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"Preparing for Recovery"

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Preface

Preparing for Recovery

"*If one adopts an historical approach to the financial process, as I do, one can see that crises originate within the financial cycle and are therefore inherent to the functioning of finance!*" This viewpoint is expressed by Michel Aglietta in his book *La crise*, in which he illustrates that he is one of the rare critical economists that have always held to Keynes over Friedman. If no effective regulatory system is in place, one must accept the bubbles and endure the sometimes severe consequences when they burst. Luxembourg, which lays claim to a first-rate financial center, has been struck through the heart by this crisis. The economic crisis has provided a dramatic reminder to us about the extent of our fragility.

The newly prepared economic recovery plan that will supplement the country's automatic stabilizer mechanism is intended to maintain current public and private expenditures without impacting social transfers and the quality of public services.

These short term measures have a rather limited impact on a small, open economy, even though recovery is developing in a concerted framework on the Community level. The recovery package, which is taking up nearly 5% of the nation's GDP this year, has stolen the show from the structural reforms program under the Lisbon Strategy. I wish to emphasize the importance of the National Plan for Innovation and Full Employment. Luxembourg's competitive position upon emerging from the economic and financial crisis will depend greatly on the implementation of an economic policy firmly grounded in productivity, innovation, the

quality of products and services provided, and on highly specialized levels of production from craft trades, commercial and industrial companies. Progress achieved in implementing this should be efficiently monitored and evaluated by means of a qualitative and quantitative economic analysis that compares resources to results. Parliament, the Government and the Social Partners require reliable, objective structural information originating from official sources to evaluate the impact of their economic policies.

This is what the Competitiveness Scoreboard, included in this Report, is offering. We should note that this year marks the 5th edition since the presentation of the Fontagné report on the competitiveness of Luxembourg's economy.

I wish to emphasize that the government program for the 2009-2014 legislative period stipulates that this type of operational competitiveness scoreboard be institutionalized and that it should incorporate the social, ecological and economic criteria suitable to the sustainable development effort.

The economic indicators that are still in force currently under the tri-partite law will thus be replaced by this **new** Competitiveness Scoreboard. Some of these indicators still date from before the shift of Luxembourg's economy to a service oriented economy and do not account for changes in assembling and processing statistics that have occurred in step with advances in information technologies. The Scoreboard will also integrate short term indicators that allow for rapid reaction to changes in the economy, which are often subject to international occurrences, while emphasizing the long term structural indicators. Analyses for this new Scoreboard will be based on work accomplished since 2004 by the *Observatoire de la Compétitivité,* the annual updating of which is now published in this Report.

Jeannot KRECKE

Minister of the Economy
and Foreign Trade

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1.1 Role and Mission of the Observatoire de la Compétitivité

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 economic well-being.

As such, it is a tool for documenting, observing and analyzