken from online surveys targeting relevant professionals. According to the definition in this study, competitiveness consists of five categories of indicators: human resources (education/training, flexibility, etc.), the business environment (taxes, regulation, etc.), market access (security, clustering, etc.), infrastructure (cost and availability of offices, etc.) and the broad determinants (perception of cities as a pleasant place to live, etc.).

London, New York and Hong Kong are again the top three in this new March 2013 edition. Luxembourg is ranked 18th worldwide and climbs 6 positions in relation to the previous semi-annual ranking (September 2012). At the European level, Luxembourg is ranked 5th behind London, Zurich (5th), Geneva (7th) and Frankfurt (10th).

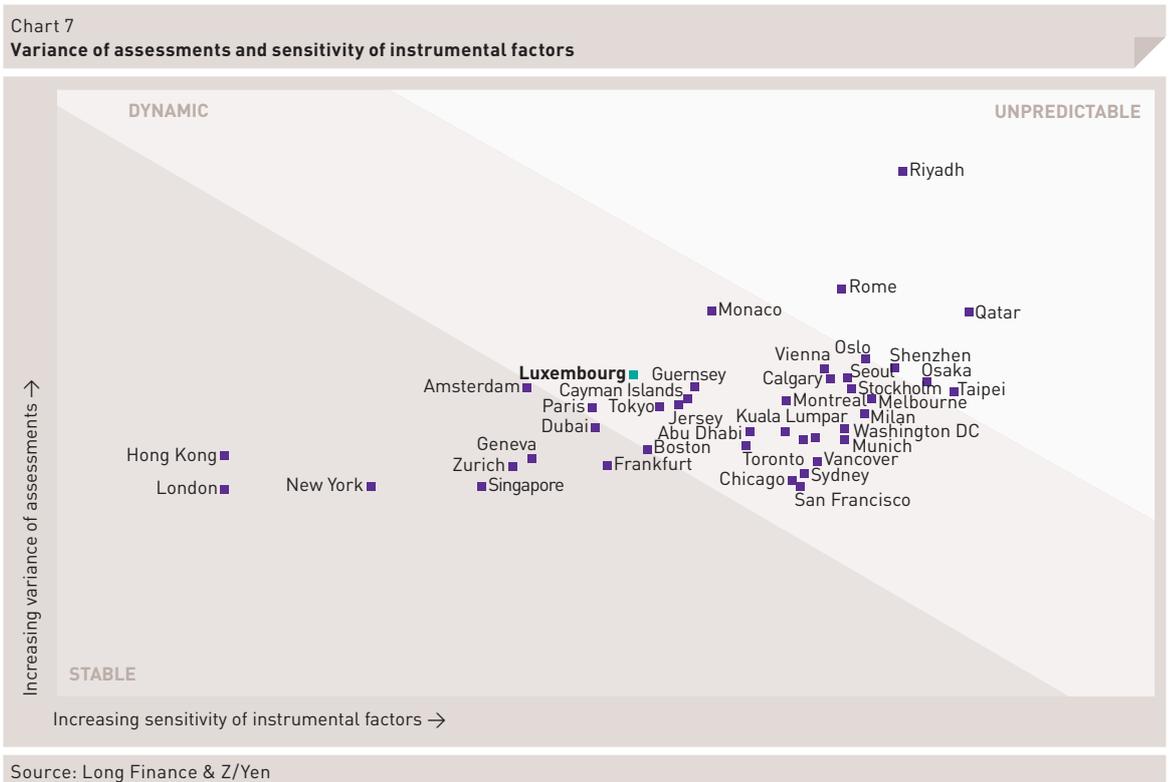
Table 10  
Top 20 of global financial centres

Centre	GFCI 13		GFCI 12		Changes	
	Rank	Rating	Rank	Rating	Rank	Rating
London	1	807	1	785	-	↑ 22
New York	2	787	2	765	-	↑ 22
Hong-Kong	3	761	3	733	-	↑ 28
Singapore	4	759	4	725	-	↑ 34
Zurich	5	723	5	691	-	↑ 32
Tokyo	6	718	7	684	↑ 1	↑ 34
Geneva	7	712	9	682	↑ 2	↑ 30
Boston	8	711	11	680	↑ 3	↑ 31
Seoul	9	710	6	685	? -3	↑ 25
Frankfurt	10	703	13	677	↑ 3	↑ 26
Chicago	11	698	8	683	? -3	↑ 15
Toronto	12	696	10	681	? -2	↑ 15
San Francisco	13	695	12	678	? -1	↑ 17
Washington D.C.	14	692	14	672	-	↑ 20
Vancouver	15	690	16	668	↑ 1	↑ 22
Montreal	16	689	17	667	↑ 1	↑ 22
Calgary	17	688	23	647	↑ 6	↑ 41
<b>Luxembourg</b>	<b>18</b>	<b>687</b>	<b>24</b>	<b>646</b>	<b>↑ 6</b>	<b>↑ 41</b>
Sydney	19	686	15	670	? -4	↑ 16
Vienna	20	685	36	633	↑ 16	↑ 52

Source: Long Finance & Z/Yen

One of the findings of this study is that Luxembourg is in the 7th place worldwide, and even 1st in Europe, amongst financial centres that that will play a more significant role in the future, according to the respondents (from an online survey). Luxembourg is also considered in this new edition, with Brussels and Geneva, as a specialized global financial centre with a relatively deep range of financial services.

Finally, we find again in this study an analysis of the volatility of the various financial centres. In this context, Luxembourg is considered as a “dynamic” financial centre, a rating to be found between “stable” and “uncertain”, meaning a financial centre with the potential to evolve in either direction.



## c.2 Venture Capital and Private Equity Country Attractiveness Index

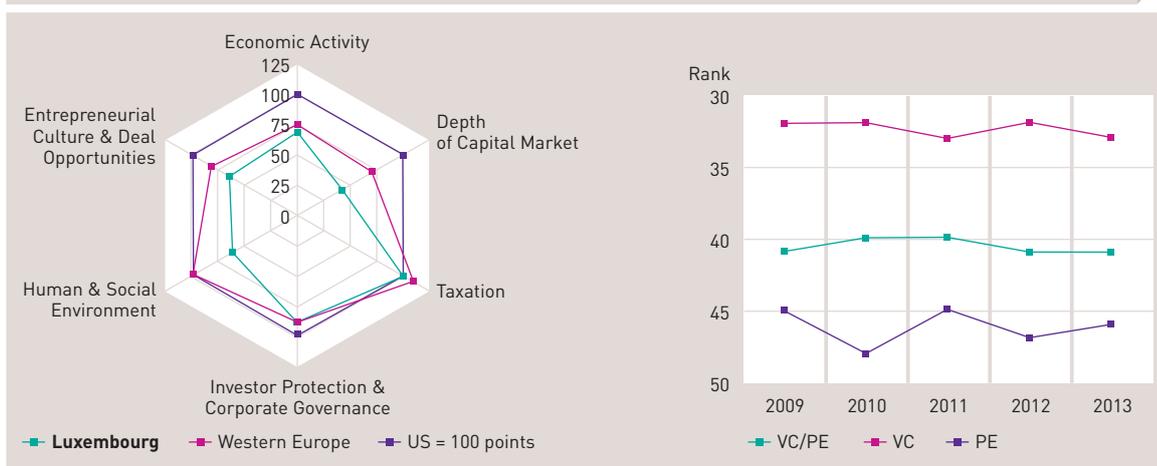
In July 2013 the IESE Business School in Barcelona published the fourth edition since 2006 of its international study of 118 countries on the venture capital and private equity<sup>7</sup>. According to the authors this study provides institutional investors with a decision-making tool to spread the capital they invest geographically, in a first stage. 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: 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 are the basis to which other countries are compared (base 100).

In this 2013 edition, the VCPE world ranking is led by the United States, Canada and the United Kingdom. Luxembourg is ranked 41st with a score of 60, the same rank as in 2009. Germany is the 7th (91.7), the Netherlands 14th (84.9), Belgium 16th (83.6) and France is ranked 19th (82.2). Generally, Luxembourg is better ranked in venture capital VC than for private equity PE. Finally, with regard to the six categories that determine the attractiveness of a country in this VCPE ranking:

- ▼ For economic activity, Luxembourg is in the 77th position (68.9);
- ▼ For the depth of capital market, 64th (41.5);
- ▼ For taxation, 32nd (101);
- ▼ For the investor protection & corporate governance, 22nd (87.4);
- ▼ For the human and social environment, 43rd (62.3);
- ▼ For entrepreneurial culture and opportunities, 31st (65.7).

<sup>7</sup> For additional details:  
<http://blog.iese.edu/vcpeindex/>

Chart 8  
Detailed VCPE 2013 ranking



Source: IESE

## d. Innovation indicators

### d.1 Global innovation index

Economic policy discussions in recent years have mainly focused on budgetary consolidation measures. Recently, this focus has been increasingly questioned and criticized in the public debate, and economic policy is again more focused on means to be implemented in order to achieve sustainable growth in the long term.

Innovation is one of the crucial determinants of such a sustained economic growth in the long term. Analyses and indicators are therefore needed to assess the innovation ability and the national innovation policies that countries implemented around the world. Within this framework, in July 2013 the World Intellectual Property Organization (WIPO), in collaboration with INSEAD and Cornell University, have published the 6th edition of the study "Global Innovation Index" (GII). This study focuses in particular on the interaction between the various agents of the national innovation system: companies, public sector, higher education and society. The 2013 edition includes a total of 142 countries. The GII composite index calculated in this report to measure the level of innovation of a country is based on two sub-indicators: inputs (institutions, human resources and research, infrastructure, market sophistication and business environment sophistication) and outputs (knowledge and technology, creativity) of the innovation system. In total, 84 core indicators are used to compute the GII<sup>8</sup>.

The world ranking of the GII 2013 edition is led by Switzerland, Sweden and the United Kingdom. Luxembourg ranks 12th, ahead of its neighbouring countries: Germany ranks 15th, Belgium 21st and France 20th. In the European ranking, Luxembourg ranks 8th.

<sup>8</sup> See also in this context *The Economist*, Quality not quantity, 18 July 2013. For additional details: <http://www.economist.com/blogs/graphicdetail/2013/07/daily-chart-14?fsrc=rss>

Table 11  
**Top 20 of Global Innovation Index ranking**

Country/Economy	Score (0-100)	Rank	Income	Rank	Region	Rank
Switzerland	66.59	1	HI	1	EUR	1
Sweden	61.36	2	HI	2	EUR	2
United Kingdom	61.25	3	HI	3	EUR	3
Netherlands	61.14	4	HI	4	EUR	4
United States of America	60.31	5	HI	5	NAC	1
Finland	59.51	6	HI	6	EUR	5
Hong-Kong (China)	59.43	7	HI	7	SEAO	1
Singapore	59.41	8	HI	8	SEAO	2
Denmark	58.34	9	HI	9	EUR	6
Ireland	57.91	10	HI	10	EUR	7
Canada	57.60	11	HI	11	NAC	2
<b>Luxembourg</b>	<b>56.57</b>	<b>12</b>	<b>HI</b>	<b>12</b>	<b>EUR</b>	<b>8</b>
Iceland	56.40	13	HI	13	EUR	9
Israel	55.98	14	HI	14	NAWA	1
Germany	55.83	15	HI	15	EUR	10
Norway	55.64	16	HI	16	EUR	11
New Zealand	54.46	17	HI	17	SEAO	3
Korea, Rep.	53.31	18	HI	18	SEAO	4
Australia	53.07	19	HI	19	SEAO	5
France	52.83	20	HI	20	EUR	12

Source: Cornell University/INSEAD

Within the two sub-pillars on which the composite index GII is calculated:

- ▼ Luxembourg is ranked 18th in the world (10th in Europe) for inputs (19th for institutions; 17th for human resources and research; 19th for infrastructure; 31st for market sophistication; 7th for business environment sophistication);
- ▼ Luxembourg is ranked 6th in the world (6th in Europe) for outputs (43rd for knowledge and technology; 1st for creativity).

The report provides the following general observation with regard to Luxembourg: "(...) it achieves 18th position in the Input sub-index, with leader positions in all pillars except Market sophistication (31st), where rankings above 100 in ease of getting credit, ease of protecting investors, and market access to foreign markets have not stopped the flow of credit, investments, and trade. Its strength in the Output sub-index (6th) comes from its 1st place in Creative outputs, driven by positions in the top 25 in all indicators and sub-pillars with only two exceptions: printing and publishing output (58th) and creative goods exports (52nd). Its position in Knowledge and technology outputs pillar is weaker (43rd)."

In conclusion, the report establishes a positive relationship between the GII level and the standard of living (measured through GDP/capita). In general, the higher a country's GII score (the better its innovation system is performing), the higher the country's standard of living. In this context, Luxembourg is among the group of countries described as "Leaders" in innovation.

## d.2 Eco-innovation index

Eco-innovation is an innovation that reduces the use of natural resources and decreases the release of harmful substances across the entire life-cycle. In a time period marked by an increasingly pronounced shortage of natural resources, eco-innovation is an opportunity to reduce the consumption of natural resources and to increase the competitiveness of companies. In this way, eco-innovation allows to “dematerialize” the economy through increased business efficiency (cost reduction) and the development of new products and services. Measuring this eco-innovation at the scale of whole economies, i.e. at the country level, allows us to identify strengths and weaknesses and to compare the performance of national systems. To this end the Eco-innovation observatory (EIO) has set up a scoreboard called “Eco-Innovation Scoreboard”, which reflects the outlines of inputs (e.g. R&D) and outputs (e.g. patents) in eco-innovation. Using the indicators included in this scoreboard, a composite index summarizing the performance of countries is calculated.<sup>9</sup>

In this latest edition of the ranking, Luxembourg is in the 11th position. Luxembourg is overtaken by Germany (4th) and Belgium (6th), France being 13th. Luxembourg has lost seven positions since the previous edition of the report, mainly because of changes in outputs and activities in eco-innovation.



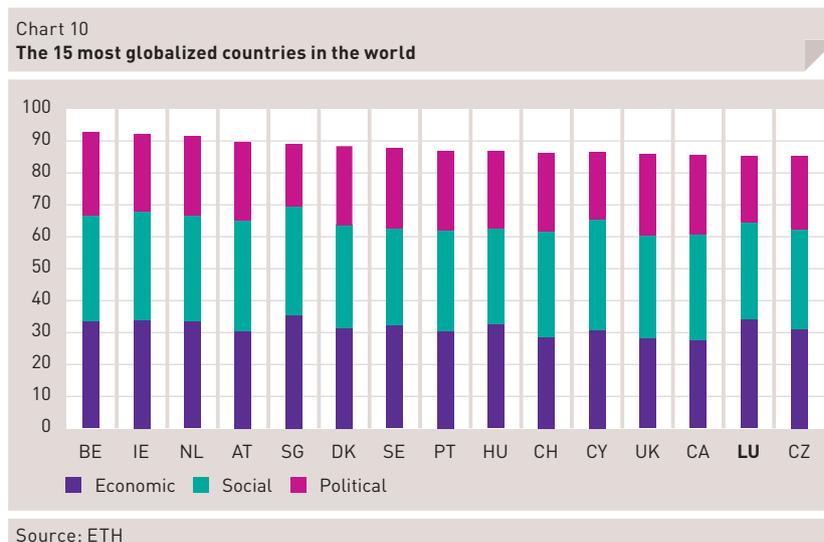
<sup>9</sup> For additional details:  
<http://www.eco-innovation.eu/>

## e. Globalization indicators

### e.1 KOF Index of Globalization

In March 2013 ETH Zurich published the new edition of its index of globalization “KOF index of globalization”. This index measures the economic, social and political dimensions of globalization using a set of 24 variables. The economic dimension measures the flow of goods, services and capital, as well as information and perceptions that are related to market exchanges. It also measures the barriers to capital flows and trade. The social dimension measures the dissemination of ideas and information, images and people, etc. The political dimension reflects the dissemination of government policies, such as the number of embassies in the country, the importance of being a member of international organizations, etc. Based on these three sub-categories, the KOF index measures globalization on a scale of 1 (least globalized) to 100 (most globalized). The data used in this new edition is from 2010.

The overall ranking is led by Belgium, Ireland and the Netherlands. Luxembourg is 14th in the 2013 edition of this study. Luxembourg’s performances are particularly high in the economic dimension for which the country has a score of 94.75 (2nd place). For social globalization, the country has a score of 80.07 (23rd place) and for political globalization Luxembourg is given a score of 79.05 (62nd) in the most recent edition of the study.



### e.2 Open markets index

The International Chamber of Commerce (ICC) has published the 2nd edition of its study on the degree of market openness: the “Open markets index” (OMI)<sup>10</sup>. The objective of this composite index is to provide a measuring tool for the degree of country openness to international trade.

<sup>10</sup> For additional details:  
<http://www.iccwbo.org/Global-influence/G20/Reports-and-Products/Open-Markets-Index/>

An open market is defined as a market that is not subject to barriers restraining the free movement of goods, services, capital and labour. The OMI is based on four components: the observed openness, trade policy, foreign direct investment (FDI) openness and infrastructure for international trade (connectivity). Thereafter, countries are ranked in five categories of economies according to their degree of market openness: from the most open class 1 (score 5-6) to the least open category 5 (score 1-2). In total, 75 economies have been analysed.

The 2013 global ranking is led by Hong Kong, followed by Singapore. Luxembourg is in the 3rd position. Belgium is ranked 4th, the Netherlands 6th, Germany 22nd and France 35th. Luxembourg, with a score slightly below 5, is part of the second category of countries, as well as Belgium, the Netherlands and Germany. France is part of the 3rd category.

Table 12  
**Top 30 of the study**

	Rank	Score
Hong-Kong	1	5.5
Singapore	2	5.5
<b>Luxembourg</b>	<b>3</b>	<b>4.9</b>
Belgium	4	4.8
Malta	5	4.7
Netherlands	6	4.7
United Arab Emirates	7	4.6
Ireland	8	4.6
Estonia	9	4.5
Iceland	10	4.5
Switzerland	11	4.5
Sweden	12	4.4
Norway	13	4.4
Slovakia	14	4.4
Denmark	15	4.3
Austria	16	4.3
Finland	17	4.2
Slovenia	18	4.2
Canada	19	4.2
Hungary	20	4.2
Czech Republic	21	4.2
Germany	22	4.2
Bulgaria	23	4.1
Australia	24	4.1
New Zealand	25	4.1
Lithuania	26	4.0
Chinese Taipei	27	4.0
Cyprus	28	4.0
United Kingdom	29	4.0
Malaysia	30	3.9

Source: ICC

Regarding the four components, Luxembourg has a score of 4.8 for openness, 4.7 for trade policy, 5.3 for foreign direct investment (FDI) openness and 5.2 for infrastructure for international trade (connectivity).

f. Connectivity indicators

f.1 Global connectedness index

Production capital and labour are becoming more closely integrated as a result of globalization. The reduction of trade barriers, technical progress and lower costs of transport and communication were the main drivers of this phenomenon. Closer direct international links are being put in place sustainably. In this context, in November 2012 DHL published the second edition of its "Global connectedness index" report, a comparative study of 140 countries around the world with regards to their global connectedness. The composite index calculated by DHL to measure connectedness is entirely based on quantitative data related to international flows, and split into four categories (flow of goods and services, capital flows, information flow and people flow). This analysis is done from the perspective of connectedness in depth and breadth.



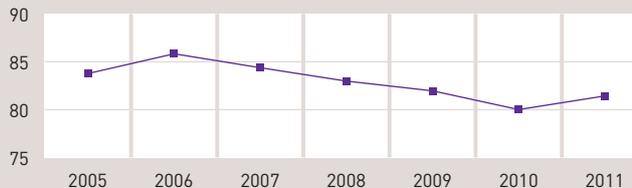
The world ranking is led by the Netherlands, Singapore and Luxembourg. Luxembourg gains two positions compared to the previous edition where the country was in 5th position, but lost one position compared to 2005 when the country was still in 2nd position. Since 2006, the index value calculated for Luxembourg has continuously deteriorated but, in this new edition of the study, it is now rising again.

Regarding depth connectedness and breadth connectedness, the first one measures how many activities and flows of a country are international in relation to the domestic component, while the second measures the dispersion of them across the number of countries. Luxembourg is much better positioned in depth (the 3rd in the world, as in the previous year) than in breadth (21st, a rise of three positions compared to the previous edition) for global connectedness, which is a typical feature for small countries. Within the four pillars discussed in more detail, positions and performance of Luxembourg are as follows: Luxembourg is ranked 29th on the flow of goods and services, 1st in capital flows and 6th on the people flow (data not available for the pillar of information flow).

Chart 12  
Luxembourg performances

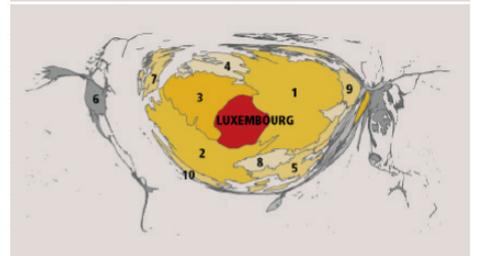
	Rank			Score		
	2011	2010	Change	2011	2010	Change
Overall	3/140	5/140	2	81/100	80/100	1
Depth	3/140	3/140	0	46/50	46/50	0
Breadth	21/140	24/140	3	35/50	35/50	1
Trade Pillar	29/140	26/140	-3	64/100	62/100	2
Capital Pillar	1/66	2/66	1	94/100	92/100	2
Information Pillar	-	-	-	-	-	-
People Pillar	6/106	6/106	0	82/100	82/100	0

Connectedness Score Trend



Source: DHL

Luxembourg's Merchandise Exports, 2011



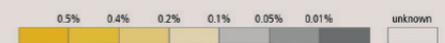
Top Export Destinations

1. Germany [27%]	6. U.S.A. [3%]
2. France [16%]	7. U.K. [3%]
3. Belgium [12%]	8. Switzerland [3%]
4. Netherlands [5%]	9. Poland [2%]
5. Italy [4%]	10. Spain [2%]

Major Export Products

Machinery and equipment, steel products, chemicals, rubber products, glass

Luxembourg's Share of Partners' Imports



## f.2 Global information technology report

In April 2013 the World Economic Forum (WEF), in collaboration with INSEAD, published the 12th edition of its “Global information technology report”. The main objective of this report is to measure the transformational impact of information technology and communication (ICT) on the economy, and on society in general, in 144 countries around the world. The world has indeed become increasingly “hyperconnected” in recent years: Internet and related services are available almost anywhere and at any time. Providing better regulatory frameworks for these technologies in order to enjoy a positive leverage to increase productivity and hence competitiveness and well-being has become a crucial issue for all countries. To that end the WEF report includes a composite index called the “Networked Readiness Index” (NRI) calculated from about fifty indicators (quantitative and qualitative) split into four pillars and ten sub-categories (political and regulatory environment and business environment; readiness through quality infrastructure, affordable prices and necessary skills, effective usage by individuals, businesses and government; estimated impact on the economy and society). The NRI aims to measure how a country uses ICT development.

The NRI 2013 world ranking is led by Finland, Singapore and Sweden. Luxembourg is 16th in the world ranking and climbed five positions compared to the previous edition of the report (2012). Germany ranks 13th, Belgium 24th and France 26th. In the European ranking, Luxembourg is ranked 9th, and in the EU-27, Luxembourg is 7th.

Table 13  
**Top 30 of the world ranking**

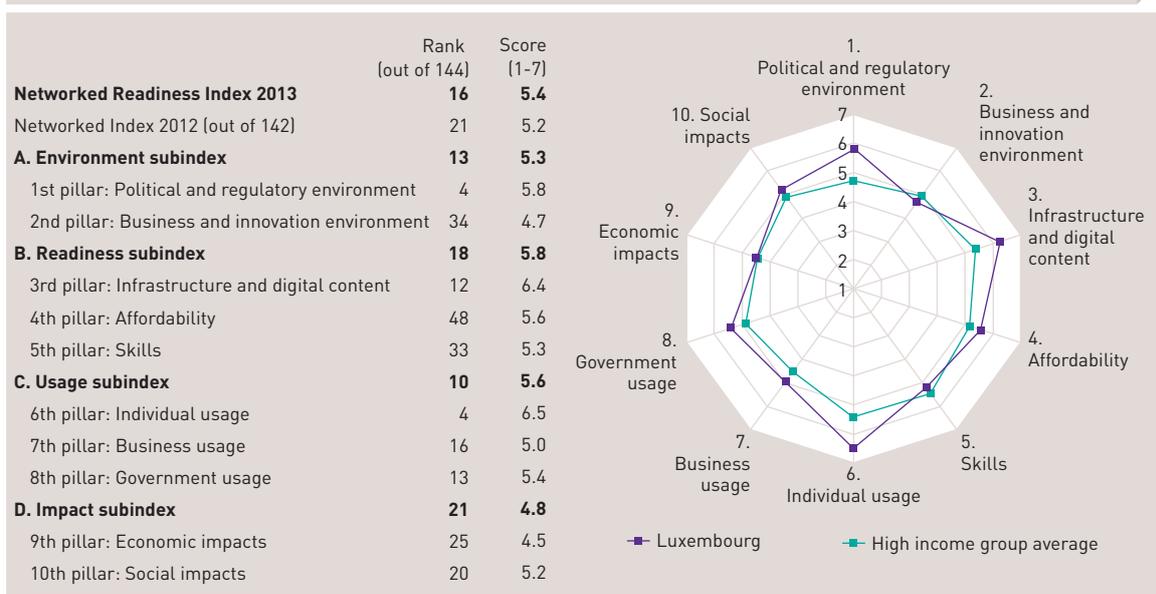
Rank	Country/Economy	Score	2012 rank (out of 142)
1	Finland	5.98	3
2	Singapore	5.96	2
3	Sweden	5.91	1
4	Netherlands	5.81	6
5	Norway	5.66	7
6	Switzerland	5.66	5
7	United Kingdom	5.64	10
8	Denmark	5.58	4
9	United States	5.57	8
10	Taiwan, China	5.47	11
11	Korea, Rep.	5.46	12
12	Canada	5.44	9
13	Germany	5.43	16
14	Hong-Kong SAR	5.40	13
15	Israel	5.39	20
<b>16</b>	<b>Luxembourg</b>	<b>5.37</b>	<b>21</b>
17	Iceland	5.31	15
18	Australia	5.26	17
19	Austria	5.25	19
20	New Zealand	5.25	14
21	Japan	5.24	18
22	Estonia	5.12	24
23	Qatar	5.10	28
24	Belgium	5.10	22
25	United Arab Emirates	5.07	30
26	France	5.06	23
27	Ireland	5.05	25
28	Malta	4.90	26
29	Bahrain	4.83	27
30	Malaysia	4.82	29

Source: WEF

Regarding the four pillars and ten sub-categories in this 2013 edition, the rankings of Luxembourg are the following:

- ▼ Luxembourg ranks 13th in the “environment” pillar (4th in political and regulatory environment and 34th for business environment);
- ▼ Luxembourg is ranked 18th in the “readiness” pillar (12th for the infrastructure component, 48th for price/cost and 33rd for skills);
- ▼ Luxembourg is 10th for “usage” pillar (4th for individual, 16th for business and 13th for public administration);
- ▼ Luxembourg ranks 21st for the “estimated impact” pillar (25th for the economic impact and 34th for the social impacts).

Chart 13  
Luxembourg's performances



Source: WEF

WEF states about Luxembourg: "Luxembourg continues to improve its ICT infrastructure and its strong uptake by individuals, businesses, and government. Since identifying ICTs as one of the crucial sectors needed to diversify its economy and improve efficiency in other crucial sectors, such as the financial sector, Luxembourg's government's strong vision in upgrading ICT uptake has resulted in one of the world's highest rates of Internet users and households with a personal computer and an Internet connection. Notwithstanding these achievements, the economic impacts of ICTs to boost innovation, while improving, still remains below other very advanced economies, the result of some weaknesses in an innovation system that has recently been developed. Further strengthening the country's national innovation capacity would thus yield better results for the ICT infrastructure and uptake that is already world class".

### f.3 ICT Development Index

In 2008 the International Communication Union (ITU) developed a composite index to track the level and pattern of ICT development and of the information society worldwide<sup>11</sup>. ICT are often a facilitator for economic growth and thus have the potential to accelerate development. This composite index, called "ICT Development Index" is built out of 11 core indicators, split into three sub-categories: access, skills and use of ICT. It includes indicators such as the rate of computer usage by households or the rate of penetration of broadband Internet, etc. The values of the composite index range from 0 (worst performance) to 1 (best performance).

<sup>11</sup> For additional details: <http://www.itu.int/ITU-D/ict/publications/idi/>

In the most recent edition of the study (2011), including 155 countries worldwide, Luxembourg comes in 7th position in the global ranking (score of 7.76). The Netherlands are ahead of Luxembourg, in 6th position (7.82). Germany is ranked 16th (7.39), France 18th (7.30) and Belgium 23rd (6.89). In the European context, the ranking is led by Sweden, Denmark and Iceland. There, Luxembourg is in 6th position.

Table 14  
The European Top 20 ranking

Economy	Regional rank 2011	Global rank 2011	ID 2011	Global rank 2010	IDI 2010	Global rank change 2010-2011
Sweden	1	2	8.34	2	8.21	0
Denmark	2	3	8.29	3	8.01	0
Iceland	3	4	8.17	4	7.96	0
Finland	4	5	8.04	5	7.89	0
Netherlands	5	6	7.82	7	7.60	1
<b>Luxembourg</b>	<b>6</b>	<b>7</b>	<b>7.76</b>	<b>6</b>	<b>7.64</b>	<b>-1</b>
United Kingdom	7	9	7.75	14	7.35	5
Switzerland	8	10	7.68	9	7.48	-1
Norway	9	13	7.52	11	7.39	-2
Germany	10	16	7.39	15	7.18	-1
France	11	18	7.30	17	7.08	-1
Austria	12	19	7.10	22	6.74	3
Ireland	13	20	7.09	19	6.99	-1
Belgium	14	23	6.89	23	6.60	0
Estonia	15	24	6.81	26	6.36	2
Slovenia	16	25	6.70	24	6.54	-1
Malta	17	26	6.69	28	6.30	2
Israel	18	27	6.62	25	6.41	-2
Spain	19	28	6.62	27	6.31	-1
Italy	20	29	6.28	29	6.13	0

Source: ITU

Regarding the three sub-categories, Luxembourg shows the following performances:

- ▼ Access to ICT: Luxembourg is 3rd worldwide (8.87) and ahead of Germany (5th), the Netherlands (10th), France (14th) and Belgium (19th);
- ▼ ICT usage: Luxembourg is 7th (7.07) and ahead of the Netherlands (9th), France (14th), Germany (19th) and Belgium (25th);
- ▼ ICT-related skills: Luxembourg is only 81st in this category, mainly because of the very poor performance due to the proportion of students in higher education, which is one of three basic indicators used for this sub-category. With an estimated rate of only 10.5% in 2011, Luxembourg is very badly placed for this indicator, which does not however take into account university students studying abroad, who are therefore not counted here, which greatly underestimates Luxembourg's performance for this sub-category, and also pulls the overall ranking of Luxembourg down in the ICT Development Index.

## g. Purchasing power and cost of living indicators

Purchasing power, the cost of living or even the quality of life are important factors in the debate on territorial attractiveness and competitiveness. It is therefore not surprising that such rankings are published regularly.

### g.1 Index of the cost of living for expatriates

In June 2013 ECA International, a provider of solutions and information for international human resources professionals, has published a new edition of its study on the cost of living for expatriates around the world. This study compares the price level in 400 cities and places of the world. These data are used by HR professionals to calculate the cost of life premium they give to their expatriates. ECA International defines and compares the level of the cost of living on the basis of an average basket of consumer goods and services. These items were chosen because they represent the products and services typically purchased by consumers. Among these products are "food", "basics" (beverages and tobacco, miscellaneous items and services) and "general" products (clothing, appliances, restaurants). The cost of living index therefore reflects daily expenses, but some costs such as housing, utilities (electricity, gas, water), car purchase and school fees are not included in this survey. Variations in exchange rates, inflation and the availability of goods and services affect the cost of living for expatriates.

Table 15  
European ranking (Top 30)

European ranking	Location	World ranking 2013	World ranking 2012
1	Oslo	1	2
2	Stavanger	3	5
3	Moscow	5	13
4	Zurich	7	9
5	Geneva	8	7
6	Basel	9	11
7	Bern	10	10
8	Copenhagen	12	14
9	Stockholm	15	22
10	Helsinki	20	19
11	Gothenburg	29	36
12	Saint Petersburg	32	51
13	Paris	39	35
14	Baku	42	48
15	Berlin	49	49
16	Brussels	59	57
17	Vienna	67	56
18	Antwerp	69	72
<b>19</b>	<b>Luxembourg</b>	<b>70</b>	<b>82</b>
20	Strasbourg	72	69

Source: ECA International

According to ECA International, the world's most expensive cities for expatriates are Oslo (Norway), Luanda (Angola) and Stavanger (Norway). In 2013 Luxembourg ranks 70th in the world and 19th in the European rankings. For example, various cities close to Luxembourg rank as follows: Paris (13th in Europe), Brussels (16th), Antwerp (18th), Strasbourg (20th), Amsterdam (21st), Frankfurt (32nd).

## h. Quality of life indicators

### h.1 Survey on the quality of living for expatriates

In December 2012 Mercer published a new 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 2012 edition, 221 cities were analysed and a total of 39 indicators were used to assess the level of quality of living. These indicators 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.

Table 16  
The ranking of cities with the highest quality of living

Mercer Quality of Living Survey – Worldwide Rankings, 2012					
Rank	City	Country	Rank	City	Country
1	Vienna	Austria	14	Ottawa	Canada
2	Zurich	Switzerland	15	Toronto	Canada
3	Auckland	New Zealand	16	Berlin	Germany
4	Munich	Germany	17	Hamburg	Germany
5	Vancouver	Canada	18	Melbourne	Australia
6	Düsseldorf	Germany	<b>19</b>	<b>Luxembourg</b>	<b>Luxembourg</b>
7	Frankfurt	Germany	20	Stockholm	Sweden
8	Geneva	Switzerland	21	Perth	Australia
9	Copenhagen	Denmark	22	Brussels	Belgium
10	Bern	Switzerland	23	Montreal	Canada
11	Sydney	Australia	24	Nurnberg	Germany
12	Amsterdam	Netherlands	25	Singapore	Singapore
13	Wellington	New Zealand			

Source: Mercer

In 2012, the cities of Vienna, Zurich and Auckland occupy the top three positions in the world ranking, as they had in 2011. In general, European cities continue to dominate this world ranking. Luxembourg is in the 19th position in the 2012 world ranking and thus occupies the same rank as in the previous three editions of the study. At European level, Luxembourg is ranked 12th and 9th within the EU.

The 2012 survey also includes a new ranking for infrastructure performance (electricity, water, telephone, post office, public transport, traffic, airlines). These have a significant impact on the quality of living for expatriates in their host cities worldwide. Luxembourg is not in the publicly available top 50 of this ranking.

## **h.2 Quality of life analysis**

In August 2013, the consulting firm Boston Consulting Group released a study on the quality of life in 150 countries worldwide, on behalf of the German business magazine *Manager Magazin*<sup>12</sup>. This study is based on economic indicators as well as on political and societal indicators, health and education indicators, environment and infrastructure indicators. The world ranking is led by Norway, Switzerland and Sweden. Luxembourg is ranked 9th.

Table 17  
**Top 10 of BCG's ranking on quality of life**

<b>Rank</b>	<b>Country</b>
1	Norway
2	Switzerland
3	Sweden
4	Iceland
5	Finland
6	Netherlands
7	Austria
8	Germany
9	Luxembourg
10	Denmark

Source: BCG/Manager Magazin

### **i. Miscellaneous indicators**

#### **i.1 Corruption perceptions index**

The institutional and regulatory framework within which economic activity takes place affects the way resources are allocated, investment decisions are guided and creativity and innovation are stimulated. Corruption therefore weakens a country and undermines the stability and security needed for economic agents to make decisions.

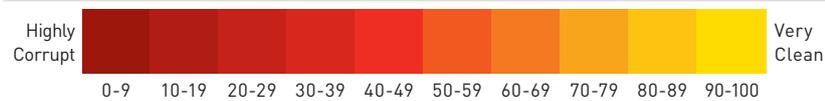
<sup>12</sup> For additional details:  
<http://www.manager-magazin.de/politik/deutschland/a-918164.html>

In December 2012 Transparency International, a non-governmental organization that is at the forefront of the fight against corruption, published in this context a new edition of its annual composite index of corruption perception: the “Corruption Perceptions Index” (CPI). The CPI composite index measures the perception of corruption in the public sector per country. It is calculated using information from surveys of experts and business decision-makers, conducted by international institutions. The results are then used to classify the territories according to the degree of perceived corruption in the national public sector. The CPI ranges from 100 (barely corrupt) and 0 (highly corrupt) for the 174 countries analysed. The methodology changed in 2012, which means that the results of this new edition are not directly comparable with those of the previous year (2011).

Table 18

**Country ranking**

Score



Rank	Country/Territory	Score	Rank	Country/Territory	Score
1	Denmark	90	22	Saint Lucia	71
1	Finland	90	25	Austria	69
1	New Zealand	90	25	Ireland	69
4	Sweden	88	27	Qatar	68
5	Singapore	87	27	United Arab Emirates	68
6	Switzerland	86	29	Cyprus	66
7	Australia	85	30	Botswana	65
7	Norway	85	30	Spain	65
9	Canada	84	32	Estonia	64
9	Netherlands	84	33	Bhutan	63
11	Iceland	82	33	Portugal	63
12	<b>Luxembourg</b>	<b>80</b>	33	Puerto Rico	63
13	Germany	79	36	Saint Vincent and the Grenadines	62
14	Hong-Kong	77	37	Slovenia	61
15	Barbado	76	37	Taiwan	61
16	Belgium	75	39	Cape Verde	60
17	Japan	74	39	Israel	60
17	United Kingdom	74	41	Dominica	58
19	United States	73	41	Poland	58
20	Chile	72	43	Malta	57
20	Uruguay	72	43	Mauritius	57
22	Bahamas	71	45	Korea (South)	56
22	France	71	46	Brunei	55

Source: Transparency International

In this edition Denmark, Finland and New Zealand jointly occupy the 1st position in the world ranking. Luxembourg is in the 12th world position. Germany is ranked 13th, Belgium 16th and France 22nd. Within the EU, Luxembourg is in 5th position. Luxembourg is therefore considered as being part of the group of countries where corruption in the public sector is perceived as relatively unimportant.

## i.2 Best countries for business

In this study, Bloomberg analyses countries worldwide according to their attractiveness as a place for doing business<sup>13</sup>. The composite index that is calculated to develop a ranking of countries is based on six criteria: the degree of economic integration, the cost of setting up a business, the cost of labour and material, costs of moving goods, less-tangible costs such as corruption, and finally the readiness of local demand. For each criterion, countries are ranked on a scale of 0-100. In this 2012 edition Luxembourg ranks 24th in the world, behind its neighbouring countries: Germany (5th), Belgium (13th) and France (14th). In addition, Luxembourg has lost 9 positions in the ranking.

Table 19  
Top 25 of Bloomberg study (January 2013)

2012 Rank	2011 Rank	Country	Score	Degree of economic integration	Cost of setting up a business	Cost of labor & material	Cost of moving goods	Less-tangible costs	Readiness of local consumer base
1	1	Hong-Kong	79.6%	75.3%	96.7%	61.8%	88.6%	79.7%	67.4%
2	3	United States	77.0%	82.1%	82.3%	76.7%	85.2%	67.2%	65.4%
3	7	Japan	75.6%	82.3%	70.8%	78.2%	81.1%	66.6%	80.0%
4	2	Netherlands	75.3%	70.1%	71.6%	69.0%	87.7%	78.6%	69.3%
5	6	Germany	74.6%	82.9%	61.8%	73.5%	87.4%	71.3%	75.2%
6	5	Australia	74.4%	79.2%	70.3%	73.0%	81.4%	73.1%	69.2%
6	12	Canada	74.4%	65.1%	71.8%	68.5%	86.2%	75.9%	74.0%
8	9	Singapore	74.0%	57.9%	90.4%	52.2%	87.9%	77.3%	66.7%
9	17	Denmark	73.8%	77.9%	84.4%	60.1%	73.2%	79.0%	66.7%
10	4	United Kingdom	73.4%	82.7%	69.0%	71.4%	81.7%	70.2%	66.7%
11	9	Austria	73.2%	79.2%	80.7%	66.8%	72.4%	71.0%	70.6%
12	14	Sweden	72.8%	78.2%	69.2%	70.8%	76.0%	73.3%	71.7%
13	13	Belgium	72.5%	70.7%	85.6%	68.6%	81.2%	58.3%	66.8%
14	8	France	71.9%	75.8%	72.1%	69.7%	81.5%	63.4%	69.7%
15	16	Finland	71.4%	75.1%	59.9%	68.1%	79.5%	76.9%	69.7%
16	21	Spain	71.0%	72.1%	66.8%	71.3%	81.5%	65.4%	67.4%
17	11	Switzerland	70.0%	71.3%	70.5%	65.3%	67.3%	76.3%	69.5%
17	24	United Arab Emirates	70.0%	69.1%	59.0%	64.3%	90.9%	71.0%	60.2%
19	18	Norway	69.8%	81.8%	66.9%	59.7%	67.5%	78.0%	72.2%
20	22	Poland	69.7%	77.0%	63.7%	71.2%	68.6%	67.9%	77.0%
21	29	South Korea	69.6%	56.2%	69.8%	72.9%	78.6%	63.6%	69.5%
22	26	Ireland	69.2%	54.5%	77.3%	63.4%	68.6%	79.0%	61.2%
23	20	Italy	68.6%	69.7%	77.8%	71.2%	70.4%	55.6%	66.8%
24	19	China	68.5%	80.3%	73.3%	70.8%	82.5%	43.7%	64.4%
24	15	Luxembourg	68.5%	39.1%	89.4%	45.9%	75.1%	81.1%	62.4%

Source: Bloomberg

<sup>13</sup> For additional details:  
<http://www.bloomberg.com/slideshow/2013-01-18/best-countries-for-business-2013.html#slide22>

### i.3 Länder-index

The German research Institute ZEW and the consultancy office Calculus Consult published the fourth edition of their investment location attractiveness index (*Länder-index*) on behalf of the *Stiftung Familienunternehmen foundation*<sup>14</sup>. The comparative index has been published every two years since 2006. It ranks 18 OECD countries according to their degree of attractiveness on the basis of five sub-indices: taxes, labour costs, productivity and human capital; regulation; financing capacity; public infrastructure. This study focuses mainly on the analysis of factors impacting family-owned businesses with a turnover exceeding 100 million euros.

The 2012 global ranking is led by Switzerland, followed by Finland and Denmark. Luxembourg occupies the fifth position in the 2012 overall ranking, and thus loses two positions with respect to the previous edition of the study (2010)..

For the "Taxes" sub-category Luxembourg is in the 3rd position in 2012, largely because of its relatively low (average) effective tax rate, attractive tax regulations for business at the national and cross-border levels, regulations for corporate succession issues, and a lower level of complexity of the national tax system. For the "Labour costs, productivity and human capital" sub-index, Luxembourg is ranked 4th. In particular, Luxembourg is in the average for hourly labour costs in the industry, and 1st in terms of productivity of the economy but is at the bottom of the table for public and private spending on educational institutions (as a % of GDP) as well as for its results in PISA (OECD) tests. For the "Regulation" sub-index, Luxembourg occupies the 8th position. For this sub-category Luxembourg is in a mid-table position for labour market and wage setting, in 15th position for the regulation of product markets and in 8th position for administrative environment for business. For the "Financing capacity" sub-index, Luxembourg ranks 9th. Luxembourg has among others a good performance in credit markets (3rd), in public and private debt as well as in "sovereign ratings" from major rating agencies. Finally, for the sub-category "Public infrastructure", Luxembourg is 6th. The country ranks 7th for transport infrastructure, 3rd for ICT infrastructure, 5th in terms of legal certainty, 6th for corruption control and 2nd on crime and political stability.

<sup>14</sup> For additional details:  
[http://www.familienunternehmen.de/media/public/pdf/studien/Studie\\_Stiftung\\_Familienunternehmen\\_Laenderindex\\_04\\_ebook.pdf](http://www.familienunternehmen.de/media/public/pdf/studien/Studie_Stiftung_Familienunternehmen_Laenderindex_04_ebook.pdf)

Table 20  
 "Länder-index" country ranking

Country	2012 Score	2012 Rank	2010 Score	2010 Rank
Switzerland	69.37	1	67.41	1
Finland	67.91	2	66.22	2
Denmark	66.92	3	64.53	5
United Kingdom	66.32	4	64.84	4
<b>Luxembourg</b>	<b>65.80</b>	<b>5</b>	<b>65.70</b>	<b>3</b>
Sweden	62.19	6	60.75	6
Netherlands	60.56	7	57.17	8
USA	59.58	8	58.98	7
Ireland	55.82	9	55.86	9
Austria	53.84	10	51.51	12
Germany	53.11	11	52.34	11
France	52.02	12	51.11	13
Belgium	51.61	13	50.76	14
Slovakia	50.99	14	53.04	10
Czech Republic	50.27	15	50.48	15
Poland	48.38	16	46.11	16
Spain	42.44	17	45.62	17
Italy	33.35	18	32.86	18

Source: ZEW/Stiftung Familienunternehmen

## 2.3 Conclusions

Many reports are published each year on competitiveness and territorial attractiveness. Even if since the fall of 2008 the global financial crisis has prompted the economic policy debate to focus primarily on short-term measures implemented to support the economy 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. There is no doubt that these rankings are the most publicized element. But the interpretation of these results goes much further than just the final rankings. One cannot lose sight of the inherent limitations of such an exercise: the relativity of the rankings, the quality of data used, the methodological differences and weaknesses, etc. Actually these rankings tell a more complex story than what their apparent simplicity would suggest.

1. A rise or fall in the ranking 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 2013 edition of the Report still often use statistics dating back to 2010, 2011 or 2012. Therefore these rankings should not be considered as short-term predicting tools.
3. Despite the attractiveness 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 13th in the IMD world ranking, it is only 22nd in the WEF ranking.
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>15</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 148 countries, the IMD only 60 and the Heritage Foundation 185. This affects the relative position of countries in the rankings. For example a decision could be made to only compare the EU in order to allow a better comparison. Luxembourg would then climb from the 22nd world position to the 9th position (WEF), from 13th to 4th (IMD) and from 15th to 5th (Heritage Foundation).

<sup>15</sup> More than 40% of the labour force in Luxembourg currently consists of cross-border workers.

6. There are groups of countries in these rankings for which the performance is relatively close (close composite indices). 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 ranking of countries may sometimes be related to small differences in the index.

In view of the above remarks, how should these rankings be regarded and above all interpreted?<sup>16</sup> Even if they give rise to numerous concerns, these reports provide a useful performance calibration device that deserves to be monitored. On the one hand they summarize complex issues down to a single figure and are extremely efficient communication tools that promote political debate and that allow public authorities to evaluate their policies by comparing them with best practices. On the other hand, their media coverage gives these benchmarks and rankings a significant impact on the brand image of a territory and can influence the investors' perception, even if they tend to be more interested in the sub-categories (e.g. rigidity of the labour market, energy costs, etc.) than just in the position of a territory in the final rankings. Over recent years this detailed thematic information has allowed investors to obtain more detailed data on markets and has thus ensured that these benchmarks have developed into decision-making tools, among others, which can influence the decisions about the location of activities. One must therefore avoid caving into the syndrome of "ranking for ranking's sake". The information provided by the final rankings is often too general to be usable and should be used to focus attention and to invite a more rigorous analysis. There is indeed no single recipe. Different policies can be compared but each country must adapt them to its own socio-economic environment. Competitiveness strategies succeed when they strike the right balance between economic imperatives and national social cohesion.

To this end, in 2003 in Luxembourg the Tripartite Coordination Committee had identified the need for an enlarged indicator scoreboard in order to better understand the country's competitiveness through indicators that better reflect the specificities of the country than international benchmarks do. This Committee entrusted Professor Fontagné (University of Paris I - Sorbonne) the task of elaborating proposals (November 2004)<sup>17</sup>. Since then the *Observatoire de la compétitivité* annually updates this national scoreboard.

<sup>16</sup> SWISSINFO, Assessing countries – How competitive are competitiveness rankings?, July 2013  
[http://www.swissinfo.ch/eng/business/How\\_competitive\\_are\\_competitiveness\\_rankings.html?cid=36258206](http://www.swissinfo.ch/eng/business/How_competitive_are_competitiveness_rankings.html?cid=36258206)

<sup>17</sup> FONTAGNÉ L., *Compétitivité du Luxembourg : une paille dans l'acier*, Report for the Ministry of Economy and Foreign Trade, Luxembourg, November 2004, pp. 102-120  
For additional details:  
[http://www.odc.public.lu/publications/perspectives/PPE\\_3.pdf](http://www.odc.public.lu/publications/perspectives/PPE_3.pdf)

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## **3 The Competitiveness Scoreboard**

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## 3.1 Introduction

Given the numerous methodological problems related to the international competitiveness analysis, as shown for example in the previous chapter relating to the international benchmarks which often do not take sufficiently into account the specificities of Luxembourg as a small open economy integrated in the Greater Region, in 2003 the Tripartite Coordination Committee asked professor Fontagné (University of Paris I – Sorbonne) to establish a national Scoreboard to measure the competitiveness of Luxembourg.

This national Competitiveness Scoreboard was first published in 2004<sup>1</sup> and included 88 indicators broken down into 10 categories. Over the years several indicators initially used in this national Scoreboard were no longer updated by their respective authors. It explains why this updated version of the national Scoreboard only includes 77 indicators, examined in this chapter, that represents the 2013 yearly update of the national Scoreboard.

The *Observatoire de la compétitivité* recalls the broad definition of the concept of competitiveness, from the Economic and Social Council (ESC) and adopted by the Tripartite Coordination Committee, which assigns the following role to 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 Scoreboard is used to point the finger at the different facets of competitiveness in Luxembourg. Thereafter, it is up to policy makers, workers and employers to find the right balance in the shaping of future policies.

<sup>1</sup> *Perspectives de politique économique* N°3 March 2005: "Compétitivité du Luxembourg : une paille dans l'acier"  
[http://www.odc.public.lu/publications/perspectives/PPE\\_003.pdf](http://www.odc.public.lu/publications/perspectives/PPE_003.pdf)

Table 1

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

- ▼ A1: Gross National Income per capita PPS (2012)
- ▼ A2: Real growth rate of GDP (2012)
- ▼ A3: Growth in domestic employment as a % (2012)
- ▼ A4: Unemployment rate as a % (2012)
- ▼ A5: Inflation rate as a % (2012)
- ▼ A6: Public balance as a % of GDP (2012)
- ▼ A7: Public debt as a % of GDP (2012)
- ▼ A8: Gross fixed capital formation of the public administration (2012)
- ▼ A9: Terms of trade (2012)
- ▼ A10: Real effective exchange rate 1995=100 (2012)
- ▼ A11: Diversification – Entropy coefficient (2012)
- ▼ A12: Foreign Direct Investment inflows and outflows (2011)

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

- ▼ B1: Employment rate as a % (Total) (2012)
- ▼ B2: Employment rate as a % (Men) (2012)
- ▼ B3: Employment rate as a % (Women) (2012)
- ▼ B4: Employment rate of persons aged 55-64 (Total) (2012)
- ▼ B5: Employment rate of persons aged 55-64 (Men) (2012)
- ▼ B6: Employment rate of persons aged 55-64 (Women) (2012)
- ▼ B7: Unemployment rate of persons under 25 (2012)
- ▼ B8: Long-term unemployment rate as a % (2012)
- ▼ B9: Persons holding a part-time job (2012)

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

- ▼ C1: Trends in total factor productivity (2012)
- ▼ C2: Trends in apparent work productivity (2012)
- ▼ C3: Productivity per hour worked as a percentage of U.S. figures (2012)
- ▼ C4: Changes in unit labour costs (2012)

- ▼ Costs / Revenue ratio in the banking sector (2006)\*

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

- ▼ Percentage of full-time employees on minimum wage<sup>2\*3</sup>

- ▼ D2: Price of electricity (ex-VAT) – industrial users (2012)
- ▼ D3: Price of gas (ex-VAT) – industrial users (2012)
- ▼ 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) (2012)
- ▼ D7: Broadband Internet access rates (2011)
- ▼ D8: Basket of domestic royalties for 2 Mbits leased lines (ex-VAT) (2012)
- ▼ 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>4\*</sup>

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

- ▼ E1: Corporate tax rate (2012)
- ▼ E2: Income tax rate (2012)
- ▼ E3: Standard VAT rate (2012)
- ▼ E4: Tax wedge – Single, without children (2012)
- ▼ E5: Tax wedge – Married, with 2 children, one-wage-earner (2012)
- ▼ E6: Administration efficiency index (2012)
- ▼ E7: Law compliance index (2012)
- ▼ E8: Regulation quality index (2012)
- ▼ E9: Degree of sophistication of online public services (2010)
- ▼ E10: Full online availability of public services (2010)

- ▼ Public sector wage costs\*

<sup>2</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>3</sup> Indicators signaled in light gray 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>4</sup> Indicators marked with an asterisk have not been updated.

Table 1  
Continued

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

- ▼ F1: Propensity for entrepreneurship (2012)
- ▼ F2: Self-employed jobs as a percentage of total employment (2012)
- ▼ F3: Net change in number of companies – start-up rate minus wind-up rate (2009)
- ▼ F4: Volatility amongst companies – start-up rate plus wind-up rate of disappearance (2009)

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

- ▼ G1: Annual cost per student in public educational facilities (2010)
- ▼ G2: Part of the population aged 25 to 64 with at least a secondary education (2012)
- ▼ Share of population aged 25 to 34 with university education\*<sup>5</sup>
- ▼ G4: Share of human resources in scientific and technological fields as a % of total employment (2011)
- ▼ G5: Lifelong learning (participation of adults in training and teaching programmes) (2012)
- ▼ G6: Secondary school drop-outs (2012)
- ▼ 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 (2011)
- ▼ H2: Public R&D budget credits (2011)
- ▼ H3: Portion of public research financed by the private sector (2011)
- ▼ 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 (2011)
- ▼ Scientific publications per million inhabitants (2005)\*
- ▼ H7: Number of USPTO patents per million inhabitants (2012)
- ▼ H8: Number of OEB patents per million inhabitants (2011)
- ▼ H9: Use of broadband connections by companies (2012)
- ▼ H10: Investment in public telecommunications as a percentage of gross fixed capital formation (2009)
- ▼ H11: Percentage of households that have Internet access at home (2012)
- ▼ H12: Number of cell and fixed phones per 100 inhabitants (2011)
- ▼ H13: Percentage of households that have broadband Internet access (2012)
- ▼ H14: Number of secure web servers per 100,000 inhabitants (2012)
- ▼ H15: Percentage of total employment in medium or high technology sectors (2011)

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

- ▼ I1: Gini coefficient (2012)
- ▼ I2: At-risk-of-poverty rate after social transfers (2012)
- ▼ I3: At persistent risk of poverty rate (2011)
- ▼ I4: Life expectancy at birth (2011)
- ▼ I5: Gender wage gap (2011)
- ▼ Serious work related accidents (2006)\*

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

- ▼ J1: Number of ISO 14001 certifications (2010)
- ▼ J2: Number of ISO 9001 certifications (2010)
- ▼ J3: Total greenhouse gas emissions (2010)
- ▼ J4: Share of renewable energy (2011)
- ▼ J5: Volume of municipal waste generated (2011)
- ▼ J6: Energy intensity of the economy (2010)
- ▼ J7: Modal breakdown in transportation choice for passenger – Percentage of car users (2010)

Source: Fontagné (2004)

<sup>5</sup> For these indicators, indicators for Luxembourg are not available.

Since the 2004 Fontagné report, indicators of Luxembourg 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, that is to say by comparing the most recent data values with those from previous years. The arrows will indicate in which direction each indicator has changed recently (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<sup>6</sup>**

<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>DK</b>	Denmark	<b>LV</b>	Latvia	<b>RO</b>	Romania
<b>EE</b>	Estonia	<b>LT</b>	Lithuania	<b>SL</b>	Slovenia
<b>ES</b>	Spain	<b>LU</b>	Luxembourg	<b>SE</b>	Sweden
<b>FI</b>	Finland	<b>MT</b>	Malta	<b>UK</b>	United Kingdom

Source: Eurostat

<sup>6</sup> Since Croatia became a member of the European Union in 2013, it is not yet included in the following calculations and comparisons which are based on data up to 2012.

Finally, indicators are synthesized by calculating a composite indicator with all the advantages and disadvantages that this implies.

Scoreboard data is updated annually. Obviously, Eurostat, OECD or the World Bank, to mention only the main sources of data, not only add the last year's data but also update the data from previous years following the updating of the national accounts, which are periodically revised, an inevitable and essential exercise. It also has a relatively important effect on other indicators, so that the results from this Scoreboard, including the ranking from the composite indicator, are not stable over time and differences can arise from one edition of the report to another.

The Scoreboard does not come up with "pseudo-scientific" truths as claimed by its critics: it merely measures a set of agreed criteria based on data supplied by the public statistics in a common conceptual framework. A serious and thorough analysis can only be done by studying each indicator separately by area and by industry. The composite index, which aggregates all the information to give a synoptic view, is valuable to the media, which are fans of compact and instant information.

Missing data in the Scoreboard have a significant effect on its outcome, and including on the composite indicator. As there are several members of the EU that are not OECD members (Bulgaria, Cyprus, Latvia, Lithuania, Malta and Romania), the ranking provided by the composite indicator is to be interpreted with caution, since some of the underlying indicators are not available for these countries.

The table below provides information on the percentage of missing data in the Scoreboard for all countries.

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

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Macroeconomic Performance	2.2	1.2	0.9	1.2	1.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	9.3
Employment	0.4	0.0	0.0	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Productivity and Labour Costs	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Market Operations	48.6	56.9	31.5	54.2	16.7	44.0	16.2	31.0	15.3	30.6	22.7	42.1	59.7
Institutional and Regulatory Framework	25.9	49.3	19.3	19.3	7.0	24.4	6.3	4.8	24.4	4.4	4.4	24.4	24.4
Entrepreneurship	15.7	15.7	15.7	15.7	14.8	27.8	27.8	4.6	27.8	2.8	75.9	75.9	50.9
Education and Training	14.1	8.9	3.0	3.7	2.2	0.7	2.2	1.5	3.0	2.2	3.7	20.0	20.0
Knowledge Economy	37.9	34.2	31.6	19.1	15.4	8.8	9.7	7.1	10.3	7.7	15.7	19.7	63.2
Social Cohesion	20.0	17.8	43.0	33.3	34.8	20.7	23.0	10.4	3.7	3.0	2.2	5.2	86.7
Environment	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	57.1	100.0

Source: *Observatoire de la compétitivité*

Macroeconomic Performance, Employment, Productivity and Labour Costs and Environment categories show the least missing data. Missing data are influenced by the source on which the data are based. In fact, when it comes to OECD data, data concerning EU Member States which are not members of the OECD are automatically missing. For the “structural” categories, data are published with some delay: a majority of 2011 and 2012 data are therefore not available for Institutional and Regulatory Framework, Entrepreneurship, Knowledge Economy, Social Cohesion and Environment categories. This missing data, from the moment it becomes available, obviously has a significant impact on the result of ranking.

## 3.2 The Competitiveness Scoreboard

In this subchapter, the indicators of the 10 categories are analysed. The green, orange and red colours indicate Luxembourg’s position relating to the EU average (EU-x). Overall, the indicators of the Scoreboard have not changed much over the last three years. In 2012, 29 out of the 73 indicators are green (+1 in relation to 2011), 30 indicators are orange (+1 in relation to 2011) and 14 indicators are red (-2 compared to 2011), which is the lowest number since 2004 (also 14 indicators in red).

A downward trend in the number of red indicators can be observed between 2000 and 2012, while the evolution of indicators in green and orange was more constant.

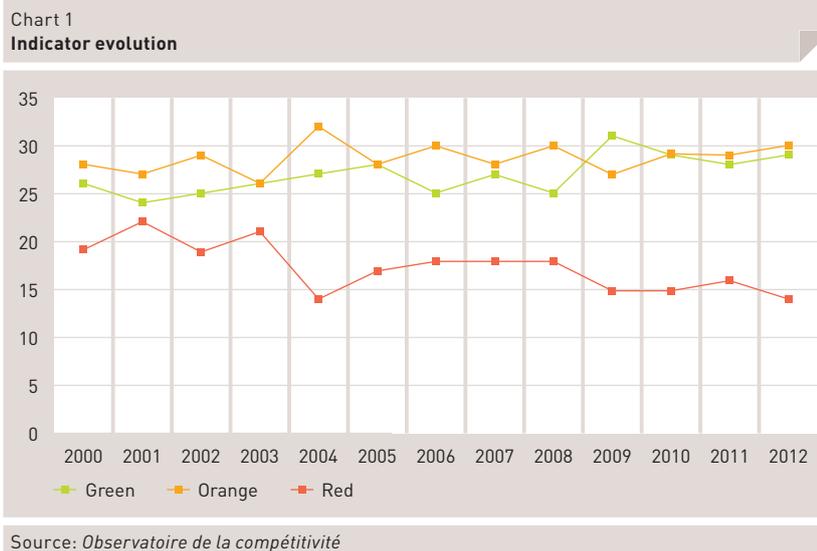


Table 4  
Colour evolution since 2000

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Macroeconomic Performance	Green	8	8	8	7	8	8	8	8	7	8	8	7	8
	Orange	2	2	2	3	2	2	2	2	2	2	2	3	2
	Red	0	0	0	0	0	0	0	0	1	0	0	0	0
Employment	Green	2	2	2	2	1	2	1	1	1	1	2	2	2
	Orange	3	3	3	4	5	4	5	5	5	7	7	6	7
	Red	4	4	4	3	3	3	3	3	3	1	0	1	0
Productivity and Labour Costs	Green	3	1	1	1	1	3	1	2	1	1	1	1	1
	Orange	1	0	2	0	2	0	1	2	0	0	0	0	1
	Red	0	3	1	3	1	1	2	0	3	3	3	3	2
Market Operations	Green	2	2	2	3	4	3	3	3	3	4	4	4	4
	Orange	4	4	4	3	4	4	3	3	3	2	1	1	1
	Red	2	2	2	2	0	1	2	2	2	2	3	3	3
Institutional and Regulatory Framework	Green	5	5	6	6	5	5	5	5	5	5	5	5	5
	Orange	3	3	2	2	4	3	3	3	4	4	4	4	4
	Red	2	2	2	2	1	2	2	2	1	1	1	1	1
Entrepreneurship	Green	1	1	0	0	0	0	0	0	1	1	1	1	1
	Orange	2	2	3	2	2	2	3	2	2	2	2	2	2
	Red	1	1	1	2	2	2	1	2	1	1	1	1	1
Education and Training	Green	0	0	0	1	1	0	0	0	0	3	3	3	3
	Orange	3	3	4	2	3	4	4	3	4	1	1	1	1
	Red	2	2	1	2	1	1	1	2	1	1	1	1	1
Knowledge Economy	Green	5	5	5	5	6	7	7	7	6	7	3	3	3
	Orange	4	4	4	4	4	3	3	3	5	4	8	8	8
	Red	4	4	4	4	3	3	3	3	2	2	2	2	2
Social Cohesion	Green	0	0	1	1	1	0	0	1	1	1	2	2	2
	Orange	5	5	4	4	4	5	5	4	4	4	3	3	3
	Red	0	0	0	0	0	0	0	0	0	0	0	0	0
Environment	Green	0	0	0	0	0	0	0	0	0	0	0	0	0
	Orange	1	1	1	2	2	1	1	1	1	1	1	1	1
	Red	4	4	4	3	3	4	4	4	4	4	4	4	4
Total	Green	26	24	25	26	27	28	25	27	25	31	29	28	29
	Orange	28	27	29	26	32	28	30	28	30	27	29	29	30
	Red	19	22	19	21	14	17	18	18	18	15	15	16	14
Total of indicators		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 table above allows us to conclude that the overall situation of Luxembourg remained constant compared to the EU average. Even if the notion of competitiveness is relative, an analysis of the evolution of Luxembourg indicators compared to the previous year is essential. Out of the 77 indicators, 36 indicators have improved and 36 indicators have deteriorated. All indicators in category J Environment deteriorated compared to the latest available figures, while most indicators of category B Employment and category I Social Cohesion have improved compared to 2011.

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

		2004	2005	2006	2007	2008	2009	2010	2011	2012
A Macroeconomic Performance (12)	↑	3	7	2	8	3	3	7	6	5
	=	0	0	2	1	0	0	0	1	0
	↓	9	5	8	3	9	9	5	5	7
B Employment (9)	↑	5	7	4	5	3	9	4	3	7
	=	1	1	1	0	0	0	1	0	0
	↓	3	1	4	4	6	0	4	6	2
C Productivity and Labour Costs (4)	↑	3	3	2	2	0	2	3	0	1
	=	1	0	0	1	0	0	0	0	0
	↓	0	1	2	1	4	2	1	4	3
D Market Operations (8)	↑	6	4	5	2	6	4	4	3	3
	=	0	0	0	0	0	0	1	1	1
	↓	2	4	3	6	2	4	3	4	4
E Institutional and Regulatory Framework (10)	↑	3	2	4	5	5	7	4	4	4
	=	3	3	2	2	3	2	3	1	3
	↓	4	5	4	3	2	1	3	5	3
F Entrepreneurship (4)	↑	1	1	2	1	1	1	2	2	3
	=	0	0	1	0	0	0	0	0	0
	↓	3	3	1	3	3	3	2	2	1
G Education and Training (5)	↑	3	2	1	3	3	4	3	3	3
	=	0	1	0	0	0	0	1	0	0
	↓	2	2	4	2	2	1	1	2	2
H Knowledge Economy (13)	↑	9	8	9	8	7	9	5	7	6
	=	1	0	1	0	1	1	1	0	1
	↓	3	5	3	5	5	3	7	6	6
I Social Cohesion (6)	↑	4	2	0	4	4	1	4	4	4
	=	1	3	2	0	0	1	1	1	0
	↓	1	1	4	2	2	4	1	1	1
J Environnement (7)	↑	2	5	4	6	6	5	1	1	0
	=	0	0	0	0	0	0	0	0	0
	↓	5	2	3	1	1	2	6	6	7
<b>Total (77)</b>	↑	<b>39</b>	<b>41</b>	<b>33</b>	<b>44</b>	<b>38</b>	<b>45</b>	<b>37</b>	<b>33</b>	<b>36</b>
	=	<b>7</b>	<b>8</b>	<b>9</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>5</b>
	↓	<b>32</b>	<b>29</b>	<b>36</b>	<b>30</b>	<b>36</b>	<b>29</b>	<b>33</b>	<b>41</b>	<b>36</b>

Source: *Observatoire de la compétitivité*

## 3.2.1 Macroeconomic Performance

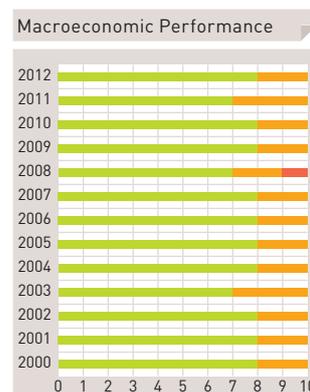
Table 6  
Category A Macroeconomic Performance

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
A1	Gross national income at market prices, per capita in PPS (2012)	↓	193	100	124.0	109.2	119.9	BU 46.1	LU
A2	Growth rate of real GDP, as a % (2012)	↓	-0.2	-0.4	0.7	0.0	-0.3	GR -6.4	LV 5.6
A3	Growth rate of domestic employment, as a % (2012)	↓	2.3	-0.5	1.1	0.0	0.2	GR -8.3	LV 2.6
A4	Unemployment rate, as a % (2012)	↓	6.1	10.5	5.5	10.2	7.6	AT 4.3	ES 25.0
A5	Inflation rate, as a % (2012)*	↑	2.7	2.6	2.1	2.2	2.6	SE 0.9	HU 5.7
A6	Public balance, as a % of GDP (2012)	↓	-0.6	-4.0	0.2	-4.9	-4.0	ES -10.6	DE 0.2
A7	Public debt, as a % of GDP (2012)	↓	21.7	85.3	81.9	90.2	99.6	EE 10.1	GR 156.9
A8	Gross fixed capital formation, as a % of GDP (2012)	↑	3.9	2.3	1.5	3.1	1.7	AT 1.0	EE 5.6
A9	Terms of trade (2012)	↑	111.30	-	97.72	98.18	97.04	FIN 85.74	RO 142.84
A10	Real effective exchange rate (index 2000 =100) (2012)	↑	103.85	92.02	95.85	96.88	101.90	UK 87.45	SK 132.17
A11	Diversification – Entropy coefficient (2012) <sup>7</sup>	↓	0.89	0.90	0.88	0.90	0.88	LT 0.81	MT 0.91
A12	Market integration (2011)	↑	610.5	2.4	1.3	2.4	9.6	EE -2.7	LU

\*LU inflation rate: IPCN, other IPCH; harmonized unemployment rate EUROSTAT/BIT LU: Adem; \*\*EU-15

Luxembourg remains in first place for the Macroeconomic Performance category. Only two categories are orange. However, Luxembourg's performance deteriorated for 7 out of 12 indicators compared to the previous year.

Public debt as a % of GDP is a good example: although depicted in green, this indicator has deteriorated from 18.7% in 2011 to 21.7% in 2012 (in 2007, public debt was 6.7% of GDP). Public debt has increased in all countries of the European Union compared to 2007, with the exception of Sweden. The deterioration of public debts can affect competitiveness: on the one hand, it can trigger a new recession, and on the other one, high levels of public debt cause higher rates of interest, blocking private investment. And finally, in the case of high public debts, governments are often under pressure to raise taxes, which slows economic activity down. There are no significant investments in R&D and education. From now on, it is important to strengthen economic governance and especially budgetary surveillance within the context of the European Semester.



<sup>7</sup> The recent change of NACE rev 1.1 (6 branches) to Nace rev.2 (10 branches) has a significant impact on the result of the entropy coefficient. More in-depth analyses are needed.

In 2012, the growth rate of real GDP was -0.2% compared to 2011, positioning Luxembourg above the EU average. However, we note that Luxembourg is far from the growth rates from before the crisis (average annual growth of 4.7% between 2000 and 2007).

The real effective exchange rate (REER), an indicator measuring the price competitiveness and cost competitiveness of a country relative to its trading partners, which is also included in the EU Scoreboard for the excessive macroeconomic imbalances procedure (MIP), improved in Luxembourg in 2012 compared to 2011. Within the MIP, it was agreed that a country is potentially at risk if the REER is higher than +5% or lower than -5%.<sup>8</sup>

In 2012 Luxembourg inflation (measured by the domestic consumer price index) is close to that of the EU, but it is traditionally higher than that of our neighbouring countries. In 2012 inflation rate decreased from 3.4% to 2.7% due to the slower development in the prices of oil products<sup>9</sup>.

The unemployment rate remains at a low level compared to other European countries, although it has increased in recent years. This is a Luxembourg paradox: on one hand, the unemployment rate rises, on the other hand employment also increases. This can be explained by the increasing number of cross-border workers in Luxembourg.

<sup>8</sup> See also Chapter 4: "The European Semester within the framework of European economic governance" of the Competitiveness Report for more details.

<sup>9</sup> See also the various semi-annual reports of the *Observatoire de la formation des prix* (OFP): [http://www.odc.public.lu/activites/observatoire\\_de\\_la\\_formation\\_des\\_prix/index.html](http://www.odc.public.lu/activites/observatoire_de_la_formation_des_prix/index.html)

## 3.2.2 Employment

Table 7  
Category B Employment

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
B1	Employment rate, as a % (aged 15-64) (2012)	↑	65.8	64.2	72.8	63.8	61.8	GR 51.3	NL 75.1
B2	Employment rate – Men (aged 15-64) (2012)	↑	72.5	69.8	77.6	68.0	66.9	ES 60.2	NL 79.7
B3	Employment rate – Women (aged 15-64) (2012)	↑	59.0	58.6	68.0	60.0	56.8	GR 41.9	SE 71.8
B4	Employment rate of persons aged 55-64, as a % (2012)	↑	41.0	48.9	61.5	44.5	39.5	SL 32.9	SE 73.0
B5	Employment rate of persons aged 55-64 – Men (2012)	↑	47.4	56.4	68.5	47.4	46	SL 40.7	SE 76.3
B6	Employment rate of persons aged 55-64 – Women (2012)	↑	34.3	41.9	54.8	41.7	33.1	MT 15.8	SE 69.6
B7	Unemployment rate of persons under 25, as a % (2012)	↓	18.0	22.8	8.1	24.6	19.8	DE 8.1	GR 55.3
B8	Long-term unemployment rate, as a % (2012)	↓	1.5	4.6	2.5	4.1	3.4	AT 1.1	GR 14.4
B9	Persons holding a part-time job, as a % (2012)	↑	19.0	20.0	26.7	18.0	25.1	BU 2.4	NL 49.8

In the Employment category, 7 out of 9 indicators are orange, thus close to the European average. Only two indicators are green: the unemployment rate of persons under 25 years and the long-term unemployment rate. However, Luxembourg's performance for these two indicators deteriorated compared to 2011. The model examples in this category among the Member States are the Netherlands, followed by Sweden and Germany. Luxembourg is in 11th position.

The employment rate increased by about one percentage point compared to 2011 and is at 65.8% in 2012. In most other European countries, the employment rate remained stable or deteriorated since the beginning of the crisis in 2008. It should be noted that the employment rate specified in the Scoreboard refers to the 15-64 age group, while the employment rate of the Europe 2020 strategy (national target: 73%) refers to the 20-64 age range in order to minimize potential conflicts between employment policies and educational policies. The national employment rate of this age group is 71.4%.

The employment rate of persons aged 55-64 has improved for several years but remains below the EU average. The government has taken a series of measures to address the recommendation from the Council to Luxembourg for 2012-2013 in order to increase the participation rate of older workers, as the law reforming the pension system entered into force on 1 January 2013.

The unemployment rate of young people (<25 years) has increased continuously for several years in Luxembourg: in the beginning of the century, the rate was still below 7%. In 2012 18.1% of young people are looking for a job. In other countries the situation of persons younger than 25 is even more tragic: in Spain and Greece the rate is 53% and 55% respectively. To provide the best support to young people when they start their working lives, the government presented an action plan for youth employment in early 2013. This action plan includes among others a "youth guarantee" which will be implemented by June 2014. ADEM (Agency for Employment Development) will therefore "(...) offer all young people within the first four months either a job or a measure allowing them to find a job or seriously enhance their employability, or a vocational training, a qualification, or a back-to-school programme, especially for early school leavers."<sup>10</sup>



<sup>10</sup> [http://www.gouvernement.lu/salle\\_presse/actualite/2013/01-janvier/23-schmit/dossier.pdf](http://www.gouvernement.lu/salle_presse/actualite/2013/01-janvier/23-schmit/dossier.pdf)

### 3.2.3 Productivity and Labour Costs

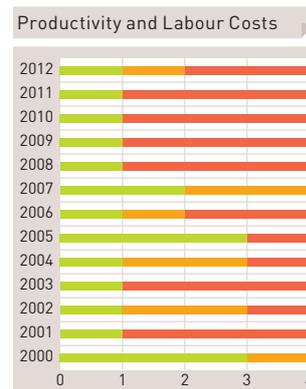
Table 8  
Category C Productivity and Labour Costs

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
C1	Trends in total factor productivity (2012)	↓	-3.15	-0.53	-0.32	-0.57	-0.74	LU	LV 1.98
C2	Trends in apparent work productivity (2012)	↓	-1.9	0.1	-0.4	0.1	-0.5	IT -2.1	LT 11.2
C3	Productivity per hour worked, as a % of US figures (2012)	↓	84	58	77	89	89	RO 15	FR 89
C4	Changes in unit labour costs (2012)	↑	3.1	2.7	2.8	1.7	3.6	GR -6.6	UK 9.5

\*EU-15; \*\*EU-25

The four indicators in Productivity and Labour Costs have deteriorated compared to the previous year. Only the Productivity per hour worked as a % of US figures is displayed in green for Luxembourg.

Changes in unit labour costs have improved slightly in relation to the last report, and Luxembourg is close to the EU average, as the nominal unit labour cost deteriorated at EU level (0.8 to 2.7). Nominal unit labour cost, which is also used by the EU in the macroeconomic imbalances procedure, compares the domestic nominal unit labour cost to that of main trading partner countries. Thus, it includes the average labour cost of an economy and the productivity level.



## 3.2.4 Market Operations

Table 9

Category D Market Operations

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
D2	Price of electricity (ex-VAT) – industrial users, in € per 100 kWh (2012)	↓	0.1007	0.0954	0.0895	0.0809	0.0950	EE 0.0647	CY 0.2171
D3	Price of gas (ex-VAT) – industrial users, in € per GJ (2012)	↓	13.99	10.11	12.04	10.51	9.17	RO 5.29	SL 14.80
D4	Market share of the primary operator in cellular telephones, as a % (2010)	↑	51	38	33	41	43	PO 31	CY 76
D6	OECD basket of mobile telephone rates for large consumers, VAT included – Total in USD (2012)	↓	663.28	1097.26**	1336.47	293.32	1326.56	AT 237.43	HU 2288.76
D7	Broadband Internet access rates in USD PPP/MB (VAT included) (2011)	↑	11.55	45.00**	30.88	5.73	40.40	DK 3.84	PO 182.00
D8	OECD Basket of domestic royalties for 2 Mbits leased lines (ex-VAT) in USD (2012)	↑	8986	23623**	13802	20262	14605	DK 4754	HO 3067549
D9	Value of public tenders using open procedure procurement, as % of GDP (2011)	↓	1.3	3.4	1.3	4.0	3.0	DE 1.3	LV 17.6
D10	Total State aid as a % of GDP (except horizontal objectives) (2011)	→	0.24	0.51	0.53	0.62	0.43	BU 0.10	MT 1.60

\*EU-15; \*\*OECD

In the Market Operations category, the colour of indicators has remained constant since 2010: 4 indicators are green, 3 red and 1 orange.

Luxembourg displays rather high prices for electricity, and in terms of gas prices for industrial users it's one of the highest amongst EU Member States, overtaken only by Slovenia. On the other hand, the pricing of communication (mobile phones, Internet access) is very competitive compared to the EU average. The OECD basket of mobile telephone rates for large consumers indicator deteriorated compared to the last figures from 2010, however, the OECD reviewed the different baskets of mobiles rates in order to take account of the changing consumption patterns, therefore, the figures from different years are not comparable.

The value of public tenders using open procedure has remained in Luxembourg since 2006 to a level between 1.2% and 1.6% of GDP.



## 3.2.5 Institutional and Regulatory Framework

Table 10  
Category E Institutional and Regulatory Framework

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
E1	Corporate tax rate, as a % (2012)	→	28.80	22.60	29.48	33.33	33.99	BU & CY 10	MT 35
E2	Income tax rate, as a % (2012)	→	41.3	38.4	47.5	50.7	53.7	BU 10	DK 60.2
E3	Standard VAT rate, as a % (2012)	→	15	21.13	19	19.6	21	LU	HU 27
E4	Tax wedge – Single, without children, as a % (2012)	↑	35.76	35.64**	49.75	50.22	56.05	IE 25.95	BE 56.05
E5	Tax wedge – Married, with 2 children, one wage-earner (2012)	↑	13.32	26.08**	34.17	43.12	41.38	IE 6.38	FR 43.12
E6	Administration efficiency index (2011)	↓	1.65	1.14	1.57	1.33	1.59	RO -0.31	FI 2.21
E7	Law compliance index (2011)	↓	1.77	1.14	1.64	1.43	1.40	BU -0.12	FI 1.94
E8	Regulation quality index (2011)	↓	1.75	1.19	1.53	1.11	1.22	GR 0.50	SE 1.89
E9	Degree of sophistication of online public services, as a % (2010)	↑	87	90	99	94	92	GR 70	PT 100
E10	Full online availability of public services, as a % (2010)	↑	72	82	95	85	79	GR 48	SE 100

\*\*OECD

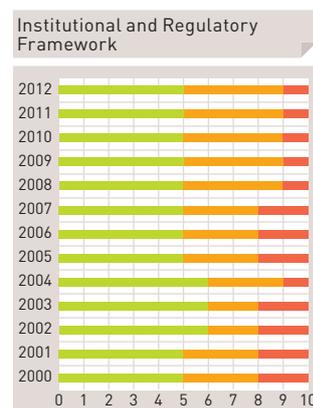
The Institutional and Regulatory Framework category is important for competitiveness, as it describes the tax environment for companies and households but also the functioning of the public administration. Luxembourg has been able to maintain its good performances in recent years with 5 indicators in green, 4 in orange and only 1 in red.

Corporate tax has remained constant in Luxembourg. According to a recent KPMG study<sup>11</sup>, corporate taxes have tended to decline worldwide for more than a decade. Many countries use corporate taxes and other fiscal incentives to remain attractive to foreign investment. However in 2012, the global average rate only reduced by 0.09% to be at 24.43% (22.60% in the EU). According to the aforementioned study this finding indicates that many countries believe they have reached their target levels and that deeper cuts would have no more direct impact on their competitiveness.

The VAT rate remains the lowest in Luxembourg at 15%. Other countries, such as Cyprus, Spain, the Netherlands and Portugal have increased the VAT rate in recent years to reduce the budget deficit. In the government statement on the economic, social and financial situation of the country (speech on the state of the nation) in April 2013, the Prime Minister did however also announce an increase in VAT in Luxembourg.

The tax wedge for married persons with 2 children and one wage-earner has improved in comparison with the last figures, and maintains the second highest rate after Ireland.

Concerning the degree of sophistication of basic public services available online and the portion of full online availability of public services, Luxembourg continues its efforts, but with 87% and 72% respectively in 2010 it is positioned in the EU average.



<sup>11</sup> KPMG's Corporate and Indirect Tax Survey 2012: [http://www.kpmg.com/DE/de/Documents/Corporate\\_and\\_Indirect\\_Tax\\_Survey\\_2012.pdf](http://www.kpmg.com/DE/de/Documents/Corporate_and_Indirect_Tax_Survey_2012.pdf)

## 3.2.6 Entrepreneurship

Table 11

### Category F Entrepreneurship

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
F1	Propensity for entrepreneurship, as a % (2012)	↓	36	37	29	40	30	SE 22	LT 58
F2	Self-employed as a percentage of total employment (2012)	↑	5.81	16.04	10.92	9.14	16.30	SE 5.19	GR 34.6
F3	Net change in number of companies, as a % (2010)	↑	2.17	-0.32	-0.18	5.46	1.28	PT -10.1	FR 5.46
F4	Volatility among companies, as a % (2010)	↑	16.87	20.74	17.62	20.10	9.18	CY 7.74	LT 45.66

\* EU-15

In the Entrepreneurship category, the performance of Luxembourg is within the EU average: two indicators are orange, one green and one red. Finally, it's noteworthy that only 2 out of 4 indicators are based on 2012 data, the latest data on the rate of enterprise creation and the rate of enterprise disappearance dates back to 2010.

According to a survey, 36% of Luxembourg population wish to be self-employed, a rate similar to the EU average rate. In 2009 in the last survey of the European Commission, the rate for Luxembourg was 44% and that of the EU 45%. The preference for employee status has increased in 23 EU Member States between 2009 and 2012, which can be explained by the effect of the crisis.

Although approximately one third of Luxembourg population wants to be self-employed, only few people (5.8% of the population) actually implement this desire and work as freelancers.



Frame 1  
**Global Entrepreneurship Monitor**

The Global Entrepreneurship Monitor project (GEM) 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. For the first time in 2013 Luxembourg participates in the largest ongoing study on the entrepreneurial dynamics in the world.

GEM explores the role of entrepreneurship in national economic growth and has three objectives:

- ▼ To measure differences in the level of entrepreneurial activity between countries;
- ▼ To uncover factors leading to appropriate levels of entrepreneurship;
- ▼ To suggest policies that may enhance the national level of entrepreneurial activity.

Data collection is based on annual surveys of the adult population. In addition, opinions of national experts on various topics (finance, government policies, domestic market openness, infrastructure, etc.) are added to gain an overview of the important conditions in order to stimulate entrepreneurial activity.

GEM is based on the following principles: first, the prosperity of an economy is highly dependent on a dynamic entrepreneurial sector. Entrepreneurship can generate an economic benefit for the less developed regions by supporting self-employment initiatives. More developed economies generate entrepreneurial opportunities because of their wealth and their ability to innovate. The second principle is that the entrepreneurial ability is based on people who have the ability and motivation to start a business, which can be enhanced by positive societal perceptions on entrepreneurship, as the participation of all groups in society, especially women, and different age groups and levels of education as well as disadvantaged minorities. Finally, strong growth entrepreneurship is a key contributor to the creation of new jobs in an economy and national competitiveness depends on innovative and cross-border business projects.

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

## 3.2.7 Education and Training

Table 12  
Category G Education and Training

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
G1	Annual cost per student in public educational facilities, in PPS (2010)	↓	13055	6829	7162	7667	8865	RO 2185	LU
G2	Part of the population having achieved at least the second cycle of secondary education, as a % (2012)	↑	78.3	74.2	86.3	72.5	71.6	PT 37.6	LT 93.4
G4	Share of human resources in scientific and technological fields, as a % of total employment (2012)	↑	58.6	42.9	45.7	48.1	50.3	RO 25.7	LU
G5	Lifelong learning, as a % of the population aged between 25-64 (2012)	↑	13.9	9.0	7.9	5.7	6.6	RO 1.4	DK 31.6
G6	Secondary school drop-outs, as a % (2012)	↓	8.1	12.8	10.5	11.6	12.0	SL 4.4	ES 24.9

The Scandinavian countries are at the top of the Education and Training category: Finland is in 1st place before Sweden and Denmark. Luxembourg is in 14th position. Luxembourg has improved in 3 out of the 5 indicators in this category, and only the early school leaving rate has deteriorated from 6.2% to 8.1%. However, Luxembourg's performance for this indicator is better than the EU average.

A population with a high level of education and training is crucial for the social and economic well-being of a country. Luxembourg ranks 29th out of 36 countries in terms of students' skills and 34th in terms of years of schooling, according to the OECD's Better Life Index. Educational outcomes are uneven and about a quarter of 15-year old students do not master basic writing skills<sup>12</sup>. For example, the World Economic Forum (WEF) is also critical of Luxembourg's educational performance: "The poor performance of the education system (26th), both in terms of quantity and quality, is the main concern for the transition to a knowledge-based society."<sup>13</sup>

Annual expenditure per pupil/student is no longer updated since 2010, the amount of expenditure for Luxembourg dates even back to 2007 (source: Eurostat). The latest OECD figures<sup>14</sup> show that Luxembourg expenditure per pupil in primary education and secondary education is the highest in the OECD countries; data on tertiary education is not available for Luxembourg. In the absence of a suitable recurring indicator reflecting the effectiveness of education, it has been decided that increased spending is a sign of degradation at the present time. Not taking the results of education into account would lead to classifying Luxembourg at the same level as Finland, world champion in Pisa tests! However, this problem did not arise concerning spending on R&D, as several studies published in the Report have shown the positive effect of R&D on a company's innovation and productivity.



<sup>12</sup> OECD Economic Surveys: Luxembourg 2012

<sup>13</sup> WEF, The Europe 2020 Competitiveness Report: Building a More Competitive Europe. For additional details: <http://www.weforum.org/reports/europe-2020-competitiveness-report-building-more-competitive-europe>

<sup>14</sup> Education at a Glance 2013, OECD

## 3.2.8 Knowledge Economy

Table 13

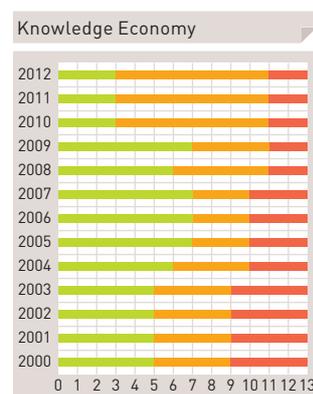
### Category H Knowledge Economy

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
H1	Internal R&D Lisbon expenditure, as a % of GDP (2011)	↓	1.43	2.03	2.84	2.25	2.04	CY 0.48	FI 3.78
H2	Public R&D budget credits, as a % of GDP (2011)	↓	33.9	34.6	30.3	37.0	25.3	LV 22.5	CY 68.3
H3	Portion of public research financed by the private sector, as a % of GDP (2011)	↑	46.1	53.9	65.6	54.0	58.6	CY 12.7	FI 67.0
H5	Number of researchers per 1,000 employed persons (public and private sectors taken together) (2011)	↓	7.12	7.03	8.08	8.95	8.91	RO 2.16	FI 15.93
H7	Number of USPTO patents per million inhabitants (2012)	↑	80.02	78.81	169.04	82.45	78.05	LT 1.66	SE 219.45
H8	Number of OEB patents per million inhabitants (2011)	↓	107.06	107.45	272.25	132.44	155.54	BU 1.52	DE 272.25
H9	Use of broadband connections by companies, as a % (2012)	↑	95	90	88	97	94	RO 63	FI 98
H10	Investment in public telecommunications, as a % (2009)	↓	1.54	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 % (2012)	↑	93	76	85	80	78	BU 51	NL 94
H12	Number of cell phones per 100 inhabitants (2011)	↑	232.70	167.54*	207.80	164.29	189.91	SK 138.78	LU
H13	Percentage of households that have broadband Internet access (2012)	→	68	73	82	77	75	RO 50	SE 87
H14	Number of secure web servers per 100,000 inhabitants (2012)	↑	203.68	96.04*	112.89	40.98	69.00	GR 18.55	NL 305.86
H15	Percentage of total employment in medium or high technology sectors (2011)	↓	0.7	5.6	9.7	4.8	5.2	CY 0.7	CZ 10.2

\*OECD

Luxembourg is within the EU average in the Knowledge Economy category, with 3 indicators in green, 8 in orange and 2 in red.

Domestic expenditure on research and development (percentage of GDP) decreased from 1.48% to 1.43% of GDP (in 2011) and remains well below the national target from 2.3% to 2.6% stated in the Europe 2020 strategy.<sup>15</sup> However, the evolution of State budgets for RDI has continued to grow from EUR 28 million in 2000 to EUR 235 million in 2012.<sup>16</sup> This development demonstrates the government's commitment to invest in RDI and to implement a sustainable policy for the development and diversification of the country, through political actions led since 1999, as shown for example through creating a National Fund for Research (FNR), creating the University of Luxembourg and acceding to international organizations such as the European Space Agency and the European Molecular Biology Laboratory. The share of public research financed by the private sector declined from 70.3% of GDP in 2009 to 46.1% in 2011.



<sup>15</sup> Note that the indicator covers up the increased spending on R&D in euro amount, as the GDP (denominator) also increases.

<sup>16</sup> National Reform Programme of the Grand Duchy of Luxembourg 2013 (NRP): [http://www.odc.public.lu/publications/pnr/2013\\_PNR\\_Luxembourg\\_2020\\_avril\\_2013.pdf](http://www.odc.public.lu/publications/pnr/2013_PNR_Luxembourg_2020_avril_2013.pdf)

The ICT sector (information and communication technologies) is one of the priority sectors of Luxembourg government, which explains the good performance of Luxembourg in the categories relating to Internet use at home, the rate of cellular access and the number of secure web servers, which are well above the EU average.

The percentage of total employment in the medium-high and high technology manufacturing sectors (defined as sectors requiring a relatively intense R&D such as aerospace construction, pharmaceutical industry, chemical industry and automotive industry) remains below the EU average, which is explained by the fact that the share of manufacturing jobs in total employment is low in Luxembourg.

## 3.2.9 Social Cohesion

Table 14

### Category I Social Cohesion

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
11	Gini coefficient (2012)	↑	27.2	30.7	29.0	30.8	26.3	SL 23.7	LV 35.9
12	At-risk-of-poverty rate after social transfers, as a % (2012)	↑	13.6	16.9	15.8	14.0	15.3	CZ 9.6	BU 22.3
13	At persistent risk-of-poverty rate, as a % (2011)	↓	6.5	10.0	10.4	6.4	8.0	CZ 4.2	BU 16.9
14	Life expectancy at birth in numbers of years (2011)	↑	81.1	80.4	80.8	82.3	80.5	LT 73.8	IT 82.8
15	Gender wage gap, as a % of gross hourly wages of male employees (2011)	↑	13.6	21.7	25.6	14.5	15.1	SL 7.6	EE 26.9

Only 1 indicator out of 5 for the Social Cohesion category deteriorated compared to the previous year, namely the at persistent risk of poverty rate. However, this indicator is green, which means that Luxembourg has a better performance than the EU average. In general, Luxembourg ranks 5th in this category, ahead of its neighbours.

A Gini coefficient of 0 indicates that the entire population has the same income (state of perfect equality). On the opposite, a Gini coefficient of 1 corresponds to the situation where a single individual would possess all income, while the others would have an income equal to 0. For 2011, the Gini coefficient for Luxembourg is 0.272 and ranks better than the average for the European Union, Germany and France.

The at-risk-of-poverty rate after social transfers has improved compared to the previous year and is currently at 13.6%. If transfers were not taken into account, the poverty rate would reach 45% of the population<sup>17</sup>, which highlights the relevance of social transfers to households as a means to remedy income inequalities.

It is necessary to pursue the initiatives aimed at strengthening social cohesion, since this is a characteristic of an attractive state for both businesses and residents. The *PIBien-être* project<sup>18</sup> will further analyse well-being in Luxembourg.

Note that the Work-related accidents indicator has been removed from this category, as the data has not been updated since 2006.



<sup>17</sup> Rapport Travail et Cohésion sociale 2012 from STATEC

<sup>18</sup> See also the chapter dedicated to the *PIBien-être* project in the current 2013 Competitiveness Report 2013.

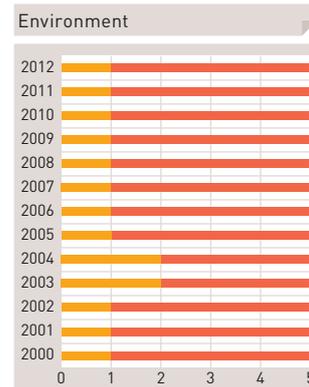
## 3.2.10 Environment

Table 15  
Category J Environment

Code	Indicator		LU	EU-27	DE	FR	BE	MIN	MAX
J1	Number of ISO 9001 certifications per million inhabitants (2010)	↓	211	706	619	458	341	LU	IT 2296
J2	Number of ISO 14001 certifications per million inhabitants (2010)	↓	38	187	73	81	75	LU	CZ 630
J3	Total greenhouse gas emissions (index 1990=100) (2010)	↓	92	89	76	93	91	LT 42	ES 123
J4	Share of renewable energy (2011)	↓	2.95	20.44	20.35	12.84	9.04	MT 0.0	SU 58.72
J5	Volume of municipal waste generated in kg per person, per year (2011)	↓	687	500	597	527	464	EE 298	DK 719
J6	Energy intensity in kg of oil equivalent per thousand of euros (2010) <sup>19</sup>	↓	140	152	142	152	191	IR 93	BU 671
J7	Modal breakdown in transportation choice for passenger method – Percentage of car users in passenger kilometres (pkm) (2011)	↓	99.6	93.4	94.3	93.4	97.0	SK 56.9	GR 122.4

The Environment category is dominated by the red color, only one indicator is orange. All indicators have deteriorated compared to the previous year. Note that for this category, only the last indicator could be updated compared to the last edition of the Report. With no available data for 2012, the majority of data is from 2010. As a result it is difficult to describe Luxembourg's current situation.

In the Europe 2020 strategy, Luxembourg has set the objective to reduce greenhouse gas emissions by 20% in relation to 2005 levels by 2020. This ambitious goal requires huge efforts in the coming years.



<sup>19</sup> This indicator differs from the indicator chosen for the Europe 2020 strategy.

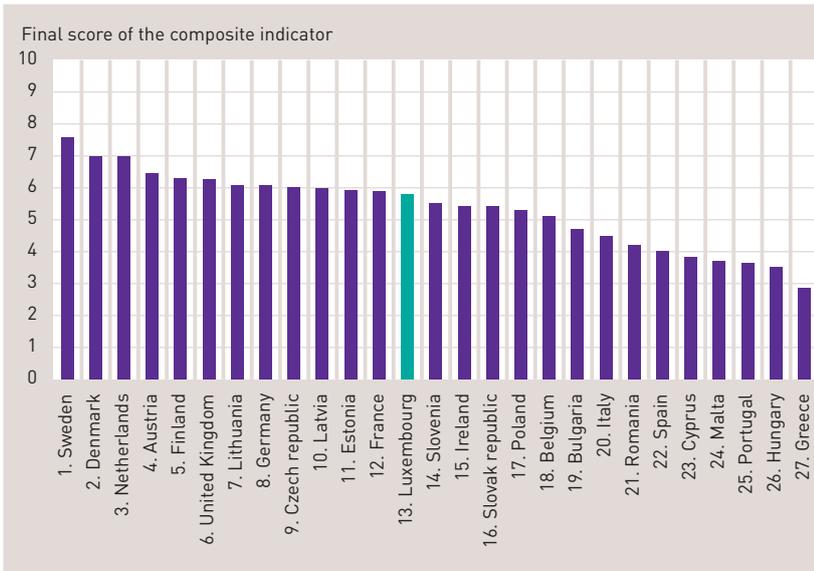
## 3.3 Competitiveness composite indicator

### 3.3.1 General Result

In 2012, Luxembourg is in 13th place and thus loses four positions compared to last year. In first place is Sweden, which has maintained its position compared to 2011. Germany (8th) and Belgium (18th) have lost one position each, while France (12th) has climbed one. Greece, Hungary, Portugal and Malta are ranked in the last positions. The biggest winner in the general ranking is Lithuania, which climbed from 15th to 7th position.

Luxembourg's 13th position is the worst since the development of the Competitiveness Scoreboard. The best position Luxembourg was able to reach over the period 2000-2012 is the 6th position in 2004 and 2005. At first glance, this observation is inconsistent with the finding that only 14 out of the 77 indicators are red (that is to say that the value of these indicators for Luxembourg is 20% worse or equal to the EU average), however, other countries placed behind Luxembourg in 2011 (Czech Republic, Estonia, Latvia, France and Lithuania) were able to further improve their performance and are now above Luxembourg. Slovenia, in 8th position in 2011, is now behind Luxembourg in 14th position. This underscores that it is a relative ranking, and so even if the performance of Luxembourg has improved in several areas, the relative position of Luxembourg has deteriorated because other countries have improved much more than Luxembourg.

Chart 2  
Final score of the composite indicator



Source: *Observatoire de la compétitivité*

As described earlier in this chapter, the positions of the six countries which are not OECD members (Bulgaria, Cyprus, Latvia, Lithuania, Malta and Romania) must be put into perspective because a number of Scoreboard indicators do not exist for these countries.

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 de politique économique N° 15*).

For some indicators, there are outliers. In particular, the indicator<sup>20</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  $i$  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  $t$  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.

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

<sup>20</sup> Technically, these indicators have been identified by the fact they have a high skewness and kurtosis.

Again it is useful to recall that from a methodological point of view, this ranking is constructed relatively, which means that Luxembourg's ranking also depends on the other countries' performance. Even if Luxembourg's performance is bad, it may be that other countries have deteriorated much more, so that the relative position of Luxembourg is better at the end. The ranking says nothing about Luxembourg's absolute performance.

In other words, an improvement in a country's ranking may be caused by a deterioration of the performance of other countries. That is why the *Observatoire de la compétitivité* always recommends that one's interpretations of the ranking be supplemented by information provided by the Scoreboard, i.e. the basic indicators.

Table 16  
Composite indicator results from 2000 to 2012

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Germany	10	9	14	16	16	15	8	11	8	11	7	7	8
Austria	8	7	10	7	7	8	7	7	7	7	6	6	4
Belgium	16	20	18	18	14	17	16	17	15	16	18	17	18
Bulgaria	25	25	24	22	19	19	26	23	14	20	21	21	19
Cyprus	18	17	19	25	20	20	21	16	18	15	20	22	23
Denmark	2	2	2	3	2	2	2	3	3	4	2	2	2
Spain	17	16	17	17	18	18	18	18	17	18	24	24	22
Estonia	9	11	7	5	9	7	6	8	10	14	10	11	11
Finland	3	3	3	4	3	4	4	4	5	5	4	5	5
France	11	12	15	12	12	14	15	13	12	12	12	13	12
Greece	21	19	23	19	22	25	20	21	23	23	27	27	27
Hungary	23	23	20	21	26	23	22	27	24	26	26	23	26
Ireland	6	6	6	8	11	12	12	10	13	10	15	14	15
Italy	19	21	21	20	21	21	23	19	21	17	16	19	20
Latvia	15	18	11	10	17	10	14	15	25	25	14	12	10
Lithuania	12	8	13	13	15	11	13	14	19	24	17	15	7
<b>Luxembourg</b>	<b>7</b>	<b>10</b>	<b>8</b>	<b>9</b>	<b>6</b>	<b>6</b>	<b>11</b>	<b>9</b>	<b>9</b>	<b>8</b>	<b>8</b>	<b>9</b>	<b>13</b>
Malta	20	26	26	24	27	24	25	24	26	27	25	25	24
Netherlands	5	4	4	6	5	5	3	2	2	3	3	3	3
Poland	26	27	27	26	24	27	24	22	22	13	19	16	17
Portugal	24	24	25	27	25	26	27	26	27	22	23	26	25
Romania	22	13	9	11	8	22	17	25	16	19	22	20	21
United Kingdom	4	5	5	2	4	3	5	5	4	2	5	4	6
Slovak Republic	27	22	22	23	23	16	19	20	20	21	13	18	16
Czech Republic	14	15	16	15	13	9	10	12	11	6	9	10	9
Slovenia	13	14	12	14	10	13	9	6	6	9	11	8	14
Sweden	1	1	1	1	1	1	1	1	1	1	1	1	1

Source: *Observatoire de la compétitivité*

### 3.3.2 Results per category

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.

Luxembourg is first in the Macroeconomic Performance category and in the top 10 EU countries for three other categories, namely the Institutional and Regulatory Framework, the Knowledge Economy and the Social Cohesion categories. Luxembourg has lost two positions compared to 2011 in the Productivity and Labour Costs and Market Operations categories, and one position in the Entrepreneurship, Education and Training, and the Knowledge Economy categories. Luxembourg has remained constant in other categories, which means it does not gain any positions in the ten categories compared to 2011.

Table 17  
Ranking by category in 2012

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

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.

In recent years, Luxembourg has improved its performance in the Education and Training (23 to 14) and Social Cohesion (13 to 5) categories, while the performance for the Environment category has remained poor. In the Employment category, Luxembourg's ranking has deteriorated between 2000 and 2008 before recovering thereafter. Although the performance of some indicators in this category was worse compared to 2000 (e.g. the rate of youth unemployment increased from 6.6% in 2000 to 18.0% in 2012), other countries have performed even worse. Other indicators in this category, such as the employment rate of older workers, have seen a marked improvement.

Luxembourg rankings in the Macroeconomic Performance and Knowledge Economy categories were fairly stable between 2000 and 2012.

The 23rd position in the Productivity and Labour Costs category should be interpreted with caution, as the ranking in this category is very volatile since the indicators depend strongly on the economic situation. Therefore the indicators will be reviewed regularly and can cause subsequent changes in the ranking. Nevertheless, one can observe a slow deterioration of Luxembourg's ranking in this category.

Table 18  
Ranking of Luxembourg by category between 2000 and 2012

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

Source: *Observatoire de la compétitivité*

### 3.3.3 The composite indicator stress test

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

The following table shows that in 76% of cases Luxembourg is in 13th place and in 11% of cases in 12th place. Luxembourg varies thus essentially in a range [12, 13]. We note that the position of Luxembourg varies much more than other countries according to the stress test: in 12% of cases Luxembourg is ranked between positions 8 and 11.

Table 19  
The 2012 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
Sweden	1	1.0	100																										
Denmark	2	2.5		49	51																								
Netherlands	3	2.5		51	49																								
Austria	4	4.2				85	14	1																					
Finland	5	5.0				13	75	11	1																				
United Kingdom	6	5.9				2	10	85	2	1																			
Lithuania	7	8.2					1	2	48	24	11	2	2	1	5	1					2								
Germany	8	7.9							43	33	14	10																	
Czech Republic	9	9.1						1	2	27	38	21	7	1	1														
Latvia	10	9.9							4	6	23	45	12	7	4														
Estonia	11	10.7								6	7	17	57	8	5														
France	12	11.7									4	2	18	71	5														
<b>Luxembourg</b>	<b>13</b>	<b>12.5</b>									<b>2</b>	<b>4</b>	<b>2</b>	<b>4</b>	<b>11</b>	<b>76</b>	<b>1</b>												
Slovenia	14	14.1													4	83	12	1											
Ireland	15	15.4														5	55	37	4										
Slovak Republic	16	15.5													1	8	33	54	4										
Poland	17	17.0														1		6	85	8									
Belgium	18	17.9																	8	92									
Bulgaria	19	19.1																			94	6							
Italy	20	20.0																		6	92	2							
Romania	21	21.1																			2	88	7	2					
Spain	22	22.1																				5	83	10	2				
Cyprus	23	23.1																				2	7	74	13	1	2		
Malta	24	24.0																				2	2	11	68	14	2		
Portugal	25	24.9																						4	12	76	8		
Hungary	26	25.8																							5	8	87		
Greece	27	27.0																											100

Source: *Observatoire de la compétitivité*

For 2011, the same test shows that Luxembourg varies essentially between the 8th and 10th position (see Table 20). The loss of four positions in 2012 compared to 2011 should be put into perspective, it is a loss of maximum 4 positions. In general, middle-ranking positions are likely to vary more than those at the top and at the bottom of the ranking, and an update of some indicators could strongly influence the final position of Luxembourg.

Table 20  
The 2011 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
			Sweden	1	1.0	100																							
Denmark	2	2.1		89	11																								
Netherlands	3	2.9		11	89																								
United Kingdom	4	4.2				80	20																						
Finland	5	4.8				20	77	2																					
Austria	6	6.0						2	98																				
Germany	7	7.2							85	11	5																		
Slovenia	8	8.5							7	60	17	10	7																
<b>Luxembourg</b>	<b>9</b>	<b>9.3</b>							<b>1</b>	<b>18</b>	<b>43</b>	<b>30</b>	<b>5</b>	<b>4</b>															
Czech Republic	10	9.6							5	7	27	52	5	2	1														
Estonia	11	10.8							2	5	7	4	67	12	4														
Latvia	12	12.1									1	5	13	55	15	11													
France	13	12.7										4	25	69	2														
Ireland	14	14.0											2	10	80	7	1												
Lithuania	15	15.1												1	6	85	2	1	5										
Poland	16	16.0														2	93	5											
Belgium	17	17.3														4	2	58	36										
Slovak Republic	18	17.5													1	2	1	36	58	1									
Italy	19	19.0																		1	96								
Romania	20	20.2																		2	81	12	2	2					
Bulgaria	21	21.1																		10	80	5	5	1					
Cyprus	22	22.1																		5	4	70	15	6					
Hungary	23	23.0																		2	4	13	49	32					
Spain	24	23.5																			1	10	27	61	1				
Malta	25	25.0																							1	92	7		
Portugal	26	25.9																									7	93	
Greece	27	27.0																											100

Source: *Observatoire de la compétitivité*

### Frame 3

#### Standardization of the ten categories and its influence on the final ranking

Luxembourg ranks 13th in the 2012 Scoreboard from *Observatoire de la compétitivité*. However, this position is not fixed, and depending on the methodology, the final ranking can change.

The following example in the Employment category shows the influence of the composite index standardization, which results in balancing the impact of the 10 categories on the final composite indicator. The country with the best category performance is assigned a score of 1, and a score of 0 is assigned to the country with the worst performance.

Category B Employment	Value before standardization	Value after standardization
Netherlands	0.88	1.00
Sweden	0.88	1.00
Germany	0.81	0.92
Denmark	0.78	0.88
United Kingdom	0.72	0.80
Finland	0.67	0.75
Austria	0.67	0.75
Estonia	0.62	0.68
Czech Republic	0.56	0.60
Cyprus	0.53	0.57
Luxembourg	0.52	0.56
France	0.47	0.50
Latvia	0.46	0.48
Lithuania	0.46	0.48
Belgium	0.44	0.46
Ireland	0.40	0.41
Romania	0.39	0.40
Portugal	0.39	0.40
Malta	0.37	0.38
Slovenia	0.37	0.38
Poland	0.35	0.35
Bulgaria	0.34	0.34
Slovak Republic	0.32	0.31
Italy	0.32	0.31
Hungary	0.28	0.27
Spain	0.22	0.19
Greece	0.07	0.00

This method was recommended by the external audit commissioned to the Joint Research Centre: “[...] A way to deal with this inconsistency between nominal and effective weights is to rescale the category scores using the min-max approach and then average them.”<sup>21</sup>

If the standardization of each category were not taken into account, Luxembourg would rank 8th in 2011 and 9th in 2012 in the final ranking.

<sup>21</sup> *Perspectives de politique économique* N°15: Luxembourg's Competitiveness Index: Analysis & Recommendations (page 39): [http://www.odc.public.lu/publications/perspectives/PPE\\_015.pdf](http://www.odc.public.lu/publications/perspectives/PPE_015.pdf)

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

The Competitiveness Scoreboard ranking is 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 2012 ranking does not remain fixed. Once all the data is available, the final ranking 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 21

**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
Competitiveness Report 2007	2	7	7	8	6	5	5						
Competitiveness Report 2008	5	7	5	8	6	7	6	9					
Competitiveness Report 2009	7	9	9	9	7	8	8	10	13				
Competitiveness Report 2010	6	11	9	9	8	6	8	9	11	9			
Competitiveness Report 2011	8	11	9	10	6	6	9	8	10	9	10		
Competitiveness Report 2012	6	10	10	9	6	6	11	9	9	6	8	11	
Competitiveness Report 2013	7	10	8	9	6	6	11	9	9	8	8	9	13

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. The composite indicator stress test published in the 2012 edition showed that “Luxembourg is ranked 9th in 1% of cases, 10th in 32% of cases, 11th in 66% of cases and 12th in 1% of cases. Luxembourg varies thus essentially in a range [10, 11].”<sup>22</sup>

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, and a revision of the indicators has a greater effect on the 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.

<sup>22</sup> Competitiveness Report 2012, page 91

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 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.

### 3.3.5 Future work - a necessary revision

After a decade, a revision of the list of Competitiveness Scoreboard indicators is becoming increasingly necessary, since the Scoreboard still nowadays includes Lisbon strategy indicators which were replaced at EU level by the Europe 2020 strategy indicators. Other indicators are simply not suitable due to the technological progress of society, as the percentage of households with Internet access at home, which is approaching 100% in many countries. In addition, the European scoreboard indicators for the macroeconomic imbalances procedure are still almost totally lacking in the current version of the Competitiveness Scoreboard.

This development and progression of the Scoreboard should be jointly organised by the ESC and the HCSD (Higher Council for Sustainable Development) as they are now closing the *PIBien-être*<sup>26</sup> project, which suggests a new system of indicators of well-being, measuring the progress of society in a long-term perspective and going beyond traditional indicators such as GDP per capita. The *PIBien-être* acts as a guide to public authorities in their choices and actions. Conclusions of this report state that, next to the measurement of well-being, "the Ministry of Sustainable Development and Infrastructure (MSDI) is responsible for developing a set of sustainable development indicators, and the *Observatoire de la compétitivité* is in charge of producing a set of competitiveness indicators."<sup>27</sup>

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

<sup>24</sup> *Perspectives de politique économique* N°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> The details of the changes are explained in Section 3.4 of the 2010 Competitiveness Report.

<sup>26</sup> For additional details: <http://www.ces.public.lu/fr/pibienetre/index.html>

<sup>27</sup> Excerpt from the Bis Technical Report: <http://www.ces.public.lu/fr/pibienetre/rapport-technique-bis.pdf>

## **4 The European semester within the framework of European economic governance**

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This chapter of the Report is aimed at monitoring Luxembourg's indicators and targets within the framework of the Europe 2020 strategy and the macroeconomic imbalances procedure MIP<sup>1</sup>, i.e. the first two pillars of the new European economic governance.

## 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 imbalances 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. In January 2013, following the publication by the Commission of its 2013 annual growth survey, the priorities of which have been validated by the European Council in March 2013, the third European Semester was launched. Then, in April 2013, Luxembourg sent its NRP and SGP to the European Commission<sup>2</sup>. Based on these two documents, the Commission published by the end of May its proposals for the 2013-2014 recommendations for each EU Member State.

<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 2013 NRP, submitted in April 2013 by the government to the European Commission within the framework of the 2013 European Semester.

<sup>2</sup> GOVERNMENT OF GRAND-DUCHY OF LUXEMBOURG, Programme national de réforme Luxembourg 2020, Luxembourg, April 2013. For additional details: [http://www.odc.public.lu/actualites/2013/04/PNR\\_Luxembourg\\_2020/index.html](http://www.odc.public.lu/actualites/2013/04/PNR_Luxembourg_2020/index.html)

Chart 1  
**Excerpts from the calendar of the “European Semester” and the “National Semester” in Luxembourg**

European Semester							
	Nov. t-1	January	February	March	April	May	June
European Commission	Annual Growth Survey					Proposals for country-specific recommendations (CSR)	
Council of Ministers and European Council			Discussions in the Council of Ministers and Spring European Council’s guidelines and priorities				Discussions on proposals and approval of CSRs by the European Council
Government		Macroeconomic forecast (STATEC)					Coordination of discussions on the CSRs proposals in the various committees in Brussels (Economic Policy Committee, etc.).
			Government revenue analysis and integration of the draft multiannual expenditure project for public investment and other public expenditures				
		Europe 2020 (NRP) interdepartmental network and Forecasting Committee (SGP) coordination					
					Government meeting and “State of the Nation” address		
					NRPs and SGPs (t+3) submission (by 30/04 at the latest)		
Chamber of Deputies		Consultation with the Chamber of Deputies about the NRP/SGP through the Economy, Foreign Trade and Solidarity Economy Commission (NRP) and the Finance and Budget Committee (SGP)					Debate in the Chamber of Deputies on CSR proposals
Social partners and civil society	Consultation with the social partners (e.g. Economic and Social Council) and civil society through thematic seminars, interviews, etc.						

National Semester					
	July	September	October	November	December
European Commission			Publication of an opinion on the t +1 draft annual budget of the Member States		
Council of Ministers and European Council	Adoption of CSRs by the Council of Ministers				
Government	CSRs implementation, especially through the bill on State’s revenue and expenditure budget for the year t +1				
			Draft annual budget t +1 submission  (by 15/10 at the latest)		Annual budget t +1 vote  (by 31/12 at the latest)
Chamber of Deputies			Discussions in the context of the vote on the bill on State’s revenue and expenditure budget for the year t +1		
Social partners and civil society	Consultation with the social partners (e.g. Economic and Social Council) and civil society through thematic seminars, interviews, etc.				

On the basis of the Commission's proposals and the discussions that followed in the various committees and formations of the Council of Ministers in Brussels, in July 2013 the Council finally adopted the 2013-2014 recommendations. This ended the European Semester.

Table 1  
Thematic distribution of proposals for country-specific recommendations (2013-2014)

	Public finances				Financial sector		Structural reforms					Employment and social policies					
	Sound public finances	Pension and healthcare systems	Fiscal framework	Taxation	Banking and access to finance	Housing market	Network industries	Competition in service sector	Public administration and smart regulation	R&D and innovation	Resource efficiency	Labour market participation	Active labour market policy	Wage setting mechanisms	Labour market segmentation	Education	Poverty and social inclusion
AT																	
BE																	
BG																	
CZ																	
DE																	
DK																	
EE																	
ES																	
FI																	
FR																	
HU																	
IT																	
LT																	
LU																	
LV																	
MT																	
NL																	
PL																	
RO																	
SE																	
SI																	
SK																	
UK																	

Note: Commission's recommendations presented on 29 May 2013 for 2013-2014. Cyprus, Greece, Ireland and Portugal should implement commitments under EU/IMF financial assistance programmes. More information at: [http://ec.europa.eu/europe2020/index\\_eu.htm](http://ec.europa.eu/europe2020/index_eu.htm)

Source: European Commission (May 2013)

In comparison with the recommendations of the previous year (2012), and with the reforms implemented since then by Luxembourg within the context of its NRP, it is noteworthy that in 2013 the Council has requested Luxembourg to strengthen the implemented reforms (in particular for components such as pensions, wage setting, etc.). Luxembourg also received a 6th recommendation with regard to taxation (corporate tax and VAT). During the next European Semester (2014) the Commission will assess how Luxembourg has implemented the 2013-2014 recommendations, which were issued in July 2013.

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

2011 European Semester for 2011-2012 <sup>3</sup>	2012 European Semester for 2012-2013 <sup>4</sup>	2013 European Semester for 2013-2014 <sup>5</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 aging; 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>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 sectoral 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>
<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)

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

<sup>3</sup> For additional details: <http://register.consilium.europa.eu/pdf/fr/11/st11/st11321-re02.fr11.pdf>

<sup>4</sup> For additional details: <http://register.consilium.europa.eu/pdf/fr/12/st11/st11263.fr12.pdf>

<sup>5</sup> For additional details: <http://register.consilium.europa.eu/pdf/en/13/st10/st10644-re01.en13.pdf>

Compared to the two previous years, what is new this year is that from 2013 onwards the European Semester formally spreads even more over the second semester for eurozone 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”)<sup>6</sup>. 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 annual budget (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.

## 4.2 Thematic coordination of structural policies

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

The Europe 2020 strategy<sup>7</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>8</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>9</sup>. 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>10</sup>. The June European Council<sup>11</sup> finally completed the development of the new Europe 2020 strategy.

<sup>6</sup> For additional details: [http://ec.europa.eu/enterprise/newsroom/cf/itemdetail.cfm?item\\_id=6662&tpa=0&tk=&lang=fr](http://ec.europa.eu/enterprise/newsroom/cf/itemdetail.cfm?item_id=6662&tpa=0&tk=&lang=fr)

<sup>7</sup> For additional information: [http://ec.europa.eu/eu2020/index\\_fr.htm](http://ec.europa.eu/eu2020/index_fr.htm)

<sup>8</sup> For additional information: [http://ec.europa.eu/archives/growthandjobs\\_2009/](http://ec.europa.eu/archives/growthandjobs_2009/)

<sup>9</sup> EUROPEAN COMMISSION, EUROPE 2020 - A strategy for smart, sustainable and inclusive growth, COM(2010) 2020, Brussels, 3.3.2010

<sup>10</sup> EUROPEAN COUNCIL, Conclusions, Brussels, March 2010  
For additional information: [http://www.consilium.europa.eu/uedocs/cms\\_data/docs/pressdata/fr/ec/113602.pdf](http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/fr/ec/113602.pdf)

<sup>11</sup> EUROPEAN COUNCIL, Conclusions, Brussels, June 2010  
For additional information: [http://www.consilium.europa.eu/uedocs/cms\\_data/docs/pressdata/fr/ec/115348.pdf](http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/fr/ec/115348.pdf)

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

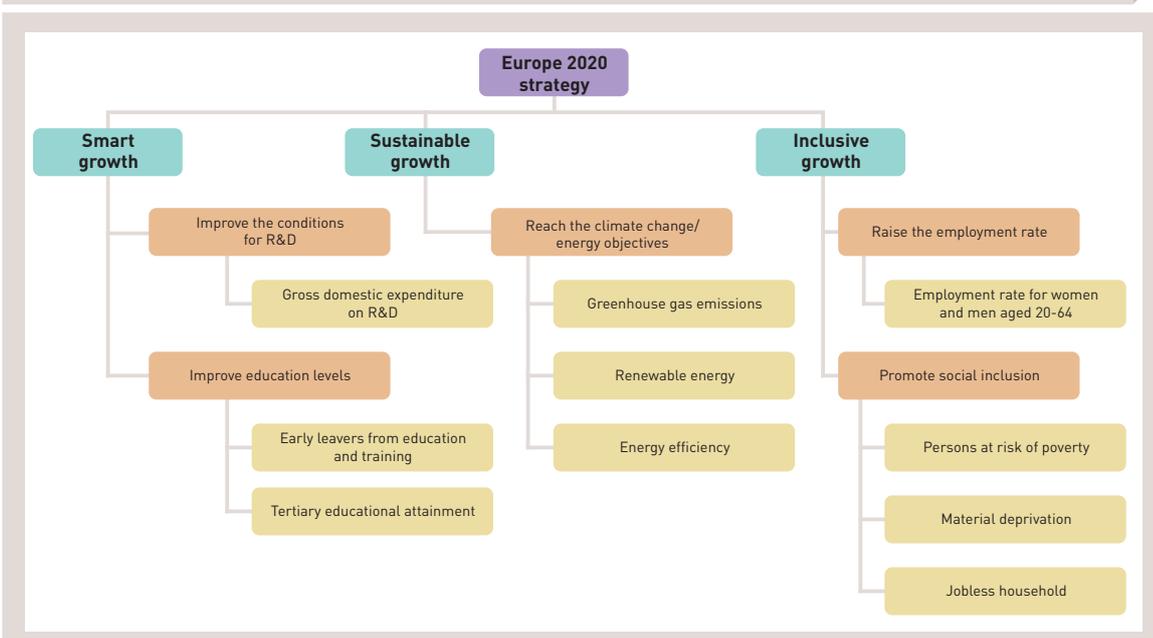
- ▼ *Aiming to raise to 75% the employment rate for women and men aged 20-64, including through the greater participation of young people, older workers and low-skilled workers and the better integration of legal migrants;*
- ▼ *improving the conditions for research and development, in particular with the aim of raising combined public and private investment levels in this sector to 3% of GDP; the Commission will elaborate an indicator reflecting R&D and innovation intensity;*
- ▼ *reducing greenhouse gas emissions by 20% compared to 1990 levels; increasing the share of renewables in final energy consumption to 20%; and moving towards a 20% increase in energy efficiency; the EU is committed to taking a decision to move to a 30% reduction by 2020 compared to 1990 levels as its conditional offer with a view to a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that developing countries contribute adequately according to their responsibilities and respective capabilities;*
- ▼ *improving education levels, in particular by aiming to reduce school drop-out rates to less than 10% and by increasing the share of 30-34 years old having completed tertiary or equivalent education to at least 40%;*
- ▼ *promoting social inclusion, in particular through the reduction of poverty, by aiming to lift at least 20 million people out of the risk of poverty and exclusion. The population is defined as the number of persons who are at risk-of-poverty and exclusion according to three indicators (at-risk-of poverty; material deprivation; jobless household), leaving Member States free to set their national targets on the basis of the most appropriate indicators.*

## 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.



Observation: Outline 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. Therefore in the context of Europe 2020, the major European objectives no longer apply uniformly to all Member States. 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 (2013 NRP)

		European objective 2020	Luxembourg target 2020
Priority 1 "smart growth"	Objective 1	"[...] raising combined public and private investment levels to 3% of GDP"	2.3 to 2.6% interval (2.0% for 2015)
	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% (...)"	- 20% <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"	14,06 % (2016 target) <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, 2013 NRP

Observations: 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 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, 30% of people aged 25-64 are graduates. In Luxembourg there is a strong disparity by country of birth. Among those born in Luxembourg, only 22% graduated from higher education, while this proportion is 40% among those born abroad. In neighbouring countries, the differences between these two populations are much less pronounced. Moreover, in these countries the proportion of graduates 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.

<sup>d</sup> In its first EEAP, under Directive 2006/32/EC, Luxembourg has set a 10.38% national indicative target for energy efficiency out of final energy by 2016. After a thorough analysis and assessment in 2011, in the context of the second EEAP preparation, the national indicative target by 2016 has been revised upwards to 14.06%. The targets for 2020 are set out in the Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EC and repealing Directives 2004/8/EC and 2006/32/EC. Luxembourg has begun work on the transposition and is currently analysing the various aspects of setting up an enforcement mechanism for energy efficiency.

Each country will have to meet its own national commitments in 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>12</sup> in order to be able to annually take stock of the state and determine if performances are going in the right direction. In the following pages the updated indicators for Luxembourg will be analysed in more detail and a descriptive overview<sup>13</sup> of its performance will be presented as well as a comparison between Luxembourg and its neighbouring countries<sup>14</sup>. Reference is made to the 2013 NRP for Luxembourg for more details on the measures implemented, in order to explain the evolution of the indicators.

#### Frame 1

#### The Europe 2020 strategy assessed by the World Economic Forum

In 2012 The World Economic Forum (WEF) carried out a performance evaluation of each EU Member State within the framework of the Europe 2020 strategy<sup>15</sup>, based on a composite index. This analysis shows that in 2012 Luxembourg is ranked 8th within the EU-27. Germany ranks 6th, Belgium 9th and France 10th. The WEF states the following observation for Luxembourg in the framework of the implementation of the Europe 2020 strategy: “Luxembourg, placed at 8th position, presents a competitiveness profile that can be regarded as in transition. With an economy largely driven by the financial sector, the country has embarked on a diversification strategy aimed at developing ICT and innovation as new sources of economic growth and employment. Overall, despite benefiting from very favourable conditions for business activity (3rd), the country still trails neighbouring countries in building a smart economy (10th).

The strong efforts to build a scientific and technological system are beginning to pay off with levels of scientific and technological production similar to the EU average, despite a shortage of available scientists and engineers in the economy (24th). However, the poor performance of the educational system (26th), both in terms of quantity and quality, is the main area of concern for transitioning towards a higher knowledge-based society. In terms of building an inclusive society (6th), the country has performed well. While the employment activity rate is low (20th) and some rigidities exist in the labour market, the industrial relations system scores quite high (5th) resulting in a fairly efficient labour market (8th). Moreover, the government has successfully achieved a reduction in poverty (3rd) and the presence of a strong social safety net (3rd) ensures that most of the population does not fall outside the system.”

<sup>12</sup> For additional details: [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)

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>13</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>14</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

<sup>15</sup> WEF, The Europe 2020 competitiveness report: building a more competitive Europe, Geneva, 2012  
For more details: <http://www.weforum.org/reports/europe-2020-competitiveness-report-building-more-competitive-europe>

Frame 1  
Continued

Economy	Rank 2012	Score	Rank 2010	Score	Change
Sweden	1	5.77	1	5.77	→
Finland	2	5.71	2	5.61	→
Denmark	3	5.60	3	5.52	→
Netherlands	4	5.46	4	5.34	→
Austria	5	5.33	6	5.25	↑
Germany	6	5.28	5	5.25	↓
United Kingdom	7	5.23	7	5.10	→
<b>Luxembourg</b>	<b>8</b>	<b>5.13</b>	<b>8</b>	<b>5.05</b>	→
Belgium	9	5.04	9	5.02	→
France	10	4.98	10	5.00	→
Estonia	11	4.74	13	4.67	↑
Ireland	12	4.66	11	4.71	↓
Slovenia	13	4.59	12	4.69	↓
Portugal	14	4.59	15	4.52	↑
Spain	15	4.52	16	4.50	↑
Czech Republic	16	4.49	14	4.54	↓
Cyprus	17	4.40	17	4.47	→
Malta	18	4.39	18	4.38	→
Latvia	19	4.36	21	4.20	↑
Lithuania	20	4.31	20	4.22	→
Italy	21	4.30	19	4.23	↓
Slovak Republic	22	4.13	22	4.17	→
Poland	23	4.08	23	4.06	→
Hungary	24	4.06	24	4.04	→
Greece	25	3.95	25	3.92	→
Romania	26	3.79	26	3.84	→
Bulgaria	27	3.76	27	3.79	→
<b>EU</b>		<b>4.94</b>		<b>4.88</b>	

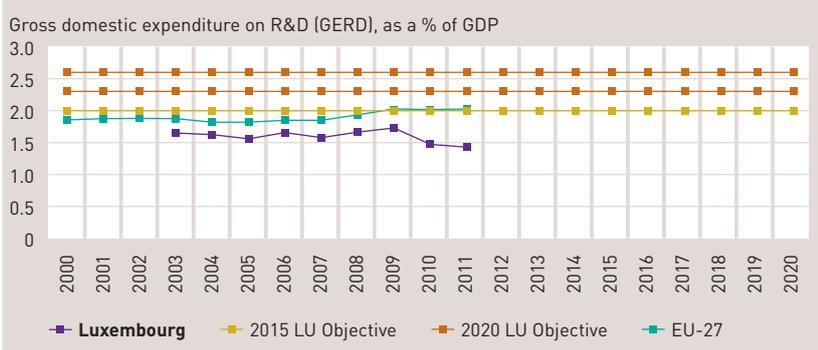
Source: WEF

## 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 spending target of 3% of GDP on R&D was set by the Barcelona European Council 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.

Chart 3  
**Gross domestic expenditure on R&D (GERD), as a % of GDP<sup>16</sup>**



Source: Eurostat

The EU-27 achieved a rate of 2.03% in 2011. At Member State level, Finland is the biggest investor in R&D (3.78% of GDP in 2011). Luxembourg has invested 1.4% of its GDP in R&D in 2011, and is therefore well below the EU average. The EU objective is to achieve a rate of 3% of GDP by 2020. Luxembourg has set in its NRP a target within a range of 2.3% to 2.6% of GDP to be achieved by 2020, with a share of 1.5 to 1.9% for the private sector and 0.7 to 0.8% of GDP for the public sector. Luxembourg still has to make significant efforts.

Frame 2  
**Analysis of the development of R&D expenditures in Luxembourg (2005-2012)**

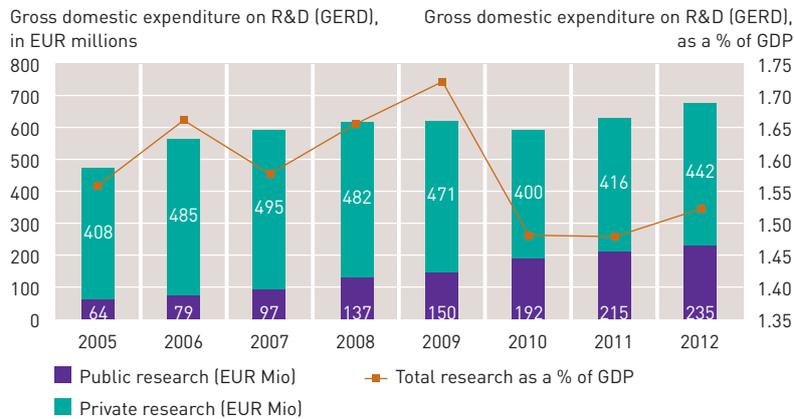
By carrying out a more detailed analysis of R&D expenditures in Luxembourg it can be seen that in Luxembourg R&D expenditures come mainly from the private sector. Indeed, about two thirds of the intensity of research in Luxembourg is funded by the private sector, and about one third by the public sector. Public research expenditure has increased steadily over the past few years to reach 235 million in 2012 (estimate). Private sector expenditure has more fluctuated during this period: it has increased from 408 million in 2005 to 482 million in 2008, and has subsequently declined at the beginning of the economic and financial crisis to reach 400 million in 2010. However according to STATEC forecasts, R&D expenditures are on the rise again in 2011 and 2012 compared to the lower threshold reached in 2010. By calculating the total R&D expenditure in Luxembourg from the public and private sectors, we can see

that between 2005 and 2009 these expenditures have steadily increased to reach 620 million in 2009, they then fell in 2010 to 591 million and, according to estimates, they have finally increased again from 2011 on to reach 677 million in 2012.

The Europe 2020 strategy's indicator for R&D expenditures is expressed as a percentage of GDP (nominal). By analysing this indicator more closely, we can see that the rate increased between 2005 (1.56%) and 2009 (1.72%) but fell sharply thereafter to 1.48% in 2010. A rate of 1.48% of GDP is expected for 2011 and 1.52% for 2012. It should be borne in mind that, for this indicator, although R&D expenditures in euro increase, GDP (denominator) also increases and these increases in R&D are partially hidden due to the relative nature of this indicator being expressed as a percentage of GDP (ratio).

<sup>16</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.

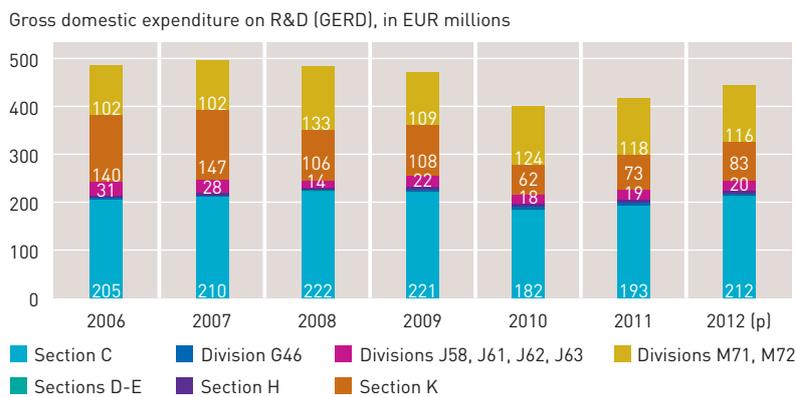
Frame 2  
Continued



Source: Public research (2013 NRP); private research (NRP 2013/STATEC)

Statec microdata from the CIS survey allow an even more in-depth analysis of private R&D expenditure. So, we can see for example that in Luxembourg:

- ▼ The manufacturing industry is the sector that most invests in R&D (about 48% of total private expenditure in 2012), and efforts in R&D are highly concentrated in this sector (the four major companies represent about 70% of this sector in 2012);
- ▼ The financial sector is also a significant player with about 19% of total R&D private expenditure (e.g. market research, software development, etc.);
- ▼ The manufacturing sector, whose R&D expenditures decreased significantly in 2010, is again on the rise and almost reached the pre-crisis level in 2012;
- ▼ R&D expenditures in the field of financial and insurance activities, though also rising again from the lower threshold reached in 2010, are still far from the performance experienced in the past. In this context, however, it is useful to remember that the measurement of innovation and R&D in the services sector<sup>17</sup> through indicators is currently a major challenge;
- ▼ In general, the lower current level of R&D private expenditure is mainly due to the lower level of expenditure in financial activities.



Source: STATEC CIS-R&D 2004-2010 surveys

Notes: C - Manufacturing / D - Electricity, gas, steam and air conditioning supply / E - Water supply, sewerage, waste management and remediation activities / G - Wholesale and retail trade; repair of motor vehicles and motorcycles / H - Transportation and storage / J - Information and communication / K - Financial and insurance activities / M - Professional, scientific and technical activities

<sup>17</sup> MINISTRY OF ECONOMY AND FOREIGN TRADE Understand, measure & promote service innovation in Luxembourg, Perspectives de politique économique, n°21, Luxembourg, May 2012. For more details: [http://www.odc.public.lu/publications/perspectives/PPE\\_021.pdf](http://www.odc.public.lu/publications/perspectives/PPE_021.pdf)

## Frame 2 Continued

These “macroeconomic” statistics are consistent with the positive trend in State aid for R&D by the Ministry of Economy and Foreign Trade for 2011 and 2012<sup>18</sup>. For the 2008 to 2012 period, with regard to the level of aid schemes of the 5 June 2009 Act on research, development and innovation (RDI) promotion, the caseload number has risen more than threefold, RDI expenditures of firms have increased by 62%, and the support of the Ministry has almost doubled. Between 2009 and 2012 the aid scheme for young innovative enterprises has supported a total financing requirement of about 42 million from 18 start-up companies with a total aid of

more than 12 million. Altogether, 298 RDI projects that represent a total expenditure of nearly 502 million envisaged by the companies have benefited from a public commitment of up to 179 million maximum, over the 2008-2012 period. For the entire 2008-2012 period the Ministry prompted 437 new investment projects or expenditure on infrastructure and production equipment, on RDI projects or on environmental projects. These projects represent a total business expenditure estimated at more than 1.06 billion and they benefit in all from a State support of up to 251 million.

## a.2 Improving education levels

Investments in human resources, along with those into R&D, are essential for the development of knowledge and new technologies. As the objective of the Europe 2020 strategy is a smart and inclusive growth, two targets are set for education and training. In general, the evolution of these two indicators is determined by demographic and social changes, as well as by policy and institutional reforms, and should therefore not be influenced by cyclical fluctuations.

### a.2.1 Early school leavers

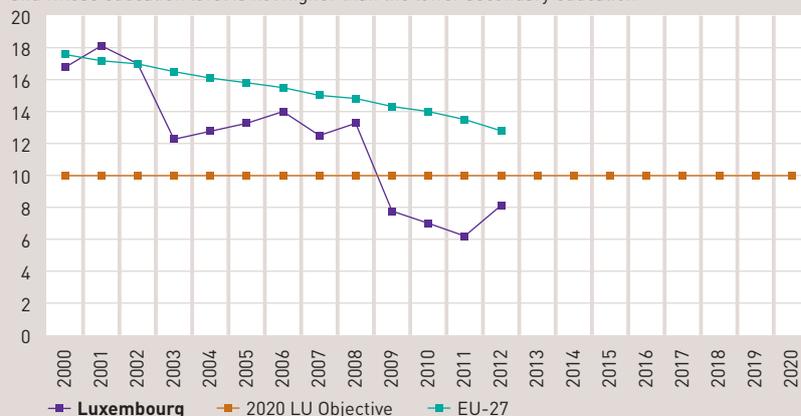
The EU-27 shows an average early school-leaving rate<sup>19</sup> of 12.8% in 2012. Within the EU, Slovenia has the lowest rate in 2012 with 4.4%, which is. According to this Eurostat indicator Luxembourg has a rate of 8.1% in 2012, and thus performs better than the EU-27 average in 2012.

<sup>18</sup> For more details: <http://www.statistiques.public.lu/fr/actualites/entreprises/entreprises/2013/02/20130218/index.html>

<sup>19</sup> Definition: From 20 November 2009, this indicator is based on annual averages of quarterly data instead of one unique reference quarter in spring. See footnotes for further details. 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.

Chart 4  
Persons who left education and training prematurely

Percentage of the population aged 18-24 that do not study nor follow any training and whose education level is not higher than the lower secondary education



Source: Eurostat

However, these statistics resulting from Eurostat's Labour Force Survey (LFS) are, for Luxembourg, prone to annual variations due to the limited size of the sample surveyed. The Ministry of Education and Vocational Training (MENFP) has set up its own national survey on early school leaving. It appears, however, that according to these two indicators early school leaving in Luxembourg is declining.

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

Study (n°)	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%

Source: MENFP

Definitions: 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 (MENFP) not available for 2004/2005

The EU objective is an early school-leaving rate of less than 10% in 2020. Luxembourg endorses this objective and has set a national target to keep the early school-leaving rate permanently below 10% and decided that the national target would be adapted if the early school-leaving rate stabilized for the long term below 10% by 2015<sup>20</sup>. Currently, Luxembourg has already achieved this 2020 target, according to both the Eurostat school leaving indicator and the MENFP national indicator.

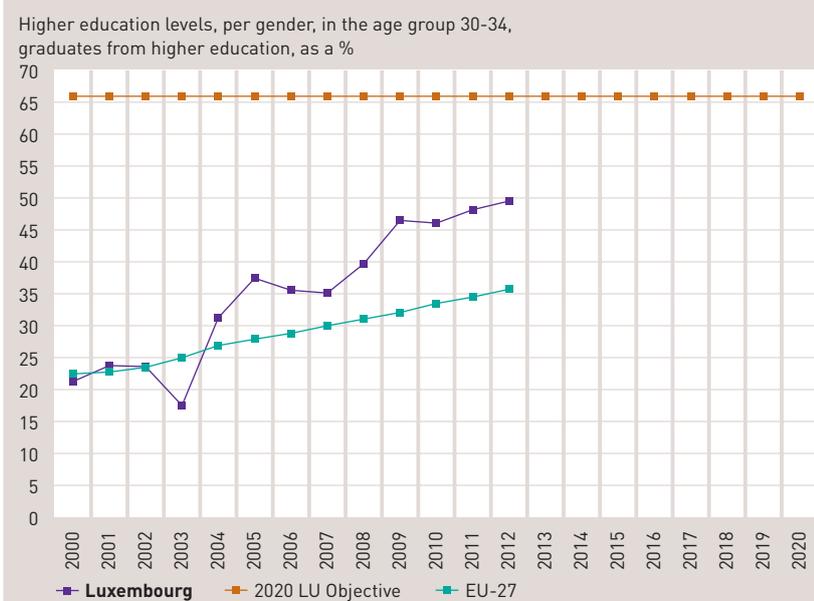
<sup>20</sup> Measuring instrument: national study on early school leaving MENFP.

## a.2.2 Share of higher education graduates

In 2012 the EU-27 has an average rate of higher education graduates (30-34 years old) of 35.8%. Ireland displays the highest rate with 51.1% in 2012. Luxembourg ranks 2nd with a rate of 49.6% and therefore clearly outperforms the average performance of the EU.

Chart 5

### Higher education levels in the age group 30-34<sup>21</sup>



Source: Eurostat

The overall EU objective is 40% by 2020. In its 2012 NRP Luxembourg set a rate of 66% for its higher education graduates. Since 2000 Luxembourg has experienced a significant increase of people with higher education levels, from 21.2% to 49.6% in 2012.

However this indicator, resulting also from the Labour Force Survey (LFS), is again not fully representative for Luxembourg since on the one hand it includes foreign graduates who are living and working in Luxembourg, and on the other hand it can neither capture people from Luxembourg who graduated abroad and are working abroad nor the cross-border workers. According to the 2012 NRP the real rate of higher education graduates among people of Luxembourg is lower than that of foreign residents. So it is necessary to also follow indicators that distinguish people who attended Luxembourg schools in order to assess the quality of the national education system. Luxembourg wishes in fact this indicator provide information on the Luxembourg national education system's ability to make young people able to successfully complete higher education, rather than reflecting the labour market's skills needs.<sup>22</sup>

<sup>21</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.

<sup>22</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.

## 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>23</sup>

#### b.1.1 Greenhouse gas emissions

In 2011 the EU-27 was at a level of 83 (base 100=1990), meaning it has reduced its emissions by about 17% since 1990, but has not yet achieved its goal of reducing emissions by 20% compared to 1990 (index 80). In 2011 Luxembourg is at an index level of 100.22 compared to 1990.

According to the 2013 NRP, Luxembourg's latest emissions inventory covers the period 1990-2011<sup>24</sup>. It shows for 2011 total emissions of 12.1 million tonnes of CO<sub>2</sub> equivalent (Mt CO<sub>2</sub>e) (excluding international air transport and emissions from land use, land-use change and forestry - LULUCF)<sup>25</sup>, some 150,000 tonnes of CO<sub>2</sub>e less than in 2010. Compared to 2005, emissions have actually decreased 1 Mt CO<sub>2</sub>e (down 7.6%). Only in 2009, a year particularly marked by the effects of the financial and economic crisis, lower emission levels were achieved (11.7 Mt CO<sub>2</sub>e). Despite the significant decline since 2005, emissions are still above and beyond the 9.5 Mt CO<sub>2</sub>e that Luxembourg is committed to achieve under the Kyoto Protocol<sup>26</sup>. Therefore, Luxembourg uses external carbon credits provided under this Protocol - the flexible mechanisms - but in much smaller proportions than previously estimated.

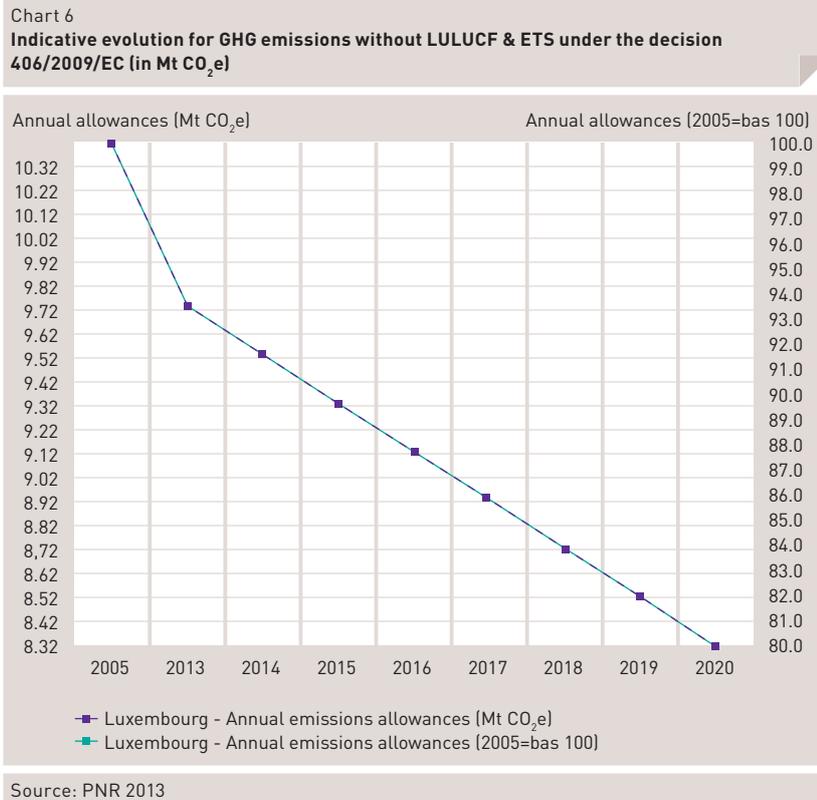
<sup>23</sup> See EU Directive 2006/32/EC. The reduction in energy consumption is a policy objective endorsed by the Member States in their Energy efficiency action plan.

<sup>24</sup> In accordance with decision No 280/2004/EC of the European Parliament and of the 11 February 2004 Council concerning a mechanism for monitoring greenhouse gas emissions in the Community and implementing the Kyoto Protocol, the estimate of GHG emissions for a year X shall be forwarded to the Commission by the 15 January of the year X+2.

<sup>25</sup> According to the 2013 NRP, a first estimate of emissions for the year 2012 will be sent to the Commission through the European Environment Agency in the summer of 2013.

<sup>26</sup> In 2011, GHG emissions were 8.1% lower than in the base year (1990). However, Luxembourg had set a 28% reduction target in emissions compared to the base year by the end of the period covered by the Protocol, i.e. the end of 2012.

For the 2013-2020 post-Kyoto period, only non-ETS sectors are subject to Member States' objectives. For Luxembourg, the target of reducing non-ETS emissions amounts to -20% by 2020 compared to the level of 2005.

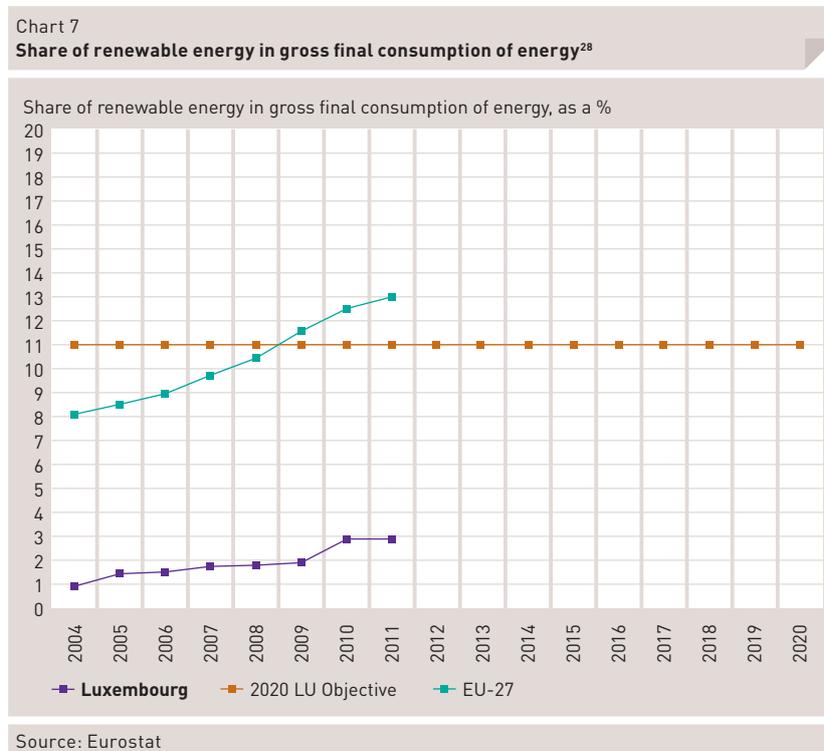


Luxembourg will therefore be allowed to emit approximately 8,325 Mt CO<sub>2</sub> that year<sup>27</sup>. Between 2013 and 2019, interim targets must be met along a linear path, the starting point of which, in 2013, consists of the average value of non-ETS emissions during the years 2008-2010. In the 2013 NRP Luxembourg estimates that, without additional measures, the deficit to be overcome for the 2013-2020 period could reach up to 12 million tonnes of CO<sub>2</sub>e using the most conservative assumptions for the forecasting of Luxembourg emissions by 2020. Over this eight-year period, the use of external credits will continue to be necessary but the volumes considered will nevertheless be lower than for the Kyoto phase.

<sup>27</sup> Regardless of the adjustment as provided for by the Article 10 of Decision No 406/2009/EC, whose calculation is being finalised at European level.

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

In 2011, the share of renewable energy in gross final consumption of energy averaged about 13% in the EU-27. In 2011 this proportion was the highest in Sweden with 46.8%. Luxembourg had a rate of 2.9% and was therefore well below the European average.

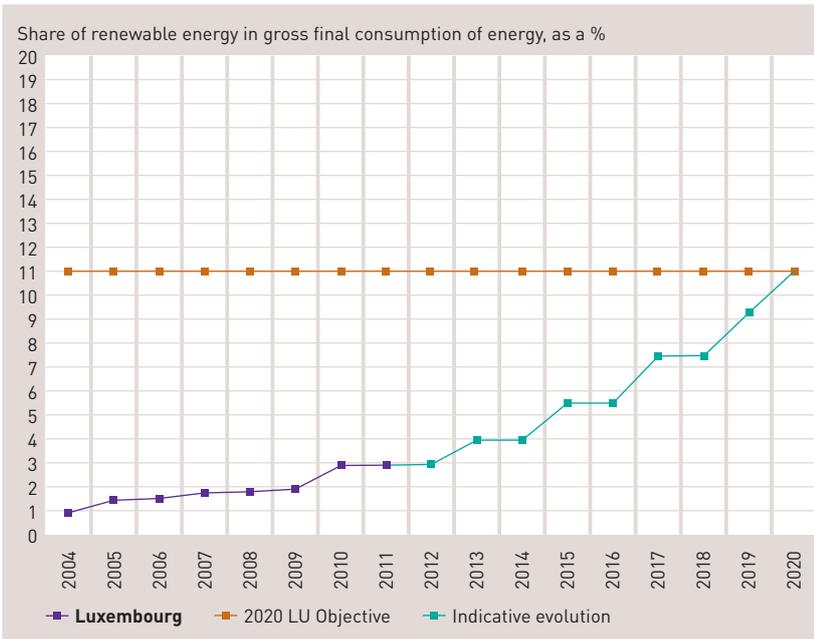


As a target, the EU has set the share of renewable energy to 20% by 2020. In this context, Luxembourg has set an overall target of 11% share of renewable energy in final energy consumption<sup>29</sup> by 2020, with an interim target of 5.45% on average in 2015/2016. Therefore Luxembourg will have to face a major challenge in the coming years to achieve its intermediate target and the 2020 target.

<sup>28</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 [http://ec.europa.eu/energy/renewables/index\\_en.htm](http://ec.europa.eu/energy/renewables/index_en.htm)

<sup>29</sup> For more details on renewable energy production (22 July 2013): [http://www.eco.public.lu/salle\\_de\\_presse/com\\_presse\\_et\\_art\\_actu/2013/07/tarification\\_e\\_renouvelables/pdf.pdf](http://www.eco.public.lu/salle_de_presse/com_presse_et_art_actu/2013/07/tarification_e_renouvelables/pdf.pdf)

Chart 8  
**Indicative evolution for the share of energy from renewable sources in final energy consumption (as a %)**



Source: Eurostat (2004-2011) / PNR 2013 (trajectoire 2012-2020)

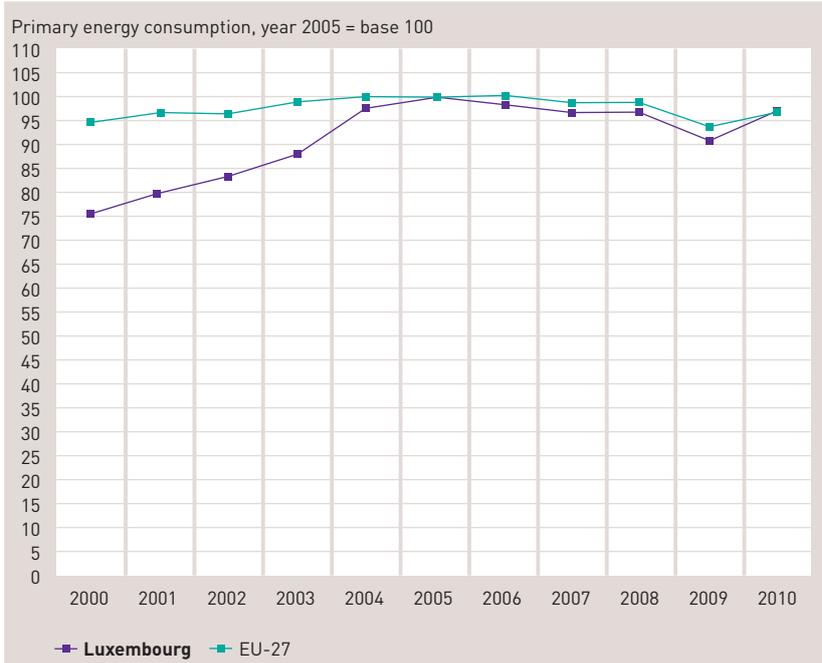
### b.1.3 Energy efficiency

During the first 2011 European semester, with a view to making comparisons between Member States with regard to energy efficiency, Eurostat still had to use a proxy indicator since the monitoring indicator was still under construction by the statisticians. So, at the time it was still a measure of the energy intensity of the economy, i.e. the energy needed to create EUR 1000 worth of wealth. Since the 2012 European Semester, Eurostat has used a new indicator, the “primary energy consumption in thousand tonnes of oil equivalent (Mtoe)”<sup>30</sup>. So, at this time, this indicator is still not providing information on energy efficiency as it only takes into account the volume of energy consumption (Mtoe), without connecting it to another variable in order to measure the energy efficiency per unit of energy consumed. An increase in energy consumption can for example be simply related to an increase in economic activity (GDP growth) and does not necessarily mean that energy efficiency has decreased. Therefore, at the present time, this indicator still does not provide information on energy efficiency gains, but simply measures energy consumption.

Until 2005 (base 100) primary energy consumption in Luxembourg increased, and then declined to a level of 96.9 in 2010. So, between 2005 and 2010, energy consumption dropped 3.1% in Luxembourg, bearing in mind that during the years 2008-2010 Luxembourg was hit hard by the economic and financial crisis, which resulted in a decrease in the economy’s energy consumption.

<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%.

Chart 9  
**Primary energy consumption between 1990 and 2010 (2005 = base 100)**



Source: Eurostat

The EU has set a target of a 20% increase in energy efficiency by 2020. After a thorough assessment within the context of the establishment of the second Energy Efficiency Action Plan (EEAP), Luxembourg has set its own national target for energy efficiency in end-use of energy at 14.06% by 2016<sup>31</sup>. The 2013 NRP states that Luxembourg has begun working on the transposition of the European Directive for the 2020 objectives.

## C. Inclusive growth

### c.1 Promoting employment

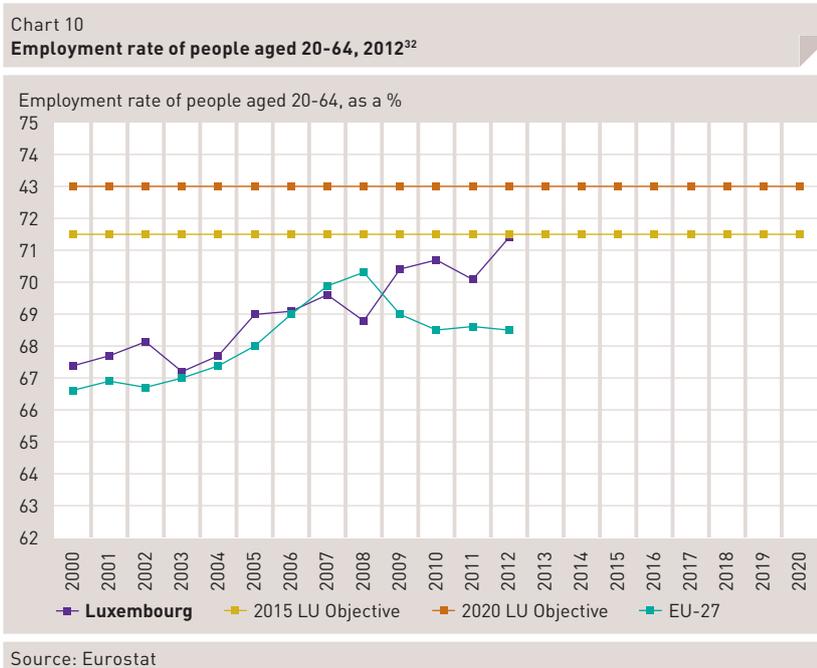
The Lisbon strategy (2000-2010) included a target related to employment policies, namely the employment rate. The new Europe 2020 target shows two major changes compared to the former Lisbon objective: firstly, the age range considered (20-64 for 2020 instead of 15-64 for 2010) in order to reduce potential 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.

<sup>31</sup> 2011: extensive analysis and assessment in the context of the establishment of the second EEAP.

In 2012 the EU-27 shows an average employment rate of 68.5%. Sweden has the highest employment rate, with 79.4%. Luxembourg has an employment rate of 71.4% in 2012, thus exceeding the EU average.

Luxembourg has set a national target of employment rate of 73% to be achieved by 2020, with an interim target of 71.5% by 2015. Since 2000 the employment rate is rising in Luxembourg, from 67.4% in 2000 to 71.4% in 2012. This development in the employment rate, an average of the resident workforce, somewhat hides important differences in rates depending on the category of workers observed. If we proceed to a narrower segmentation of the employment rate, for example according to gender or age of the worker, we can see that the employment rate fluctuates significantly. In fact, while the overall employment rate is 71.4% in 2012, that for men is approximately 78% for women about 64%, or for older people aged 60-64 about 22.7%, for instance. 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), 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”<sup>33</sup>. In contrast, the employment rate for young people, women and older workers is useful for understanding the use of human resources in the economy.

<sup>32</sup> Definition: The employment rate is calculated by dividing the number of individuals 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.

<sup>33</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>

## 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 for work further on social inclusion indicators, including also non-monetary indicators. In June 2010 the European Council decided to ensure that 20 million people at least no longer be faced with the risk of poverty and exclusion, and defined this population as the number of people at risk of poverty and exclusion according to three indicators, Member States being free to set their national targets on the basis of indicators they consider most appropriate among these:

- ▼ At-risk-of-poverty rate: people living on less than 60% of the national median income. The at-risk-of-poverty rate is the key indicator to measure and monitor poverty in the EU. This is a relative measure of poverty, linked to the income distribution, which takes into account all sources of monetary income, including market revenues and social transfers. It reflects the role of employment and social protection in the prevention and reduction of poverty;
- ▼ Material deprivation rate: people whose lives are severely limited by a lack of resources, experiencing at least four of the nine defined situations of deprivation<sup>34</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.

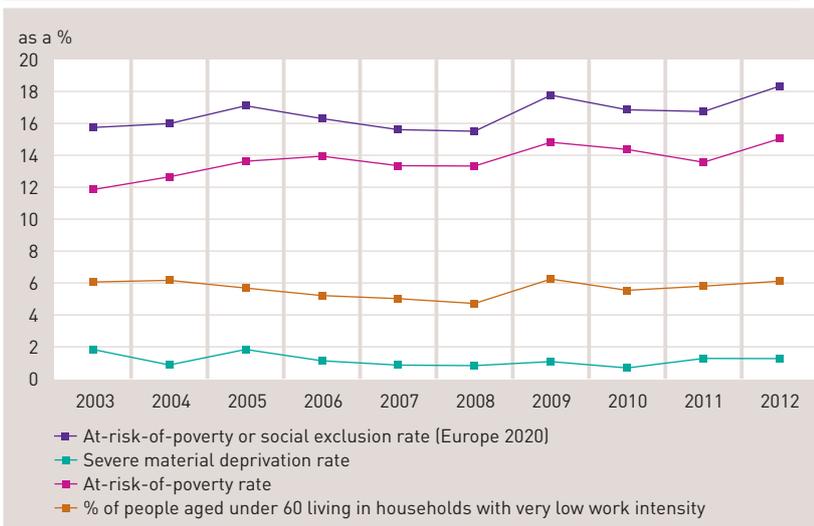
The risks that have an impact on the evolution of poverty indicators are related to macroeconomic developments, but also to the ability of employment policies to promote an inclusive labour market and employment opportunities for all and to the welfare system's capacity to improve efficiency and effectiveness 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 also mention in this context the service vouchers that are not taken into account.

<sup>34</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.

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.

By analysing this indicator, we find that in 2011, 24.2% of the total population in the EU-27 were at risk of poverty or social exclusion. In Luxembourg, the rate is 18.4% in 2012 and involves more than 95,000 people (16.8% or 84,000 people in 2011). Examining the intersections of the three sub-indicators reveals that the vast majority of people (80,800 people) at risk of poverty or social exclusion are excluded in only one of the three dimensions (risk of poverty, severe material deprivation or living in households with very low work intensity). The remaining 14,400 people, i.e. 3% of the total population, are in a situation of multiple exclusion, with at least two out of the three dimensions concerned.

Chart 11  
**At-risk-of-poverty or social exclusion rate (Europe 2020), at-risk-of-poverty rate, severe material deprivation rate and % of people living in households with very low work intensity, 2003-2012**



Source: STATEC (in collaboration with CEPS/INSTEAD), EU-SILC

By analysing separately the three underlying indicators for the year 2012, we can see that, regarding the indicator for people at-risk-of-poverty after social transfers, Luxembourg has a rate of 15.1% in 2012 (78,400 people); for the indicator of people experiencing severe material deprivation, Luxembourg has a rate of 1.3% (6,800 persons); concerning the indicator for people living in households with very low work intensity, Luxembourg has a rate of 6.1% (25,700 people).

## 4.2.3 Intermediate conclusions before the Annual growth report

Based on the Europe 2020 updated data we can see that Luxembourg:

- ▼ Must still make significant efforts in R&D;
- ▼ Is on the right path in terms of education;
- ▼ Must make significant efforts on climate change and in the field of energy;
- ▼ Is on the right track in terms of employment;
- ▼ And finally, must ensure to reduce the number of people at risk of poverty or exclusion.

Table 5  
Summary table of the Europe 2020 strategy objectives (July 2013)

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	Persons
LU *	1.43%	8.1%	49.6%	9.86	2.9%	n.d.	71.4%	95,200
Tendency **	-	+	+	+	+	+	+	-
2015 Objective	2.0%	n.d.	n.a.	n.a.	5.45%	14.06%***	71.5%	n.a.
2020 Objective	2.3-2.6%	<10%	66%	8.32****	11%	n.a.	73.0%	-6,000

Source: Eurostat / 2013 NRP

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

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

\*\*\* 2016 Interim objective

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

## 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 eurozone 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 eurozone. For example, public and private debt rose sharply in Greece, real estate bubbles were created in Spain and Ireland, and Italy, Spain, Portugal and Greece experienced significant losses in cost competitiveness<sup>35</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 eurozone 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 among Member States<sup>36</sup>. This legislative package on economic governance was finally voted by the European Parliament on 28 September 2011 and the European regulation entered into force in late 2011 before the beginning of the European Semester of last year (2012).

<sup>35</sup> MONETARY POLICY & THE ECONOMY, Prevention and Correction of Macroeconomic Imbalances: the Excessive Imbalances Procedure, Q4/2011

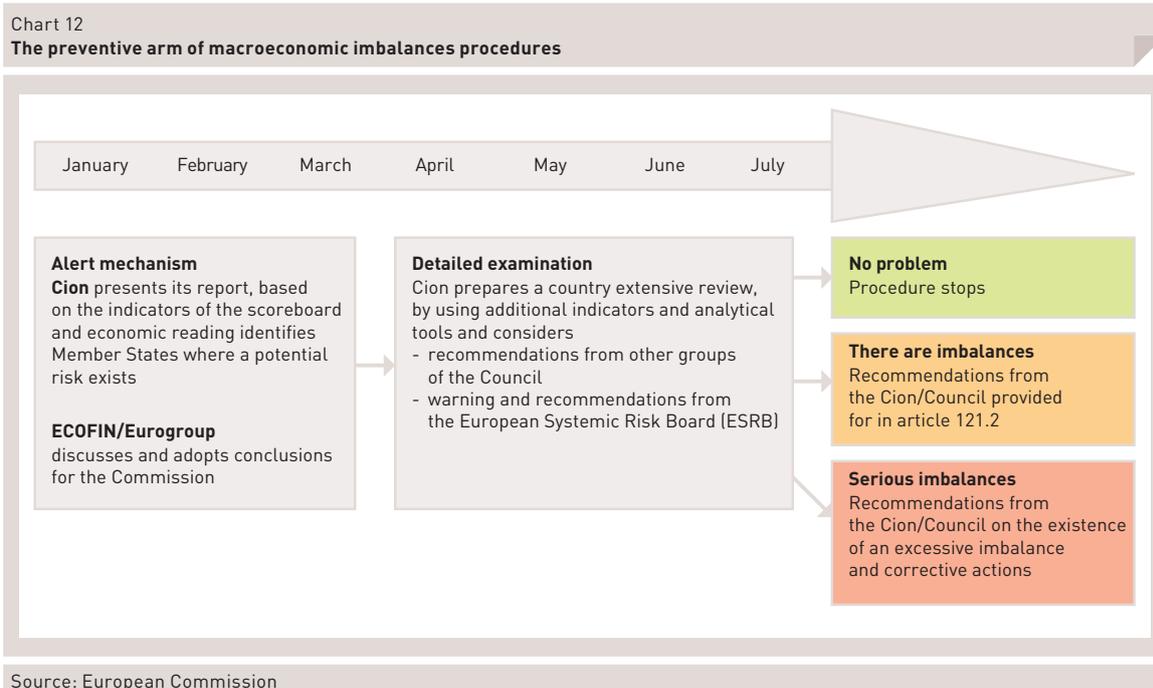
<sup>36</sup> Based on the two European regulations 1176/2011 and 1174/2011. For more details: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011R1176:EN:NOT>  
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011R1174:EN:NOT>

## 4.3.2 Macroeconomic imbalances monitoring 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>37</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.



<sup>37</sup> EUROPEAN COMMISSION, Alert Mechanism Report, Report prepared in accordance with Articles 3 and 4 of the Regulation on the prevention and correction of macroeconomic imbalances, Brussels, 14.2.2012 COM(2012)68 final

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>38</sup> and the data that are updated periodically during the year are published by Eurostat<sup>39</sup>.

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>40</sup>. This means that if a Member State exceeds a threshold, it could display a macroeconomic imbalance. 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>41</sup>.

<sup>38</sup> For more details:  
[http://ec.europa.eu/economy\\_finance/indicators/economic\\_reforms/eip/](http://ec.europa.eu/economy_finance/indicators/economic_reforms/eip/)

<sup>39</sup> For more details:  
[http://epp.eurostat.ec.europa.eu/portal/page/portal/excessive\\_imbalance\\_procedure/imbalance\\_scoreboard](http://epp.eurostat.ec.europa.eu/portal/page/portal/excessive_imbalance_procedure/imbalance_scoreboard)

<sup>40</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>41</sup> CENTRE FOR EUROPEAN POLICY STUDIES, Macroeconomic Imbalances in the Euro Area: symptom or cause of the crisis?, Policy Brief n°266, April 2012

Table 6  
AMR scoreboard Indicators and thresholds (November 2012)

External imbalances and competitiveness						
<b>Indicator</b>	3-year average of <b>current account balance</b> as a % of GDP	<b>Net International Investment Position</b> as a % of GDP	% change (3 years) of <b>Real Effective Exchange Rate</b> , HICP deflators relative to 35 industrial countries (a)	% change (5 years) in <b>export market shares</b>	% change (3 years) in <b>nominal unit labour cost</b> (b)	
<b>Data source</b>	EUROSTAT (Balance of Payments statistics)	EUROSTAT (Balance of Payments statistics)	DG ECFIN (data base Price and Cost competitiveness)	EUROSTAT (Balance of Payments statistics)	EUROSTAT (National Account)	
<b>Indicative thresholds</b>	-4/+6 % Lower quartile (also used as a reference for upper threshold)	-35 % Lower quartile	+/-5 % for € A +/-11 % non € A Lower and Upper Quartiles of EA -/+ s.d. of EA	-6 % Lower quartile	+9 % € A +12 % non € A Upper Quartile € A +3 %	
<b>Period for calculating thresholds</b>	1970-2007	First available year (mid 1990s) -2007	1995-2007	1995-2007	1995-2007	
<b>Some Additional indicators to be used in economic reading</b>	Net lending/ borrowing vis-à-vis ROW (CA+KA) as % of GDP	Net External Debt as % GDP	Real effective exchange rate vis-à-vis rest of the euro area	Export market shares based on volumes of goods; Labour productivity; Trend TFP growth	Nominal unit labour costs (changes over 1, 5, 10 years); Effective unit labour cost relative to the rest of the euro area	
Internal imbalances						
<b>Indicator</b>	y-o-y % change in <b>deflated house prices</b> (c)	<b>private sector credit flow</b> as % of GDP (d), (e)	<b>unemployment rate</b> - 3-year average	<b>private sector debt</b> as % of GDP (d), (e)	<b>general government debt</b> as % of GDP (f)	y-o-y % change in <b>Total Financial Sector Liabilities</b> , non-consolidated data
<b>Data source</b>	EUROSTAT	EUROSTAT (National Accounts)	EUROSTAT (Labour Force Survey)	EUROSTAT (National Accounts)	EUROSTAT (EDP - treaty definition)	EUROSTAT (National Accounts)
<b>Indicative thresholds</b>	+6 % Upper quartile	+15 % Upper Quartile	+10 %	160 % Upper Quartile	+60 %	+16.5 %
<b>Period for calculating thresholds</b>	First year available-2007	1995-2007	1994-2007	1994-2007		1991-2007
<b>Some Additional indicators to be used in economic reading</b>	Real house price changes (cumulated over 3 years): Nominal house price index Value-added in residential construction	Change in private debt		Private sector debt based on consolidated data		Debt over equity ratio

Source: European Commission

Notes :

(a) for EU trading partners HICP is used while for non-EU trading partners, the deflator is based on a CPI close to the HICP in methodology;

(b) index providing ratio of nominal compensation per employee to real GDP per person employed;

(c) changes in house prices relative to the consumption deflator of EUROSTAT;

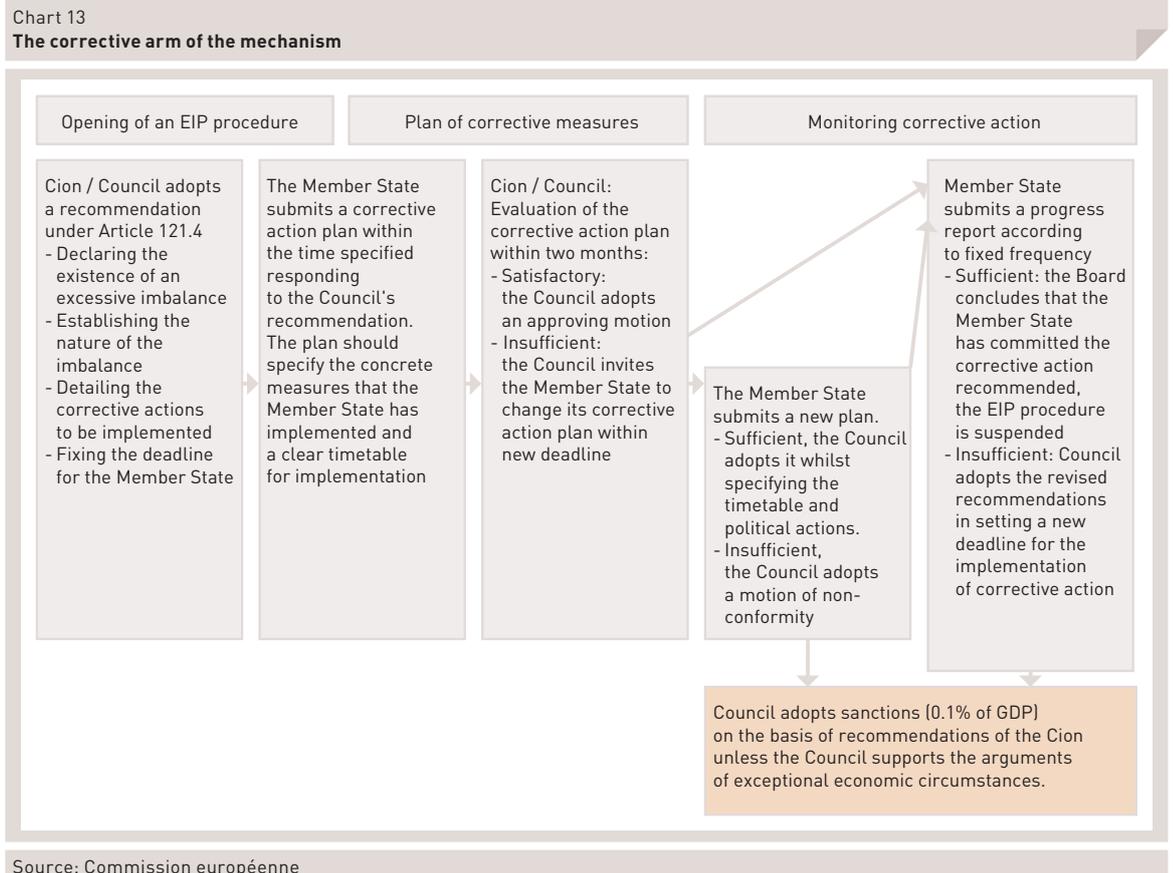
(d) private sector is defined as non-financial corporations; households and non-profit institutions serving households;

(e) sum of Loans, and Securities other than shares; liabilities, non-consolidated;

(f) the sustainability of public finances will *not* be assessed in the context of the MIP given that this issue is already covered by the SGP. However this indicator is part of the scoreboard because public indebtedness contributes to total indebtedness of the country and therefore to the overall vulnerability of the country.

## 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 2013 edition of the alert mechanism report

The second edition of the scoreboard was published in the alert mechanism report in November 2012 in the framework of the European Semester. In this second edition of the scoreboard Luxembourg exceeds four thresholds: the current account balance, the nominal unit labour cost, the private sector debt and the evolution of the overall export market shares. Regarding the overrun of the current account balance and the private sector debt thresholds, the European Commission is not too worried because these overruns are due first to an enormous concentration of the economic activities and secondly to corporate intra-group financing. On the other hand, the Commission emphasises that Luxembourg price competitiveness decreased as a result of a wage increase and a low productivity growth. Although Luxembourg has overrun 4 thresholds in the AMR scoreboard, no in-depth analysis has been requested for Luxembourg in the framework of the 2013 European Semester, and the macroeconomic imbalance procedure has therefore stopped:

"[...] Luxembourg was not identified as experiencing imbalances. In the updated scoreboard a number of indicators are above their indicative thresholds, namely the current account surplus, nominal unit labour cost, private sector debt and this time also the export market shares indicator. On the external side, the persistent large current account surplus, beyond the indicative threshold, is expected to be reduced in the coming years. It does not appear to be related to an excessively subdued domestic demand, but essentially results from the very high concentration of economic activities in Luxembourg, mainly in the financial sector, attracted by an overall favourable environment (including the tax system). While the current account surplus is unlikely to constitute a harmful imbalance for Luxembourg or its partners, it hides a constant deficit of the goods trade balance, which reflects losses in overall export market shares. At the same time Luxembourg keeps gaining export market shares in services. The evolution of nominal unit labour costs is the likely cause of the weak performance of trade in goods; indeed, the nominal unit labour costs has risen substantially faster than in the euro area since 2000 and more than five times faster than in Germany. Moreover, unit labour cost is expected to grow at a rate higher than the euro area average in the coming years, in spite of recent measures taken by the government on wages. High private sector indebtedness is mainly explained by large lending and borrowing operations inside international non-financial corporations, rather than an excessive indebtedness of the private sector. The household debt level is relatively contained and mainly related to real-estate loans. The growth rate of house prices, while recording a strong cumulated rise in the last decade, is now slowing down and mostly reflects the interplay between strong demand and limited supply. Finally, while the financial sector remains sound overall, the financial crisis appears to have dented its growth potential. Given its large size compared to the overall economy, a question arises regarding the impact of a less dynamic sector for employment and sustainability of public finances. Overall, the Commission will at this stage not carry out further in-depth analysis in the context of the MIP."

Table 7  
AMR scoreboard indicator results (November 2012 edition)

Year 2011	3 year average of Current Account Balance as % of GDP	Net International Investment Position as % of GDP	% Change (3 years) of Real Effective Exchange Rate with HICP deflators	% Change (5 years) in Export Market Share	% Change (3 years) in Nominal unit labour cost	% y-to-y change in deflated House Prices	Private Sector Credit Flow as % of GDP	Private Sector Debt as % of GDP	General Government Debt as % of GDP	Unemployment rate - 3-year average	y-to-y % change in Total Financial Sector Liabilities, non-consolidated data
Thresholds	-4/+6%	-35%	±5% & ±11%	-6%	+9% & +12%	+6%	15%	160%	60%	10%	16.5%
BE	-0.3	65.7	-0.5	-10.2	6.2	-0.1	11.6	236	98	7.8	4.7
BG	-3.4	-85.6	3.1	17.2	20.3	-9.0	-6.7	146	16	9.4	5.6
CZ	-3.0	-49.3	0.3	8.4	3.3	0.0	2.5	78	41	6.9	3.8
DK	5.0	24.5	-1.7	-16.9	4.7	-4.9	-2.2	238	47	7.0	4.7
DE	5.9	32.6	-3.9	-8.4	5.9	1.4	4.8	128	81	6.9	2.1
EE	2.8	-57.8	0.8	11.1	-6.2	3.3	6.8	133	6	14.4	-4.4
IE	0.0	-96.0	-9.1	-12.2	-12.8	-15.2	4.0	310	106	13.3	-0.6
EL	-10.4	-86.1	3.1	-18.7	4.1	-5.1	-5.5	125	171	13.2	-3.4
ES	-4.3	-91.7	-1.3	-7.6	-2.1	-10.0	-4.1	218	69	19.9	3.7
FR	-1.6	-15.9	-3.2	-11.2	6.0	3.8	4.0	160	86	9.6	7.3
IT	-2.9	-20.6	-2.1	-18.4	4.4	-2.0	2.6	129	121	8.2	3.8
CY	-8.4	-71.3	-0.9	-16.4	8.8	-8.5	16.1	288	71	6.6	-0.2
LV	3.1	-73.3	-0.6	23.6	-15.0	4.9	-2.5	125	42	18.1	-4.5
LT	0.0	-52.6	3.6	25.2	-8.4	2.4	-0.8	70	39	15.6	8.9
<b>LU</b>	<b>7.5</b>	<b>107.8</b>	<b>0.8</b>	<b>-10.1</b>	<b>12.5</b>	<b>1.5</b>	<b>2.5</b>	<b>326</b>	<b>18</b>	<b>4.8</b>	<b>11.3</b>
HU	0.6	-105.9	-3.3	-2.8	3.7	-4.1	6.4	167	81	10.7	-2.6
MT	-4.3	5.7	-3.0	11.7	5.8	-2.3	2.2	210	71	6.8	1.4
NL	7.5	35.5	-1.6	-8.2	5.8	-4.0	0.7	225	66	4.2	7.2
AT	2.2	-2.3	-1.0	-12.7	5.9	-8.0	4.1	161	72	4.4	-0.3
PL	-4.6	-63.5	-10.9	12.8	4.3	-5.7	7.1	80	56	9.2	4.4
PT	-9.1	-105.0	-1.9	-9.5	0.9	-3.6	-3.2	249	108	11.9	-0.7
RO	-4.3	-62.5	-2.4	22.8	12.9	-18.9	1.8	72	33	7.2	4.3
SI	-0.4	-41.2	-0.3	-6.1	8.3	1.0	1.9	128	47	7.1	-1.3
SK	-2.1	-64.4	4.3	20.9	4.4	-5.6	3.3	76	43	13.4	1.2
FI	0.6	13.1	-1.3	-22.9	9.1	-0.3	4.6	179	49	8.1	30.8
SE	6.6	-8.3	3.9	-11.6	1.2	1.0	6.3	232	38	8.1	3.6
UK	-2.2	-17.3	-7.1	-24.2	8.1	-5.4	1.0	205	85	7.8	8.5

Source: European Commission

Based on the alert mechanism<sup>42</sup> the Commission requested an in-depth analysis for fourteen Member States<sup>43</sup>. Each of these further analyses studied the origin, nature and severity of a possible macroeconomic imbalance. Following the in-depth analysis, the Commission concluded that there is no risk in twelve Member States and that only in two Member States, namely Spain and Slovenia, there is a risk but that it cannot be regarded as excessive. The corrective arm of the procedure has therefore not been initiated in 2013.

<sup>42</sup> For more details: [http://ec.europa.eu/europe2020/pdf/amreport2013\\_en.pdf](http://ec.europa.eu/europe2020/pdf/amreport2013_en.pdf)

<sup>43</sup> This concerns more particularly the following Member States: Belgium, Bulgaria, Denmark, Spain, France, Italy, Cyprus, Hungary, Malta, Netherlands, Slovenia, Finland, Sweden, United Kingdom. Member States that are implementing reforms under a financing plan are not affected by this procedure as they are already under surveillance. This is the case of Greece, Ireland, Portugal and Romania.

## 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 published data in the AMR scoreboard in November 2012. Therefore differences can occur between these results and those of the November 2012 scoreboard. The data used has been downloaded in early July 2013, and thus is an update halfway between the last Commission report (November 2012) and the one that will be published by the Commission in November 2013.

### 4.3.4.1 External and competitiveness imbalances

#### a. The current account balance<sup>44</sup>

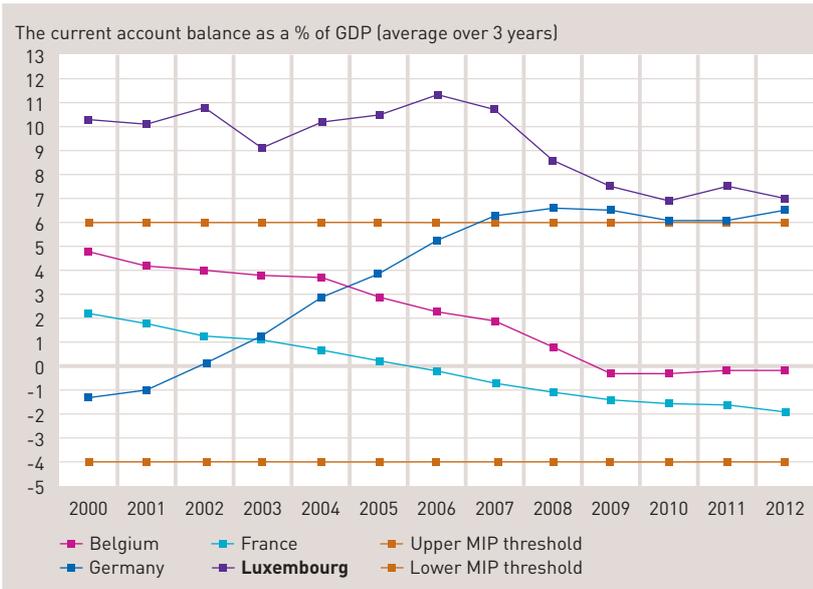
Regarding the current account balance, unlike a country financing need (negative balance), a financing capacity (positive balance) does not seem an evidence of imbalance since it doesn't threaten the sustainability of its external debt. For this indicator, it has been agreed under the MIP that a country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

Since 2000 Luxembourg exceeds the MIP's upper threshold, and therefore, in theory, has a "too high" current account balance, according to the MIP criteria. We also notice that in recent years the country is increasingly moving towards the limit value of this threshold. In Luxembourg only the services balance is in surplus. Financial services alone represent by far the greatest proportion of this surplus, although other business services, telecommunication services, transport services and insurance are also in surplus. On the contrary other partial balances are in deficit.

<sup>44</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 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 14  
**The current account balance, as a % of GDP (average over 3 years)**



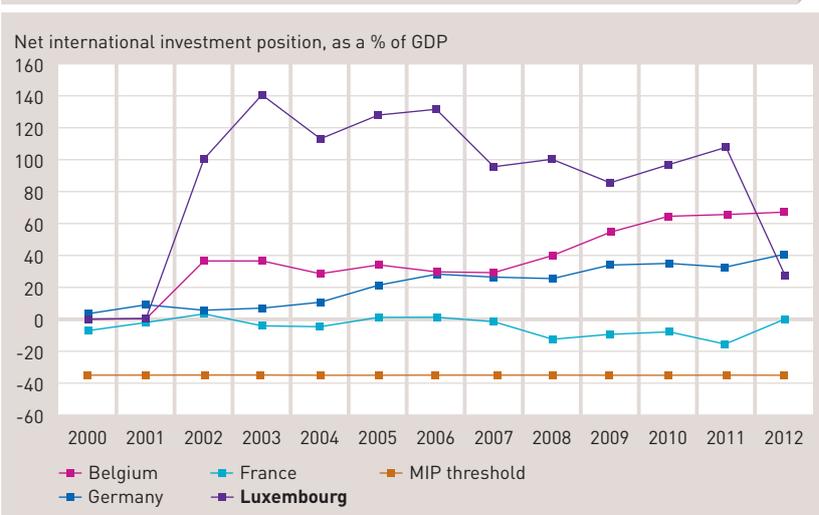
## b. Net international investment position<sup>45</sup>

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.

Given that the MIP sets the threshold at -35% of GDP, Luxembourg complies with the criteria with a positive balance (higher foreign assets than foreign liabilities). In this context, the situation of Luxembourg is peculiar within the EU for the size of the financial centre is very large compared to the size of the country, so that the external assets and liabilities are far beyond the national GDP.

<sup>45</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.

Chart 15  
**Net international investment position, as a % of GDP**



Source: Eurostat; orange bar = -35% threshold set by the MIP

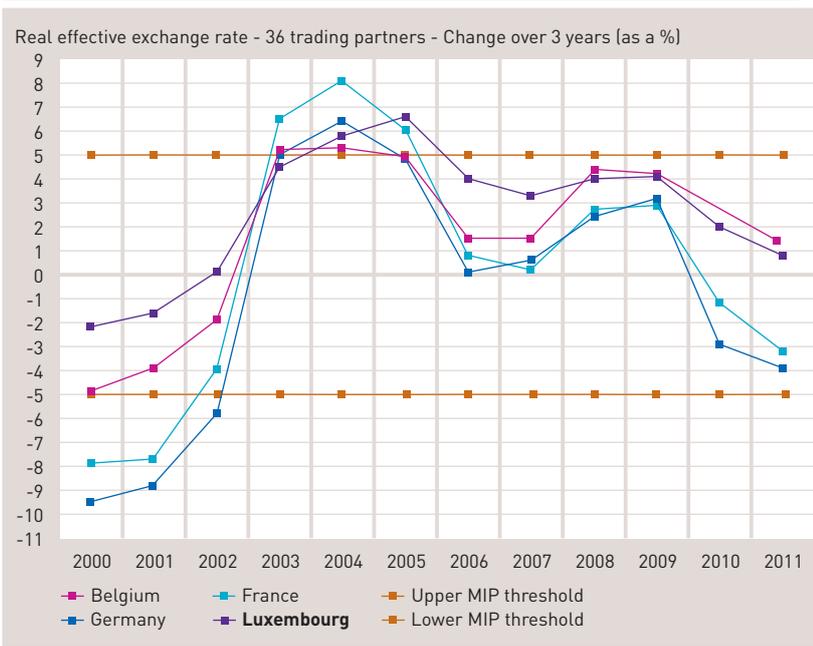
### c. The real effective exchange rate (REER)<sup>46</sup>

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 equivalent to a decline of competitiveness. The REER is constructed from currencies of major trading partners. For this indicator, it has been agreed under the MIP that a country is potentially at risk if the REER indicator is above + 5% or under -5% (for Member States of the eurozone).

In 2004 and 2005 Luxembourg, like its neighbours, had exceeded the upper threshold but between 2006 and 2011 it is again under the upper threshold.

<sup>46</sup> The REER (or “price and cost relative indicator”) aims to assess the price competitiveness or the cost competitiveness of a country (or of a currency area) 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 36 countries (i.e. EU-27 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 of 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.

Chart 16  
**The real effective exchange rate (36 trading partners, % change over 3 years)**



Source: Eurostat, orange bars, +/- 5% thresholds for eurozone States, +/- 11% for other States, set by the MIP

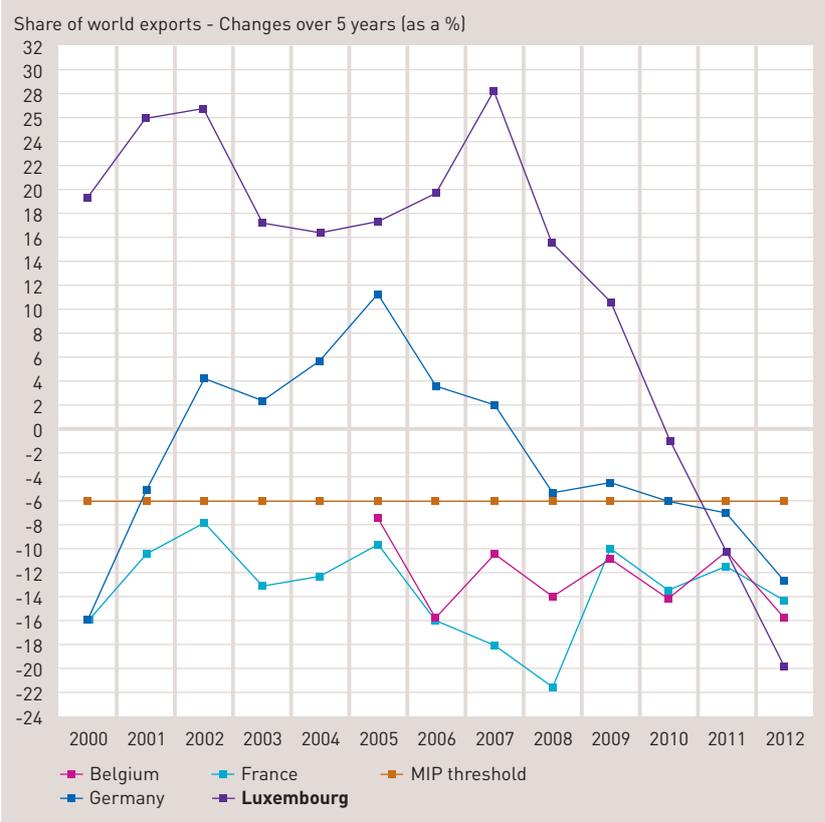
#### d. Share of world exports<sup>47</sup>

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%.

With important positive changes between 2000-2010, Luxembourg has fully respected the threshold fixed under the MIP. But since 2011 Luxembourg, like its neighbours, has lost market shares at global level, so that it no longer meets the MIP threshold.

<sup>47</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 27 EU Member States.

Chart 17  
Share of world exports (% change over 5 years)



Source: Eurostat, orange bar, -6% threshold set by the MIP

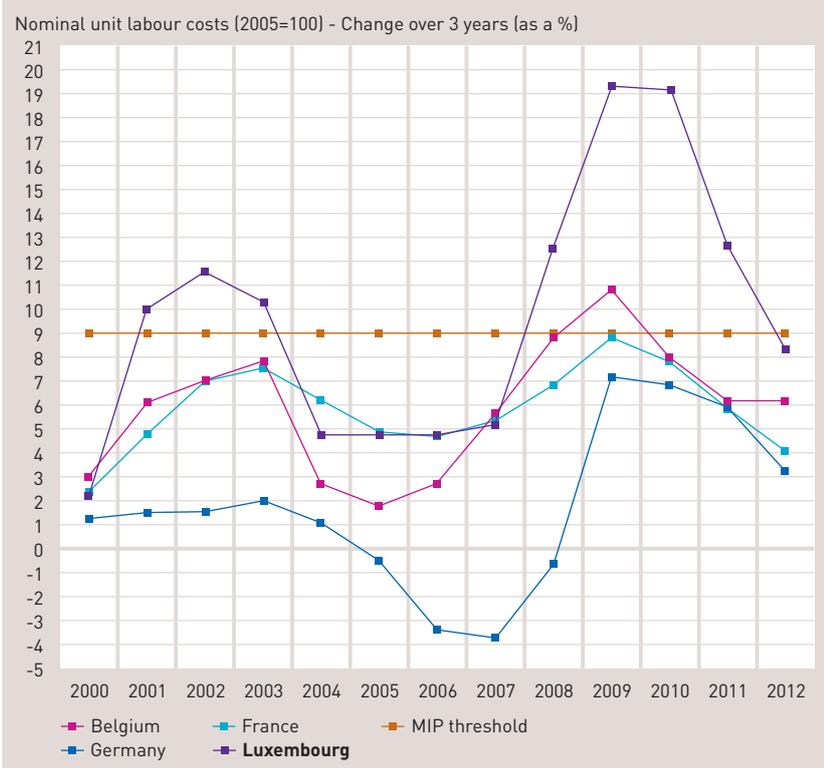
### e. Nominal unit labour costs<sup>48</sup>

The nominal unit labour costs (nominal ULC) is the indicator traditionally used to measure the cost-competitiveness of an economy. Within the scope of “cost”, we compare the domestic nominal unit labour costs, or the cost of labour per unit of value added produced, 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 under the MIP that a country is potentially at risk if this indicator is higher than +9%.

Luxembourg had exceeded the threshold in 2001-2003 and exceeds it again from 2008 on. The increase since 2008 is linked to the collapse of productivity in almost all sectors. This unfavourable evolution in Luxembourg may be explained by the larger weight of the financial sector in the Luxembourg economy, a sector which, by its large loss of productivity in recent years has greatly contributed to the increase of the ULC in Luxembourg. The same explanation applies to changes in the manufacturing sector, which has carried out major plans to safeguard jobs in the recent years of crisis.

<sup>48</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 2005 (CLV05) 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 ESA95 transmission programme. Data are expressed as a percentage change in indices between the year Y and the year Y-3.

Chart 18  
Nominal ULC - % change over 3 years



Source: Eurostat, orange bars = +9% threshold for eurozone States and +12% for other Member States, set by the MIP

#### 4.3.4.2 Internal imbalances

##### a. Housing prices<sup>49</sup>

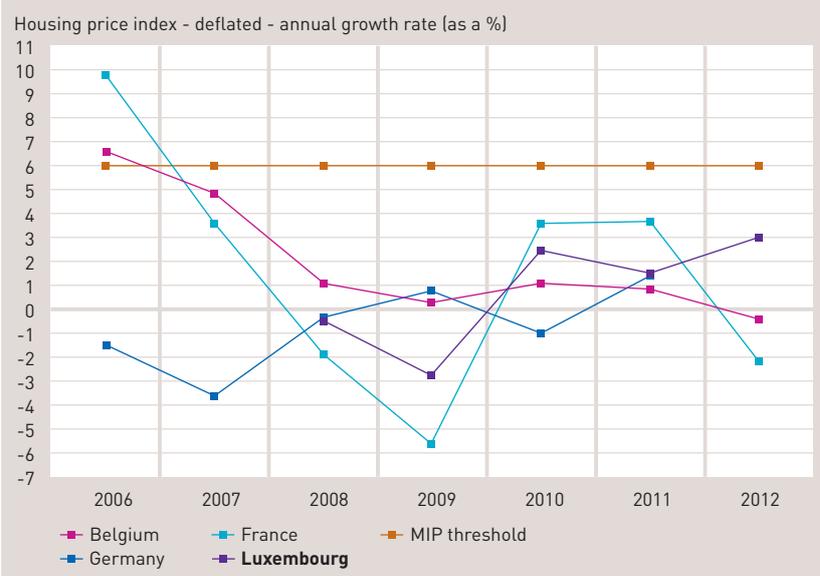
This indicator measures changes in the acquisition prices of real estate within the EU Member States to detect internal imbalances linked to a potential “housing bubble”. For this indicator, it has been agreed under the MIP that a country is potentially at risk if this indicator is higher than +6%.

Luxembourg does not exceed the set threshold limit. It is worth noting that for Luxembourg this indicator is only available since 2007-2008 and only measures the changes in the purchase price of apartments, but still provides a proxy for changes in house prices<sup>50</sup>.

<sup>49</sup> The deflated index of housing 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 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.

<sup>50</sup> The indicators are based on the official selling price stated in the deeds that are registered with the Administration of the Registration and Domains. In addition, the concerned indicators only measure “pure” price changes, since the differences in quality of apartments sold are neutralized (hedonic price index).

Chart 19  
**Deflated index of housing prices (% change over 1 year)**



Source: EUROSTAT, orange bar = +6% threshold set by the MIP

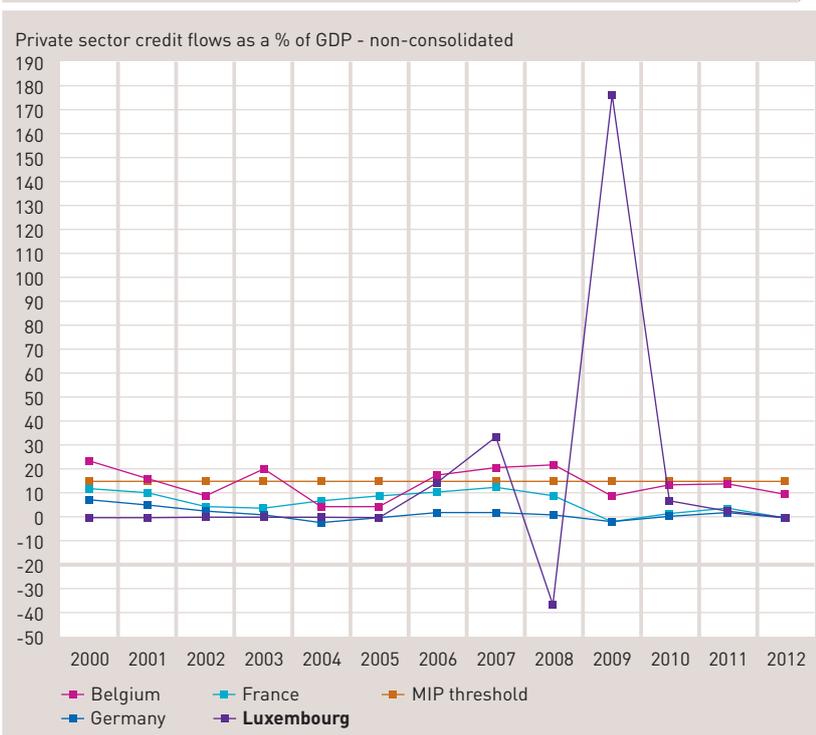
### b. The private sector credit flow<sup>51</sup>

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 that have been contracted during the year. For this indicator, it has been agreed under the MIP that a country is potentially at risk if this indicator is above +15%.

Generally, Luxembourg has met the threshold set by the MIP since 2000, even if in 2007 and 2009 the threshold was overrun twice. Since 2010 Luxembourg is below the limit again.

<sup>51</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 flows 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 ESA95. Data are expressed in EUR million and calculated on a non-consolidated basis, i.e. by including transactions among units of the same sector.

Chart 20  
Private sector credit flows (as a % of GDP)

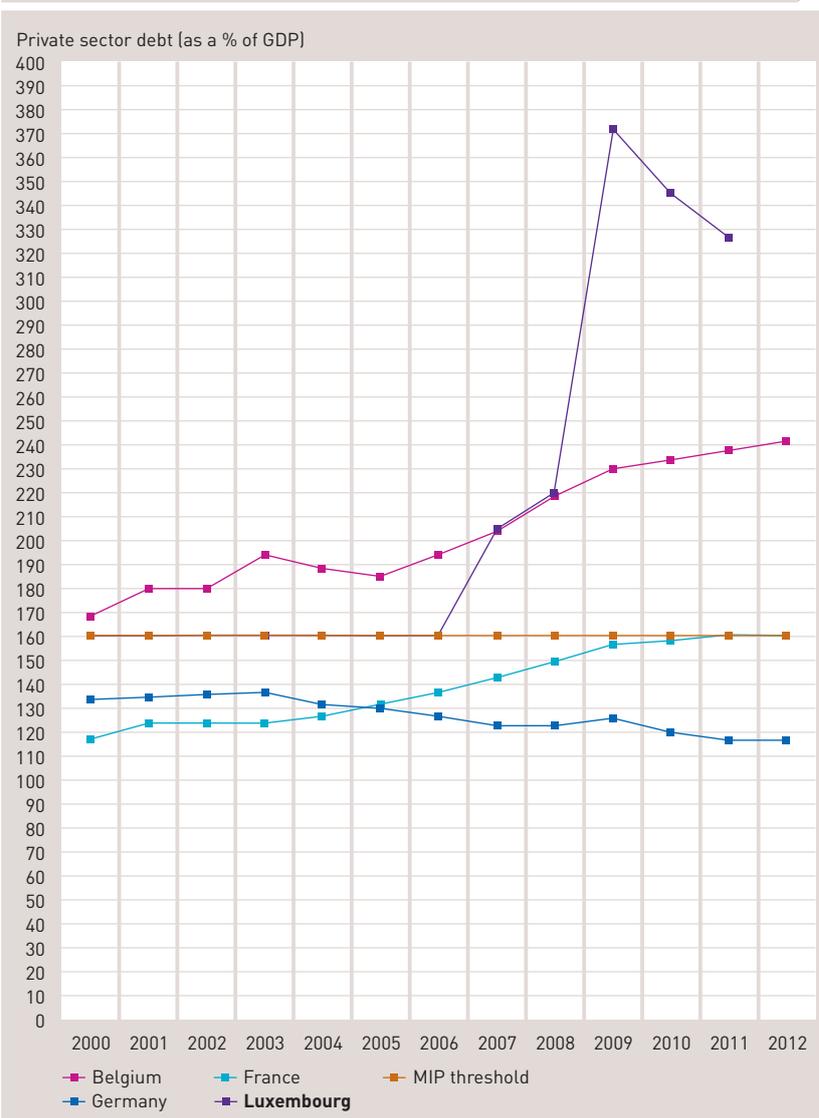


### c. Private sector debt<sup>52</sup>

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 (as a % of GDP), which is calculated as the amount of loans and securities other than shares. The indicator is based on non-consolidated data, meaning it includes intra-sector debt such as intra-company loans. For this indicator, it has been agreed under the MIP that a country is potentially at risk if this indicator is above +160% of GDP.

<sup>52</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" (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 ESA95. Data is expressed in EUR million and calculated on a non-consolidated basis, i.e. including transactions between units of the same sector.

Chart 21  
Private sector debt (as a % of GDP)

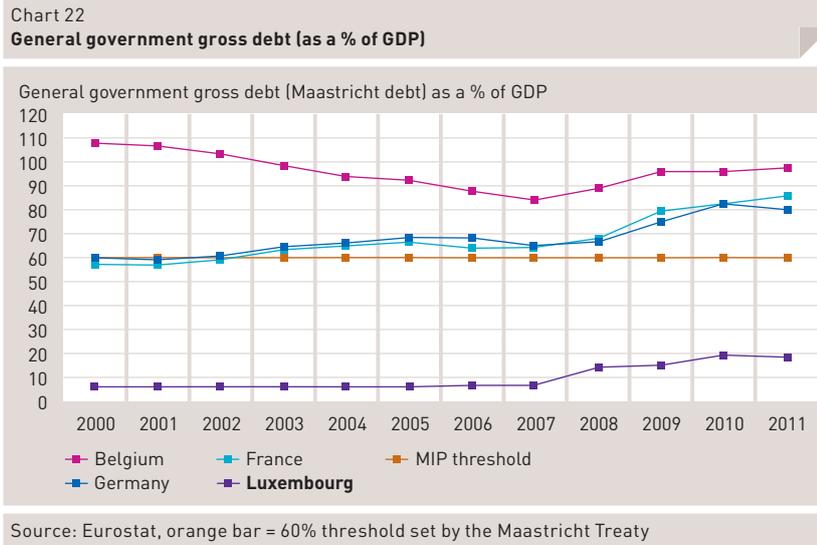


Source: Eurostat; orange bar = 160% threshold set by the MIP

Since this indicator is available for Luxembourg (2006), it overruns the threshold set by the MIP. However, in Luxembourg this indicator should be interpreted with caution because most of this private sector debt is incurred by non-financial companies. 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 nominator 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 the country 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 nominator (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.

#### d. General government gross debt<sup>53</sup>

This indicator takes into account the potential contribution of public 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.



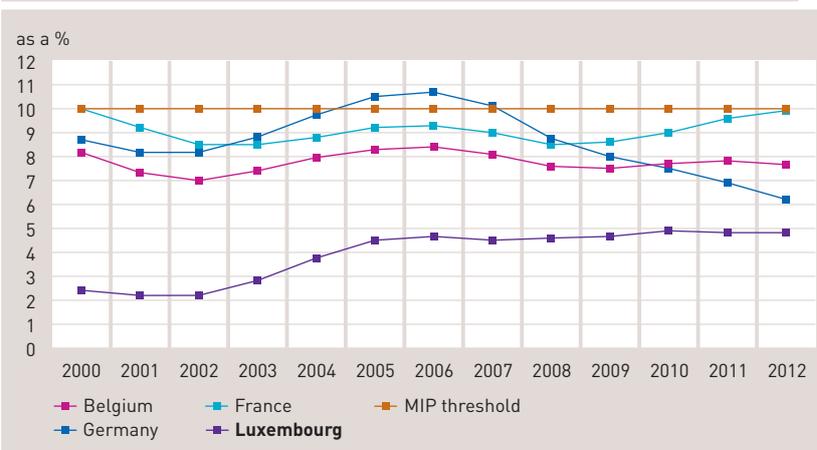
Luxembourg has a public sector debt level well below the threshold set by the MIP, and well below that of its neighbours, although since 2007 public sector debt has risen sharply in Luxembourg.

<sup>53</sup> Public sector debt is defined in the Maastricht Treaty as the consolidated gross debt of the whole general government sector in nominal value at the end of the year. The government sector includes the following 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 ESA95 transmission programme, and not from the EDP notifications. The revised GDP data being transmitted in a delayed schedule, it may result in potential differences in debt as a % of GDP, according to the source, EDP or AMR scoreboard.

### e. The unemployment rate<sup>54</sup>

This indicator is intended to monitor high and persistent unemployment rates and it points to 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 under the MIP that a country is potentially at risk if this indicator is above 10%. Luxembourg has an unemployment rate well below the threshold set by the MIP, and lower than that of its neighbouring countries, although since 2000 unemployment has risen sharply in Luxembourg.

Chart 23  
The unemployment rate (3-year average)



Source: Eurostat; orange bar = 10% threshold set by the MIP

### f. Total financial sector liabilities<sup>55</sup>

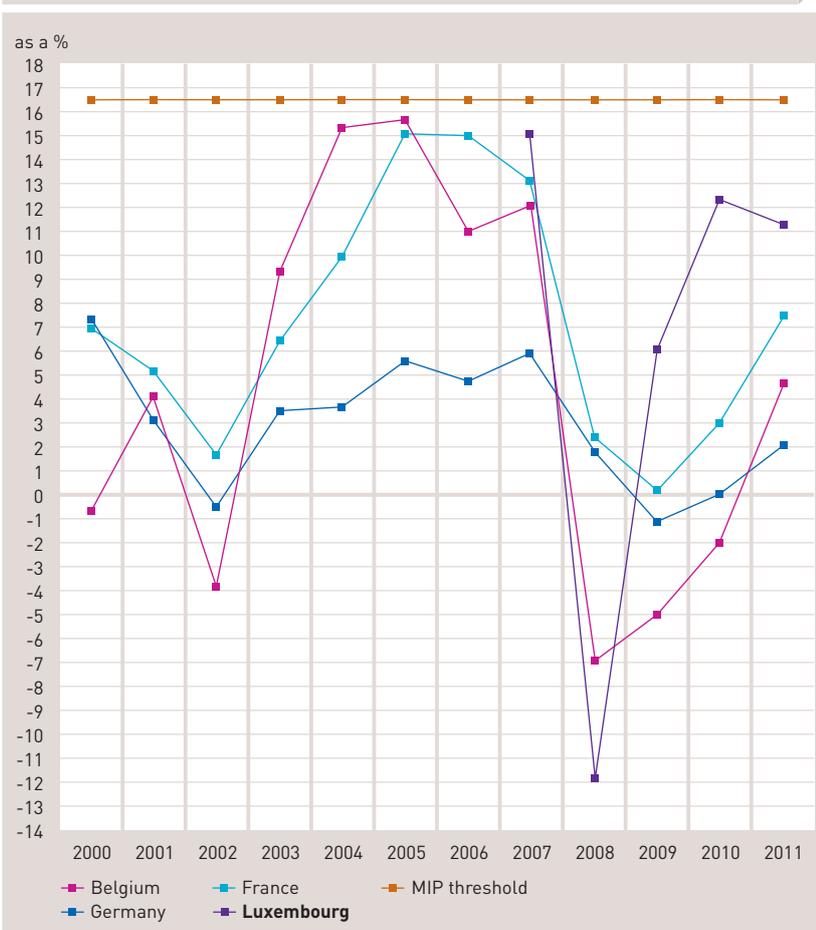
This indicator measures the evolution of the sum of the liabilities of the entire financial sector of a country. The indicator is expressed as an annual growth rate. For this indicator, it has been agreed under the MIP that a country is potentially at risk if this indicator is higher than +16.5%.

Since this indicator has been available, Luxembourg has been below the limit set by the MIP. However, the annual change is stronger in Luxembourg than in its neighbouring countries and the country is closer to the upper threshold set by the MIP than its neighbouring countries.

<sup>54</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/communiqués/Note\\_technique\\_sur\\_les\\_DSM\\_-\\_ADEM\\_24\\_02\\_2012.pdf](http://www.adem.public.lu/publications/communiqués/Note_technique_sur_les_DSM_-_ADEM_24_02_2012.pdf)

<sup>55</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.

Chart 24  
**Growth rate of the total financial sector liabilities**



Source: Eurostat; orange bar = 16,5% threshold set by the MIP

#### 4.3.4.3 Intermediate conclusions until the new AMR report

Based on the updated data used in this chapter, and pending the AMR report in November 2013, we note that Luxembourg has overrun three MIP thresholds. These indicators are the same as those mentioned in the last AMR report of November 2012, namely the current account balance, the debt of the private sector and the change in global export market share. Regarding the fourth indicator exceeded in November 2012 (nominal unit labour costs), Luxembourg is currently very slightly below the threshold set in the context of macroeconomic surveillance.

Table 8  
Summary table of the alert mechanism update (July 2013)

	External imbalances					Internal imbalances					
	Current account	Net external positions	Real effective exchange rate	Market share	Nominal ULC	Housing prices - deflated	Private sector credit flow	Private sector debt	Public sector debt	Unemployment rate	Financial sector liabilities
LU *	+7.0	+27.5	+0.8	-19.8	+8.3	+2.9	+2.5	326.3	21.1	4.8	+11.3
Thresholds **	> -4% < +6%	> -35%	> -5% < +5%	> -6%	< +9	< +6%	< +15%	< 160%	< 60%	< 10%	< +16.5%

Source: Eurostat

Note: \* Situation according to the most recent data available (2011 or 2012)

\*\* Conditions for not being considered imbalanced (eurozone)

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[http://ec.europa.eu/economy\\_finance/indicators/economic\\_reforms/eip/](http://ec.europa.eu/economy_finance/indicators/economic_reforms/eip/)

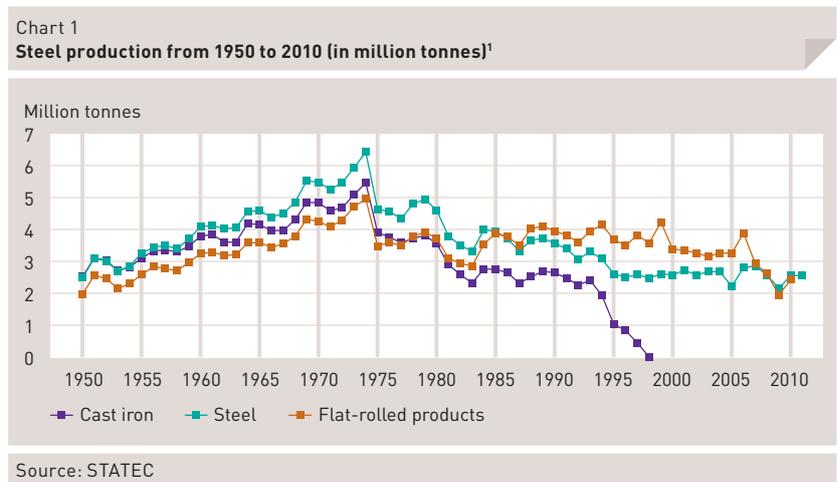
[http://epp.eurostat.ec.europa.eu/portal/page/portal/excessive\\_imbalance\\_procedure/imbalance\\_scoreboard](http://epp.eurostat.ec.europa.eu/portal/page/portal/excessive_imbalance_procedure/imbalance_scoreboard)

## **5 Searching for promising sectors for the future**

5.1	The four priority areas of the Ministry of the Economy and Foreign Trade	144
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The Luxembourg economy was dominated by the steel industry until the 1970s. It was especially as from 1950 that Luxembourg steel industry underwent a considerable development.

This steel industry boom and its dominance in the creation of economic wealth in Luxembourg led the Luxembourg government to a policy of industrial diversification. From 1950s Luxembourg has been able to attract the first U.S. (non-steel) companies as Goodyear (tyre production), DuPont de Nemours (polyester production) or Monsanto (nylon thread production). With the creation of the *Société Nationale de Crédit et d'Investissement* (SNCI) (National Credit and Investment Company), industrial areas and around a hundred of new companies from 1980, industrial diversification was evidenced by a decrease in the share of steel industry and an increase in other industries in Luxembourg's gross domestic product (GDP).

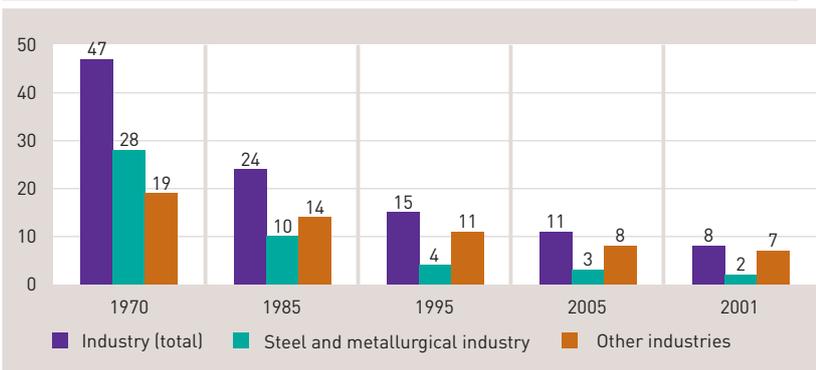


During the 1970s, Luxembourg's steel industry, which was then still the main pillar of the Luxembourg economy, was strongly impacted by the steel and oil crises. Chart 2 shows the decline of total industry and of the steel industry share in the sum of the values added from 1970 to 2011. Total industry and steel industry made up 47% and 28% of the total value added in 1970. In 2011 these rates have dropped to 8% and 2% respectively.

Corresponding to the continuing decline of the steel industry that followed, the financial sector emerged in Luxembourg. During the 80s and 90s, the financial sector grew strongly, mainly due to a favourable regulatory and tax framework compared to other European countries.

<sup>1</sup> STATEC, Luxembourg, 1960-2010. L'évolution économique globale du Luxembourg sur la longue durée, December 2012

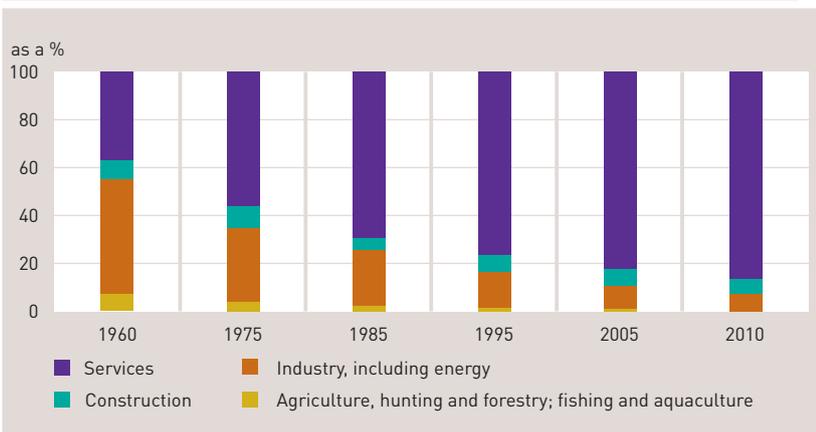
Chart 2  
Share of industry in total value added, 1970-2011 (as a %)<sup>2</sup>



Source: STATEC

Despite this shift from an industrial fabric to a services economy, the monolithic structure of the Luxembourg economy remained. Indeed, the heavy dependence on the steel industry in the industrial era has been followed by the strong dependence on the financial sector since the 80s. The steel and oil crises in the 1970s and the 2008 financial crisis have highlighted the vulnerability of the Luxembourg economy that is dependent on one sector of activity, and the need for sectoral diversification. Chart 3 shows this shift towards a services economy: in 1960 less than 40% of gross value added was created by the services sector, while in 2010 services made up approximately 85% of gross value added. At the same time the industry share in the Luxembourg economy decreased from 50% in 1960 to about 7% in 2010.

Chart 3  
Changes in the structure of the sum of the gross value added<sup>3</sup>



Source: STATEC, national accounts

<sup>2</sup> STATEC, Luxembourg, 1960-2010. L'évolution économique globale du Luxembourg sur la longue durée, December 2012

<sup>3</sup> STATEC, Luxembourg 1960-2010. L'essor du secteur tertiaire au Luxembourg, December 2012

Especially for small countries such as Luxembourg, spreading risks over several sectors is a major challenge. To strengthen the Luxembourg economy and protect oneself against possible external shocks, the Luxembourg government has initiated in 2004 a new policy of economic diversification based on a multisectoral specialisation.

An analysis published in the 2007 Competitiveness Report<sup>4</sup> outlines the issue of diversification and over-specialisation of small countries taking Luxembourg economy as an example. The analysis describes the specialization of Luxembourg in the field of financial intermediation from 1985 onwards and highlights the difficulty and the importance of diversification for a small economy such as Luxembourg. Diversification is necessary to protect oneself against the possibility of sectoral shocks.

## 5.1 The four priority areas of the Ministry of the Economy and Foreign Trade

An Ernst & Young's survey<sup>5</sup>, carried out in 2008, has shown that some sectors have the potential of contributing in the future to Europe's economic growth, among others information and communication technology (ICT), biotechnology, energy, logistics and transportation. This survey was conducted among 834 international economic decision-makers, and the following fields have reached the top five: environmental technology 45%; energy 38%; information and communication technology 37%; pharmaceutical industries and biotechnology 37%; and logistics 19%.

This survey was repeated in 2013<sup>6</sup> and confirmed the decision-makers views from 2008. According to the 808 economic decision-makers surveyed in 2013, 31% believe that the ICT sector will drive growth in Europe, 28% of decision-makers decided on energy and water and waste treatment, 23% on pharmaceutical and biotechnology industries, 20% on "clean technologies" (environmental technologies), 14% on transportation and automobile industries and 10% on logistics and distribution. The Ernst & Young's study mentions the potential for significant productivity gains in information and communication technology and the future importance of the pharmaceutical and biotechnology industries in order to respond to the population ageing and increasing costs in the health system.

From 2004, the Luxembourg government has initiated a new policy of economic diversification in a multisectoral specialization perspective: the development of four areas of activity considered as sectors able to generate high value-added activities and to create new jobs and economic growth.

<sup>4</sup> MINISTRY OF THE ECONOMY AND FOREIGN TRADE, 2007 Competitiveness Report "En route vers Lisbonne" - 'An Analysis of the sectoral diversification of a small open economy: the case of Luxembourg', 2007

<sup>5</sup> Ernst & Young's European attractiveness survey 2008

<sup>6</sup> Ernst & Young's European attractiveness survey 2013

The policy of diversification is aimed at increasing the density of the economic fabric of the country and at strengthening the Luxembourg economic model: a partial decoupling of the dependence on the financial sector and an economic reorientation are essential for Luxembourg, in order to be safe from a shock in the financial sector.

Frame  
Definitions

**Biotechnology** is defined as *"the application of science and technology to living organisms, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services."* (OECD 2005)

**Information and communication technology (TIC)** is defined as *"all technical means used to handle information and aid communication. This includes both computer and network hardware as well as their software"*. (Eurostat Glossary)

**Logistics** is the set of activities aimed at providing, at the lowest cost, a quantity of products, where and when there is a demand. Logistics therefore relates to all operations determining the movement of goods such as location of factories and warehouses, supplies, physical management of work in process, packaging, storage and stock management, handling and preparation of orders, transportation and delivery<sup>8</sup>. (ASLOG<sup>9</sup>)

**Environmental technologies** are defined as *"all technologies whose use is less environmentally harmful than the use of standard technologies meeting the same needs."* (ETAP 2004)

The identification of these four areas is mainly due to the following advantages:

- ▼ Biotechnology: the existing infrastructure in the health sector, such as the National Health Laboratory, the Public Research Centres, and the University of Luxembourg;
- ▼ Information and communication technology: multinational companies like Amazon, Skype and eBay are already located in Luxembourg. Attractive tax (VAT for e-commerce) and sophisticated IT infrastructure of the financial sector;
- ▼ Logistics: the favourable geographical position of Luxembourg in the middle and at the intersection of the two main Western European corridors has the potential to become an intercontinental logistics platform in Europe. Good infrastructure such as the motorway network, proximity of the Findel freight airport and the former WSA site in Bettembourg;
- ▼ Environmental technologies: they offer great opportunities to provide solutions to the many environmental problems and to address the rising costs of traditional energy sources and reducing energy dependence on other countries.

<sup>7</sup> For more details: [http://epp.eurostat.ec.europa.eu/statistics\\_explained/index.php/Glossary:Information\\_and\\_communication\\_technology\\_\(ICT\)/fr](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Glossary:Information_and_communication_technology_(ICT)/fr)

<sup>8</sup> Médan Pierre and Anne Gratacap, *Logistique et Supply Chain Management*, p. 12

<sup>9</sup> ASLOG = Association Française pour la Logistique

The importance of the four promising sectors and their priority are anchored in their respective action plans. Successively, the four action plans have been designed and measures have been implemented to develop them:

- 1) The 2006 national "Logistics and Transport " action plan aims to exploit the favourable geographical position of Luxembourg in the middle and at the intersection of the two main Western European corridors as a future international "hub" for logistics. The action plan focuses on developing areas dedicated to complex and multi-modal, high value added, logistics activities. The development of a multimodal logistics platform in Bettembourg/Dudelange is supposed to accelerate the integration of the sector in the intra-Community logistics network;
- 2) The 2007 "Health technology" action plan aims to:
  - (i) improve the health system: quality and range of medical treatments, efficiency of medical expenses, and
  - (ii) create high added-value job;
- 3) The 2009 "Environmental technologies" action plan aims to promote innovation and to foster the development of environmental technologies, including the protection of the natural environment and the progressive use of renewable resources;
- 4) The 2009 "ICT<sup>10</sup> and broadband" national action plan describes the need to develop and to extend the existing capacity and the importance of connecting to global networks in order to meet the current and future needs of local users, whether professionals or individuals.

Luxembourg has identified these four priority sectors and continues today to develop them in order to strengthen the Luxembourg economic model and to cope with the major challenges that are, among others, the ageing population and the rising costs of the health system, environmental impacts, future depletion of fossil resources, the country's energy dependence and the digitisation of society.

Today these four sectors are at different stages of development. New biotechnology and environmental technologies sectors are in the start-up stage, information and communication technology is booming and the logistics sector is reaching its maturity level. According to Bruno Bizalio's life cycle concept, the four sectors in Luxembourg are as follows (Table 1):

Sector	Phase in the life cycle
Biotechnology	Launch
Environmental technology	Launch
Information and communication technology	Growth
Logistics	Pre-maturity

<sup>10</sup> ICT = Information and communication technology

Table 2 shows the companies' evolution (private component) from these four sectors for the 2008-2011 period. Note that the 2008 economic crisis limited the development of these four sectors.

Sector - private component	Indicator	2008	2009	2010	2011
Biotechnology	Number of companies	9	13	15	20
	Employees	n.a.	150	173	256
	Weight in GDP at factor cost (as a %)	0.01	0.01	0.02	0.03
ICT*	Number of companies	1,517	1,594	1,680	n.a.
	Number of people employed	13,626	13,651	14,269	n.a.
	Value added at factor cost (EUR million)	2,264.65	2,196	2,600	n.a.
Logistics	Number of companies	734	753	743	780
	Employees	13,532	13,115	12,779	12,906
	Value added at market prices (EUR million)	907	720	918	838
Eco-businesses	Number of companies	97	99	97	96
	Number of employees	3,248	3,373	3,506	3,565
	Value added at factor cost (EUR million)	208	257	267	280

\*Note: e-commerce is not included in the statistical analysis because of the confidentiality of data of a small number of companies (statistical confidentiality).  
Source: Statec, Eurostat

The number of biotechnology companies has doubled since 2008, with 20 companies in 2011. In 2009 wage employment in these companies amounted to 150 people. This figure increased by 23 people in 2010. The following year there were 256 employed in the private component of biotechnology in Luxembourg. In 2011 these 256 employees contributed 0.03% to Luxembourg GDP (factor cost).

Despite the economic crisis the ICT sector has experienced a significant positive development. The number of people employed increased by more than 600 people in two years, between 2008 and 2010. Value added at factor cost amounted to EUR 2,600 million in 2010.

The number of logistics companies increased slightly during the period considered. On the other hand, employment in the sector decreased from 13,532 to 12,906 people, and the value added (at market prices) declined by € 69 million.

In collaboration with the Luxembourg EcoInnovation Cluster, a first identification of about 100 eco-companies in Luxembourg was made. Eco-companies are defined as companies whose corporate purpose is to develop, manufacture and sell goods, technologies and services for the natural environment protection<sup>11</sup>, such as filters or waste treatment.

The number of eco-businesses remained constant over this period. On the other hand, the number of employees increased in absolute terms by 317 new jobs. In these four years the value added (at factor cost) increased in absolute terms by EUR 72 million, but as a % of the total economy the value added decreased in 2011.

<sup>11</sup> "Eco-technologies"  
Action Plan, p. 5

Eco-businesses do not represent all the activities of the private component of environmental technologies. To fully represent the private component, we should expand the scope of the analysis by including also the environmental technology activities of environmentally responsible companies. Environmentally responsible businesses are defined as "companies whose field of activity does not relate explicitly to the environment, but which develop methods, processes or products that meet environmental criteria."<sup>12</sup> Therefore, the private component includes the environmental technology activities of these two types of companies, eco-businesses and environmentally responsible companies. Currently a more detailed analysis cannot be performed due to the unavailability of data.

Table 3 shows the main activities of public research institutes in these four priority sectors in Luxembourg. The information has been collected from public documents (annual reports and websites) and through interviews conducted with some officials and e-mails received from these institutes. Table 3 is a compilation of this information.

Sector – public research	Indicator	2008	2009	2010	2011	2012
Biotechnology	Number of employees	296	341	409	473	505
	Ongoing projects	134	168	195	252	285
	Number of publications	114	165	192	199	240
	Funding (in EUR)	25,824,144.80	54,972,187.56	61,637,630.64	57,674,368.79	55,407,032.70
	Expenses (in EUR)	27,232,945.64	50,827,488.42	58,232,924.39	55,096,470.76	55,124,322.67
ICT	Number of employees	317	362	400	402	454
	Ongoing projects	114	130	170	205	187
	Number of publications	239	393	475	478	594
	Funding (in EUR)	12,437,096.69	19,584,623.50	20,921,535.24	23,532,690.38	24,849,619.52
	Expenses (in EUR)	13,631,096.69	21,014,623.50	22,315,535.24	24,907,690.38	26,469,619.52
Logistics	Number of employees	46	54	80	85	88
	Ongoing projects	8	7	8	10	10
	Number of publications	6	6	4	10	10
	Funding (in EUR)	798,434.51	637,092.15	416,315.84	703,978.77	1,174,634.81
	Expenses (in EUR)	798,434.51	637,092.15	416,315.84	703,978.77	1,174,634.81
Environmental technology	Number of employees	105	139	174	193	188
	Ongoing projects	68	80	94	97	123
	Number of publications	78	110	116	151	149
	Funding (in EUR)	5,396,694.04	8,062,206.82	10,004,728.36	11,431,643.35	12,697,251.77
	Expenses (in EUR)	8,634,282.88	11,394,859.29	13,791,404.05	15,054,199.35	17,149,586.77

<sup>12</sup> "Eco-technologies" Action Plan presentation, 2009

Below is a list of leading institutes in each sector.

**Biotechnology sector:**

- ▼ The Luxembourg University “Luxembourg Centre for Systems Biomedicine”;
- ▼ The University of Luxembourg “Life Sciences” research unit;
- ▼ The “Centre de Recherche Public de la Santé” (CRP-Santé);
- ▼ The “Integrated Biobank of Luxembourg”;
- ▼ The CRP Henri Tudor “Centre de Ressources SANTEC”;
- ▼ The CRP-Gabriel Lippmann “Environnement et Agro-biotechnologies” department;
- ▼ The “Laboratoire National de Santé”.

**ICT sector:**

- ▼ The “centre interdisciplinaire pour la sécurité, la fiabilité et la confiance” (SnT);
- ▼ The University of Luxembourg “Computer Science and Communications” (CSC) research unit;
- ▼ The CRP Henri Tudor “Service Science et Innovation” (SSI) department;
- ▼ And the CRP-Gabriel Lippmann “Informatique, Systèmes et Collaboration” (ISC) department.

**Logistics sector:**

- ▼ The CRP Henri Tudor “Transport et Logistique” innovation programme.

**Environmental technology sector:**

- ▼ The University of Luxembourg “unité de recherche en ingénierie”;
- ▼ The University of Luxembourg “laboratoire photovoltaïque”;
- ▼ The CRP-Gabriel Lippmann “Environnement et Agro-biotechnologies” department;
- ▼ The CRP-Gabriel Lippmann “Génie des Nanomatériaux” unit;
- ▼ The CRP Henri Tudor “Centre de Ressources des Technologies pour l’Environnement”;
- ▼ The CRP Henri Tudor “Science et Analyse des Matériaux” department.

## 5.2 Conclusions

- ▼ The **biotechnology** sector has grown considerably in recent years in Luxembourg, a development considered as favourable to the diversification of the economic fabric and, incidentally, able to improve the national health system and to cope with the increase in certain diseases due to longer life expectancy. In Luxembourg this recent development focuses on three pathologies:
  1. Diabetes: one of the first diseases receiving biological medicinal products, namely insulin;
  2. Cancer (especially lung cancer): most of new drugs come from biotechnological processes;
  3. Neurological diseases: research in Luxembourg focuses on Parkinson's disease.
- ▼ Today Luxembourg has an excellent **information and communication technology** infrastructure, mainly due to significant investments made by a committed government, but also to existing infrastructure and expertise from the financial sector.

The importance of ICT for the financial sector, which is 26.6% of GDP in Luxembourg (2012), as well as the benefit of the Internet for businesses and individuals cannot be enough singled out. Productivity gains for the Luxembourg economy and especially for the financial sector are considerable, however, they are related to possible job loss and partial relocation.

- ▼ In a small country and a services economy (about 85% of GDP in 2012), that has in terms of gross domestic product only a small local industry (about 7% of GDP in 2012), the **logistics** sector in Luxembourg is dependent on international flows of goods.

Without a "real" national market, but in the middle of Western Europe's logistics network and of a European market of 500 million consumers, the logistics sector promises to generate economic growth, especially through the creation of high value added logistics activities.

- ▼ **Environmental technologies** are promising long-term productivity gains and economic growth. But facing the intense international competition, Luxembourg, which is a small country starting in the environmental technologies, will certainly meet the big challenge to identify new niches, and develop and export environmental technology innovations.

However, the importance of achieving in Luxembourg a greener economy that is less dependent on conventional energy through the use of new ecological products and processes, continuing to adhere to international environmental standards and contributing to a greener society and to the welfare of Luxembourg's residents is unquestionable.

## **6 Business attitude towards variations in costs**

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- 6.2 Study on price adjustments in Luxembourg companies 159

In recent years, there have been increases in several production factors such as energy or raw materials. Since a mere increase in prices is not always possible in an intense competitive environment of a market economy, companies must look for other solutions to ensure their sustainability.

In this context, two recent studies analyse more specifically the behaviour of Luxembourg companies, when faced with changes in their production costs: the first study focuses on the access to finance by small and medium-sized enterprises and includes a question about the reaction of companies to a shock on production costs. This European survey, conducted in 2010 under the auspices of Eurostat, aims to collect data on the availability of funding, its development over time, future financing needs and preferred sources of funding. The second study examines the adjustment of company prices as a response to external shocks or to anticipated situations. This study is based on a sample of 20 companies ("case studies"), both in craft and commercial sectors, which are located in Luxembourg. It is a qualitative study, aiming to shed light on the diversity of practices, and it is not intended to be statistically representative. This chapter aims to provide a synthesis of these two studies.

## 6.1 Access to finance by SMEs in Luxembourg<sup>1</sup>

The 2008 financial crisis has drawn public attention to the potential difficulties for small and medium-sized enterprises (SMEs) in obtaining external financing. For small businesses, access to finance is often one of the main obstacles to their survival and growth. The creation of new companies is also hampered with tighter credit conditions. A European survey was carried out in 2010 under the auspices of Eurostat in order to better understand the challenges faced by SMEs employing at least 10 people. The survey aims to identify the difficulties, but also the funding channels sought in 2007, 2010 and those anticipated for the period 2011-2013. The Luxembourg survey specifically includes a question about the reaction of companies in the event of a strong and unexpected increase in production costs, the results of which will be analysed in this section.

<sup>1</sup> STATEC Bulletin No. 3/2011 "L'accès au financement des PME autonomes en 2010" can be downloaded from: <http://www.statistiques.public.lu/catalogue-publications/bulletin-Statec/2011/PDF-Bulletin3-2011.pdf>

## 6.1.1 The sampled companies

The survey's target population was restricted by criteria imposed at Community level. Accordingly, only autonomous SMEs existing since 2005 and employing more than 10 people in 2010 were surveyed. In the case of Luxembourg, these criteria have thus excluded many foreign subsidiaries located in the country. Companies targeted by the survey must meet the following conditions:

- ▼ To have been created prior to 2006;
- ▼ To be still operating during the reference year 2010;
- ▼ To have employed between 10 and 249 people in 2005 and at least 10 people in 2010;
- ▼ To have a centre of economic interest on the economic territory of Luxembourg and to be autonomous, i.e. not be a subsidiary of another company in the same Member State or abroad.

Questionnaires filled by 1,174 companies could be used, which corresponds to a response rate of 84% of companies. The response rate is the lowest for accommodation and food service activities. Mainstreaming the results to other sub-populations that were not covered by the survey must be done with caution. The survey targets 38% of companies with 10 or more employees in 2008.

Most of the sampled companies employ between 10 and 19 people (536 companies, so 46%). 40% of companies have up to 49 employees and 4% (48 companies) have more than 100 employees. 54 companies are ringleaders of a group of companies.

Table 1  
Total population, target population and response rates by sector of activity

Sector of activity (NACE Rév.2)		(a) Total population of companies in 2008	(b) Population of companies with 10 or more employees in 2008	(c) ATF target population	Relative share of (c) in (b)	(d) Number of questionnaires used	Response rate (d) / (c)
B - E	Mining and quarrying, manufacturing, energy	983	367	126	34%	109	87%
F	Construction	2,942	947	478	50%	405	85%
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	6,857	836	336	40%	281	84%
H	Transportation and storage	1,156	336	90	27%	77	86%
I	Accommodation and food service activities	2,728	336	153	46%	119	78%
J	Information and communication	1,507	227	36	16%	29	81%
M - N	Professional, scientific and technical activities, administrative and support service activities	6,089	621	175	28%	154	88%
<b>Total</b>		<b>22,262</b>	<b>3,670</b>	<b>1,394</b>	<b>38%</b>	<b>1,174</b>	<b>84%</b>

Notes:

(a) and (b) are determined in accordance with structural business statistics regulation

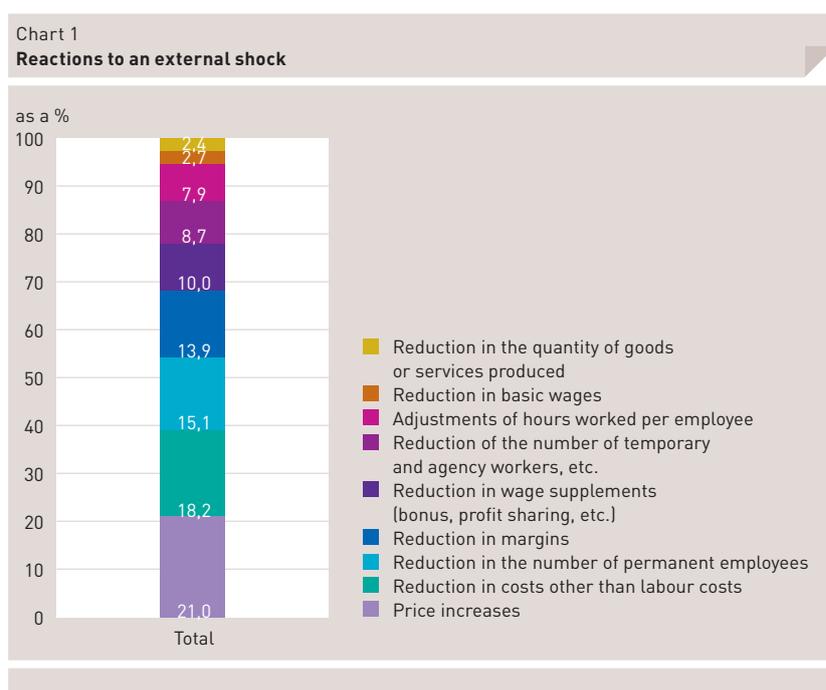
(c) corresponds to businesses that meet the described conditions for creation date, jobs, sector of activity, residence and autonomy

(d) consists of questionnaires returned and validated

The response rate is the ratio between the number of questionnaires used and the number of firms in the target population.

## 6.1.2 General reaction of companies to a new production cost shock

In case of a production cost shock, it seems that, in general, companies would offset higher costs primarily by price increases (21%), followed by a reduction in costs other than labour costs (18%) and by reducing the number of permanent employees (15%). These three categories account for more than half of business reactions. Reducing basic wages and production don't appear to be a solution for companies in case of a strong and unexpected increase in production costs.



## 6.1.3 Reaction of companies by sector

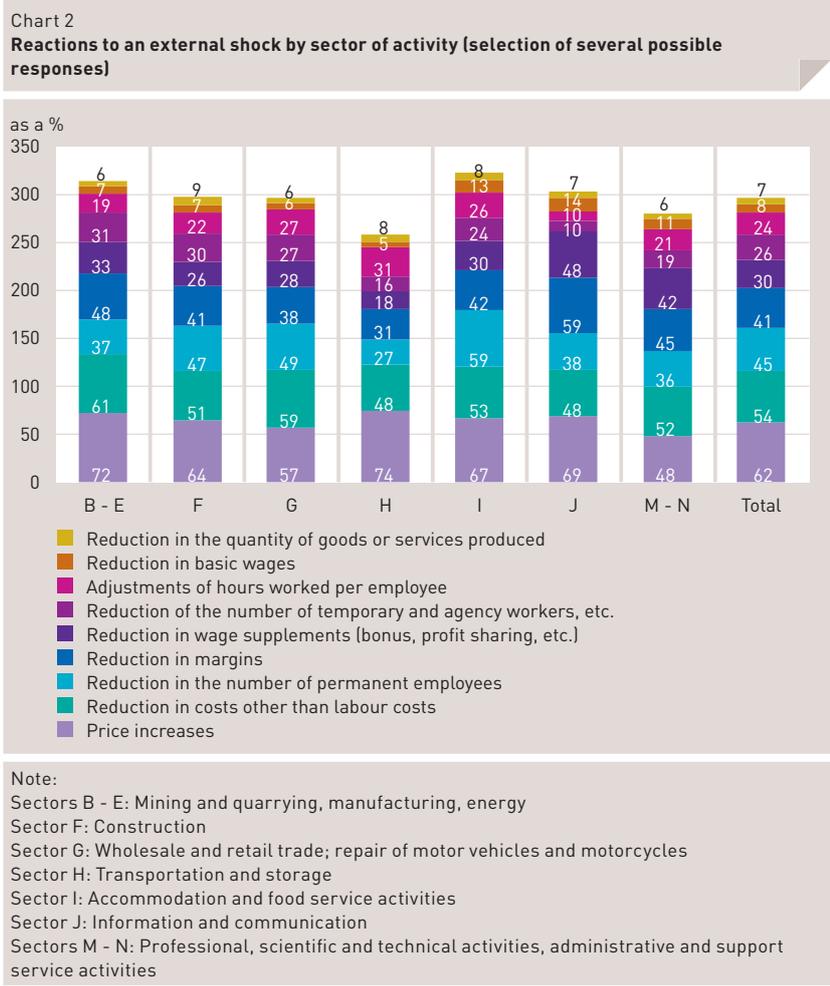
In general, firms react to an external shock first by an increase in prices (mentioned by 62% of companies) or a reduction in costs other than labour costs (54%), before reducing the number of permanent employees (45%) or reducing the margin (41%). The reduction in wage supplements and the reduction in the number of temporary or agency workers as well as the adjustment of hours worked are only considered by less than one out of three companies.

By analysing the responses by sector of activity, major differences occur: nearly 3 out of 4 companies in the industry sector increase their prices in case of an external shock on production costs. This sector also prefers to lower its margins before reducing the number of permanent staff.

Two sectors, namely the trade and service sectors, prefer to reduce costs other than labour costs before increasing prices. This finding can be explained by the important competition in the trade sector, which is very sensitive to the final consumer price.

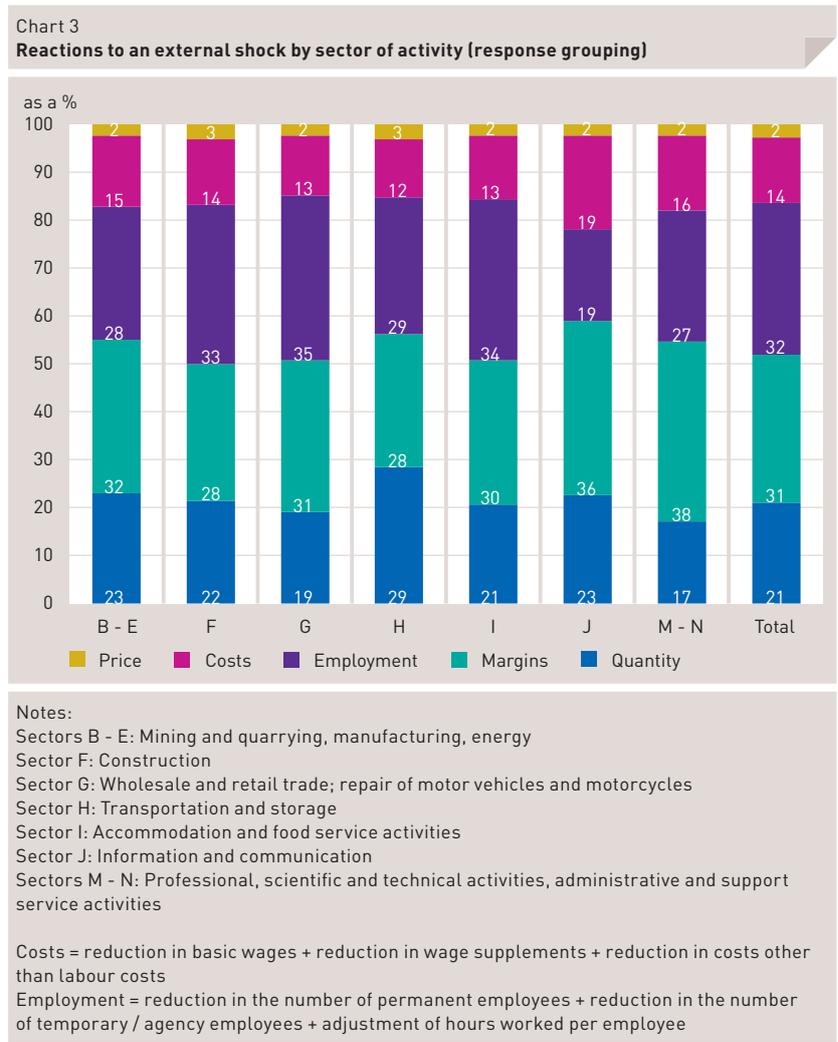
The construction and Horeca sectors show little difference with global responses. However, ICT services begin by increasing their prices, then reduce their margins and then wage supplements and costs other than labour costs.

On average, companies have selected three out of the nine possible answers following a rise in production costs, which explains the scale on the graph below (ranging up to 350%). The transportation industry has selected an average of 2.5 responses, while the Horeca sector selected 3.2 answers.



Generally, it appears that industry and transportation, which are sectors of activity where companies are most likely to increase their prices, are also those in which permanent workforce reductions are less frequent.

By grouping the different possible answers into 5 main categories (price, costs, employment, margins, quantity), we note that two categories are dominant as a reaction to an increase in production costs: employment (32%) and costs (31%). The employment category includes the reduction in the number of permanent employees, of temporary employees and the adjustment of hours worked. The costs category includes the reduction in basic wages, in wage supplements and overheads (other than labour costs). In the transportation sector, firms react equally in three areas: prices, employment and costs. The reduction in the margin is the most chosen by the information and communication sector (19% against 14% on average), which could mean that companies active in ICT have a greater margin in the event of an unexpected increase in production costs. Reducing the quantity produced does not seem to be an attractive solution for companies; it corresponds only to a 2% share of responses.

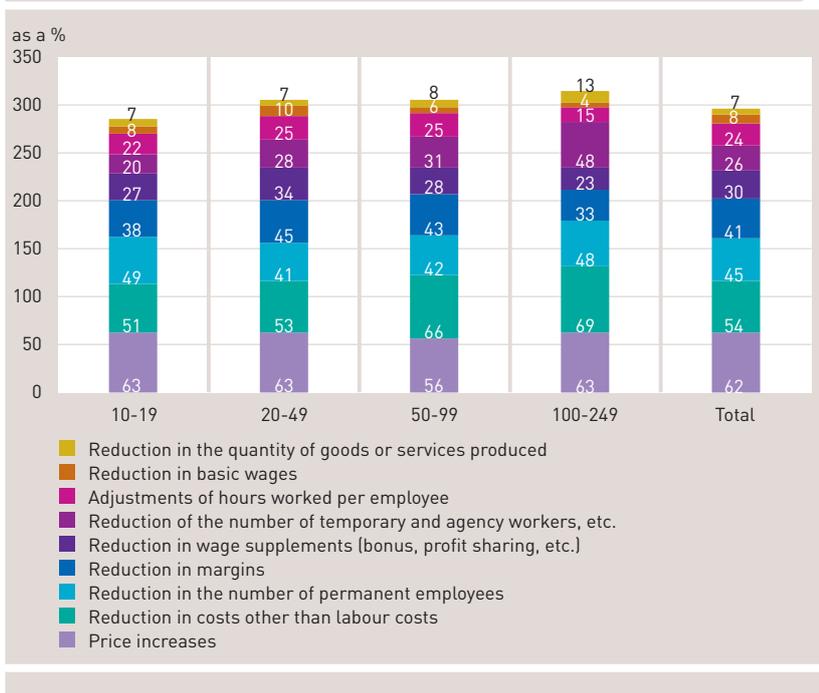


## 6.1.4 Reaction of companies according to the number of employees

By grouping companies according to the number of employees, we find that very small companies (VSEs) with between 10 and 19 employees have selected only 2.8 responses on average, while large companies have selected more than 3.2 possible choices when an external shock happens. Large companies seem therefore to have more ways to deal with a situation of rapidly increasing production costs than small firms.

Chart 4

Reactions to an external shock by number of employees (selection of several possible responses)

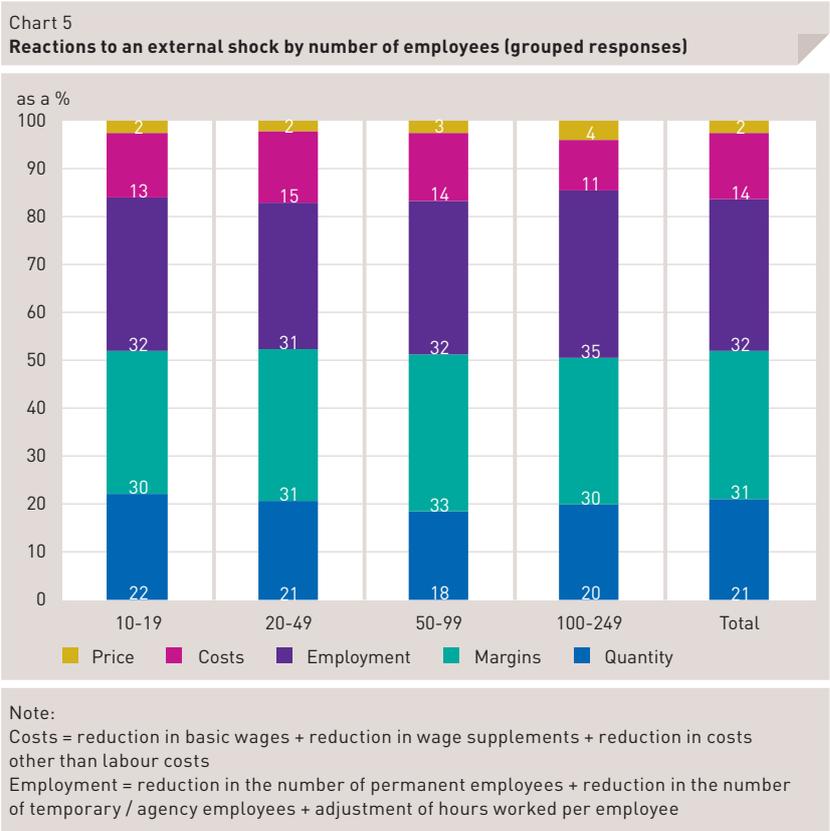


Half of VSEs want to reduce the number of permanent staff; this is the highest proportion among the groups. This observation can be explained by the fact that VSEs are more sensitive to external shocks and do not have a lot of flexibility to counter a situation of rapidly rising costs. Another factor may be the lack of trade union representation in small businesses, making it easier to dismiss permanent employees in the event of external shocks on the production costs.

Large firms with 100 or more employees have the highest proportion of reduction in the number of temporary employees (48% against 26% on average).

There is a positive relationship between reducing costs other than labour costs and the size of the business, which can be explained by the fact that a large company usually has more overheads than a company with a reduced number of employees. Thus, in a situation of rapidly increasing production costs, large companies have more flexibility.

If we group the different responses in 5 categories and by resizing each staff category to 100%, we find that the reaction of companies to external shocks is similar, regardless of the number of employees. Companies would offset external shocks primarily by reducing staff and costs (approximately one third for each category), followed by increasing prices and reducing the margin. The scale adjustment to 100% of the categories of staff leads to the fact we can no longer observe the positive relationship between the number of responses and the size of the company.



In conclusion, companies have a variety of options to respond to a strong and unexpected increase in production costs. According to the survey of 1,174 companies, it can be argued that companies, regardless of sector of activity and number of employees, use a combination of several measures to deal with an unexpected increase in production costs. The price increases, which are mentioned by almost two thirds of companies, may be risky if competitors do not adjust their prices upwards, but adopt an alternative strategy (downsizing or decreasing other costs) in order to improve their market share.

## 6.2 Study on price adjustments in Luxembourg companies<sup>2</sup>

In 2012, the *Observatoire de la formation des prix* (Observatory of price formation), integrated into the *Observatoire de la compétitivité* of the Ministry of Economy and Foreign Trade, has commissioned a legal study on how the regulation of price indexation clauses in contractual relations is implemented<sup>3</sup>. Using a comparative law approach, this study is especially an analysis of regulations in Luxembourg and in its three neighbouring countries. The authors recommended maintaining the principle of freedom to stipulate such clauses in the future legislation, while supervising it. This supervision should be done in the spirit of control over inflation and consumer protection.

The *Observatoire de la formation des prix* wished to supplement the findings of this legal study by an economic study, through a microeconomic analysis based on interviews with 20 craft and commercial companies located in Luxembourg. This study, commissioned from the consultancy Deloitte, analyses price adjustments in companies in Luxembourg, firstly due to unforeseen developments (shocks) and, secondly, due to foreseeable developments. This section summarizes the Deloitte study, provides additional analyses and presents excerpts from the statements by consumer representatives and employers' organisations belonging to the "price formation" commission of the *Conseil de la consommation*.

### 6.2.1 The panel of companies

The approach of the study is qualitative, based on a panel of twenty companies, and aims to analyse the diversity of practices. Hence, the results cannot be extrapolated to a particular sector or to Luxembourg companies in general. The panel used consists of twenty companies equally spread among sectors of activity divided into four main groups: construction, Horeca, trade, services to end customers (B2C), and that operate mainly in Luxembourg. The selection ensures a mix of company profiles, particularly in terms of sizes, structures, types of products and services, geographic markets and competitive positions.

<sup>2</sup> Perspectives de politique économique N°26: "Étude des adaptations de prix des entreprises au Luxembourg" [http://www.odc.public.lu/publications/perspectives/PPE\\_026.pdf](http://www.odc.public.lu/publications/perspectives/PPE_026.pdf)

<sup>3</sup> Perspectives de politique économique N°19: "Modalités de la réglementation des clauses d'indexation de prix en France, Allemagne, Belgique et au Luxembourg" [http://www.odc.public.lu/publications/perspectives/PPE\\_019.pdf](http://www.odc.public.lu/publications/perspectives/PPE_019.pdf)

Table 2

The following are the selected companies:

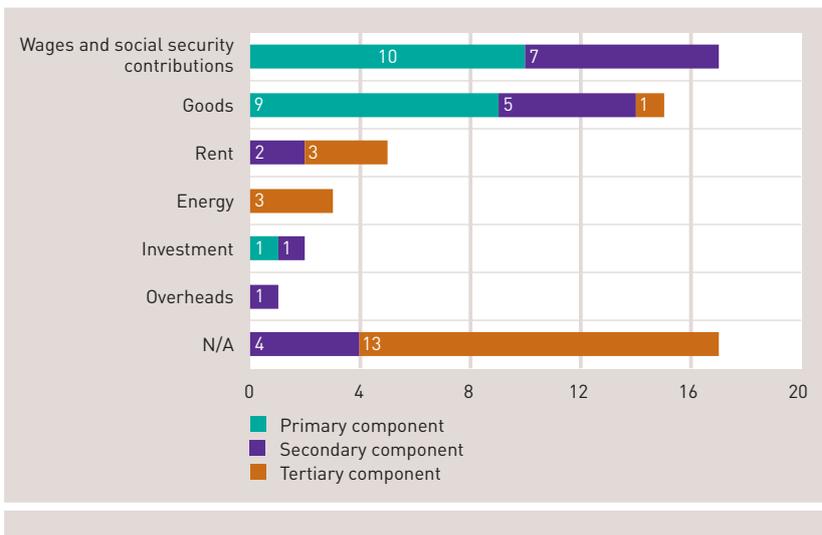
Construction sector	Trade sector
Joinery installation VSE	Large retail outlet
Roofing SME	Local caterer
Glazing SME	Traditional bakery
Traditional construction company	Clothing shop
Painting VSE	Bakery products chain
Service sector (B2C)	Horeca sector
Luxembourg chain of hairdressing salons	Café-bar in Luxembourg
Phone operator	Hotel belonging to an international chain
Insurance services (agency)	Family hotel and restaurant
Alteration of clothing services	International restaurant chain (franchise)
Car service chain	Local traditional restaurant

## 6.2.2 Price fixing practices

It's important to identify how the company's prices are defined, as this breakdown impacts how the company is sensitive to changes in its environment and thus how the company is likely to respond through its prices. Personnel costs and goods appear as determinant factors when defining sales prices, with varying importance depending on the sector.

Chart 6

Main components



For most companies in the service and construction sectors, personnel costs are by far the main component of prices. Goods, so raw materials and finished products, are the main cost item for trade and Horeca, but also for some construction companies for which the materials are particularly expensive. The other cost items are considered much less significant, and it is possible that these factors are underestimated since these observations are not based on financial results, but only on assessments provided by the companies.

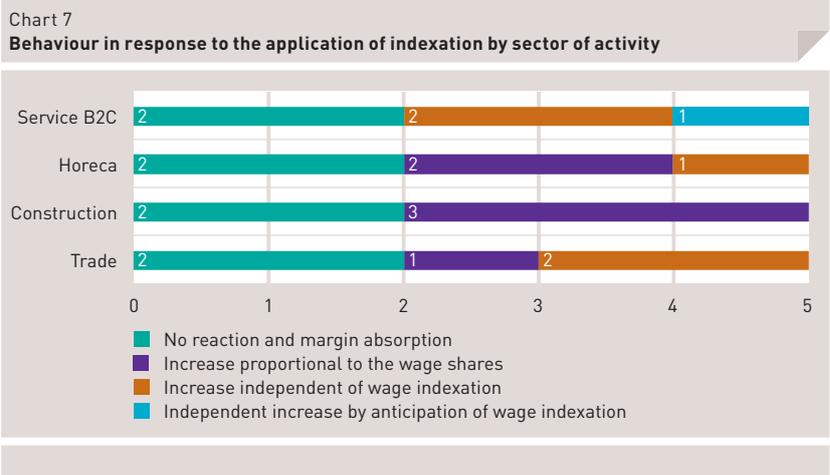
The margin does not appear on the previous chart. On the one hand, its definition varies and is therefore difficult to compare (gross margin, which is used to cover the costs, or net margin, i.e. the benefits resulting from the operation of the company), on the other hand, companies do not mention it as a main component. According to the interviews, companies feel a constant pressure on their margins, following the progressive increase in their overall costs, particularly in the purchasing cost of goods.

### 6.2.3 Price review and adjustment

The companies surveyed tend more to adjust prices upwards. If cost factors were decreasing, most of these companies would not cut their prices, seeing the opportunity to build up a reserve to absorb future increases in costs or to avoid price fluctuations in favour of a certain stability. Companies endeavour to stabilise prices at a certain level and avoid as much as possible too frequent price fluctuations in favour of coherence and in order not to affect the customers. The sampled firms seem to lower prices only if there is pressure from competitors.

9 out of the 20 companies changed prices up to three times in the past five years, while 4 companies changed their prices more than once a year. It is interesting to note that these 4 companies are also prominent leaders or major players in their industry and goods are their main cost components. Pressure from international suppliers appears to be higher than that from Luxembourg-based suppliers, who have some flexibility to facilitate their business relations. International suppliers, linked to multinational companies, increase commodity prices more often and at more regular intervals than domestic suppliers. Logically, the Horeca sector changes its prices less often, no more than once a year.

Even if the pressure from suppliers is intense, the main trigger for a price change is an increase in wages and in social security contributions. For half of the companies surveyed, personnel costs play a critical role when establishing prices. For the other half of the companies, personnel costs have no influence on the pricing policy. There is no direct link with the sector of activity or market position and no link with the main component in company's costs. This can be explained by the fact that the anticipated mechanisms, such as the application of wage indexation, can trigger price increases that also include changes in costs of goods. 14 out of the 20 companies do not directly increase their prices after an increase in costs of goods and raw materials, but absorb them in their margin, at least temporarily. In case of the application of wage indexation, firms seem to tend to react faster. Companies take advantage of automatic wage indexation, understood and accepted by Luxembourg resident customers, to finally pass other cost increases that were, until then, offset by a lower margin.



In general, the companies surveyed believe that their customers are mostly perceived as fairly insensitive to price changes, even if they are mainly upward variations. Only a quarter reported a significantly negative perception by customers after rises, mainly in the trade and B2C services sectors.

Within the companies surveyed, we can identify seven key price adjustment behaviours. These reflect the business environment, the market conditions and a certain level of sophistication. Behaviours are not specific to a sector or a particular type of company.

- ▼ Type 1 – Structured annual review: these companies, often prominent leaders, revise their selling prices once a year, carrying out in a structured and analytical way an annual summary of the evolution of costs and of any other external element which may influence the price.
- ▼ Type 2 – When it is possible: these companies, belonging to the construction sector, primarily aim not to increase their prices on the market for fear of negative impact on the business volume due to the high competition. So they tend to accumulate and absorb the cost variations in their margin, pending an opportunity to raise prices.
- ▼ Type 3 – Analytical (demand, margin level): in this group, companies undertake an analytical process designed to study the demand and its evolution in relation to margin targets per product or service to set their prices. The price is a marketing variable.
- ▼ Type 4 – Without proper price management: these are generally small businesses from all sectors of activity that merely follow any instructions of their trustee at the end of the accounting year. In this segment, the price is not a proactive tool of commercial or financial management, but rather an issue entrusted to the trustee, as they do for accounting management.
- ▼ Type 5 – Free and ongoing reviews: these companies review their prices continuously throughout the year, with a high degree of freedom. This behaviour is not organised and is mainly influenced by the market situation and the status.
- ▼ Type 6 – Which cannot review: companies that do not have the freedom to set up and review their prices, because they are either imposed and timed by the head office or driven by suppliers. As the price is no longer an instrument, but a non-modifiable data element, the only lever for action of the company then lies in the dynamic cost and margin management.
- ▼ Type 7 – Static, following competitors: these companies raise their prices when competitors increase theirs. Their behaviour is patterned primarily on market developments. It is only when the margin strongly deteriorates that these companies take the initiative to increase their prices, regardless of the market.

## 6.2.4 Price governance

Deloitte's study of price adjustments showed great variability of response resources in terms of price governance: half of the companies follow the operational profitability, especially in the services sector (B2C). Generally larger companies have implemented robust procedures for price review. In the construction sector, priority is given to monitoring developments in suppliers' prices, since this factor represents the largest proportion of the total costs of the company.

It is not really surprising to note that many companies surveyed follow the prices charged by their competitors; however, only seven companies use regular and structured benchmarks, for the other companies it is rather an informal and occasional process. The analysis of demand, that is to say the monitoring sales practices, is usually formalised only in the catering sector.

According to Deloitte, the companies surveyed can be divided into 3 groups according to their level of development in their price determination, review and governance policy and their profitability monitoring:

1. High sophistication: five companies (three from the services sector and two from the construction sector) have a high degree of sophistication. They are mainly large companies (only one VSE) and major players in their sector. In contrast, the prominent leaders do not perform a rigorous monitoring of their operating costs, perhaps due to their leadership position that does not require as much rigour in their process of determining and especially reviewing prices;
2. Intermediate sophistication: this group comprises 9 companies from all sectors and sizes. Half of these companies belong to a local chain or an international group, so they benefit from the tools and processes provided by the group;
3. Low sophistication: six companies are classified in this last group, and they are without exception very small local enterprises that do not belong to a local chain or an integrated group.

There is a clear link between the company size and the degree of sophistication. VSEs are usually local businesses and are often only active on the local market. However, all local businesses do not necessarily show low sophistication, since a very small enterprise is classified in the first group and three in the second group. But this result should be qualified: a VSE manager does not have to monitor changes in demand, costs and prices of competitors with the same precision as the director of a large company offering a wide range of products and services.

The ad hoc “price formation” commission of the *Conseil de la consommation*, composed of consumer representatives, representatives of employer organisations and government officials, is responsible for the analysis and the reports from the *Observatoire de la formation des prix*. In this context, the delegation of employer organisations and the delegation of consumers expressed their positions after considering the price adjustments in Luxembourg companies, which will be presented in the following frames.

Frame 1

**Extract from the position of the delegation of the employer organisations**

It is pointed out that companies are under a more or less high pressure due mainly to personnel costs and the costs of goods, elements that appear to be determinant factors in the structure of the selling price. In addition, the increase in labour costs is all the more problematic because companies face foreign competitors who are not subject to the same constraints such as wage indexation to price changes, and the adjustment of the minimum social wage. In addition those who target customers in the Greater Region and are in a competitive position in relation to companies from this region have little flexibility to set their selling price. Often companies cannot set the price of goods, particularly when they are faced with key suppliers on some markets as well as rising labour costs triggered by the automatic wage indexation.

Needless to say that the margins are a component of the selling price, but according to the study, the net margins remain proportionally a weak determining factor compared to other components of the price.

Therefore, the often-heard allegation that companies systematically increase their prices to keep their margin is not, according to employers, evidenced in the results of the study. On the contrary, the Luxembourg companies that are experiencing an increase in commodity prices and wage costs cannot increase their prices accordingly given the strong competition to which they are subject. They rather tend to reduce part of their margin to delay price increases. Thus, companies seek more to preserve the status quo than to increase prices.

In conclusion, for the employers, the survey showed the weight of personnel costs and of the costs of goods in the selling price determination by Luxembourg companies and the constant reduction of the margins of firms exposed to increasingly fierce competition. It would therefore be wise to limit increases in items that may, in the medium term, impact the selling prices and resulting from purely national mechanisms, such as the system of wage indexation.

The entire statement can be downloaded from:  
[http://www.odc.public.lu/actualites/2013/07/Observatoire\\_de\\_la\\_formation\\_des\\_prix/UEL.pdf](http://www.odc.public.lu/actualites/2013/07/Observatoire_de_la_formation_des_prix/UEL.pdf)

For the consumer delegation, it is important to stress at the outset that this study does not enable conclusions that can be extrapolated to all companies established in Luxembourg due to the small size of the sample chosen and to the absence of an analysis of financial data to confirm the results of the survey.

The companies surveyed are reluctant to lower prices, except on an occasional or temporary basis (e.g. promotions), in order to cope with future increases in costs, without having to immediately affect their prices. As the cost reductions are not reflected in the prices according to the consumer delegation, the profit margins increase in this case until the next increase in costs (which, one has to wonder, might also be integrated in the new selling price).

As the factors of lower prices seem primarily related to market pressures, we can deduce that price competition is not very high, otherwise companies would have an incentive to lower their prices when their costs fall, in order to increase their market share. The study also does not allow to draw conclusions about the existence and the impact of parallel behaviour among companies in terms of price determination.

If some companies surveyed prefer to pass cost increases onto margins rather than increasing prices, it is noteworthy that in a market economy and on a competitive market, margin declines are a phenomenon that should not be considered as unusual. A comparison of margin levels is necessary in order to assess how much a higher cost absorption really affects corporate profitability: indeed, if one starts from a high margin, it might not be necessary to pass on cost increases to the prices.

Wages naturally entail cost for companies. However, it should be noted that their development happens in a relatively regular and predictable way. Conversely, the study shows that the cost of goods (also an important factor) often increases steadily and irregularly; however these increases are difficult to pass in the selling price. So wage indexation allows companies to have a widely known and accepted mechanism to offset not only the labour cost, but also the changes in other internal costs, including the cost of goods, on selling prices.

It is also worth noting that one third of the companies take advantage of the index-related adjustments to increase their income while they increase their prices more than appropriate to offset rising costs.

In addition, the companies surveyed do not necessarily show great expertise regarding the determination and adjustment of their prices. If they have the tools to accurately determine their costs or to analyse the markets on which they operate (e.g. through cost accounting), they do not use them to adjust or review their selling prices, matching the constraints they face. The systematic use of these tools in order to adjust the prices appears reserved to large companies and market leaders, other companies choosing instead empirical approaches or depending on their trustee, who warns them of excessive deterioration in margins that threatens their activity.

The entire statement can be downloaded from:

[http://www.odc.public.lu/actualites/2013/07/Observatoire\\_de\\_la\\_formation\\_des\\_prix/CSL.pdf](http://www.odc.public.lu/actualites/2013/07/Observatoire_de_la_formation_des_prix/CSL.pdf)

## 7 Thematic studies

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The *Observatoire de la compétitivité*, in coordination with STATEC and G.I.E. Agency for standardisation and the knowledge economy (ANEC), has launched a Research unit within STATEC (EPR2 Unit)<sup>1</sup>, whose work is structured around applied research themes related to the measurement and identification of the determinants of productivity and competitiveness, including innovation and its own determinants. The results of these works are published regularly in “Perspectives de Politique Économique” from the *Observatoire de la compétitivité* and in “Économie et statistiques” from STATEC.

The short contributions presented in this chapter of the 2013 Report provide insight on several key aspects of Luxembourg’s competitiveness and the dynamics operating at both micro and macroeconomic levels.

1. **Productivity and Competitiveness in Luxembourg – The LuxKlems Project 2012:** this contribution analyses the trends in labour productivity, total factor productivity (TFP), efficiency and technological change in Luxembourg between 1995 and 2011.
2. **Choosing standardisation – Why companies engage in:** standardisation is often recognised as a tool for supporting competitiveness of companies, and therefore that of a country. However, not all companies have undertaken a standardisation process. This study identifies the characteristics of firms that engage in such processes.
3. **Beyond GDP – Suggestions from the economics of well-being:** after World War II industrialised countries experienced substantial economic growth which significantly improved living conditions. However, this increased wealth has not led to a greater well-being of citizens, which are not more satisfied with their lives than before. If GDP cannot explain the trends in this subjective well-being or the differences observed among countries, then which other factor can do it? This contribution consolidates the findings of recent studies on this subject and illustrates the political implications thereof.

<sup>1</sup> For more details:  
<http://www.statistiques-public.lu/en/actors/statec/organisation/epr/index.html>

## 7.1 Productivity and competitiveness in Luxembourg

The LuxKlems Project 2012<sup>1</sup>

### Abstract

This article analyses patterns of labour productivity, Total Factor Productivity (TFP), efficiency and technical change for Luxembourg from 1995 to 2011, focusing on how the financial crisis affected these patterns. Using a deterministic frontier approach (DEA), labour productivity growth is decomposed into changes in the capital labour ratio and changes in Total Factor Productivity. Labour productivity growth was weak in most of the countries analysed, due to a deterioration in TFP performances vis-a-vis sustained rates of capital accumulation. Both slow (or negative) technical progress and efficiency losses appear to have contributed to this outcome. The crisis appears to have exacerbated this tendency. In Luxembourg, productivity fall was more pronounced than in other countries. The analysis of Luxembourg industries reveals that also structural shifts in Luxembourg's economy affected productivity trends. The most important was the continued decline in goods-producing industries in the face of sustained growth in services. Some restructuring also occurred in the financial services, where the auxiliary activities to financial intermediation and insurance were the most dynamic industry. Despite signs of recovery in 2010, productivity has not gone back to its pre-crisis level.

KEYWORDS: Total Factor Productivity; production frontiers; Malmquist indices.

The global financial crisis and the current sovereign debt crisis have placed once again countries' competitiveness on the top of the policy agenda. The current debate, which involves policy-makers as well as scholars, is focused on ways of restoring and fostering competitiveness of western European economies, largely perceived as eroded by the economic structural changes which took place during the last decade. These issues are also debated in Luxembourg. Competitiveness, however, is often a vague and not clearly defined concept. Thus, this article focuses on the concept of productivity, which is regarded as a determinant (and sometime used as a synonymous) of countries' competitiveness, as well as a key ingredient of economic growth. The OECD (2012) emphasises that "productivity and unit labour costs are widely recognised as being two of the most important drivers [of countries' economic performances and growth]". What do data tell us concerning Luxembourg productivity performance?

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Productivity has been historically volatile in Luxembourg, but data also show a substantial decline in average productivity growth since the 90s, in comparison with the previous decade. This article overviews recent trends in productivity growth in Luxembourg. It highlights the contribution of capital, labour and Total Factor Productivity to the evolution of labour productivity at aggregate and industry level. At aggregate level, it compares Luxembourg performance to western European countries and the US. It also compares performances of manufacturing versus service industries, and analyses productivity in each industry against the relevant best-practice benchmark.

Productivity is a broad concept which can be measured in many different ways. This publication adopts the idea of “productive efficiency”, which compares outputs against the inputs used to produce those outputs (Farrell, 1957). Thus, increases in productivity reflect an economy’s ability to expand output by using inputs more efficiently, expanding its existing amount of knowledge, or enhancing scientific and technical progress. Here, the focus is on labour productivity – the amount of output produced per worker – and Total Factor Productivity (TFP). TFP is the residual growth in output that cannot be derived from the contributions to growth of capital and labour inputs; its dynamics is disembodied into efficiency gains and pure technical progress.

The productivity indicators presented in this report results from the last update of the LuxKlems database, which covers the period from 1995 to 2011, the latest available observation. They are computed using a non-parametric deterministic frontier approach, known as Data Envelopment Analysis (DEA, Charnes et al., 1978). While making minimal assumptions, the DEA method allows us to identify the best-practise technology comparing observed inputs and outputs, and to evaluate the performance of economic units (countries/industries/firms) with reference to such efficient frontier.

This choice of method is dictated by data availability and by the need of avoiding restrictive assumptions on market structure and behaviour, in order to better account for the structure of Luxembourg’s economy. Luxembourg is a very small open economy where rapid economic growth has been determined by the expansion of service industries, which took place alongside the decline of the traditional steel manufacturing. The country is now a prominent international financial services center, specialised in wealth and investment management. The expansion of financial industries has also generated increased activity in the business services and real estate, while some diversification has taken place in the export-led manufacturing industries. Currently, service industries account for about 85% of value added. The size, degree of specialisation and openness of the economy, and the prominence of potentially volatile financial activities makes the country especially exposed to economic fluctuations. As a result, Luxembourg’s data are highly volatile, which often makes their interpretation difficult, as it will be seen in this report. Results from previous data vintages were given by DiMaria and Ciccone (2008), Dubrocard et al. (2010), and Peroni (2012).

Across countries, the data point to a decline in labour productivity and TFP growth since the turn of the century. Due to a combination of a decrease in output and steady growth in the labour input, in Luxembourg labour productivity fell significantly since the outbreak of the financial crisis, and this decline was spread across industries. More worryingly, the TFP experienced a fall more pronounced than labour productivity, and has not recovered to its pre-crisis levels. However, in view of the pro-cyclicality of productivity data, it is too early to conclude that these developments reflect a longer-term trend. Overall, TFP has followed different patterns across Luxembourg industries: manufacturing industries were characterised by efficiency losses compared to slow or even negative technical progress in the services. The financial services seem to have weathered well the crisis.

This article is structured as follows. Section 7.1.1 analyses Luxembourg's labour productivity and TFP growth at aggregate level against a group of European countries (EU15) and the US over the period 1995-2011. Then, Section 7.1.2 compares the contribution of the different Luxembourg industries to the observed evolution of productivity measures. Section 7.1.3 gives concluding remarks. The Appendix has detailed tables of yearly changes for the main productivity variables from 2000 to 2011.

## 7.1.1 International comparison of productivity indicators

Labour productivity and Total Factor Productivity (TFP hereafter) are important indicators of countries' economic performances. Broadly speaking, the concept of productivity compares outputs to the inputs used in producing those outputs. Here, production is measured by GDP. Inputs to production are labour and the gross stock of capital. The labour input is measured by the number of persons employed, so that the level of labour productivity is given by GDP per worker.<sup>2</sup> TFP is computed using DEA, by comparing GDP to the contributions of both labour and capital stock.<sup>3</sup> These two measures of productivity are linked in a framework whereby the growth in labour productivity is decomposed into the contributions of capital deepening (changes in the ratio of capital to labour) and TFP growth.<sup>4</sup> In turn, TFP growth is disembodied into gains in the efficiency of the production process and technical changes. In the production frontier framework the change in technology is described by shifts of the frontier, whereas efficiency changes correspond to movements towards/away from the frontier; capital deepening describes movements along the frontier (the so-called scale effect).

<sup>2</sup> LuxKlems adopts the domestic employment concept. This is appropriate for Luxembourg as it includes both residents and non-residents workers. In Luxembourg non-resident workers account for nearly 40% of total employment.

<sup>3</sup> Here, Malmquist indices of productive efficiency are interpreted as indices of Total Factor productivity following Caves et al. (1982) and Fare et al. (1994a). These authors propose to construct productivity indices using the distance function approach, developing an idea first suggested by Malmquist (1953). Define the distance  $D(x; y)$  as the reciprocal of the largest factor by which one should increase output in order to reach the production frontier, given the input  $x$  and the technology  $S$ . The Malmquist productivity index is defined as follows:

$$M^{t,t+1} = \left( \frac{D^t(x^{t+1}, y^{t+1})}{D^t(x^t, y^t)} \right) \left( \frac{D^{t+1}(x^{t+1}, y^{t+1})}{D^{t+1}(x^t, y^t)} \right)^{\frac{1}{2}}$$

The equation above considers how much an economic unit could produce using the inputs available in  $t + 1$ , if it used the technology at time  $t$ , and how much a unit could produce using the inputs available in  $t$ , if it used the technology available in  $t + 1$ , and takes the geometric mean of the answers to these two questions. If, for example, the output resulting from the use of inputs in  $t + 1$  were halved when using as technology  $S_t$ , and the output from the use of inputs in  $t$  were doubled when using as technology  $S_{t+1}$ , the index above would show that a substantial technology progress has occurred from period  $t$  to  $t + 1$ . An advantage of this approach is that the Malmquist index can be decomposed into efficiency gains and technical progress as shown in Fare et al. (1994b). For a more detailed account of the methodology used one can see the technical section in Peroni (2012).

<sup>4</sup> Kumar and Russell (2002) have formalised the decomposition of labour productivity into capital deepening and TFP growth in the non-parametric frontier context. These authors found that capital deepening was the driving force of economic growth. In contrast, Fare et al. (2006) and Badunenko et al. (2008) identified technical change as the main source of growth.

## Overview of results

Table 1 presents average yearly growth rates of labour productivity (GDP/L) and its components, respectively, capital deepening (K/L), TFP, technical (TECH) and efficiency (EFF) changes, covering the time period 1995-2011. To provide insights into the consequences of the crisis, table 2 presents the same indicators over two distinctive time periods: i) 1995-2006; and ii) 2007-2011; the latter period captures the changes that occurred since and during the crisis.<sup>5</sup> (Tables in the appendix B detail yearly Charts for all countries.)

The evolution of TFP largely accounted for patterns in labour productivity growth, and its weak dynamics was largely responsible for the decline in output per worker. Overall tendencies were as follows:

- ▼ Labour productivity growth was lower than 2% in all western European countries and the US. It was negative in some countries (Italy and Greece);
- ▼ Countries experienced sustained rates of capital deepening compared to weaker TFP performances. TFP growth was generally low, below 1% per year, and negative in countries such as Portugal, Ireland, Italy, Greece, Spain and the UK. This was attributed to both efficiency losses and negative technical gains. The US and Luxembourg made an efficient use of inputs to production, characterising the best practise frontier;
- ▼ A comparison of growth rates over the pre- and post-crisis periods shows a dramatic and generalised deterioration in productivity performances. The 2007-2011 period was characterised by negative labour productivity growth, with only three exceptions (Ireland, Portugal and Spain).<sup>6</sup> TFP growth was also negative. A large majority of countries experienced efficiency losses and weak or even negative rates of technical progress;
- ▼ In Luxembourg, productivity patterns pre- and post-crisis were remarkably different. The years 1995-2006 were characterised by the efficient use of inputs and positive rates of technical change. After the outbreak of the crisis, Luxembourg experienced some efficiency losses, which displaced the country from the efficient frontier, and technical regress.

Overall tendencies described above are based on period averages which, however, may be misleading. The variables' time series reveal that labour productivity growth fell to or below zero in all countries in 2008 and 2009. This was followed by a marked recovery in 2010, with growth rates often close or above 3%. In 2011, however, when economic difficulties linked to large deficits and growing public debts emerged in the eurozone, productivity growth had once again slowed down or turned negative. TFP followed a similar pattern, but its recovery in 2010 was less strong than labour productivity. TFP fell or stabilised in 2011 in nearly all countries. The growth in TFP recorded in 2010 was generated by sustained rates of technical progress, which more than compensated continued efficiency losses. The fall in 2011 was instead due to the combination of efficiency losses and weaker technical gains. In Luxembourg, labour productivity gains in 2010 were weak (1.2%), and productivity fell again in 2011. This evolution is mainly explained by the strong dynamics of employment.

<sup>5</sup> One should note that any definition of sub-periods is potentially arbitrary.

<sup>6</sup> This result, however, should be interpreted with care as this is likely to reflect stronger falls in employment compared to output.

Chart 1 compares the evolution of Luxembourg's TFP to neighbouring countries and the US (panel a). Despite the higher volatility in the data, Luxembourg's TFP evolution was similar to the one of France, Belgium and the US in the period up to the crisis. After a period of sustained growth attributed to technical gains, TFP growth stagnated (panel b). The fall in TFP prompted by the recession, however, was more pronounced in Luxembourg than in the other countries (-7% in 2008 and 2009); Luxembourg also failed to experience a recovery in productivity growth: a mild increase (+ 1%) in 2010 was followed by a negative growth in 2011, when substantial technical gains were compensated by large efficiency losses, which displaced the country from the efficient frontier in 2011.

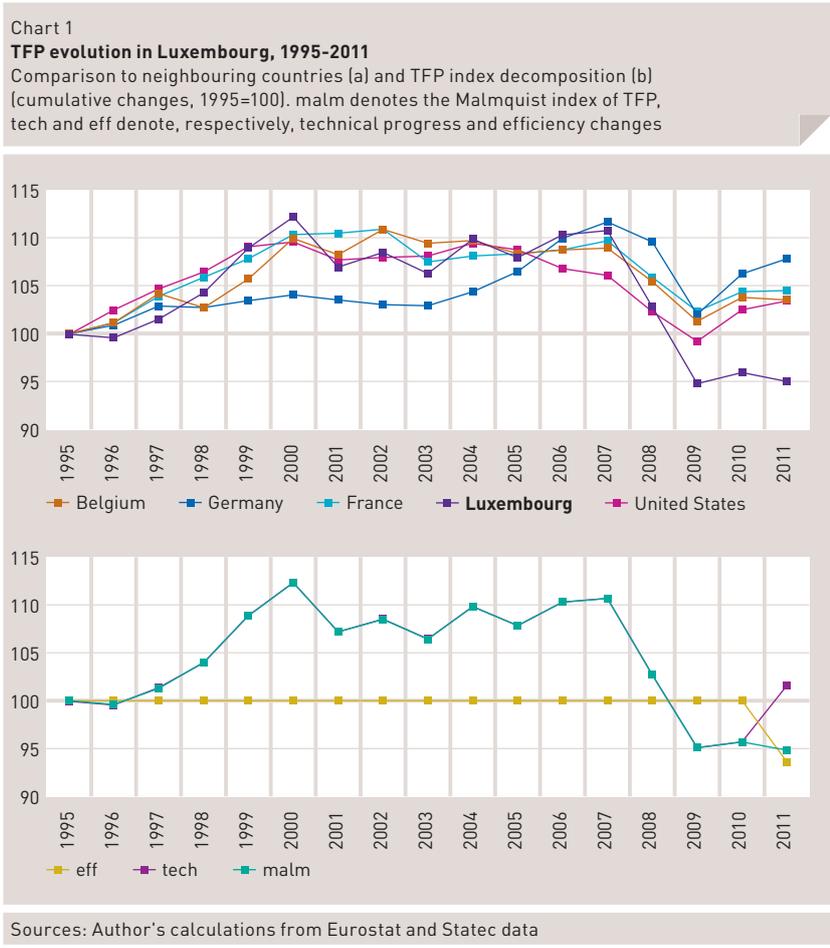


Table 1  
Annual labour productivity growth and its components (%): 1995-2011

Country	GDP/L	K/L	TFP	TECH	EFF
AT	1.17	2.79	0.59	0.92	-0.33
BE	0.58	1.58	0.22	0.82	-0.60
DE	1.66	3.25	0.48	0.16	0.32
DK	0.76	3.00	-1.03	-0.83	-0.20
ES	-0.08	2.84	-1.06	0.53	-1.58
FI	1.28	1.54	0.56	0.06	0.50
FR	1.05	2.84	0.28	0.58	-0.30
GR	-0.56	2.50	-2.29	-1.10	-1.20
IE	1.95	4.31	-0.41	-0.41	0.00
IT	-0.54	2.50	-1.62	-0.15	-1.47
<b>LU</b>	<b>-0.15</b>	<b>1.30</b>	<b>-0.32</b>	<b>0.11</b>	<b>-0.43</b>
NL	0.84	2.05	0.18	0.32	-0.14
PT	0.70	4.96	-3.99	-2.18	-1.85
SE	1.66	2.13	0.57	-0.68	1.26
UK	0.52	2.04	-1.40	-1.68	0.28
US	1.11	2.70	0.21	0.21	0.00

Legend: GDP/L denote GDP per capita; K/L is capital intensity; TFP is a Malmquist index of total factor productivity, TECH and EFF denote, respectively, technical progress and efficiency changes. Charts are period averages of annual percentage changes (geometric means). Country codes are available in the Appendix E, Table 22.  
Sources: Author's calculations from Eurostat and Statec data

Table 2  
Annual productivity growth (%): period comparison

Country	1995-2006				2007-2011			
	GDP/L	TFP	TECH	EFF	GDP/L	TFP	TECH	EFF
AT	2.10	1.23	0.89	0.34	-0.85	-1.29	1.04	-2.31
BE	1.20	0.72	0.81	-0.09	-0.78	-1.26	0.87	-2.12
DE	2.44	0.93	0.26	0.67	-0.04	-0.88	-0.15	-0.73
DK	1.28	-0.58	-0.61	0.03	-0.38	-2.34	-1.46	-0.89
ES	-0.62	-1.33	0.37	-1.69	1.12	-0.25	1.02	-1.26
FI	2.28	1.56	0.33	1.23	-0.91	-2.36	-0.73	-1.64
FR	1.61	0.78	0.65	0.13	-0.17	-1.21	0.38	-1.59
GR	0.34	-1.22	-0.87	-0.35	-2.51	-5.44	-1.80	-3.71
IE	0.92	-0.96	-0.91	-0.05	4.25	1.25	1.11	0.14
IT	-0.54	-1.34	0.19	-1.53	-0.53	-2.43	-1.15	-1.30
<b>LU</b>	<b>1.17</b>	<b>0.86</b>	<b>0.86</b>	<b>0.00</b>	<b>-2.98</b>	<b>-3.77</b>	<b>-2.10</b>	<b>-1.70</b>
NL	1.38	0.72	0.61	0.11	-0.34	-1.42	-0.53	-0.90
PT	0.73	-4.65	-2.00	-2.70	0.62	-1.98	-2.70	0.74
SE	2.49	1.32	-0.33	1.66	-0.13	-1.64	-1.70	0.07
UK	1.94	-0.95	-1.31	0.37	-2.54	-2.75	-2.75	0.00
US	1.60	0.49	0.48	0.01	0.05	-0.62	-0.62	0.00

Legend: Charts are period averages of annual percentage changes (geometric means).  
Sources: Author's calculations from Eurostat and Statec data

## 7.1.2 Productivity in Luxembourg at industry level

Productivity growth differ greatly across industries, the source of this variation being linked to the intensity to which industries use capital and labour, market structures, the degree of market competition, the intensity of innovation, the skills of the workers employed, and the ability to absorb external knowledge etc.<sup>7</sup> For this reason, the contribution of each industry is key to understand the drivers of productivity growth at the aggregate economy level.

This section analyses productivity changes, and associated technical and efficiency gains, in Luxembourgish industries from 1995 to 2011. (Data are sourced from National Accounts tables.) Malmquist indices of productivity are computed for each industry at the NACE 2-digit level. Service and manufacturing are analysed separately, and production frontiers are constructed for each group of industry. Industries' performances are evaluated by comparing gross output to three inputs: number of employees, capital stock, and intermediate inputs (energy, raw materials, and services) and compared to the relevant frontier. This is done to better reflect the structure of the Luxembourg economy and the different weights of manufacturing and services on output and employment.<sup>8</sup>

Results, however, should be interpreted with care for several reasons. Output is difficult to measure in service industries and, particularly, in financial services (Crespi et al., 2006; Wolfl, 2004; Balling et al., 2009). Moreover, the high volatility in the data, due to the small size and specialisation of the Luxembourg economy, also complicates the interpretation of results.

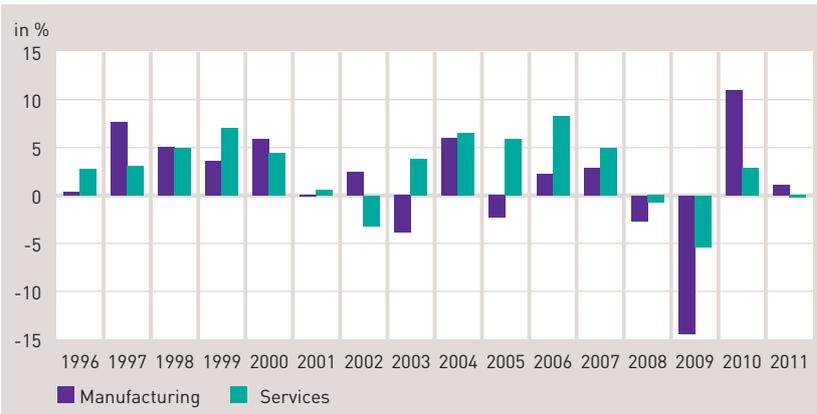
In the period analysed, service industries have been the drivers of Luxembourg's growth. Services' gross output and employment have increased at rates more than double those recorded in the manufacturing sector (respectively about 7 and 3 percent per year).<sup>9</sup> Chart 2 shows that output per worker has grown at sustained rates over the period in service industries, less so in manufacturing. During the global recession of 2007-2009, output per worker has fallen in both manufacturing and service industries, a decline linked to stronger decline in output compared to employment. The decline, however, was more pronounced in the manufacturing sector (-15% in 2010) than in services. This was followed by a sharp recovery in 2010 and a further slowdown in 2011. The failure of employment to adjust to the decline in output during negative economic cycles is often referred to as labour hoarding. An explanation is that firms, facing shortages of skilled labour and costly recruitment processes, choose to retain staff even if demand for goods/services is low. This observed fact is often advocated as an explanation of low productivity per capita in Luxembourg.

<sup>7</sup> The sources of the variation in productivity growth across industries have been investigated by various authors. On the role of market structure and competition and regulation one can see, for example, Syverson (2003) and Syverson (2004).

<sup>8</sup> Manufacturing industries account for only about 20% of total value added in the economy. The structures of manufacturing and service industries are also quite different. Luxembourg's services are rather fragmented whereas manufacturing industries are often dominated by few big firms. To aid interpretation of results, tables 23 and 24 in appendix E report each industry share on total employment and output of the corresponding group of activities.

<sup>9</sup> Data on output and inputs are not reported for reasons of space, but are available from the author upon request.

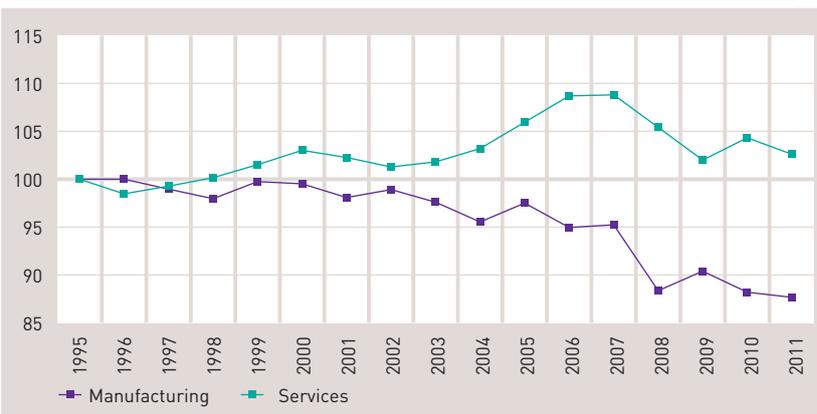
Chart 2  
**Growth in output per worker, Luxembourg 1995-2011**  
 Comparison of manufacturing (purple) and service (green) industries.  
 (Data are percentage changes on previous year.)



Sources: Author's calculations from Statac data

Over the past 15 years, productivity growth was driven by the service industries. This reflected both a robust productivity dynamics and an increase in the overall share of activity, especially in the financial industries. (Service industries in Luxembourg account for more than two third than total value added). Chart 3 compares the overall evolution of Malmquist TFP indices in services and manufacturing. One observes the deterioration of TFP performances in manufacturing industries, in face of a steady increase in productivity growth in services. Services' TFP grew until 2007, at an especially fast pace since 2004, and subsequently declined as a consequence of the financial crisis. Despite signs of recovery in 2010, TFP in services has not gone back to its pre-crisis level and has slightly declined in 2011.

Chart 3  
**TFP growth in Luxembourg 1995-2011**  
 Indices for manufacturing (purple line) and service (green line) industries (cumulative, 1995=100)



Sources: Author's calculations from Statac data

### 7.1.2.1 Services

Table 3 presents period averages of labour productivity growth and its components for the Luxembourg service industries from 1995 to 2011. Table 6 compares average yearly growth between the two subsequent periods 1995-2006 and 2007-2011. (Tables 12-16 in the appendix give annual Charts for labour productivity, TFP, technical change and efficiency gains from 2000 to 2011.)

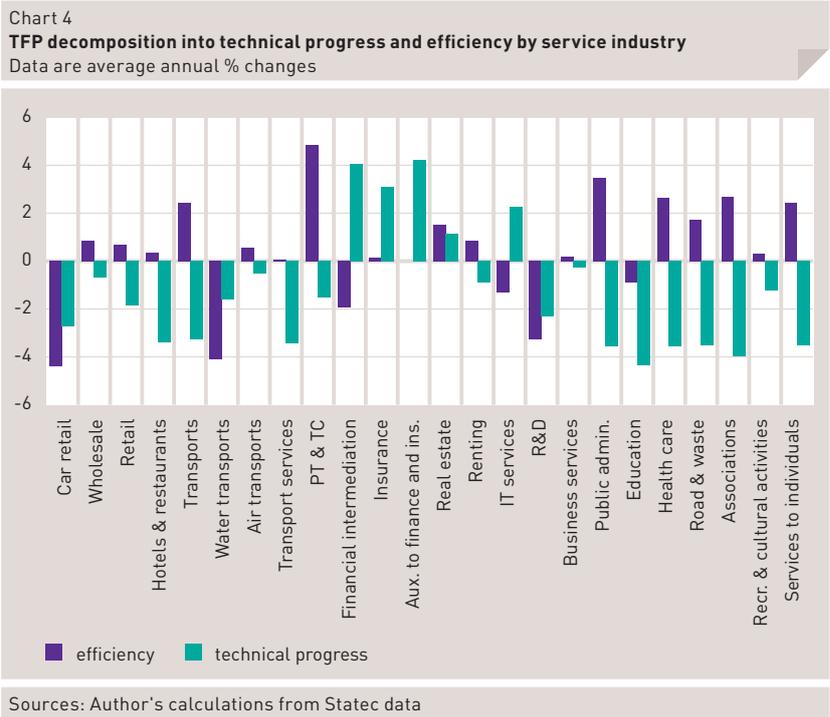
Productivity growth rates differed strongly across industries. Labour productivity grew at sustained rates in postal & telecommunications services (12% per year), in the commerce industries (5.5% and 7% in, respectively, retail and wholesale) and in business services (3.6%). The growth in productivity in these industries was generated by the sustained dynamics of capital intensity. Rates of growth were much lower, or even negative, in the other industries. Overall, labour productivity growth in services was mainly attributable to the capital labour ratio dynamics. Notably, the relative contribution of TFP and capital deepening was reversed for the financial activities, which were characterised by a larger share of labour productivity growth attributable to TFP increases.

Services' TFP performance was rather disappointing, with negative growth in nearly all industries. Positive TFP growth was recorded only in postal & telecommunications (3.2%) and in the financial services. As shown in chart 4, which depicts the contributions of technical changes and efficiency gains, this result was generated by zero, or even negative, technical progress and efficiency losses. Many activities suffered negative rates of technical change. Real estate and auxiliaries financial activities made an efficient use of inputs and characterised the best-practise frontier over the period of analysis.

For most industries, labour productivity and TFP have declined since the onset of the financial crisis, with some exceptions. Retail, telecommunications, transport and business services' productivity increased even during the crisis. (Postal & TC services made substantial TFP gains, due to increased efficiency which placed this industry on the efficient frontier.) Overall, TFP performances deteriorated substantially during the crisis.

The financial sector confirmed its prominence with positive rates of labour productivity growth in financial intermediation and the auxiliary to financial intermediation and insurance activities. This result was generated by sustained rates of TFP growth, about 2% per year for financial intermediation and 4% per year for the auxiliaries activities. (Despite a fall in labour productivity, the insurance's TFP also grew at about 3% per year). Technical change contributed to this outcome, while the auxiliary industry characterised the efficient frontier. In financial intermediation, positive rates of technical progress were only partly counter-balanced by efficiency losses.

The financial services weathered well the crisis: labour productivity grew at positive rates in the insurance and auxiliary activities. Notably, the driver of this result seems to be positive TFP growth, characterised by sustained technical change. In particular, TFP grew at higher rates than in the pre-crisis period in insurances and auxiliaries (respectively, 8.3 and 8.8%). In contrast, financial intermediation suffered labour productivity and TFP losses (the latter generated by efficiency losses). Overall, Luxembourg financial centre seems to have benefitted from its solid reputation and a flight-to-quality mechanism during the crisis.<sup>10</sup> This evolution may also suggest some restructuring within the financial sector, with the auxiliaries activities gradually gaining prominence on traditional financial intermediation.



<sup>10</sup> On the latest developments in the financial services, one can also see OECD (2008).

Table 3  
**Services: labour productivity growth and its components (%) 1995-2011**

Industry	Y/L	K/L	TFP	TECH	EFF
Car retail	-2.53	2.81	-6.96	-2.69	-4.39
Wholesale	5.49	4.52	0.12	-0.71	0.84
Retail	7.08	4.28	-1.20	-1.85	0.65
Hotels & restaurants	-1.43	3.27	-3.01	-3.39	0.40
Transports	1.14	0.11	-0.87	-3.24	2.44
Water transports	-9.71	14.52	-5.62	-1.61	-4.07
Air transports	0.16	2.14	0.02	-0.51	0.53
Transport services	0.61	2.75	-3.39	-3.45	0.06
PT & Telecommunications	12.59	5.51	3.19	-1.55	4.82
Financial intermediation	3.39	2.61	2.02	4.07	-1.97
Insurance	-1.05	-6.82	3.22	3.08	0.13
Auxiliaries to fin. int.	6.84	-1.12	4.22	4.22	0.00
Real estate	-1.37	-1.01	-2.25	-2.25	0.00
Renting & leasing	1.16	13.92	-0.05	-0.90	0.85
IT services	-4.52	-5.87	0.92	2.25	-1.30
R&D	-7.18	-0.29	-5.45	-2.27	-3.25
Business services	3.57	0.61	-0.10	-0.30	0.21
Public administration	0.10	1.11	-0.18	-3.53	3.47
Education	0.38	2.09	-5.15	-4.32	-0.87
Health care	0.00	4.06	-1.00	-3.56	2.65
Road & waste	-4.86	-1.67	-1.82	-3.49	1.73
Associations	1.52	8.86	-1.34	-3.94	2.71
Recr. & cultural activities	-7.08	1.63	-0.89	-1.22	0.33
Services to individuals	0.24	2.06	-1.15	-3.51	2.44

Sources: Author's calculations from Eurostat and Statec data

Table 4  
**Services productivity growth (%): period comparison**

Industry	1995-2006				2007-2011			
	Y/L	TFP	TECH	EFF	Y/L	TFP	TECH	EFF
Car retail	-1.31	-6.91	-1.88	-5.13	-5.16	-7.06	-4.43	-2.75
Wholesale	6.25	0.63	-1.28	1.93	3.84	-0.98	0.54	-1.51
Retail	2.78	-4.06	-2.75	-1.35	17.17	5.39	0.18	5.20
Hotels & restaurants	-1.23	-3.06	-2.26	-0.82	-1.87	-2.90	-5.84	3.13
Transports	1.70	0.05	-2.29	2.40	-0.07	-2.88	-5.28	2.53
Water transports	-7.93	-7.13	0.18	-7.29	-13.50	-2.20	-5.43	3.41
Air transports	1.40	1.29	-0.85	2.16	-2.53	-2.73	0.26	-2.99
Transport services	-1.86	-1.83	-2.26	0.44	6.27	-6.72	-6.00	-0.76
PT & TC	10.87	0.05	-2.82	2.95	16.47	10.47	1.30	9.06
Financial intermediation	6.31	4.67	4.73	-0.06	-2.74	-3.56	2.64	-6.04
Insurance	-1.69	0.98	2.28	-1.27	0.36	8.33	4.88	3.29
Auxiliaries to fin. int.	8.69	2.19	2.19	0.00	2.88	8.81	8.81	0.00
Real estate	-1.39	-1.76	-1.76	0.00	-1.33	-3.33	-3.33	0.00
Renting & leasing	-0.58	0.23	-0.21	0.43	5.07	-0.66	-2.40	1.78
IT services	-0.67	-0.57	1.20	-1.75	-12.48	4.28	4.60	-0.30
R&D	-6.82	-3.59	-0.67	-2.95	-7.95	-9.40	-5.71	-3.91
Business services	2.29	0.39	-1.60	2.02	6.44	-1.16	2.62	-3.68
Public administration	0.18	1.19	-2.36	3.64	-0.09	-3.12	-6.05	3.12
Education	-0.04	-2.90	-2.90	0.00	1.31	-9.91	-7.36	-2.75
Health care	1.53	-1.91	-2.46	0.57	-3.27	1.02	-5.92	7.38
Road & waste	-1.43	0.45	-2.39	2.91	-12.00	-6.65	-5.87	-0.83
Associations	-0.23	-2.17	-2.71	0.55	5.48	0.50	-6.61	7.60
Recr. & cultural activities	-9.17	-0.54	0.95	-1.48	-2.32	-1.68	-5.82	4.40
Services to individuals	-0.17	-1.03	-2.41	1.42	1.17	-1.42	-5.86	4.71

Sources: Author's calculations from Eurostat and Statec data

## 7.1.2.2 Manufacturing

The productivity performance of manufacturing industries deteriorated substantially since the outbreak of the global financial crisis. This may be attributed to the negative economic cycle, which has determined a contraction in output in face of rigidities in the adjustment of inputs to production. Luxembourg's export-oriented manufacturing sector is largely dominated by the steel industry, although it has reached some degree of diversification over time (textiles, chemical and plastic & rubber industries have non-negligible shares on manufacturing total output and employment). In recent years, manufacturing industries have confronted weakened external demand due to the global recession and economic conditions in the euro area, Luxembourg's principal export market. The export of industrial goods has fallen dramatically during 2009 and has slowed down again in 2011. There are, however, some indications that this decline may be of a structural nature, reflecting the decline in traditional heavy industries.

The introduction to this section has already highlighted the generalised deterioration in the TFP performance that took place in the manufacturing industries over the whole period 1995-2011. Table 5 shows that TFP growth was weak or negative across all industries. The decline in TFP was driven primarily by efficiency losses. In contrast, output per worker grew at more sustained rates, driven by substantial increases in the capital labour ratio.<sup>11</sup>

Table 6 shows that labour productivity and TFP performances were generally poorer in the years 2007-2011 than in 1995-2006. Output per worker in the basic and fabricated metal industries deteriorated substantially compared to the pre-crisis period (respectively, -1.7 and -8.6% per year between 2006 and 2011, against 5.9 and 0.1% in the previous period). It increased in only one industry, the manufacturing of rubber & plastic (5.53 against 1.87 recorded up to 2006). TFP growth turned negative in the large majority of activities, improving only in a handful of industries compared to the pre-crisis period. Notably, TFP growth slightly increased in the chemicals and rubber & plastics industries compared to the previous period. Another feature of the data is that since and during the crisis the manufacturing industries have realised substantial technical gains, while the deterioration in TFP was mainly due to efficiency losses.

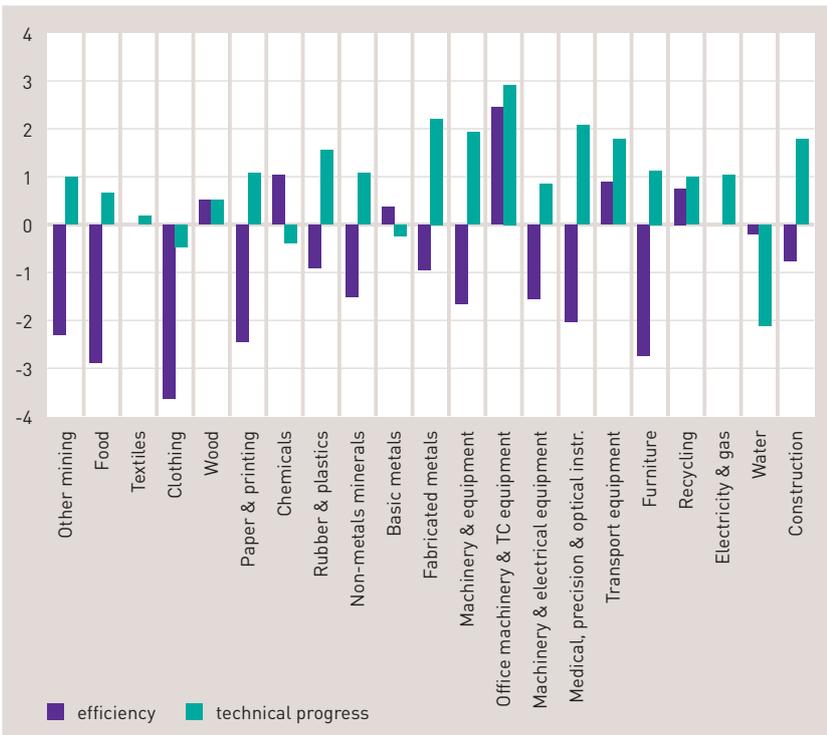
More detailed data (see tables in Appendix D) on the evolution of the variables of interest show the dramatic fall in output per worker which occurred in 2008 and 2009, prompted by the sharp contraction in output vis-a-vis stable employment Charts.<sup>12</sup> A sharp generalised recovery took place in 2010. Data for 2011 show large variations across industries, with some activities recording a striking increase in output per worker (energy industries) and others facing a substantial fall in this Chart. TFP data also showed large improvements following the financial crisis. TFP performance, however, was more diversified in 2011. Notably, output per worker and TFP of the fabricated metals industry fell by, respectively, 10% and 2% in 2011. Public utilities (electricity and gas) and textiles industries characterised the efficient frontier over the whole period.

<sup>11</sup> One should note that, in the case of industries, output Charts are gross and do not correspond to value added.

<sup>12</sup> The relative robustness of employment may be explained by the adoption of short-working time schemes. In future work, the use of hours-worked data may clarify the relevance of such adjustments.

In construction, an important industry often used as an indicator of economic health, output and inputs increased at sustained rates.<sup>13</sup> Productivity performance was poorer, as labour productivity grew by about 1% per year, as output grew faster than employment. TFP increased by 1%, due to the technical gains (1.7%) and efficiency losses (-0.8%). In particular, productivity indicators for this industry deteriorated substantially after the 2003 recession. Labour productivity growth has remained negative in 2010 and 2011, while TFP recovered in 2010 but slowed down in 2011. During the crisis, the construction industry experienced big efficiency losses, which displaced this activity from the best practice frontier in 2008, partially recovered in 2010 and 2011.

Chart 5  
**TFP decomposition into technical progress and efficiency by manufacturing industry**  
 Data are average annual % changes



Sources: Author's calculations from Statec data

<sup>13</sup> Construction accounts for about 10% of Luxembourg total employment and about 6% of the economy's value added.

Table 5  
Labour productivity in manufacturing: average annual growth (%) 1995-2011

Industry	Y/L	K/L	TFP	TECH	EFF
Other mining and quarrying	0.41	4.15	-1.39	0.97	-2.34
Food	-0.67	2.04	-2.24	0.64	-2.86
Textiles	0.78	-1.04	0.16	0.16	0.00
Clothing	2.46	2.99	-4.09	-0.46	-3.65
Wood	6.03	2.12	1.05	0.52	0.52
Paper & printing	1.39	5.58	-1.40	1.07	-2.45
Chemicals	4.55	2.33	0.68	-0.37	1.05
Rubber & plastics	3.00	1.02	0.64	1.55	-0.89
Non-metallic minerals	2.52	4.79	-0.45	1.08	-1.51
Basic metals	3.45	3.33	0.10	-0.25	0.35
Fabricated metals	-2.71	0.39	1.26	2.22	-0.94
Machinery & equipment	2.00	3.94	0.23	1.93	-1.67
Office machinery & TC equipment	9.99	-11.14	5.46	2.92	2.46
Machinery & electrical equipment	3.18	4.91	-0.76	0.82	-1.57
Medical, precision & optical instr.	8.53	4.43	-0.02	2.07	-2.05
Transport equipment	4.85	-0.76	2.70	1.80	0.89
Furniture	1.11	7.69	-1.62	1.14	-2.73
Recycling	0.24	5.25	1.75	1.00	0.74
Electricity & gas	6.58	4.22	1.03	1.03	0.00
Water	-2.06	1.41	-2.36	-2.15	-0.21
Construction	1.05	0.71	1.01	1.78	-0.76

Sources: Author's calculations from Statec data

Table 6  
Manufacturing productivity growth (%): period comparison

Industry	1995-2006				2007-2011			
	Y/L	TFP	TECH	EFF	Y/L	TFP	TECH	EFF
Other mining and quarrying	1.75	-0.81	0.27	-1.07	-2.49	-2.64	2.55	-5.06
Food	-0.25	-1.37	-0.05	-1.32	-1.57	-4.13	2.16	-6.16
Textiles	1.65	0.51	0.51	0.00	-1.11	-0.59	-0.59	0.00
Clothing	1.98	-1.34	-1.34	0.00	3.54	-9.86	1.51	-11.20
Wood	9.02	1.55	-0.32	1.87	-0.27	-0.05	2.39	-2.38
Paper & printing	2.69	-1.67	-0.21	-1.46	-1.41	-0.82	3.95	-4.58
Chemicals	5.30	0.64	-0.59	1.24	2.94	0.77	0.13	0.64
Rubber & plastics	1.87	0.18	-0.36	0.54	5.53	1.67	5.88	-3.98
Non-metallic minerals	2.67	-0.08	0.06	-0.14	2.19	-1.24	3.36	-4.46
Basic metals	5.88	0.61	-0.69	1.31	-1.70	-1.00	0.73	-1.72
Fabricated metals	0.09	1.83	1.52	0.31	-8.58	0.01	3.77	-3.62
Machinery & equipment	2.99	0.90	0.89	0.02	-0.16	-1.23	4.25	-5.26
Office machinery & TC equipment	4.76	2.73	-0.25	2.98	22.43	11.74	10.27	1.33
Machinery & electrical equipment	4.31	-1.61	-0.56	-1.06	0.74	1.13	3.92	-2.68
Medical, precision & optical instr.	9.42	0.53	0.06	0.48	6.59	-1.24	6.62	-7.38
Transport equipment	6.28	2.52	0.67	1.84	1.76	3.09	4.32	-1.18
Furniture	1.60	-1.95	0.01	-1.96	0.05	-0.88	3.67	-4.40
Recycling	1.27	1.21	0.13	1.08	-2.00	2.95	2.95	0.00
Electricity & gas	7.42	1.70	1.70	0.00	4.76	-0.42	-0.42	0.00
Water	-0.24	-1.15	-1.15	0.00	-5.96	-4.96	-4.30	-0.69
Construction	1.82	1.13	1.13	0.00	-0.63	0.74	3.22	-2.40

Sources: Author's calculations from Eurostat and Statec data

### 7.1.3 Conclusions

Main productivity tendencies highlighted in this report are summarised as follows:

- ▼ Productivity measures showed a large and generalised decrease during the recent financial crisis. However, the slowdown in productivity started well before the crisis. The subsequent recovery has been characterised by sustained rates of technical progress. Productivity data show signs of a further slowdown in 2011;
- ▼ Luxembourg's TFP stagnated due to a deterioration in the country's technical progress performance. The global recession of 2007-09 prompted a large fall in Luxembourg's labour productivity and TFP. The country failed to innovate at a sustainable rate while efficiency losses displaced Luxembourg from the efficient frontier in 2011. The reasons for this may be traced to the country's high exposure to external conditions, to a labour-hoarding mechanism, and some restructuring taking place in the economy. However, it is too early to say whether recent developments reflect deeper structural changes or simply severe economic fluctuations;
- ▼ The decline in productivity measures which took place since the outbreak of the crisis was generalised across Luxembourg industries. There were, however, large differences in efficiency and technological progress across industries. The analysis of productivity by industry revealed the continued decline in goods-producing industries in the face of sustained growth in services. The latter was led by telecommunication and, most of all, financial services. Among financial industries, the activities auxiliaries to financial intermediation and insurance were the most dynamic. Overall, the financial industries had a strong TFP performance and weathered the crisis.

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## 7.1.5 Appendix

### A Data

For the DEA analysis, output is measured by real Gross Domestic Product (GDP), and capital stock and labour are the inputs to production. The labour input is measured by the number of workers (full time equivalent). This includes both resident and non-resident workers. GDP and employment series are from the Eurostat Economy and Finance database. The series have been converted using the PPPs, which ensures comparability of aggregates across countries. PPPs allow researchers to express economic variables 'as if' they were recorded in a single common currency. This takes into account not only nominal exchange rates but also the different price levels (purchasing powers) across countries, and ensures that, for example, variables such as GDP reflect the actual size of an economy. Estimates of capital stock are constructed using capital stock data from the EUKLEMS database and investment series from Eurostat. The EUKLEMS database provides an initial capital stock level (i.e. the last year available in the database for all countries) and capital stock series that allow us to compute depreciation rates. The initial stocks are then updated using yearly investment Charts and the depreciation rate. Details on the method used to compute the capital stock are available on the 2010 report (Dubrocard et al., 2010, page 24-25). EUKLEMS Database, March 2007, see Timmer et al. (2007); downloadable at [www.euklems.net](http://www.euklems.net). Luxembourg data are from the Statec.

### B Tables: international comparison

Table 7  
Labour productivity growth (%) 2000-2011

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AT	4.74	-3.18	3.87	0.76	2.97	-1.24	2.52	0.15	-2.98	-5.06	2.36	1.46
BE	5.22	-1.44	3.53	-1.37	0.00	-1.10	0.50	0.36	-3.46	-3.75	3.00	0.09
DE	2.29	0.94	1.67	2.43	3.04	3.16	3.71	1.96	-2.05	-6.98	4.76	2.53
DK	3.88	-2.36	2.06	-2.02	4.38	-1.86	1.46	-0.42	-3.88	-4.71	5.83	1.66
ES	-0.10	-1.83	0.74	-3.38	-1.36	-2.35	1.12	1.00	-2.05	1.60	3.01	2.10
FI	4.16	-2.21	1.35	0.50	7.28	0.23	2.46	3.69	-3.93	-7.45	3.89	-0.26
FR	3.44	1.06	1.54	-3.45	1.99	1.87	0.73	1.56	-3.53	-3.07	3.11	1.24
GR	3.58	3.60	2.46	-0.38	0.74	-4.32	2.73	-1.11	-3.14	-4.93	-1.70	-1.61
IE	2.60	-2.55	2.50	0.24	1.59	-0.59	0.72	4.04	-4.48	5.31	10.80	6.17
IT	1.98	-0.49	-5.99	-3.19	-1.08	-0.03	1.24	2.04	-2.14	-5.85	1.65	1.89
<b>LU</b>	<b>3.03</b>	<b>-5.15</b>	<b>1.95</b>	<b>-1.64</b>	<b>4.05</b>	<b>-1.94</b>	<b>2.57</b>	<b>0.51</b>	<b>-7.58</b>	<b>-7.70</b>	<b>1.22</b>	<b>-0.96</b>
NL	3.43	-3.10	-0.31	-2.59	4.98	1.90	1.96	2.17	-2.11	-5.52	4.07	-0.05
PT	1.51	-2.16	-0.53	-0.74	0.04	4.66	1.39	2.29	-3.02	-1.00	4.34	0.66
SE	3.86	-4.53	2.03	2.37	7.44	-1.19	2.88	2.81	-4.38	-7.18	6.31	2.40
UK	5.87	2.02	1.14	0.00	3.00	0.06	0.29	-0.47	-6.55	-5.54	2.46	-2.32
US	1.71	-0.40	1.71	0.92	2.17	0.25	-2.12	0.23	-3.88	-2.13	4.82	1.43

Sources: Author's calculations from Eurostat, Statec data

Table 8  
Capital deepening 2000-2011 (%)

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AT	5.87	0.35	5.89	3.06	3.46	-0.57	1.71	-0.61	-1.76	0.41	1.99	0.90
BE	4.98	0.88	4.69	-0.15	-1.16	0.29	0.95	0.90	-1.26	1.08	2.35	0.29
DE	3.36	3.03	4.40	4.99	3.72	4.43	2.46	1.35	-0.65	-0.71	2.21	1.51
DK	5.03	0.69	5.21	0.69	5.06	-0.81	2.67	2.10	0.05	2.84	5.70	1.99
ES	1.82	1.11	4.44	-0.36	1.34	0.26	3.41	3.67	1.94	8.38	5.37	3.13
FI	2.65	-1.00	2.93	1.86	6.35	0.49	1.14	2.17	-1.01	2.96	2.32	-0.82
FR	3.86	3.26	4.22	-1.12	2.57	3.63	1.86	3.13	-0.04	2.34	3.64	1.82
GR	6.27	5.43	5.32	-0.05	2.16	-1.76	3.22	3.01	2.01	1.27	5.10	6.05
IE	2.88	1.57	4.97	4.42	5.03	2.40	3.61	6.14	2.63	12.87	10.90	3.18
IT	3.42	2.47	-2.03	0.78	0.69	2.74	2.72	3.86	1.75	1.03	1.31	2.67
<b>LU</b>	<b>-0.05</b>	<b>-2.38</b>	<b>3.43</b>	<b>2.44</b>	<b>4.95</b>	<b>-1.60</b>	<b>2.74</b>	<b>0.26</b>	<b>-1.37</b>	<b>-0.42</b>	<b>1.57</b>	<b>1.05</b>
NL	4.26	-0.90	2.99	-0.16	5.00	2.51	1.66	1.57	-0.56	0.00	3.64	0.51
PT	7.36	4.23	5.87	5.69	2.80	7.52	2.94	2.87	-0.49	3.44	3.87	2.16
SE	2.83	-2.80	2.10	2.34	5.52	-0.76	2.77	4.18	0.36	-0.16	2.37	1.52
UK	6.25	3.51	2.81	0.06	3.81	1.22	1.88	0.53	-2.25	0.07	2.55	-1.72
US	3.46	3.78	4.22	2.02	2.27	1.79	-0.45	2.04	-0.86	1.95	3.26	0.72

Sources: Author's calculations from Eurostat, Statec data

Table 9  
TFP growth (%) 2000-2011

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AT	3.39	-3.26	2.64	0.17	2.32	-1.13	2.17	0.29	-2.62	-5.11	1.74	0.98
BE	4.02	-1.63	2.52	-1.34	0.22	-1.16	0.32	0.16	-3.21	-3.90	2.27	-0.09
DE	0.65	-0.55	-0.50	-0.12	1.38	2.08	3.25	1.67	-1.93	-6.89	4.03	1.61
DK	1.48	-2.68	-0.45	-2.37	1.24	-1.32	-0.27	-1.74	-3.91	-6.62	1.35	0.02
ES	-0.68	-2.23	-1.18	-3.19	-2.19	-2.52	-1.14	-1.29	-2.97	0.22	1.40	0.41
FI	3.36	-1.82	-0.15	-0.51	3.30	-0.12	1.67	2.48	-3.26	-8.98	2.77	0.43
FR	2.42	0.13	0.34	-3.02	0.55	0.15	0.40	0.92	-3.52	-3.38	2.03	0.13
GR	-1.88	0.58	-0.41	-0.35	-0.62	-3.21	0.69	-2.91	-4.38	-5.78	-5.38	-6.23
IE	0.45	-3.63	-1.13	-2.43	-1.40	-2.14	-1.58	0.14	-6.13	-0.66	7.42	4.94
IT	0.79	-1.43	-4.99	-3.59	-1.50	-1.85	-0.55	-0.46	-3.30	-6.56	0.61	-0.32
<b>LU</b>	<b>3.04</b>	<b>-4.73</b>	<b>1.42</b>	<b>-1.96</b>	<b>3.33</b>	<b>-1.71</b>	<b>2.12</b>	<b>0.47</b>	<b>-7.36</b>	<b>-7.65</b>	<b>1.21</b>	<b>-0.96</b>
NL	2.54	-2.90	-1.34	-2.50	2.04	0.59	1.63	1.83	-2.01	-5.52	2.38	-0.38
PT	-5.45	-6.13	-6.04	-6.08	-2.69	-2.66	-1.51	-0.57	-2.55	-4.30	0.45	-1.47
SE	2.48	-3.25	1.01	0.91	3.99	-0.69	1.09	0.19	-4.61	-7.07	4.41	1.15
UK	-0.36	-1.44	-1.63	-0.06	-0.33	-0.92	-1.21	-0.88	-4.78	-5.59	0.28	-0.78
US	0.56	-1.78	0.25	0.12	1.20	-0.52	-1.92	-0.64	-3.53	-3.01	3.29	0.94

Sources: Author's calculations from Eurostat, Statec data

Table 10  
Efficiency changes (%) 2000-2011

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AT	1.99	-1.55	1.70	0.17	0.34	-0.81	3.52	0.36	1.80	-1.95	-6.19	-2.71
BE	2.50	0.28	1.58	-1.26	-1.70	-0.90	1.83	0.25	1.07	-0.82	-5.26	-3.34
DE	0.45	1.92	-0.20	0.09	0.22	2.50	5.19	1.81	2.11	-4.36	-0.64	0.07
DK	0.71	0.18	-0.39	-1.00	1.96	-0.45	1.18	-0.75	0.02	-2.62	-0.46	-0.49
ES	-1.49	-0.11	-1.10	-2.73	-2.39	-1.60	0.55	-0.29	0.61	3.23	-5.35	-3.29
FI	2.54	0.41	0.20	0.11	2.73	0.87	3.50	3.37	0.10	-6.09	-0.13	-0.32
FR	1.57	1.63	-0.17	-3.16	-0.24	0.67	2.41	1.07	0.40	-0.70	-3.69	-2.30
GR	-2.26	4.29	-0.13	1.60	0.74	-2.43	1.88	-2.02	-0.07	-1.36	-6.78	-6.45
IE	0.00	0.00	0.00	0.00	-0.19	-1.31	-0.20	1.16	-2.52	2.74	0.41	0.00
IT	0.26	0.61	-4.66	-2.74	-1.23	-0.95	1.06	0.61	0.19	-3.01	-1.39	-0.96
<b>LU</b>	<b>0.00</b>	<b>-6.63</b>										
NL	1.42	-1.69	-1.38	-2.12	1.23	1.14	3.67	2.02	1.86	-3.08	-0.93	-1.37
PT	-5.19	-2.16	-3.77	-5.60	-1.92	-1.53	0.05	0.42	1.93	1.38	0.54	-0.86
SE	1.76	-0.33	0.93	3.08	5.24	0.15	2.42	1.16	-0.58	-2.89	2.82	1.01
UK	-0.08	2.73	0.75	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
US	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Sources: Author's calculations from Eurostat, Statec data

Table 11  
Technical progress (%) 2000-2011

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
AT	1.38	-1.73	0.92	0.00	1.97	-0.32	-1.30	-0.06	-4.34	-3.22	8.46	3.80
BE	1.48	-1.91	0.92	-0.08	1.95	-0.26	-1.48	-0.09	-4.23	-3.10	7.95	3.37
DE	0.20	-2.42	-0.31	-0.21	1.15	-0.41	-1.84	-0.14	-3.95	-2.65	4.69	1.54
DK	0.76	-2.85	-0.06	-1.38	-0.71	-0.87	-1.43	-0.99	-3.93	-4.11	1.82	0.51
ES	0.82	-2.13	-0.08	-0.48	0.20	-0.94	-1.68	-1.00	-3.56	-2.91	7.13	3.82
FI	0.81	-2.22	-0.35	-0.62	0.56	-0.97	-1.77	-0.85	-3.35	-3.08	2.91	0.75
FR	0.84	-1.48	0.52	0.15	0.79	-0.52	-1.96	-0.16	-3.91	-2.70	5.94	2.49
GR	0.39	-3.56	-0.28	-1.92	-1.35	-0.80	-1.17	-0.91	-4.31	-4.48	1.50	0.24
IE	0.45	-3.63	-1.13	-2.43	-1.22	-0.84	-1.39	-1.00	-3.70	-3.31	6.98	4.94
IT	0.53	-2.03	-0.35	-0.87	-0.28	-0.91	-1.59	-1.06	-3.48	-3.67	2.03	0.65
<b>LU</b>	<b>3.04</b>	<b>-4.73</b>	<b>1.42</b>	<b>-1.96</b>	<b>3.33</b>	<b>-1.71</b>	<b>2.12</b>	<b>0.47</b>	<b>-7.36</b>	<b>-7.65</b>	<b>1.21</b>	<b>6.07</b>
NL	1.11	-1.23	0.04	-0.40	0.80	-0.55	-1.97	-0.18	-3.79	-2.51	3.34	1.00
PT	-0.28	-4.06	-2.36	-0.51	-0.78	-1.14	-1.56	-0.99	-4.39	-5.60	-0.09	-0.61
SE	0.70	-2.94	0.08	-2.11	-1.19	-0.83	-1.30	-0.96	-4.05	-4.31	1.55	0.13
UK	-0.28	-4.06	-2.36	-0.51	-0.33	-0.92	-1.21	-0.88	-4.78	-5.59	0.28	-0.78
US	0.56	-1.78	0.25	0.12	1.20	-0.52	-1.92	-0.64	-3.53	-3.01	3.29	0.94

Sources: Author's calculations from Eurostat, Statec data

## C Tables: service industries

Table 12  
Services: labour productivity growth (%) 2000-2011

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
31	-4.92	1.60	-5.82	-0.97	-7.99	-8.11	-3.40	-8.74	-3.63	-11.20	-3.00	1.28
32	4.14	4.70	2.40	12.84	3.62	0.59	16.19	9.59	13.57	-16.24	5.47	9.79
33	1.03	-0.59	3.70	-6.62	3.40	-1.34	30.45	28.50	11.37	13.81	15.71	17.17
34	-2.58	-0.19	-0.81	-6.22	-2.62	-1.31	-2.33	-0.42	-3.27	-5.57	-1.06	1.09
35	4.24	-1.63	-0.12	-3.82	6.75	1.42	3.77	0.21	0.34	-5.41	4.05	0.66
36	-10.62	-3.81	-0.26	-5.52	-27.36	-28.60	40.32	-24.67	14.00	-16.90	8.17	-37.25
37	-0.06	-4.47	0.27	-5.04	11.22	9.54	-7.16	3.10	-5.97	-11.48	8.92	-5.88
38	-11.87	-7.49	-17.57	-5.92	21.67	-17.83	8.03	-4.01	12.60	-1.42	12.48	13.10
39	13.38	8.23	11.02	5.18	4.87	5.40	25.38	16.39	17.56	21.54	22.23	5.41
40	6.99	-0.98	-2.64	0.16	10.93	8.24	11.27	3.84	-6.02	-12.60	3.73	-1.64
41	-10.98	-11.11	-3.96	-6.73	1.01	11.01	0.51	1.37	-1.93	-6.28	14.43	-4.48
42	8.92	-8.67	-7.54	22.30	18.44	29.32	15.60	3.21	2.26	13.65	1.48	-5.30
43	1.42	3.37	8.78	-5.47	-2.58	-2.63	-8.25	1.99	-6.54	-3.90	3.45	-1.32
44	25.65	4.01	-11.19	-14.48	8.77	-8.56	23.05	14.40	8.00	9.25	-12.91	8.94
45	-1.04	-6.16	-11.39	133.94	41.22	-17.09	-11.84	-20.63	-18.66	-8.73	-18.28	6.66
46	-17.31	-8.94	-3.06	-10.17	-11.56	-7.08	-12.13	-7.21	-8.11	-16.14	-8.18	0.66
47	-4.35	12.90	-1.21	12.98	5.93	1.82	4.45	3.31	8.46	-0.46	11.35	9.98
48	1.87	1.33	-1.34	-1.15	0.76	0.17	-0.13	1.35	-0.09	-1.92	-0.13	0.36
49	0.86	-0.49	-2.48	-0.48	-1.12	-1.74	0.85	1.59	0.39	1.19	2.66	0.72
50	-3.15	2.53	-1.57	1.53	3.39	-0.80	-0.05	1.51	-11.12	-1.10	-1.74	-3.40
51	-1.34	-8.03	4.93	-8.77	4.60	1.15	-2.91	-2.62	-26.92	-0.18	-11.05	-16.47
52	-0.44	12.73	-4.34	-10.42	2.14	-7.17	2.00	2.11	25.00	10.73	0.97	-8.50
53	-11.26	-6.27	6.45	-8.96	-21.79	5.29	-37.07	-3.03	5.20	-12.86	-0.15	0.22
54	2.25	0.67	-3.07	1.04	2.03	-2.37	-0.48	-2.28	6.57	-5.12	2.64	4.51

Sources: Author's calculations from Statec data

Table 13  
**Services: capital deepening (%) 2000-2011**

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
31	-0.19	0.35	3.30	1.67	6.19	3.03	4.09	3.90	1.46	4.50	2.13	1.47
32	2.06	1.80	4.20	6.31	9.58	2.35	12.67	6.08	3.40	4.09	2.43	1.30
33	5.66	2.43	6.22	4.93	6.02	4.92	4.14	4.94	1.86	4.09	2.13	0.67
34	3.70	3.77	2.24	2.17	2.23	3.79	2.65	3.77	-0.37	2.77	0.78	-0.43
35	-3.85	-4.08	-3.93	-3.02	5.90	8.53	-2.51	-2.03	-0.37	4.24	3.46	3.33
36	41.28	-10.29	17.28	68.00	13.34	-19.17	41.04	5.02	42.84	17.77	6.30	5.97
37	-3.20	5.74	7.30	-3.72	7.97	-1.63	-8.95	-0.77	-1.76	-1.20	-2.61	-5.74
38	-3.31	-3.35	11.12	1.92	4.90	-0.73	9.44	0.29	-2.48	6.49	4.90	0.60
39	6.24	4.84	5.18	2.20	6.44	4.92	6.06	7.32	6.83	-2.18	0.82	2.97
40	2.33	-0.12	3.71	3.00	-0.07	0.24	-3.69	9.70	12.99	0.27	1.15	-1.90
41	-14.96	-13.77	-5.37	-1.44	-1.06	1.56	-5.68	-2.68	-9.53	-6.75	-6.56	-5.40
42	20.30	3.87	5.25	-0.38	-6.26	-9.02	-15.83	-25.73	-18.64	-10.48	-7.63	-4.45
43	-1.38	0.33	6.00	-3.81	1.33	-2.23	-8.18	1.36	-7.29	-2.13	-0.27	-1.21
44	-2.18	39.34	46.15	21.95	23.54	28.01	22.20	16.32	15.13	2.31	-1.39	2.41
45	-16.44	-16.52	8.64	20.33	45.33	28.63	10.10	-6.35	-10.88	-15.84	-17.93	-20.35
46	-7.69	1.26	6.35	-0.90	2.07	0.32	-1.28	-0.18	0.38	-9.48	3.34	1.41
47	-9.51	-3.84	5.54	35.30	2.23	12.80	-3.45	-3.94	-3.91	5.99	0.61	3.74
48	0.22	2.45	-0.51	-0.90	0.06	1.25	4.70	2.83	-1.86	-0.22	4.21	2.19
49	-1.31	-0.83	0.86	4.51	3.36	3.47	3.99	2.21	1.87	1.31	1.91	-0.44
50	3.47	-1.04	-0.02	10.83	8.51	4.10	7.98	5.83	-2.21	0.81	-1.33	0.43
51	-5.03	-2.80	2.10	-0.64	0.57	-1.22	0.72	0.29	-0.33	-3.60	-1.52	-2.69
52	11.34	17.23	25.40	61.63	-6.04	6.06	11.91	9.93	0.62	0.47	0.48	1.39
53	-2.98	3.10	-0.59	7.46	3.55	7.28	1.99	-0.68	1.33	-0.97	1.79	-0.43
54	1.28	1.71	-1.68	0.23	1.42	2.37	1.59	0.81	1.45	1.18	-1.73	0.23

Sources: Author's calculations from Statec data

Table 14  
**Services: TFP growth (%) 2000-2011**

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
31	0.66	-4.61	-5.66	-26.29	-4.95	-9.74	-5.15	-10.58	-13.69	-0.03	-4.82	-5.58
32	0.77	4.25	-1.15	2.86	-3.96	0.36	1.33	2.42	2.61	-14.78	-0.56	6.91
33	7.53	0.73	-1.66	-12.22	1.28	-2.58	-27.21	15.36	3.46	2.28	3.87	2.54
34	0.81	-0.71	0.85	-4.89	-2.34	-2.83	-6.73	-6.17	-0.27	-3.38	-2.26	-2.34
35	-0.04	-4.39	-0.32	-6.61	2.70	6.36	-2.52	-4.39	-7.19	-1.45	1.40	-2.54
36	-10.66	-3.81	-0.26	17.06	-4.45	-5.90	-21.58	-19.42	5.10	4.32	-2.67	4.03
37	-0.09	-4.47	0.27	-5.04	11.22	9.32	-7.25	2.48	-6.89	-7.10	6.76	-8.00
38	10.96	-2.21	12.33	-11.70	-12.90	8.91	-3.32	-3.51	-7.01	-15.58	-9.70	3.24
39	16.09	-11.82	27.13	-9.86	13.38	-4.09	-7.82	13.59	12.31	13.00	9.55	4.18
40	4.87	-1.23	-3.52	0.27	9.56	7.52	8.84	-0.06	-6.95	-12.60	5.50	-2.72
41	-6.85	-10.19	-3.33	-6.55	1.85	12.12	12.14	9.80	6.12	-1.64	29.97	0.15
42	-3.90	-7.17	-7.09	15.19	13.26	21.92	16.21	17.90	13.37	22.73	-4.01	-3.12
43	16.25	-3.14	4.77	-10.91	-3.19	3.78	-0.65	8.24	-13.32	-11.65	1.22	0.60
44	27.17	-20.56	-13.98	11.67	24.25	5.07	5.95	0.52	-0.66	2.69	-10.48	5.40
45	4.73	4.49	-8.94	19.95	-2.75	-17.21	-1.61	-0.86	2.08	4.91	7.96	7.61
46	-8.21	-7.48	-9.70	-7.64	-5.68	12.51	-3.10	-10.05	-5.86	-18.28	0.04	-11.80
47	4.48	5.89	-0.84	-11.21	1.35	-5.33	4.97	5.33	-2.20	-3.44	-5.57	0.42
48	-8.67	7.33	-3.88	-1.26	2.93	-3.68	6.39	-3.55	-4.70	-3.19	-2.88	-1.25
49	3.25	-3.36	-5.57	-6.81	-4.16	5.10	-4.64	-8.13	-7.80	-23.30	-5.14	-3.69
50	-8.72	2.98	-7.57	-1.37	0.32	-5.41	1.29	-0.06	0.10	-4.00	11.37	-1.66
51	3.17	-0.39	0.58	0.19	1.20	2.71	-6.33	-5.40	-12.72	-4.61	0.62	-10.56
52	-3.90	-16.08	-1.33	-14.32	12.32	1.39	5.00	16.40	-23.33	1.99	-4.88	18.39
53	-11.27	-6.35	6.54	-9.56	0.97	4.27	34.34	-2.23	-12.27	2.36	5.50	-0.79
54	0.16	-2.87	-2.12	-1.26	-5.98	3.70	-5.39	-4.25	-0.52	-8.73	3.35	3.60

Sources: Author's calculations from Statec data

Table 15  
**Services: technical progress (%) 2000-2011**

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
31	30.35	-8.71	0.63	-10.26	-3.64	8.82	2.68	3.64	-9.37	-16.63	-0.11	1.91
32	4.93	1.96	0.68	-2.71	-3.10	1.85	0.74	2.30	-0.63	-0.90	1.27	0.70
33	28.59	-8.23	0.00	-15.36	-3.76	8.45	2.70	2.49	-1.67	-1.43	0.80	0.78
34	30.13	-8.60	0.40	-15.84	-3.72	8.75	4.99	13.17	-21.73	-17.92	-0.11	1.91
35	27.91	-8.45	0.44	-16.22	-3.66	9.00	5.33	13.67	-20.07	-17.54	-0.11	1.91
36	1.23	3.37	8.78	-11.62	-3.55	9.64	5.70	8.29	-16.97	-17.35	-0.11	1.91
37	0.69	3.37	8.78	-5.47	-2.58	0.16	-4.46	2.28	-4.12	0.56	1.70	1.02
38	28.06	-8.03	-0.54	-14.26	-3.59	8.70	3.72	11.84	-21.38	-18.02	-0.11	1.91
39	31.83	-9.08	0.70	-17.05	-3.55	9.78	-0.37	2.49	-4.58	4.32	0.34	4.18
40	4.87	-1.23	-3.52	0.27	9.56	18.28	8.78	0.73	4.19	13.65	-0.23	-4.27
41	-4.82	-0.06	-1.75	-0.55	8.35	14.10	-0.97	0.88	9.78	19.37	-4.17	0.15
42	-3.90	-7.17	-7.09	15.19	13.26	21.92	16.21	17.90	13.37	22.73	-4.01	-3.12
43	16.25	-3.14	4.77	-10.91	-3.19	3.78	-0.65	8.24	-13.32	-11.65	1.22	0.60
44	4.94	2.06	6.13	-13.43	-3.55	9.75	5.99	12.27	-13.80	-9.96	0.14	1.50
45	-2.01	4.49	-6.28	16.54	18.50	8.99	-1.12	0.89	8.39	15.67	-1.99	0.99
46	4.13	2.03	0.46	-2.82	-3.45	6.30	5.85	13.81	-21.98	-17.54	-0.11	1.91
47	1.86	3.17	-3.21	0.05	-2.08	2.40	0.31	1.90	3.13	8.39	-1.02	0.92
48	26.11	-8.12	-0.41	-15.05	-3.59	8.68	3.92	11.82	-21.32	-18.25	-0.11	1.91
49	3.25	-3.36	-5.57	-6.81	-4.16	5.10	-4.64	3.55	-18.19	-20.85	-0.11	1.91
50	28.82	-8.48	0.42	-15.98	-3.72	8.77	4.85	12.70	-21.43	-18.24	-0.11	1.91
51	30.14	-8.68	0.21	-16.09	-3.57	9.21	4.98	13.00	-21.67	-18.00	-0.11	1.91
52	26.81	-8.16	-0.21	-13.59	-3.64	7.07	0.45	7.56	-19.87	-19.01	-0.11	1.91
53	0.93	3.33	7.51	-4.90	-3.06	9.94	4.90	13.20	-21.89	-17.69	-0.11	1.91
54	26.53	-8.07	-0.09	-15.28	-3.75	8.63	4.69	12.90	-21.68	-17.86	-0.11	1.91

Sources: Author's calculations from Statec data

## D TABLES: MANUFACTURING INDUSTRIES

Table 16  
Services: efficiency gains (%) 2000-2011

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
31	-22.78	4.50	-6.25	-17.86	-1.35	-17.06	-7.63	-13.72	-4.77	19.90	-4.71	-7.35
32	-3.96	2.25	-1.82	5.72	-0.89	-1.47	0.59	0.12	3.26	-14.01	-1.81	6.16
33	-16.38	9.76	-1.65	3.71	5.23	-10.17	-29.13	12.56	5.22	3.76	3.05	1.75
34	-22.53	8.64	0.45	13.01	1.43	-10.65	-11.17	-17.09	27.42	17.72	-2.14	-4.16
35	-21.85	4.44	-0.76	11.47	6.61	-2.42	-7.45	-15.89	16.12	19.51	1.51	-4.37
36	-11.75	-6.94	-8.31	32.45	-0.93	-14.18	-25.81	-25.59	26.58	26.22	-2.56	2.09
37	-0.77	-7.58	-7.82	0.45	14.16	9.14	-2.92	0.19	-2.89	-7.62	4.98	-8.93
38	-13.35	6.32	12.94	2.98	-9.66	0.19	-6.79	-13.73	18.27	2.98	-9.59	1.31
39	-11.94	-3.02	26.25	8.67	17.56	-12.63	-7.48	10.83	17.70	8.32	9.18	0.00
40	0.00	0.00	0.00	0.00	0.00	-9.10	0.06	-0.78	-10.69	-23.10	5.74	1.62
41	-2.14	-10.14	-1.61	-6.03	-6.00	-1.74	13.24	8.84	-3.33	-17.60	35.62	0.00
42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44	21.19	-22.16	-18.95	29.00	28.82	-4.27	-0.04	-10.46	15.25	14.05	-10.60	3.84
45	6.87	0.00	-2.85	2.93	-17.94	-24.04	-0.50	-1.74	-5.83	-9.30	10.15	6.55
46	-11.85	-9.32	-10.11	-4.96	-2.31	5.84	-8.46	-20.96	20.66	-0.90	0.16	-13.46
47	2.58	2.64	2.45	-11.26	3.50	-7.55	4.65	3.38	-5.17	-10.92	-4.60	-0.50
48	-27.58	16.81	-3.48	16.23	6.77	-11.37	2.37	-13.75	21.13	18.42	-2.77	-3.10
49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-11.27	12.70	-3.10	-5.04	-5.50
50	-29.14	12.51	-7.95	17.40	4.19	-13.03	-3.40	-11.32	27.40	17.42	11.50	-3.50
51	-20.72	9.08	0.37	19.40	4.95	-5.95	-10.77	-16.28	11.43	16.32	0.74	-12.23
52	-24.22	-8.62	-1.13	-0.85	16.57	-5.30	4.53	8.22	-4.32	25.94	-4.77	16.18
53	-12.09	-9.37	-0.90	-4.90	4.16	-5.16	28.07	-13.63	12.31	24.36	5.62	-2.65
54	-20.83	5.65	-2.04	16.55	-2.33	-4.53	-9.63	-15.19	27.01	11.11	3.47	1.66

Sources: Author's calculations from Statec data

## D Tables: manufacturing industries

Table 17

### Manufacturing: labour productivity growth 2000-2011 (%)

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
8	6.03	-1.67	0.50	-15.41	-2.39	-10.15	17.29	7.04	-8.91	-9.40	-4.40	4.39
9	4.67	0.00	-0.17	-4.09	3.31	5.88	-11.55	-1.09	1.21	-3.06	-5.79	1.05
10	18.37	-1.49	-27.91	-1.10	14.91	-9.24	0.24	-2.13	-3.00	-16.48	18.54	0.60
11	-5.18	19.62	33.50	4.40	-3.11	-41.03	6.91	6.68	-4.41	12.04	0.40	3.75
13	-2.39	-6.06	3.44	6.35	13.58	-3.32	1.59	-1.69	-16.24	2.62	16.85	-0.07
14	-3.05	6.60	2.12	2.48	17.45	-1.38	-4.39	3.73	5.42	0.42	2.44	-17.21
16	8.33	10.49	19.53	-0.16	-7.76	0.69	24.58	28.81	-11.88	-30.91	35.51	8.74
17	36.56	4.03	1.58	-8.38	9.14	8.92	5.35	5.97	-8.13	-16.62	54.36	4.44
18	5.29	2.67	-6.19	-3.39	14.56	3.99	1.62	1.58	0.42	-13.05	13.24	10.96
19	3.86	-2.73	7.77	1.88	10.84	-8.66	14.81	2.42	5.09	-29.34	20.87	-0.16
20	2.01	-12.36	2.17	-7.05	5.94	-25.62	26.00	-5.85	-15.89	-22.77	16.68	-10.52
21	0.79	2.76	0.45	-4.38	-3.80	-2.68	8.06	8.87	-11.49	-14.59	18.34	1.86
22	44.33	-16.66	-38.32	6.54	-43.35	54.92	55.86	105.44	20.75	-11.96	13.16	11.32
23	4.03	21.90	-15.84	5.84	7.94	-2.81	31.52	7.29	9.81	-6.50	-6.39	0.61
24	5.72	1.59	1.02	-7.31	142.76	16.35	-32.12	9.09	-29.45	-21.83	82.56	25.29
25	-6.46	-1.03	5.15	12.63	15.17	12.67	13.67	30.83	10.68	-36.57	1.42	17.17
26	10.98	-11.75	-22.56	3.54	-0.73	4.46	-6.18	-3.08	-1.71	-7.81	11.77	2.13
27	-7.75	-6.91	-11.53	17.72	12.07	13.20	-5.92	-11.93	3.12	-16.66	8.58	9.99
28	9.69	31.00	10.33	-4.37	19.35	16.11	-3.82	10.84	-3.35	-19.82	5.27	39.54
29	-12.09	-3.85	13.89	-0.73	-3.36	-15.55	4.65	23.31	-10.18	-6.78	-17.21	-13.95
30	5.06	0.02	5.56	-5.74	-3.58	-0.86	-1.08	4.46	0.73	-2.64	-1.50	-3.96

Sources: Author's calculations from Statac data

Table 18

### Manufacturing: capital deepening 2000-2011 (%)

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
8	0.00	5.03	-0.58	-1.19	2.59	2.77	4.91	0.37	4.43	9.16	10.05	11.37
9	5.51	-0.58	-1.33	-0.78	1.08	2.66	3.34	7.02	6.03	2.48	1.26	3.20
10	23.73	0.48	-36.52	-4.54	14.20	-9.87	-0.71	-0.80	4.95	7.02	2.59	-3.62
11	5.66	-10.15	-3.20	-0.37	-3.33	6.07	2.82	-0.26	-19.17	-5.67	-1.78	-2.07
13	-0.59	10.20	1.87	-8.35	2.17	0.58	5.16	-0.64	-2.52	6.56	4.84	1.42
14	0.62	5.51	6.00	5.78	5.15	5.35	2.18	13.93	4.56	6.28	7.94	3.22
16	-5.05	1.90	3.88	-5.59	2.91	9.84	28.36	31.29	-5.06	3.36	-4.30	-6.62
17	14.33	2.18	5.82	-13.61	2.20	2.86	2.07	6.45	3.86	5.86	4.17	-3.96
18	-0.92	3.98	4.48	5.23	6.45	6.12	5.53	13.58	3.59	5.81	9.38	7.29
19	-1.19	-0.80	5.94	-4.52	7.00	5.65	2.98	4.81	2.89	6.79	2.74	6.20
20	-8.05	-1.56	4.30	-1.43	1.45	1.91	1.45	-0.16	0.18	7.41	0.43	-3.27
21	-2.72	3.04	9.52	-1.98	2.63	3.54	3.14	3.99	0.77	7.90	1.64	-1.27
22	-0.95	5.87	-31.78	286.61	-53.05	19.82	-9.11	-52.45	-6.10	-12.91	-13.10	9.02
23	-3.05	10.13	-5.11	0.85	0.99	1.04	4.02	2.84	3.37	3.59	3.13	2.33
24	4.29	2.98	8.84	-0.94	-6.56	5.06	13.19	7.30	8.30	7.37	1.39	1.62
25	1.81	4.69	3.36	-15.15	-8.55	-2.03	-6.26	-5.11	-2.37	2.20	3.84	0.94
26	13.33	-12.42	-11.18	196.19	6.59	4.29	-5.55	-0.57	2.97	8.73	-0.04	-1.17
27	6.75	7.88	8.69	-1.37	6.65	1.49	2.14	-1.86	-4.54	5.17	13.67	13.45
28	5.96	4.78	-0.05	5.84	6.37	3.64	-2.45	3.63	4.90	6.54	1.68	16.23
29	1.78	-1.34	15.52	2.35	0.11	-0.23	3.71	3.16	-6.09	-4.70	0.40	1.61
30	-0.32	-2.56	-2.90	-5.21	0.62	-0.26	-0.61	-0.11	0.01	6.96	6.04	5.22

Sources: Author's calculations from Statac data

Table 19  
**Manufacturing: TFP growth 2000-2011**

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
8	7.96	-13.42	4.16	-2.13	-2.53	-1.00	-0.10	-1.87	-11.03	-2.37	6.70	-3.83
9	-4.87	-2.74	1.18	-1.31	1.38	2.69	-6.22	-3.68	-10.55	2.65	-4.85	-3.75
10	7.38	-2.56	-11.36	-0.17	8.15	-4.48	-0.04	0.89	-5.06	-13.77	16.16	1.16
11	-2.90	8.73	28.04	-7.45	-7.43	12.21	7.83	3.06	-5.88	-34.93	-5.81	0.09
13	5.38	-2.09	6.75	-5.58	3.74	-2.48	-5.39	-5.51	-7.49	4.57	9.70	-0.52
14	1.31	-2.98	0.23	-3.38	0.58	-2.64	-2.50	-0.60	-1.12	1.11	-2.94	-0.49
16	-2.41	1.86	6.71	-3.06	-2.07	-2.94	5.20	8.95	-3.04	-14.19	9.53	4.64
17	3.92	-2.16	4.15	-4.29	-3.13	4.04	-2.21	3.03	-7.39	-0.13	10.94	2.77
18	-1.31	-2.87	-5.79	-1.47	8.59	3.27	0.20	-1.87	-4.87	-3.14	0.08	3.82
19	1.95	-2.79	-0.34	6.40	-5.77	-0.04	-8.67	10.95	-1.98	-23.33	14.20	-0.12
20	1.86	-1.15	4.19	-6.96	6.00	-9.73	13.20	-4.24	1.44	3.76	0.87	-1.56
21	2.00	2.32	-2.79	-4.69	0.99	3.84	4.16	0.38	-6.30	-0.91	0.33	0.51
22	10.39	0.15	-11.73	-23.07	29.68	41.31	-21.07	60.75	-5.54	-2.33	12.34	4.55
23	-6.39	-0.60	-6.62	1.06	3.93	-1.34	-5.03	0.25	4.48	-0.94	1.55	0.38
24	6.07	-2.35	2.13	-4.34	4.09	10.79	-17.37	0.59	-10.27	-8.30	2.46	10.76
25	2.57	-4.36	3.66	20.18	2.09	7.45	-3.61	12.05	0.77	-9.08	5.78	7.24
26	12.10	-5.94	-17.80	6.53	2.03	1.90	-7.99	12.05	-8.35	-1.67	-5.80	0.57
27	0.30	-1.05	8.63	-5.29	3.22	10.98	-5.59	-9.37	3.14	41.23	-10.23	-2.43
28	4.49	2.90	-1.10	-0.20	7.29	4.17	-0.97	-1.97	-8.09	-13.69	2.16	23.25
29	8.65	-2.02	0.41	10.23	-2.97	-17.91	2.21	0.12	-12.76	-1.56	13.43	-20.49
30	1.50	1.06	4.65	-1.87	-0.90	1.08	-0.29	3.92	-2.37	-0.24	2.41	0.12

Sources: Author's calculations from Statec data

Table 20  
**Manufacturing: technical progress 2000-2011**

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
8	7.64	-8.80	1.68	-3.46	3.49	10.59	-6.12	41.98	-27.57	12.96	-2.92	0.56
9	4.14	-5.79	1.15	-3.29	2.84	6.37	-2.97	44.11	-29.26	19.17	-5.84	-2.71
10	7.38	-2.56	-11.36	-0.17	8.15	-4.48	-0.04	0.89	-5.06	-13.77	16.16	1.16
11	2.41	-4.99	9.18	-4.65	-0.59	15.25	-13.92	12.35	-13.66	37.07	-14.38	-5.31
13	6.78	-4.99	0.19	-2.61	2.15	1.64	-1.73	10.14	-3.30	-5.40	6.55	4.83
14	4.23	-6.04	1.05	-3.30	2.84	5.00	-3.03	41.76	-19.18	6.93	-1.60	0.67
16	6.67	-4.91	-0.31	-2.70	2.09	1.74	-1.36	1.73	-3.61	-6.18	6.12	3.09
17	7.10	-8.05	1.34	-3.30	2.80	5.47	-3.33	28.43	-9.31	4.98	4.49	4.17
18	4.73	-6.32	1.00	-3.31	3.06	8.00	-4.52	38.97	-20.89	8.75	-1.99	0.69
19	6.89	-5.42	-0.27	-2.89	2.20	1.25	-1.48	6.71	-4.00	-9.97	8.40	3.74
20	3.71	-3.08	0.41	-3.21	2.21	4.32	-1.55	55.55	-29.50	22.32	-7.62	-2.90
21	4.37	-4.66	0.38	-3.24	2.65	5.85	-3.80	37.70	-17.80	10.33	-2.05	0.68
22	4.73	-5.81	3.73	-3.41	-0.57	24.90	-15.68	50.47	-5.54	-2.33	12.34	4.55
23	3.73	-6.76	6.02	-4.18	3.44	6.34	-3.24	56.33	-26.09	12.55	-4.65	-2.26
24	3.46	-6.74	7.42	-4.40	1.28	5.43	-3.51	47.23	-23.38	19.09	-0.12	2.69
25	5.02	-6.61	11.57	-5.57	2.09	7.45	-3.61	50.99	-20.76	12.38	-5.92	-2.32
26	3.06	-4.97	4.26	-4.57	-0.59	13.39	-13.27	28.97	-23.79	45.05	-10.63	-5.99
27	5.34	-7.16	8.63	-5.29	3.22	10.98	-5.59	37.69	-28.73	34.54	-10.23	-2.43
28	4.49	2.90	-1.10	-0.20	7.29	4.17	-0.97	-1.97	-8.09	-13.69	2.16	23.25
29	8.65	-2.02	0.41	10.23	-2.97	-17.91	2.21	0.12	-12.76	18.41	-5.70	-17.71
30	1.50	1.06	4.65	-1.87	-0.90	1.08	-0.29	3.92	11.60	5.97	-3.32	-1.39

Sources: Author's calculations from Statec data

Table 21  
**Manufacturing: efficiency gains 2000-2011 (%)**

Industry	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
8	0.30	-5.06	2.44	1.38	-5.82	-10.48	6.41	-30.89	22.83	-13.58	9.91	-4.36
9	-8.65	3.24	0.02	2.05	-1.42	-3.46	-3.34	-33.16	26.44	-13.87	1.05	-1.08
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	-5.18	14.44	17.27	-2.94	-6.89	-2.64	25.27	-8.27	9.02	-52.53	10.01	5.70
13	-1.32	3.05	6.54	-3.05	1.56	-4.06	-3.72	-14.22	-4.33	10.54	2.95	-5.10
14	-2.80	3.26	-0.82	-0.08	-2.20	-7.27	0.55	-29.88	22.34	-5.44	-1.36	-1.15
16	-8.51	7.12	7.05	-0.37	-4.07	-4.60	6.65	7.10	0.59	-8.53	3.21	1.50
17	-2.97	6.40	2.77	-1.02	-5.77	-1.35	1.15	-19.77	2.12	-4.87	6.18	-1.35
18	-5.76	3.68	-6.72	1.91	5.37	-4.39	4.93	-29.39	20.24	-10.94	2.12	3.11
19	-4.62	2.78	-0.07	9.57	-7.79	-1.28	-7.30	3.98	2.10	-14.84	5.35	-3.73
20	-1.78	1.99	3.76	-3.87	3.70	-13.47	14.99	-38.44	43.89	-15.18	9.18	1.38
21	-2.27	7.33	-3.15	-1.49	-1.62	-1.90	8.27	-27.10	13.98	-10.19	2.43	-0.17
22	5.41	6.33	-14.91	-20.36	30.42	13.14	-6.40	6.83	0.00	0.00	0.00	0.00
23	-9.76	6.61	-11.92	5.47	0.48	-7.22	-1.85	-35.87	41.37	-11.99	6.51	2.70
24	2.53	4.71	-4.92	0.06	2.77	5.08	-14.36	-31.68	17.11	-23.00	2.58	7.86
25	-2.33	2.41	-7.09	27.27	0.00	0.00	0.00	-25.79	27.16	-19.09	12.44	9.79
26	8.78	-1.02	-21.16	11.63	2.63	-10.13	6.09	-13.12	20.26	-32.21	5.40	6.98
27	-4.78	6.58	0.00	0.00	0.00	0.00	0.00	-34.18	44.73	4.97	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-16.87	20.29	-3.38
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-12.52	-5.86	5.93	1.53

Sources: Author's calculations from Statec data

## E Tables: legend

Table 22  
**Country codes**

Code	Country name
AT	Austria
BE	Belgium
DE	Germany
DK	Denmark
ES	Spain
FI	Finland
FR	France
GR	Greece
IE	Ireland
IT	Italy
<b>LU</b>	<b>Luxembourg</b>
NL	Netherlands
PT	Portugal
SE	Sweden
UK	United Kingdom
US	United States
EU15	European Union (15 countries)

Table 23

**Manufacturing: industry codes and shares on manufacturing's total output and employment (%)**

Code	Industry name	Output share (%)	Employment share (%)
8	Other mining and quarrying	0.40	0.41
9	Food products	5.10	6.75
10	Textiles	5.36	2.03
11	Clothing	0.02	0.05
13	Wood & wood products	1.47	0.80
14	Paper & printing	3.39	3.22
16	Chemicals	3.05	0.98
17	Rubber & plastics	8.10	6.30
18	Non-metal mineral products	4.20	3.29
19	Metals	12.95	7.66
20	Fabricated metals	5.13	6.49
21	Machinery & equipment	4.97	3.71
22	Office machinery & TC equipment	0.45	0.19
23	Machinery & electrical equipment	0.91	0.94
24	Medical, precision & optical	2.51	2.60
25	Transport equipment	0.76	0.80
26	Furniture	0.18	0.38
27	Recycling	0.41	0.45
28	Electricity & gas	5.82	1.86
29	Water distribution & purification	0.37	0.55
30	Construction	34.46	50.55

Output and employment shares are percentage shares over totals for manufacturing. Data refer to 2010.

Sources: Author's calculations from Statec data

Table 24

**Services: industry codes and shares on services' total output and employment**

Code	Industry name	Output share (%)	Employment share (%)
31	Motor vehicles retail & repair	0.51	3.27
32	Wholesale	4.92	5.75
33	Retail	3.50	7.68
34	Hotels & restaurants	1.13	6.14
35	Land transports, storage	1.98	5.74
36	Water transports	0.03	0.07
37	Air transports	1.82	1.50
38	Transport services	0.43	1.33
39	PT & Telecommunications	6.30	1.86
40	Financial intermediation	39.17	10.77
41	Insurance	3.87	1.21
42	Activities auxiliaries to financial intermediation and insurance	15.78	3.16
43	Real estates activities	4.54	1.41
44	Renting & leasing	0.74	0.34
45	IT services	1.57	2.93
46	R&D	0.38	0.92
47	Business services	5.32	17.04
48	Public administration	2.79	6.75
49	Education	1.52	6.04
50	Health & social work	2.51	11.19
51	Sanitation, road & waste	0.15	0.67
52	Associations	0.18	0.85
53	Recreational & cultural activities	0.66	1.81
54	Services to individuals	0.20	1.56

Output and employment shares are percentage shares over totals for services. Data refer to 2010.

Sources: Author's calculations from Statec data

## 7.2 Choosing standardisation - Why companies engage in

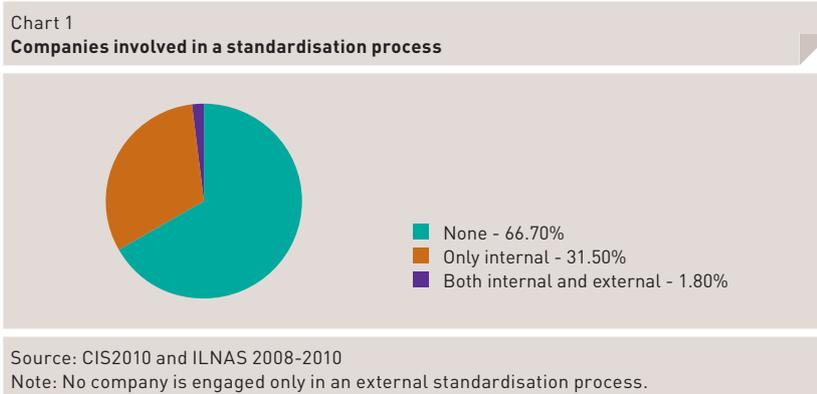
### Summary

Policy makers regard standardisation as a useful tool to support the competitiveness of companies. However, not all companies have undertaken a standardisation process. The results of the study presented here identify the characteristics of firms that engage in such processes. An econometric analysis was conducted on a sample of companies that is representative of the Luxembourg economy as a whole. This sample was obtained by merging the 2010 Community Innovation Survey and the list of companies participating in the work of the Luxembourg Standardisation Institute. All available variables enable to describe the characteristics of the company and its market (such as size, branch of a group, exports, perceived competition (through price or quality) or sector of activity) as well as its behaviour in activities related to innovation (e.g. types of cooperation developed, R&D activities, use of qualified research personnel). The analysis reveals some interesting phenomena. So, companies that do operate in a market whose future technological developments are uncertain are much more likely to develop activities related to standardisation, *ceteris paribus*. In order to increase the participation of companies in standardisation activities, we can rely on the company profiles that are most liable to adhere to the standardisation process. In particular, the results show the importance of the employees' education level in order to increase the participation in external standardisation committees.

## 7.2.1 Context

The 2010-2020 national standardising strategy has been recently updated, recognising a quasi-absent normative culture in Luxembourg and the low market involvement on matters relating to standards and standardisation.

As shown in chart 1, between 2008 and 2010, only 1.8% of Luxembourg companies with more than 10 employees participated in technical committees. By comparison, in the Netherlands where the normative culture is old (compared to Luxembourg, where ILNAS activities only began in 2008), 11% of Dutch companies are involved in the standardisation process (Blind et al., 2012).



This fact must be taken seriously because it prevents companies from benefiting from the contributions that standards and standardisation can bring them and, through them, to the whole Luxembourg economy, particularly in terms of sustainable growth and productivity gains. Indeed, standardisation is recognized as an essential tool to ensure company competitiveness (Wakke and Blind, 2012) and therefore that of a country (e.g. Acemoglu et al., 2012; AFNOR, 2009; Hesser et al., 2007; Jungmittag et al., 1999; Swann, 2000, 2010). So why don't all companies engage in a standardisation process?

In order to align the standardising strategy with market expectations, making so the ILNAS efforts more effective, it is important to better know the specificities of the Luxembourg economic fabric as well as the characteristics and behaviours of companies operating in its market. This study was made in this perspective and results from the collaboration between ILNAS and STATEC. The ultimate goal is to provide a rigorous assessment of the contribution of standardisation to the Luxembourg economy and the benefits that can be expected by the companies involved in the development of standards.

## 7.2.2 Analysis

A quantitative analysis was conducted on a sample of companies that is representative of the economy as a whole. More details are available in Riillo (2013). The database was created merging information provided by companies that had responded to the Community Innovation Survey conducted in 2010 (CIS Survey 2010) with the list of companies participating in technical standardisation committees coordinated by ILNAS. The database enables then to distinguish four types of business engagement in standardisation activities: those who have no standardisation activity, those that carry out only internal activities, those that carry out only external activities, and finally, those who have developed the two types of activities at once. External standardisation means participating in a Luxembourg technical committee coordinated by ILNAS. Internal standardisation refers to the development of internal standards within the company. Thus it has been observed in the previous chart that no company has undertaken a process of external standardisation only. This is a characteristic that should be taken into account in the modelling. Based on the previous literature (Blind 2006, Blind and Mangelsdorf, 2008, 2013, Wakke, 2010), the econometric model used seeks to estimate the influence of a number of factors on the choice of standardisation strategies by companies such as:

- ▼ Perceived competition (price competition, quality competition...);
- ▼ Activities related to innovation (described through the cooperation patterns implemented, the types of R&D activities developed or the share of skilled employment);
- ▼ The sectors in which the company operates.

The company characteristics are used as control variables, including the size, being a branch of a group or being an exporting company.

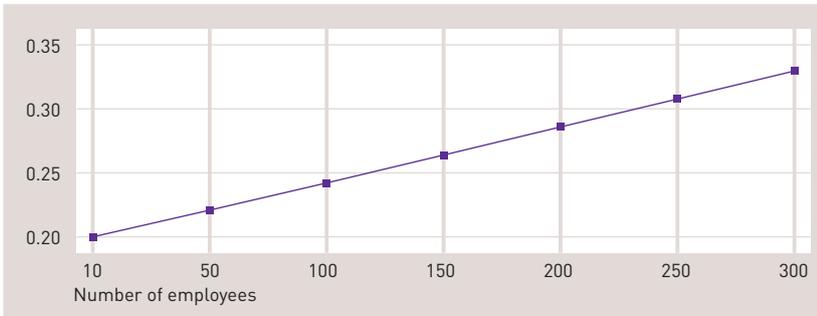
### **The model and the main results**

The estimated model is a multinomial logit model as described by Greene (2012, p. 763-766). The econometric model calculates the probability that a company would be engaged in an external standardisation process, based on its characteristics. For the sake of clarity, we report only the results on the probability of participating in a standardisation committee for a typical company. This typical company is defined as an industrial company operating in a market characterized by uncertain technological developments; this company develops R&D activities in cooperation with other companies or organisations and more than 50% of its workforce is made of employees with higher qualification than the final high-school diploma. Other features are set by taking the average of the sample.

All other things being equal, if the company employs less than 250 employees, the odds of participating in a standardisation committee are 20 in 100, whereas if the company has more than 250 employees, this likelihood amounts to nearly 31.

In other words, a large company has a 50% greater chance than a small business to participate in a standardisation committee. Thus the size of the company plays an important role in engaging in standardisation.

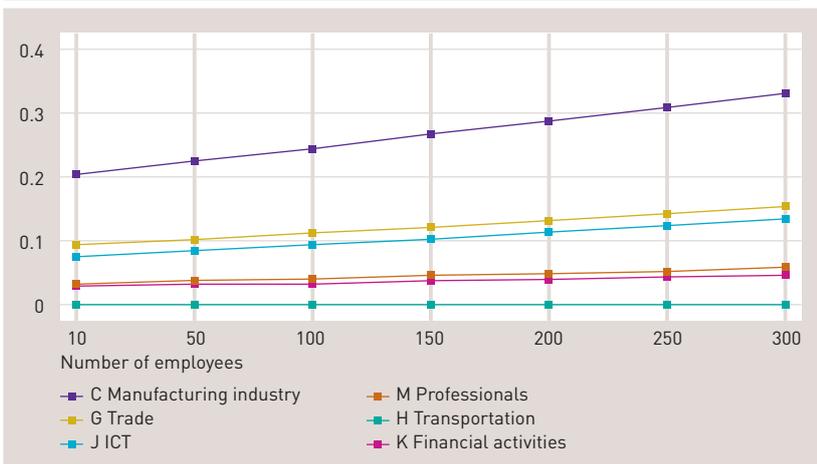
Chart 2  
**Predicted probabilities, according to the size as measured by the number of employees**



Source: CIS2010 and ILNAS 2008-2010  
 Note: Predicted probabilities for an industrial company, whose market is marked by uncertainty about technological developments, which has R&D activities developed in cooperation and with more than 50% of its workforce consisting of employees with higher qualification than the final high-school diploma. Other features are set at the sample average. External standardisation = participation in an ILNAS Luxembourg Technical Committee.

The sector of activity has a considerable influence on the probability that a company participates in a standardisation committee, as shown in chart 3. So, all things being equal, the odds an industrial company participates in a standardisation committee are between 20 and 30 in 100. In contrast, the likelihood of participation of a transport company is almost zero.

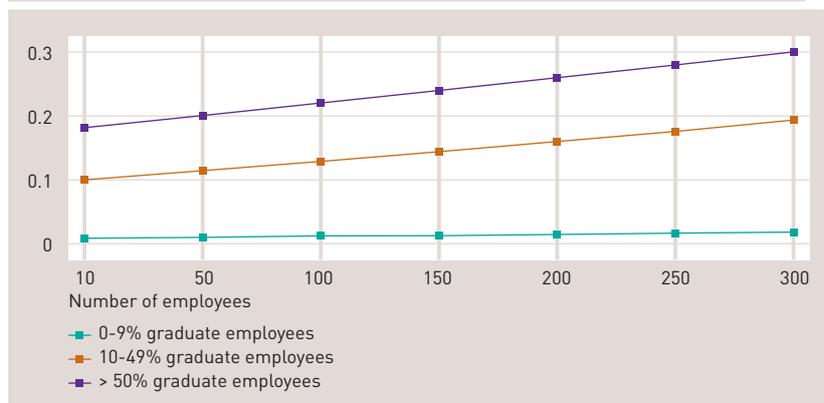
Chart 3  
**Predicted probabilities, according to the sector of activity**



Source: CIS2010 and ILNAS 2008-2010  
 Note: Predicted probabilities for an industrial company, whose market is marked by uncertainty about technological developments, which has R&D activities developed in cooperation and with more than 50% of its workforce consisting of employees with higher qualification than the final high-school diploma. Other features are set at the sample average. External standardisation = participation in an ILNAS Luxembourg Technical Committee.

The education level of employees has a significant influence on the probability that a company participates in a standardisation committee. As shown in chart 4, other things being equal, the typical company has a much lower probability of participating in a standardisation committee if less than 9% of its workforce has attained higher education. In contrast, the likelihood of participation increases significantly with the proportion of employees with a higher education degree: the probability increases from 10 (for 10 employees) to 19 points (for 250 employees) if the graduates represent between 10 and 49% of payroll and from 18 (for 10 employees) to 30 points (for 250 employees) when they represent more than 50% of payroll.

Chart 4  
**Predicted probabilities, according to the proportion of employees with a higher education degree**

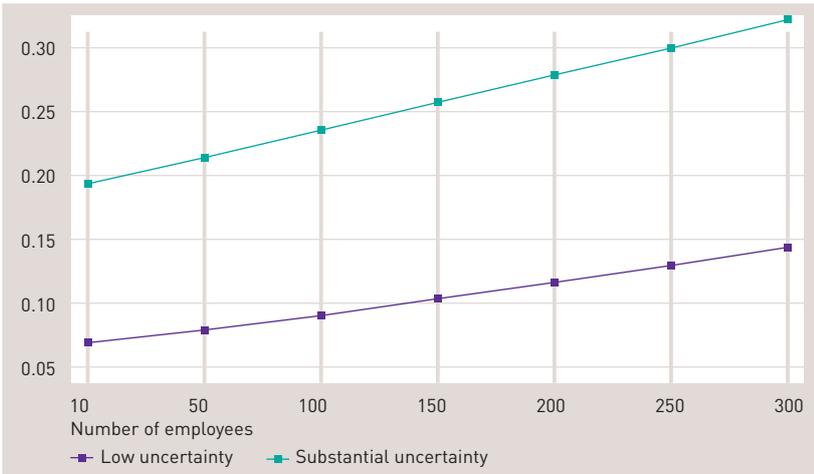


Source: CIS2010 and ILNAS 2008-2010

Note: Predicted probabilities for an industrial company, whose market is marked by uncertainty about technological developments, which has R&D activities developed in cooperation and with more than 50% of its workforce consisting of employees with higher qualification than the final high-school diploma. Other features are set at the sample average. External standardisation = participation in an ILNAS Luxembourg Technical Committee.

Companies operating in markets where technological developments are difficult to predict are more likely to participate in a standardisation committee, as shown in chart 5. All things being equal, the odds of participating in standardisation for a typical company are between about 20 (for 10 employees) and 33 in 100 (for 250 employees) if the company operates in a market in which future technological developments are highly uncertain, while for the same company without any technological uncertainty, the probability is between 7 (for 10 employees) and 15 in 100 (for 250 employees). Standardisation is then seen as particularly useful for dealing with the uncertainty of technological developments and can also be used to improve coordination in new markets.

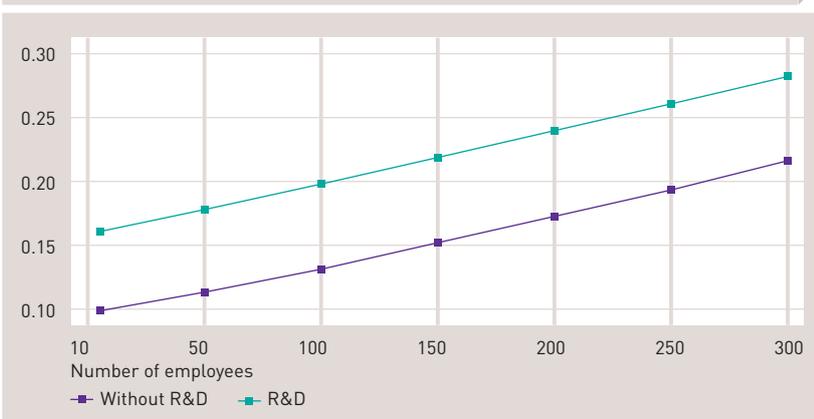
Chart 5  
**Predicted probabilities, according to the degree of uncertainty relating to technological developments**



Source: CIS2010 and ILNAS 2008-2010  
 Note: Predicted probabilities for an industrial company, whose market is marked by uncertainty about technological developments, which has R&D activities developed in cooperation and with more than 50% of its workforce consisting of employees with higher qualification than the final high-school diploma. Other features are set at the sample average. External standardisation = participation in an ILNAS Luxembourg Technical Committee.

Companies that have research and development activities are more likely to participate in a standardisation committee. Chart 6 shows the difference in the probability of participating in standardisation committees depending on whether companies develop R&D activities or not. All things being equal, the likelihood of participating in standardisation for a typical company is between 10 (for 10 employees) and 22 in 100 (for 250 employees) where there is R&D, while for the same company without an R&D effort, the probability ranges only between 16 (for 10 employees) and 28 (for 250 employees) in 100.

Chart 6  
**Predicted probabilities, according to whether the company develops innovation activities or not**



Source: CIS2010 and ILNAS 2008-2010  
 Note: Predicted probabilities for an industrial company, whose market is marked by uncertainty about technological developments, which has R&D activities developed in cooperation and with more than 50% of its workforce consisting of employees with higher qualification than the final high-school diploma. Other features are set at the sample average. External standardisation = participation in an ILNAS Luxembourg Technical Committee.

## 7.2.3 Conclusion and recommendations

This study contributes to the ongoing research aimed at identifying the factors that explain the behaviour of companies with respect to the standardisation of their processes and the adoption of standards. The benefits of standardisation are significant from a macroeconomic point of view, but the costs incurred do not allow small businesses to engage in such processes despite the benefits they would be able to reap. The action of policy makers is therefore justified and it helps to reach a social optimum. In this sense, the low propensity of companies in Luxembourg to participate in standardisation can be seen as both a limitation and an opportunity. The preliminary results of the study enable to draw up two strategies - a short-term one and a long-term one - to enhance normative culture and company involvement.

- ▼ The first one is to engage those companies that are most likely to join soon the standardisation committees, according to their own characteristics. The best candidates are therefore the large companies with a high proportion of highly qualified personnel and operating in markets experiencing a constant technological change;
- ▼ The second strategy targets a broader business audience, including even the smallest companies, proposing targeted measures, tailored to their specific needs. (One of them, already proposed by ILNAS, is to offer the costs associated with the participation in standardisation, "no pay to play"). If we consider standardisation as a tool for marketing new products and services and as an important vehicle for technology transfer, it may be appropriate to include the participation in standardisation in the field of research and development, eligible for a public contribution under the law of 5 June 2009 relating to the promotion of research, development and innovation, only for those companies less likely to participate due to proportionately too high costs.

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## 7.3 Beyond GDP: suggestions from the economics of well-being<sup>1</sup>

### Abstract

Is economic growth the way to pursue for improving people's well-being? After the Second World War industrialized countries experienced an unprecedented economic growth that dramatically improved people's living conditions. However, raising wealth did not result in higher well-being: Charts confirm that people in rich countries are not more satisfied with their lives than previously. This result – known as the "Easterlin paradox" – suggests that modern societies should not expect durable improvements for their well-being from economic growth. This is inconsistent with the long-lasting belief that economic growth is the solution to improve the human condition and raises the question: if not GDP, what does explain the subjective well-being trends and their differences across countries?

Recent studies show that social capital, and particularly people's social interactions, plays a major role in determining people's well-being. Social research explored the relationship between social capital, economic growth and well-being both across and within countries, including Luxembourg. Results document that, to improve people's well-being, it is necessary to re-define the economic policy agenda. To pursue durable improvements in people's well-being, policy makers have to focus on something else – such as social capital – the attention and the resources that modern societies have been employing to support economic growth. This article provides an overview of these studies and illustrates their policy implications.

### 7.3.1 Introduction

In recent years the public and scientific debate has paid considerable attention to subjective well-being. The number of scientific articles, conferences and journals dealing with people's well-being increased significantly. The media, from magazines to TV shows, have been increasingly ready to report the latest discoveries and to emphasize their implications for people's lives. This debate became so relevant that governments, international institutions and political organizations started coining this knowledge into policy-oriented guidelines for better societies. For example, in 2007 the European Commission and other organizations hosted a conference titled "Beyond GDP" leading – two years later – to the institution's commitment to improve Europeans' quality of life (European Commission, 2009). At the same time the French Economic Commission directed by Stiglitz, Sen and Fitoussi (Stiglitz et al., 2009) published a report recommending the development of indices of well-being to supplement the more commonly used income-based measures. In the same vein, in 2011 the Organization for Economic Co-operation and Development (OECD) launched the "Better Life Initiative" to bring together internationally comparable measures of well-being and to inform about how well people are doing in modern societies (OECD, 2011).

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Luxembourg itself, thanks to initiatives such as the “PIBien-être” programme, is moving its own steps in this direction promoting a debate on how to measure people’s well-being, the efficacy of the policy making and the sustainability of the economic development.

The information underlying the whole debate is trivial for it comes from a very simple question: in the course of surveys, people are asked to evaluate their lives as a whole, i.e. their subjective well-being. Usually these questions ask directly the respondents to state how happy or satisfied with their lives they are. For example, subjective well-being, sometimes also referred to as “happiness” or “life satisfaction”, is usually observed through answers to survey questions such as: “Taking all things together, how happy would you say you are?” or “All things considered, how satisfied are you with your life as a whole these days?” (van Praag et al., 2003).

These measures proved to be reliable sources of information about individual’s well-being and, in the last decades, have been employed in many fields of applied social research, including testing the hypothesis that economic growth improves the human lot. The reliability of these measures has been corroborated by experimental evidence from several disciplines. For example, subjective well-being correlates with objective measures of well-being such as the heart rate, blood pressure, frequency of Duchenne smiles and neurological tests of brain activity (Blanchflower and Oswald, 2004; van Reekum et al., 2007). Moreover, subjective measures of well-being are strongly correlated with other proxies of subjective well-being (Schwarz and Strack, 1999; Wanous and Hudy, 2001; Schimmack et al., 2010) and with the judgements about the respondent’s happiness provided by friends, relatives or clinical experts (Schneider and Schimmack, 2009; Kahneman and Krueger, 2006; Layard, 2005).

The reliability and the wide availability of these measures allowed to adopt these tools in various domains. For example, happiness measures have been adopted in macro as well as microeconomics (Di Tella and MacCulloch, 2008; Alesina et al., 2004). They have been used for policy evaluations and to study poverty and inequality (Diener et al., 2009; Clark et al., 2012, 2013). Happiness measures have also been used to analyse the impact of non economic aspects such as age, gender, marital and employment status on well-being (Powdthavee, 2007; Stutzer and Frey, 2012) as well as the relationship between political institutions and subjective well-being (Frey and Stutzer, 2000).

Probably the reason why the debate on subjective well-being became so prominent is because happiness measures allow to answer a fundamental question: after years of almost uninterrupted economic growth, to what extent have modern societies truly benefited? Paraphrasing Easterlin (1974): did economic growth keep its promise of improving the human lot?

Contrary to the common belief that a growing economy is the key to better lives, the available evidence suggests that modern societies shouldn't expect significant improvements for well-being from economic growth (Easterlin, 1974). This finding – commonly referred to as the “Easterlin paradox” – has been extensively challenged and questioned (see e.g. Stevenson and Wolfers, 2008; Deaton, 2008; Sacks et al., 2010; Veenhoven and Vergunst, 2013), but the current state of the debate is that in the long run the paradox does exist (see e.g. Bruni and Stanca, 2008; Easterlin and Angelescu, 2009; Becchetti et al., 2011; Clark et al., 2012). The reason for the disagreement on the existence of the paradox is that researchers have been neglecting the temporal dimension. In a recent article, Easterlin et al. (2010) clarified that economic growth improves people's well-being only over the business cycle (one or two years), but in the long run (more than ten years) economic growth does not have any significant effect on well-being. In other words, the positive effect of a flourishing economy on well-being lasts for only a few years. This is surprising and disappointing at the same time for societies that have been organized pursuing the idea that a higher income (at individual level) or a higher Gross Domestic Product (GDP) per capita (at national level) is the most efficient way to improve people's well-being.

Mainly two theories have been proposed to explain the paradox: adaptation and social comparisons (Blanchflower, 2008). These theories rest on the idea that one's income aspirations negatively affect subjective well-being (Frederick and Loewenstein, 1999; Truys, 2010). Aspirations may depend either on one's own past income (adaptation) or on the income of one's own reference group (social comparisons). In the first case, the effect of a higher income for well-being depends on people's past achievements. On the basis of what they've got, people set their future aspirations. For example, last year's wage is the reference point for the current year's wage. But, if the actual wage does not meet the aspirations, the result for well-being is negative. The second mechanism works in a similar way, but this time people are not comparing their achievements with their past ones, but with those from other people. In other words, the effect of a higher income for well-being depends on a relative amount: do I earn more, the same, or less than my colleagues, neighbours and friends? These “others” may comprise various groups of people whom we consider a reference point to assess our success. Both theories are well-established in economic and psychological theory, and are both supported by a large body of empirical evidence (Brickman et al., 1978; Frank, 1997; Diener et al., 2006).

Thus we know that a higher income will not deliver higher well-being in the long run and we also know why. But what does make people happier and more satisfied with their lives? Since the existence of the paradox is a matter of time-span, also the answer to this question involves an analysis over time or, more precisely, of trends of some relevant variables. But which variables can help explaining the variations of well-being over time?

Recently, a new stream of research answered this question emphasizing the role of social capital (Uhlener, 1989; Helliwell, 2002, 2008; Bartolini et al., 2013). Consistently with the definitions provided by Putnam (2000) and the OECD (2001), these studies consider social capital as “networks together with shared norms, values and understandings that facilitate co-operation within or among groups” (OECD, 2001, p. 41). Remarkably, a number of recent experiments document that social capital is related to subjective well-being. In particular, it seems that the relational quality of people’s experience, that is to say the quality of the relationships among people, has a predominant impact on well-being (Helliwell and Putnam, 2004; Helliwell, 2006; Bruni and Stanca, 2008; Becchetti et al., 2009). Therefore, social capital seems a good candidate to help explaining the trends of subjective well-being. What do the data tell?

### 7.3.2 Empirical evidence

A recent study by Bartolini and Sarracino (2011) explores the relationship among these variables at aggregated level using WVS-EVS data. The authors compare the trends of social capital – as proxied by the participation of people in groups and associations – with the trends of subjective well-being and of GDP per capita considering all the countries with at least 15 years and three waves of observations, a reasonable long-term.

Results inform that in the long run the trend of group membership is significantly and positively correlated with subjective well-being also after controlling for the trend of GDP per capita (see chart 1). This result confirms Easterlin’s evidence that in the long run economic growth is not correlated with the trends of subjective well-being and it adds that the trends of group membership are positively correlated with the trends of well-being.

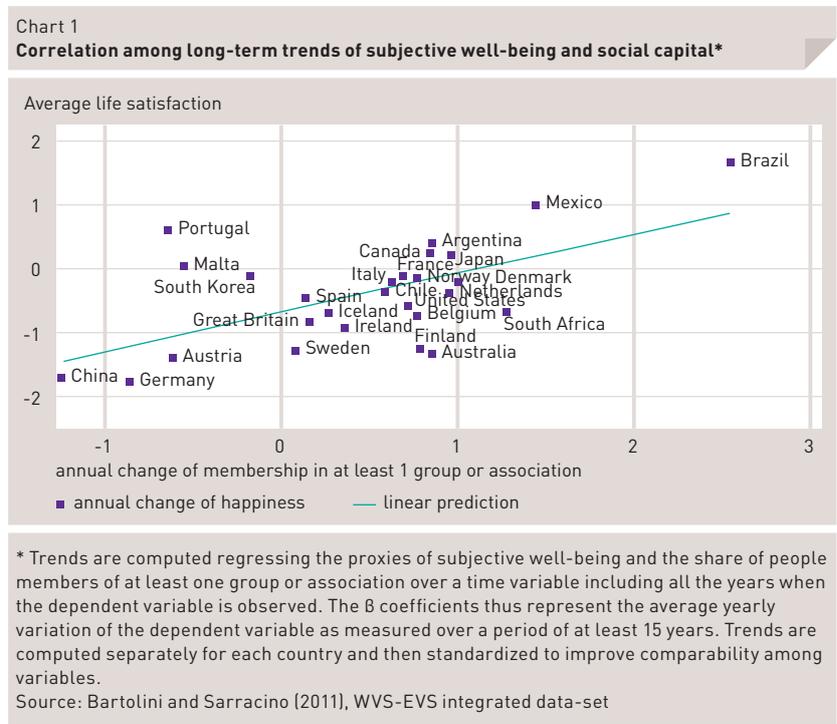
This result is confirmed also after adopting another proxy of social capital: social trust, available in the European Social Survey (ESS).<sup>2</sup>

Also in this case, the coefficients associated with the trends of social capital, computed over a period of at least 6 years – a medium rather than a long period, are strongly and significantly associated with the trends of well-being, whereas GDP shows a weaker correlation.

Of course it is plausible that this result is driven by more developed countries, in which basic needs have been met and people are finally free to care for something else, such as social relationships. Evidence from poorer countries is scarce, nonetheless two recent works provided some evidence in this regard. Easterlin (2009) and Bartolini et al. (2012b) show that even if economic growth does matter for people’s well-being in transition countries, also in this case social relationships are important for subjective well-being. Despite the small sample size, results are robust to the presence of influential points and suggest that the changes in social capital are as important as economic growth for people’s well-being in transition countries.

<sup>2</sup> <http://www.europeansocialsurvey.org>

Summarizing, the evidence from two different data-sets providing internationally comparable information about social capital and well-being trends across countries confirms that economic growth is only weakly associated with the trend of well-being. The longer the perspective, the lower is the role of GDP and the more social capital matters for well-being.



However, this conclusion hinges on cross-country studies – analyses run with aggregated data on sample of various countries. This casts the doubt that present results are an artefact due to pulling together countries with different histories, socio-economic backgrounds and political and cultural systems. For this reason some further studies focused on single countries analysing the determinants of the trends of well-being on the level of individuals, i.e. within countries. Also in this case, results show that social capital is an important factor shaping people’s well-being over time.

Using data from the US General Social Survey over the last 30 years, Bartolini et al. (2013) show that a large portion of the declining American happiness trend is explained by four forces acting in contrasting directions. The first one is the increase in per capita income, which positively affects subjective well-being, while the remaining three negatively affect happiness. The declining American well-being seems shaped by three forces: 1) social comparisons, which erode approximately 2/3 of the positive impact brought about by the increase in family income; 2) the decrease in the confidence in institutions, a further component of social capital and 3) the erosion of social capital whose magnitude is comparable to the one exerted by social comparisons.

Many indicators suggest that the American society experienced indeed an increase in solitude, in communicative difficulties, in apprehension, in loneliness, in distrust, in familiar instability, in generational cleavages, in civic engagement, in participation in social networks and a reduction in solidarity and honesty (Putnam, 2000).

The combined effect of these four forces on American subjective well-being is negative: the effects of social comparisons, lower confidence in institutions and the erosion of social capital more than offset the positive impact of increasing income. Simulations reveal that, if social capital had stayed constant at its 1975 levels, American subjective well-being would have been higher today.

These relationships have been confirmed more recently also for three other countries: Germany, Luxembourg and China. Using the German Socio-Economic Panel and a wider set of variables, Bartolini et al. (2012a) confirm previous results about the US showing that the variation in the German subjective well-being between 1994 and 2007 is explained by the same forces shaping the American well-being. The only difference, in this case, is that, during the last fifteen years, German social capital has been increasing with an overall positive effect on subjective well-being. Still, this study suggests that if social capital had not increased, the net result for subjective well-being would have been the same as the American one.

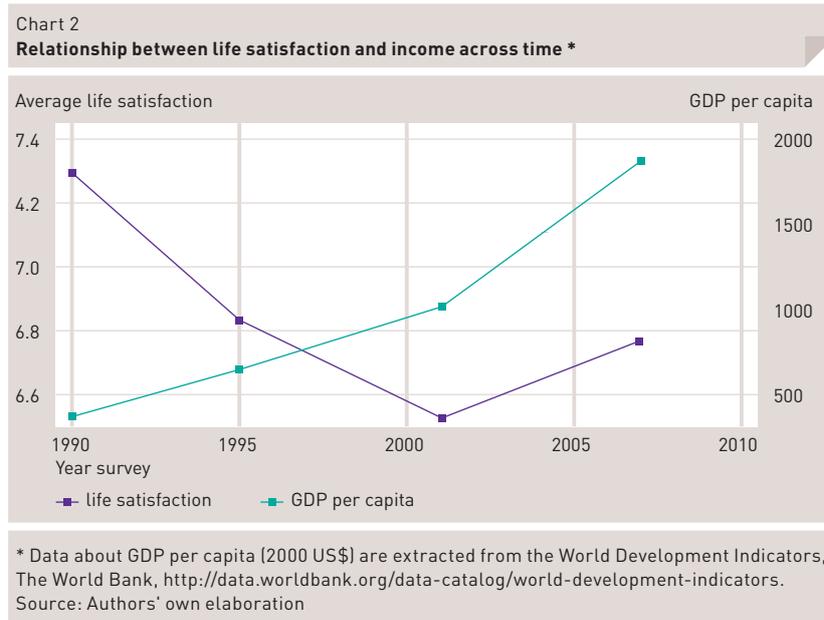
Looking at data from the European Value Study, Sarracino (2013b) focused on the relationship between social capital and subjective well-being in Luxembourg. Despite its small dimensions and its peculiarities (the small population size as well as the high share of migrant workers), Luxembourg is one of the countries with the highest income per capita<sup>3</sup>. Hence, it is an interesting case to test whether people in rich countries are destined to wealthy but unsatisfactory lives. After accounting for the highly heterogeneous social fabric of the country, the Charts between 1999 and 2008 document that in Luxembourg social capital, in the form of trust in others, participation in groups and associations and confidence in various institutions, has been increasing together with subjective well-being. These results are encouraging because they suggest that the erosion of social capital is not a legacy of the richest countries in the world.

However, all that glitters ain't gold. A deeper analysis reveals divergences between natives and immigrants in Luxembourg that need careful consideration. The encouraging trends of confidence in institutions, people's well-being and involvement in social activities characterizing Luxembourg are not homogeneously experienced by immigrants and natives. These discrepancies raise some concern and call for interventions to promote social integration and the social sustainability of Luxembourg development (Sarracino, 2013a).

Nonetheless, in an international perspective, the cases of Germany and of Luxembourg indicate that economic performance can be compatible with overall rich social environments and well-being. This evidence has important implications for policy making since it supports the idea that the way economic systems are organized matter for their social and well-being outcomes. In other words, whether economic growth is associated to unhappiness and erosion of social capital is a matter of economic organization.

<sup>3</sup> This Chart does not change even if, to account exclusively for the output of the national population, we focus on the gross national income, rather than considering gross domestic product. Source: the World Bank, World Development Indicators database, July 2012, <http://data.worldbank.org/data-catalog/world-development-indicators>

More recently Easterlin et al. (2012) and Brockmann et al. (2009) have used various datasets to explore the relationship among economic growth and well-being also in China, one of the countries that experienced the most impressive and sustained rate of economic growth over the last 20 years. It is reasonable to expect that an average yearly economic growth of 9.7% results in a general improvement of several social, economic and sanitary dimensions of people's life and on their well-being more in general. However, as illustrated in chart 2 also in this case it seems that economic growth missed to keep its promise of improving the human lot.



Sarracino (2013c) has looked into this paradoxical evidence using WVS data between 1990 and 2007 and the Blinder-Oaxaca decomposition. In line with previous results, the author finds that the increased importance of social comparisons largely contributes to explain the disappointing trend of well-being. However, a second force also contributed to shaping the trend of Chinese well-being: the erosion of social capital. Some estimates suggest that about 18.56% of the well-being loss in China is related to social capital. Moreover, some computations suggest that if the latter stayed constant at its level of 1990, the loss of well-being would have been 5.81% smaller. Hence, the Chinese economic growth has been going hand in hand with the erosion of social capital, an increase in social comparisons and decreasing subjective well-being.

Overall, there seems to be convincing evidence that in the long run what really matters for people's well-being are social relationships rather than money. Shall we conclude that GDP has no role for people's well-being? Data show that economic growth has a clear and strong effect on life satisfaction, but only in the short run. When the changes over time are computed over intervals of 2 years, GDP turns out to be almost two times more strongly correlated to well-being than social capital (Bartolini and Sarracino, 2011; Bartolini et al., 2012b).

The evidence coming from both within and cross-country studies, various techniques and different data set supports the conclusion that, excepted transition economies, in the long run economic growth is negatively correlated not only with social capital, but also with subjective well-being. The good news is that this outcome is not for granted. There are some cases where economic growth has not been accompanied by social erosion and unhappiness. This suggests that having happier lives in wealthier countries is a matter of economic and social organization.

### 7.3.3 Conclusion

Available evidence yields a picture in which rich countries should not expect substantial increase in well-being from economic growth and should rather re-orient their efforts towards some other aspects, such as social capital, to promote well-being. Some countries, such as Germany and Luxembourg, demonstrated that it is possible to make economic prosperity compatible with social capital and well-being. However, the implications for developing countries are milder. Poorer countries can expect to achieve higher levels of well-being from economic growth, but also in this case growth should be obtained by paying attention to the containment of its social costs. The evidence from China raises a serious warning concerning the sustainability of its economic development.

This point calls for a re-definition of economic policy agendas. Subjective evaluations of well-being proved to be a reliable and powerful tool to account for people's well-being and give researchers a new opportunity to further explore their main determinants. Social capital emerged as a significant explanatory factor. Obviously, this conclusion still needs further investigation and analysis, but, whenever the role of social capital for well-being is confirmed, economic policies to improve people's well-being should consider their effects on social capital. Moreover, these studies have shown that policy makers have many tools to balance economic growth, social capital and well-being. Some examples show that it is possible to adopt specific policies to preserve or enhance social capital and well-being (Rogers et al., 2010; Helliwell, 2011; Bartolini, 2013). Hence, the way many existing institutions work could be reconsidered in the light of the new role that these studies attribute to social capital.

Available results inform that to obtain short-term improvements in well-being that tend to fade as time goes by, the receipt to follow is boosting economic growth. In this case, current policy efforts should not change. On the contrary, to promote durable improvements of well-being we know that – beyond a very positive short-term effect – increasing GDP will not provide the expected results. To achieve durable improvements in people's well-being, policy efforts should focus on something else – such as social capital – the attention and the resources that modern societies have been employing to support economic growth.

Regarding Luxembourg, the available evidence points out some specific areas of intervention. Indeed, as other European countries, the Luxembourg economic system is more compatible with the relational needs of its people and their well-being. Compared to others, the trends of well-being and of several indicators of social capital in Luxembourg are very positive. However, this progress is not uniformly shared by natives and immigrants. Charts document that, while natives and immigrants appreciate the performance of the social security system, the political parties and the judicial system, immigrants are those whose confidence in Luxembourg institutions grew the most. On the contrary, the confidence of natives in the Parliament, the civil service, the press, the police and labour unions stagnated and, in the case of the educational system, it decreased. Moreover, natives are increasingly and significantly involved in social activities and voluntary associations, whereas immigrants seldom participate in associational activities. Also the higher levels of trust in others that Luxembourg exhibits compared to the rest of Europe are entirely driven by immigrants, since natives do not show any significant change in trust over time. The distinction between the two groups of the population is also mirrored by differences in perceived well-being: between 1999 and 2008 the well-being reported by natives has increased, whereas immigrants – whose initial level of well-being was already 11% lower than the one of natives – stayed behind reporting decreasing satisfaction with their lives.

In the light of the multicultural fabric of the Luxembourg society, the “peaceful coexistence” between the two groups calls for urgent interventions to promote social cohesion. The trends of well-being, of involvement in social activities and of confidence in institutions ring an alarm bell about the cohesiveness of the Luxembourg social fabric, the well-being of its population and, ultimately, about the sustainability of its development. Differently from other European countries, these changes are still not severe and can be reverted. To this aim future economic and social policies should account for these differences and trends actively promoting social integration.

Summarizing, new scenarios are available for policies aiming at increasing well-being: urban organization, educational system, labour market, and health systems are only some of the fields in which re-considering the role of social capital can significantly improve people's experience with their lives. In particular, a growing body of research confirms that people's well-being asks not only for material needs, but also for further aspects coming from the delicate connection of human relationships with others and the surrounding environment.

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## 8 The measurement of well-being of Luxembourg society – Completion phase of *PIBien-être* project

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## 8.1 The Minister of the Economy and Foreign Trade reiterated the government's commitment to the implementation of the *PIBien-être* project

In the public hearing held on 2 July 2013 in the Chamber of Deputies, the Minister of the Economy and Foreign Trade, Etienne Schneider, answered to a question with debate asked by Deputy Marcel Oberweis on the progress of the *PIBien-être* project<sup>1</sup>. In his speech, Etienne Schneider stressed the government's continued commitment to the implementation of the *PIBien-être* project set out in the 2009 government programme<sup>2</sup> in order to better measure the well-being of Luxembourg society. Since then the Economic and Social Council (ESC) and the Higher Council for Sustainable Development (HCSD) are entrusted with the implementation of the project called "GDP of well-being", i.e. a system of indicators of well-being that go beyond traditional indicators such as GDP per capita, to measure the progress and the quality of living of society.

To launch this project, a joint working group formed from members of both institutions - ESC and HCSD - was set up to select the themes, define the work programme (support, target, communication) and organise consultations (who, how, when). In addition, a technical working group, made up of members of the joint group and of the *Observatoire de la compétitivité*, the Ministry of Sustainable Development and Infrastructure and STATEC, was set up to monitor the project on a daily basis.

The project began in 2010 with a wide consultation with civil society, national and international experts and institutions. This consultation was run in the form of workshops, conferences and seminars on topics such as GDP reform, quality of living, sustainability, measuring well-being and quality. Debates and discussions gave the opportunity to citizens, scientists and association representatives to share their concerns about the quality of living or their societal expectations.

These consultations were intended to involve Luxembourg civil society in the best way, to observe expectations, priorities, concerns and to listen to the comments and suggestions. All this input was important to set up a system of indicators and of information reflecting the concerns of citizens.

Throughout these events, issues were raised and discussed about the future of the Luxembourg model of society and about the indicators to be adopted. The technical report drawn up thereafter aims to provide indicators, issues and measurement modes to meet the different expectations. However, it does not address the more political aspects related to the model of society.

<sup>1</sup> Video of the public hearing in the Chamber of Deputies: <http://visilux.chd.lu/ArchivePage/video/1157/sequence/46079.html>

<sup>2</sup> "...the Higher Council for Sustainable Development (HCSD) and the Economic and Social Council (ESC), the *Observatoire de la compétitivité* are jointly developing a composite indicator for well-being beyond the standard GDP per capita indicator, intended to measure the progress in society and well-being in a long-term perspective. This indicator, which takes into account international developments in the area, is being implemented based on statistics and official databases provided by STATEC."

Frame

**Consultation with civil society regarding the implementation of the *PIBien-être* project between 2010 and 2012**

- ▼ Workshop "Reforming the system of national accounts and GDP" on 19 May 2010 at the E.I.B.
- ▼ Workshop "Towards sustainable development in Luxembourg" on 29 October 2010
- ▼ Workshop "Towards a better assessment of quality of life" on 11 November 2010 at the European Court of Auditors
- ▼ Conference "Towards other measurements of wealth and well-being" by Mr Le Clézio, who officially launched the *PIBien-être* project on 1 March at the Chamber of Commerce of Luxembourg
- ▼ Conference "Having more or being better" or "How to measure happiness?" by Mr Patrick Viveret, philosopher, counsellor of the Court of Accounts of the French Republic, author of the "Reconsidérer la richesse" report (Reviewing wealth), held on 2 June 2010, at the Cercle-Cité
- ▼ Presentation of the *PIBien-être* project to the working group of the "Diaconie et Caritas" diocesan commission on well-being and values in Luxembourg, on 6 October 2010
- ▼ Presentation of the *PIBien-être* project and of its initial findings at the meeting of Eurostat working group on the sustainable development indicators (SDI), on 14 and 15 October 2010
- ▼ Workshop No. 2 "Towards sustainable development in Luxembourg", on 29 October 2010
- ▼ Workshop No. 3 "Towards a better assessment of the quality of life", on 11 November 2010
- ▼ Presentation of the *PIBien-être* project and of its initial findings at the "Luxembourg 2020" symposium, from 7 to 9 December 2010
- ▼ Presentation and discussion of *PIBien-être* at STATEC economic seminar "WellBeBe: Towards theoretically sound and democratically legitimate indicators of well-being in Belgium", with Prof. Dr Tom Bauler, on 25 January 2011
- ▼ Conference for delivery of the *PIBien-être* project's technical report, on 9 March 2011
- ▼ Presentation of the *PIBien-être* project and research topics related to the Higher Council for Research and Innovation (CSRI), on 6 April 2011
- ▼ Presentation of the *PIBien-être* project, its main results and the future of the project at the conference "How much is enough?" with Prof. Skidelsky, on 27 May 2011
- ▼ Presentation of the *PIBien-être* technical report to the Economic and Social Council of the German-speaking Community of Belgium (WSR DG), on 6 December 2011
- ▼ CES-HCSD public conference: "What data to better understand the societal changes and citizen's quality of life" on 18 January 2012
- ▼ On 23 January 2012 the CES-HCSD and the *Observatoire de la compétitivité* organised a panel discussion with Prof. Dr Ulrich Brand from the University of Vienna on the German experience of the *PIBien-être*

## 8.2 The technical report<sup>3</sup> and the technical report 2<sup>4</sup>

The objective of the technical report is to define and specify the structure and content of an information system, based largely on existing data, that achieves a synthetic and general overview of the situation in Luxembourg, beyond a mere observation of the three key indicators of public statistics, i.e. GDP, unemployment rate and inflation rate.

Moreover, it is clear that the chosen indicators should be monitored over time to keep the societal pace, which means they should adapt to the new objectives that society wishes to set.

In the identification process of the indicators for the *PIBien-être* project, it was first necessary to define the term "well-being" itself. In this sense, the following definition was proposed: "Well-being = Sustainability + Quality of life."

Thus, during its plenary session on the 12 January 2012, the ESC decided to deepen its analysis based on the technical report 2, which was finalised a few weeks later. For this purpose, a "*PIBien-être*" Working Committee and Drafting Committee were set up by the ESC. These committees started working on 21 March 2012, going through and discussing all the indicators of the new report. It was also decided to continue to work with the HCSD in order to achieve a system of common indicators.

The first CES-HCSD joint meeting, on 28 March 2012, primarily provided a platform for an exchange of views on the philosophy underlying the concept of well-being, but also on the respective approaches to growth. Given that each other's views were not diametrically opposed on this point, a distribution of tasks between the CES and the HCSD was agreed in order to speed up the work. Therefore, the ESC carried out an analysis of indicators that fall under a household perspective on current well-being, while the HCSD focused more on indicators related to sustainability and future well-being.

As for the final report to be submitted to the government, the two institutions reaffirmed their commitment to issue a joint position or at least to provide a common proposal on indicators. Even if that position is likely to include parts that are brought in only by one group, it was decided they would issue a single coordinated document that includes, if appropriate, all views on this subject.

<sup>3</sup> Technical report  
<http://www.ces.public.lu/fr/actualites/2011/03/conf-restitution/rapport-technique-v2.pdf>

<sup>4</sup> Technical report 2  
<http://www.ces.public.lu/fr/pibienetre/rapport-technique-bis.pdf>

## HCSO position

In the context of its work, the HCSO commissioned Professor Christian Schulz from the University of Luxembourg to develop a proposal for a "system of indicators of well-being", which includes:

- ▼ A general opinion on the technical report 2, including an assessment of the relevance and feasibility of the indicators, the weighting of the areas analysed and the consistency of the concept with existing strategic documents (National Plan for a Sustainable Development, Sector plans, National environmental technologies action plans, climate...);
- ▼ A shortlist of key indicators;
- ▼ A strategy for visualization and dissemination of monitoring results (frequency of publication, dissemination channels) and
- ▼ Prospects for the future of the scoreboard.

In addition, the HCSO found it useful to consult the citizens, especially young people, but also foreigners and cross-border commuters on what is important to their well-being and commissioned a survey to identify the major concerns of the general public in terms of sustainable development.

Additionally, the HCSO initiated and co-financed a TEEB-type study<sup>5</sup> (The Economics of Ecosystems and Biodiversity) with the CRP Henri Tudor, to assess the economic value of biodiversity and ecosystem services.

At the CES-HCSO joint group meeting on 11 September 2012, it was agreed that the ESC and the HCSO would individually elaborate a report regarding their specific indicators that will lead to a common position.

On 2 July 2013 the Minister of the Economy and Foreign Trade highlighted that in order to issue a joint position, the Economic and Social Council (ESC) and the Higher Council for Sustainable Development (HCSO) agreed on a common working method, by distinguishing the current well-being from future well-being, which adds the notion of sustainability to the concept of well-being.

As a framework of reflection the HCSO has taken on the national strategic plans<sup>6</sup>, considering that the aim of these strategic planning tools is to ensure the development of Luxembourg in a long-term perspective, beyond the indicators chosen by the Stiglitz-Sen-Fitoussi Commission and by the OECD in its report "How's life?".

<sup>5</sup> The TEEB (Economics of Ecosystems and Biodiversity) initiative, launched in 2007 by the Potsdam G8 and five major developing countries, aims to assess the economic value of biodiversity and ecosystem services. TEEB is focused on the economic benefits of biodiversity and takes into account the costs of biodiversity loss. TEEB aims at an integration of economic values of biodiversity and ecosystem services in the process of decision-making.

<sup>6</sup> National Plan for Sustainable Development (PNDD2 - 2010), Transportation Sector Plan (PST - draft 2008), Landscapes Sector Plan (PSP - draft 2008), Areas of economic activity Sector Plan (PSZAE - draft 2009), Housing Sector Plan (PSL - draft 2008), National Environmental Technologies Action Plan (2009), Climate Package (2011), National Nature Protection Plan (PNPN - 2007), Global Strategy for Sustainable Mobility - for residents and cross-border people (MODU - 2012), National Reform Programme Luxembourg 2020 (PNR - 2012)

The differentiation is that these indicators are designed to measure the efforts made in a long-term perspective while also ensuring future generations the necessary conditions for their well-being.

The HCSD has proposed indicators in areas other than those used by the OECD or the Stiglitz-Sen-Fitoussi report, taking into account the following indicators: economic development, equal opportunities for women and men, land-use planning, integration and cohesion.

## ESC position

The ESC choice of well-being indicators is made from a "households" perspective. This perspective includes employees, the self-employed, retired workers, entrepreneurs, etc.

After analysing the strengths and weaknesses of the indicators selected by the Stiglitz-Sen-Fitoussi Commission and the OECD in its "How's life?" report, the ESC only kept categories and indicators according to their internationally recognised relevance, availability, readability, comparability and methodology. However, it proved necessary to introduce contextual indicators according to the specific societal environment of Luxembourg.

The material conditions of well-being may vary from one household to another and the same applies to the households' perception of their living conditions in general. For these reasons, the subjective aspects, often neglected until then, were also taken into account by the ESC in addition to purely objective and measurable aspects to provide an as complete picture as possible of well-being, whether objective or subjective.

In addition, the ESC considered relevant to disaggregate some indicators to grasp the diversity of situations that can lie hidden behind a simple arithmetic average. This method has the additional advantage of revealing discrimination of any kind in an integrated way across all analysed areas. The proposed breakdown is included in brackets for each indicator and uses indices of dispersion that reflect the societal differences: age, occupation, gender, etc.

The common position is expected to be adopted on 28 October 2013 by the ESC and HCSD members in a plenary session.

## 8.3 Conclusions

After three years of preparatory work for the implementation of the *PIBien-être* project, going through consultation with civil society, seminars, conferences, drafting and even adaptation leading to a technical report 2, the project is in its completion phase and will be able to start its work on the analysis and measurement of the quality of living of Luxembourg society. From the outset of this project, the government has shown its commitment to the implementation of this work. This new measurement of well-being of society will thus be an important tool in decision-making on a socio-economic and political level.

The various stages through which this project went through in its development point out that this project is not only made for the Luxembourg civil society, but it is also made by the civil society.

The ESC and the HCSD objective was to define the structure and content of a new system of indicators, on the one hand to get an overview of the quality of life in Luxembourg, and on the other to rally to a wider international movement to a new way of measuring well-being at the national level. The indicators selected in this project complement the conventional indicators highly scrutinised by the media – GDP per capita, unemployment, inflation – which have emerged in the past decades as main measurement standards and which still strongly dominate much of the news currently.

## **9 The impact of a decrease in foreign deposits on the banking sector and on the economy of Luxembourg: a simulation with the LSM2 model**

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## 9.1 Introduction

The dynamic stochastic general equilibrium models (DSGE) are now commonly used by Central Banks. Luxembourg has included this tool in its economic simulation toolbox. These models have the advantage of being micro-founded. Calibrated, rather than econometrically estimated, they have the disadvantage of giving more qualitative responses to simulated shocks. Compared to recursive dynamic computable general equilibrium models they have the advantage of not considering myopic behaviours; they also have a much better representation of the financial sector. But their sectoral breakdown is very limited. A first LSM version has been widely used to consider the consequences of structural policies. But this initial version was not suited to studying the consequences of hyper-specialisation of Luxembourg in its cluster of financial activities. The development of a new version of LSM, named LSM2, addresses this concern, which was reinforced by the crisis. We briefly present here the structure of this new model and the results of a simulation using the innovations in this new version, prior to making a sensitivity analysis. The simulated shock (a decrease of foreign deposits) is naturally simplistic with respect to the complexity of the effects of the crisis. The decrease in deposits is a manifestation of the crisis, without necessarily being a direct effect. The issue of banking secrecy (which is a very indirect consequence of the crisis) may also have contributed. But we hope to illustrate in this way the properties of this new simulation tool that is now available for Luxembourg.

Reading the results of the simulation must be done with caution. Firstly, it is a calibrated model, which is primarily intended to give qualitative responses, magnitudes of changes in the macroeconomic variables under study. The figures should therefore be used with caution: an increase of 1.1% demonstrates a positive response to the shock, and 1% is the magnitude conditional on the size of the shock. Secondly, the model is still more appropriate for moderate shocks moving away from the steady state, rather than big or cumulative shocks. We can then be led to simulate shocks of moderate magnitude in order to know the direction of the variables' response. Thirdly, the representation of taxes and transfer or replacement incomes is necessarily simplified in a model of such complexity, and sectoral breakdown remains minimal.

These various reservations, usual for this type of model, are even more acute in the current economic environment, which challenges all the simulation models, whatever their nature. In the case of LSM, calibration is done before the crisis, over the 2001-2006 period, which is supposed to represent a situation where the economy is close to balance. Therefore, the reactions of the model represent those of an economy that is slightly deviating from equilibrium following a shock. Finally, reading the results should be made keeping in mind that these are percentage deviations from a reference scenario. For certain economic quantities, the percentages may be high for absolute changes that are all in all limited. Whenever it is helpful, we will rather present the development of the absolute quantities for an easier reading. This is the case, for example, for the public deficit or the external balance.

## 9.2 The LSM2 model

A DSGE model is particularly suited to the study of macroeconomic and financial interactions and to the transmission of shocks. A transmission channel is an opening, whether for the trade of goods or for export of services. This channel is particularly important for small and very open economies such as Luxembourg. In order to study it, we have deeply changed the LSM model to integrate a distribution sector (of imports) and a banking and financial sector including two "activities", namely "domestic banks" (mainly in charge of providing the capital necessary for the operating of local firms), and the international financial activity, represented here by "international banks" established in Luxembourg and converting foreign deposits. The model is fully calibrated, but this has been done by using the actual data from the Luxembourg economy. These data are reproduced by the model.

There are four types of agents in LSM2 - households, non-financial companies, banks and trade unions - plus the government. Households are represented by overlapping generations and maximize their utility in an inter-temporal way by considering a budget constraint. This optimization determines their consumption and saving choices. The choices of individual households are then aggregated to obtain the usual macroeconomic quantities. The government levies capital income and labour income taxes. Its expenditures relate to unemployment benefits for residents, other social transfers to non-residents, other transfers to residents, public consumption, and finally public investments. In the case of a deficit, public debt is financed by issuing government securities. The interest rate is exogenous given the fact it is a small open economy, belonging to a monetary union. However, the accumulation of public debt creates a risk premium.

The assets include government securities, foreign securities and shares in companies located in Luxembourg (held by households). These three classes of assets are perfect substitutes in households' portfolios and have the same performance, when balanced.

Companies produce intermediate and final goods (and services). The (differentiated) intermediate goods sector operates in monopolistic competition. The production function combines capital and the several labour categories - a stylization of the dual nature of the labour market in the Luxembourg. Companies fashion their demands for production factors according to their cost (salaries and cost of capital). The final goods sector operates under perfect competition and creates combinations of intermediate goods.

An interesting specificity of the model is that of replicating some features of the Luxembourg labour market. Wages are set by negotiations between the trade unions representing employees and the employers. The resulting wages determine the labour demand. Resident employees are distinguished from non-residents.

We introduce a banking sector comprising two types of banks. In the so-called "domestic" banking sector there is a representative bank that intermediates, in perfect competition, loans between households and businesses. It produces financial services using labour, capital and reserves. The bank is owned by domestic households. Companies (and banks also) must finance a portion of their production factors expenses in advance, before earning revenues through their sales. This corresponds therefore to a cash flow requirement.

In the so-called "international" banking sector there is a representative bank that intermediates loans, in perfect competition, between foreign households and foreign companies. It produces financial services using capital, labour and reserves. This bank is also owned by domestic households, with no loss of generality to the extent that there are no profits to be repatriated. To finance foreign demand for loans, the bank receives deposits from abroad, depending on the interest rate offered.

Finally, we introduce the distribution sector. Distributors import foreign varieties and combine them with capital and labour to produce distribution services aimed at domestic final producers. These services can also be re-exported. Foreign demand for re-exports is exogenous, in accordance with the small country assumption.

Capital is segmented, which means it is not mobile from sector to sector (except on the occasion of new investments) while labour is mobile. Naturally, this assumption of labour mobility, needed to analytically solve the model, is unrealistic: there are frictions in the labour market, which prevent a rapid reallocation and it should be taken into account when interpreting simulation results.

All the details of the functioning of the labour market can hardly enter a model of this type, which already includes the negotiation between employers and trade unions in wage determination, companies deciding the volume of employment given the wage.

To illustrate the operation and the many possible applications of LSM2, we conduct an exercise in using the refinements introduced as compared with the previous version of the model.

The simulated shock focuses on the impact on the banking sector and the Luxembourg economy resulting from a decrease in foreign deposits in the country's international banking sector, which amounts to a manifestation of the financial crisis. We seek to identify the impact of the decrease in foreign deposits in Luxembourg banking system on growth, sector activities, income, and public accounts. Given the strong financial specialisation of Luxembourg, this exercise is particularly revealing.

## 9.3 A decrease in foreign deposits

We present now the simulation results of the effects of one of the manifestations of the financial crisis, namely a decrease in foreign deposits, on Luxembourg economy. We simulate a permanent and exogenous 5% decrease in foreign deposits processed by international banks located in Luxembourg. The simulated decrease is limited, but importantly, the crisis involved other shocks, such as the decline in international demand, and the different risk perception, which may have much greater effects than what we simulate here when they combine with lower deposits.

The starting point of the economic mechanism sequence is the relative complementarity between deposits and other production factors used by international banks. These banks will seek to reduce the use of capital and labour, now in excess in this sector (Table 1). Capital stock decreases gradually (2% within 10 years), resulting in a lower cost of capital. Regarding the adjustment of the labour market, one should keep in mind the unions' goal of maximizing workforce, with negotiations combining a marked decline in employment (-5.3% in the first year) moderated by the lower labour cost (wages decrease by 1.4% initially, by 1% within 10 years). The final payroll falls by more than 6% under the combined effect of lower wages and reduced employment. The effects are not differentiated between residents and non-residents employees in each sector. Efficiency in the use of resources being constant, and the amount of production factors being in decline, the share of production of international banking sector in national added value decreases by 4.7% (and therefore the added value of the international banking sector also declines, since Luxembourg GDP decreases, as we will see).

International banks are thus negatively affected by the decrease in deposits and adjust by reducing employment, wages, assets and production. This decline is permanent, as long as deposits decrease.

**Table 1**  
**Impact on the international banking sector of a 5% decrease in foreign deposits**  
**(deviation as a %)**

	1 year	2 years	3 years	4 years	5 years	10 years
Capital stock	-0.3	-0.5	-0.7	-0.9	-1.1	-2.0
Resident Employment	-5.3	-5.2	-5.2	-5.2	-5.1	-5.0
Non-resident Employment	-5.3	-5.2	-5.2	-5.2	-5.1	-5.0
Resident Wage	-1.4	-1.4	-1.3	-1.3	-1.3	-1.1
Non-resident Wage	-1.4	-1.4	-1.3	-1.3	-1.3	-1.1
Resident payroll	-6.6	-6.5	-6.5	-6.4	-6.3	-6.0
Non-resident payroll	-6.6	-6.5	-6.5	-6.4	-6.3	-6.0
Share in the value added (as a % of GDP)	-4.7	-4.6	-4.6	-4.6	-4.6	-4.4

This negative effect on the international banking sector is not fully compensated by the rest of the economy and GDP decreased by 2.0% in the first year (Table 2). However, the compensating effects, detailed below, slightly cushion the shock over time: after 10 years the decline in relation to the baseline is only -1.6%. The adjustment channel here is the employment rate in non-banking sectors in Luxembourg. The downward pressure on wages increases employment in these sectors, so that the payroll increases (from 2% to 3% depending on the sector and the years). As the employment of employees requires the use of capital, it also supports investment outside of the banking sector (1% to 3% depending on the sector, with the effect being very tempered in the distribution sector). As the aggregate disposable income decreases more than consumption, savings declines at the aggregate level; however, this phenomenon is in turn tempered by the slight decline in investment at the aggregate level. But as we see, this compensation is only partial and the shock on the Luxembourg economy is deep and lasting. Aggregate payroll finally declines by -3.0% immediately and is still lower by -2.5% than its baseline level after 10 years. This is explained by the combination of lower wages with, on the whole, less jobs (approximately equally).

Therefore, at the macroeconomic level the crisis distorts the distribution of added value at the expense of employees whose bargaining power is affected by the 1.4% increase in unemployment from the second year. Economic activity in Luxembourg recovers outside the banking sector, but this compensation remains incomplete.

Profits (which are part of income) recover (+2%), savings decline, so that consumption drops only negligibly. Investment declines, as well as the capital stock, which hampers the prospects for long-term growth.

The public deficit widens, and public debt increases by 2.4 GDP percentage points. Public spending is reduced to reduce this further deficit, limiting the increase in debt. Sectors operating in imperfect competition improve their relative performance, as we will see, which increases profits. Taxation of profits brings additional revenue to the State, but that does not compensate the decrease in income from labour and capital tax.

The negative effects are propagated by the fact that lower income and economic activity are accompanied by a decline in credit demand (domestic deposits decrease by -3.0% within the first year), which is in the end unfavourable to the domestic banking sector (Table 3). The latter in turn reduces its demand for capital and labour, reduces its activity and hence its share in the value added.

In short, the decrease in foreign deposits in the international banking sector in Luxembourg reduces the production and use of other factors in this sector, despite lower wages and therefore lower labour costs. The domestic banking sector is affected in turn. The factors made available are partly used in other sectors, particularly in the non-tradable sector, while unemployment rises significantly. Public finances deteriorate, investment and GDP decrease while consumption resists, which deteriorates the balance of trade.

Table 2  
Macroeconomic impact of a 5% decrease in foreign deposits (deviation as a %)

	1 year	2 years	3 years	4 years	5 years	10 years
GDP	-2.0	-2.0	-1.9	-1.9	-1.8	-1.6
Consumption	-0.0	-0.0	-0.1	-0.1	-0.1	-0.1
Investment	-0.9	-0.9	-1.0	-1.0	-1.1	-1.2
Capital stock	-0.1	-0.2	-0.3	-0.4	-0.4	-0.8
Profits	2.0	2.0	2.0	2.0	2.0	2.1
Resident Employment	-1.4	-1.4	-1.4	-1.4	-1.4	-1.3
Non-resident Employment	-1.4	-1.3	-1.3	-1.3	-1.3	-1.3
Resident Wage	-1.6	-1.6	-1.5	-1.5	-1.4	-1.2
Non-resident Wage	-1.6	-1.6	-1.5	-1.5	-1.5	-1.2
Resident payroll	-3.0	-2.9	-2.9	-2.8	-2.8	-2.5
Non-resident payroll	-3.0	-2.9	-2.9	-2.8	-2.7	-2.5
Total factor productivity	0.0	0.0	0.0	0.0	0.0	0.0
<i>Household disposable income</i>	-1.3	-1.3	-1.3	-1.2	-1.2	-1.2
<i>Government balance (as a % of GDP)</i>	-0.6	-0.5	-0.4	-0.4	-0.3	-0.3
<i>Unemployment (as a % of labour force)</i>	1.4	1.3	1.3	1.3	1.3	1.3
<i>Balance of trade (as a % of GDP)</i>	-3.4	-3.4	-3.4	-3.4	-3.4	-3.4

Note: in italics, changes as a percentage compared to the baseline for household disposable income and as percentage points compared to the baseline for the variables expressed as a percentage (last three rows of the table).

Table 3  
**Impact on the domestic banking sector of a 5% decrease in foreign deposits  
(deviation as a %)**

	1 year	2 years	3 years	4 years	5 years	10 years
Capital stock	-0.1	-0.3	-0.4	-0.5	-0.6	-1.1
Resident payroll	-5.9	-5.6	-5.4	-5.2	-5.1	-4.3
Non-resident payroll	-5.9	-5.6	-5.4	-5.2	-5.1	-4.3
Share in the value added (as a % of GDP)	-3.9	-3.7	-3.6	-3.4	-3.3	-2.7

We may finally detail the effects on the rest of the economy by examining general equilibrium effects, that is to say the indirect effects on the rest of the economy of the shock on the international banking sector. The lower cost of capital is favourable to the other sectors of the economy, with the exception of the domestic banking sector and, in a mild way, for the distribution sector (Tables 4-6). Other areas require more capital but also more work because of lower labour costs. Profits and payroll increase in the rest of the economy for resident and non-resident employees. Production increases in the rest of the economy, whether for national distributors or producers, regardless of the horizon of simulation.

Obviously, this is the result other things being equal. If labour is not perfectly mobile between sectors (contrary to the assumption of the model discussed above), there will be no countervailing growth in other sectors, which will amplify the negative effects observed here. Similarly, it is doubtful that banks are as willing to lend to businesses after the shock as before, credit rationing can then take place. In this case an increase in the cost of capital would occur, with a negative effect on production added to the difficulty to attract employees to areas that are not directly affected by the shock. Finally, to the extent that the crisis is not just financial (and that it is not limited to a decrease in foreign deposits), other negative shocks on the economy could lead to opposite developments, such as a decrease in external demand and/or a decrease in the aggregate TFP due to the increase in the rate of natural unemployment.

Table 4  
**Impact on the non-tradable goods sector of a 5% decrease in foreign deposits  
(deviation as a %)**

	1 year	2 years	3 years	4 years	5 years	10 years
Capital stock	0.2	0.3	0.4	0.6	0.7	1.3
Resident Employment	4.3	4.3	4.3	4.3	4.3	4.3
Non-resident Employment	4.3	4.3	4.3	4.3	4.3	4.3
Resident Wage	-1.5	-1.4	-1.4	-1.3	-1.3	-1.1
Non-resident Wage	-1.5	-1.4	-1.4	-1.3	-1.3	-1.1
Resident payroll	2.8	2.8	2.9	2.9	3.0	3.2
Non-resident payroll	2.8	2.8	2.9	2.9	3.0	3.2
Profits	2.7	2.8	2.8	2.9	2.9	3.2
Share in the value added (as a % of GDP)	4.9	4.9	4.9	4.9	4.9	4.9

Table 5  
**Impact on the tradable goods sector of a 5% decrease in foreign deposits  
(deviation as a %)**

	1 year	2 years	3 years	4 years	5 years	10 years
Capital stock	0.1	0.2	0.3	0.4	0.5	0.9
Resident Employment	3.8	3.8	3.8	3.7	3.7	3.5
Non-resident Employment	3.8	3.8	3.8	3.7	3.7	3.5
Resident Wage	-1.5	-1.4	-1.4	-1.3	-1.3	-1.1
Non-resident Wage	-1.5	-1.4	-1.4	-1.3	-1.3	-1.1
Resident payroll	2.3	2.3	2.4	2.4	2.4	2.4
Non-resident payroll	2.3	2.3	2.4	2.4	2.4	2.4
Profits	2.3	2.3	2.3	2.3	2.3	2.4
Share in the value added (as a % of GDP)	4.4	4.4	4.4	4.3	4.3	4.1

Table 6  
**Impact on the distribution sector of a 5% decrease in foreign deposits  
(deviation as a %)**

	1 year	2 years	3 years	4 years	5 years	10 years
Import of varieties	1.9	1.9	1.9	1.9	2.0	2.0
Capital stock	0.1	0.2	0.2	0.3	0.4	0.7
Resident Employment	3.0	3.0	3.0	2.9	2.9	2.8
Non-resident Employment	3.0	3.0	2.9	2.9	2.9	2.8
Resident Wage	-1.4	-1.4	-1.3	-1.3	-1.2	-1.0
Non-resident Wage	-1.4	-1.4	-1.3	-1.3	-1.2	-1.0
Resident payroll	1.5	1.6	1.6	1.6	1.6	1.8
Non-resident payroll	1.5	1.6	1.6	1.6	1.6	1.8
Profits	1.8	1.8	1.9	1.9	1.9	2.0
Share in the value added (as a % of GDP)	3.6	3.6	3.5	3.5	3.5	3.4

Finally, an important determinant of the results that we have presented is the reaction of foreign deposits to the interest rate offered (what is called "elasticity"). The difficulty here is that the value of this elasticity is difficult to estimate. Previously we have presented the results for a "reasonable" elasticity level (associated to the  $\sigma_{FB}=3.5$  parameter). To validate the previous results, it is therefore necessary to consider whether they are very sensitive to the value of this elasticity. We perform now a robustness analysis by substantially varying elasticity downward and upward.

We observe that the results are qualitatively robust, although unsurprisingly the magnitude of the results depends on this elasticity. Indeed, the results summarised in Table 7 show that when the sigma parameter is higher than in the central scenario (equal to 4 or 4.5 so that the elasticity of foreign deposits to interest rate is lower than in the central scenario), the effects of the decrease in foreign deposits are more negative, and vice versa for lower values. But, in the end, differences are limited, suggesting a high robustness of our results to the calibration of this important parameter.

Table 7  
**Impact of a 5% decrease in foreign deposits (deviation as a %)  
according to the elasticity of deposits to interest rates**

		1 year	2 years	3 years	4 years	5 years	10 years	
<b>Sigma_FB</b>	<b>Elasticity</b>							<b>GDP</b>
2.5	0.67	-1.7	-1.7	-1.6	-1.6	-1.6	-1.4	
3.0	0.50	-1.9	-1.9	-1.8	-1.8	-1.7	-1.5	
3.5	0.40	-2.0	-2.0	-1.9	-1.9	-1.8	-1.6	
4.0	0.33	-2.2	-2.1	-2.0	-2.0	-1.9	-1.7	
4.5	0.29	-2.2	-2.2	-2.1	-2.0	-2.0	-1.7	
<b>Unemployment (as a % of labour force)</b>								
2.5	0.67	1.1	1.1	1.1	1.1	1.1	1.1	
3.0	0.50	1.3	1.2	1.2	1.2	1.2	1.2	
3.5	0.40	1.4	1.3	1.3	1.3	1.3	1.3	
4.0	0.33	1.4	1.4	1.4	1.4	1.4	1.4	
4.5	0.29	1.5	1.5	1.4	1.4	1.4	1.4	
<b>Public debt (as a % of GDP)</b>								
2.5	0.67	0.6	1.0	1.4	1.7	2.0	2.2	
3.0	0.50	0.7	1.2	1.6	1.9	2.2	2.4	
3.5	0.40	0.8	1.3	1.7	2.0	2.3	2.6	
4.0	0.33	0.8	1.3	1.8	2.1	2.5	2.7	
4.5	0.29	0.8	1.4	1.8	2.2	2.6	2.9	

Note: changes as a percentage compared to the baseline for GDP and as percentage points compared to the baseline for the variables expressed as a percentage (unemployment and public debt).

**10 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)

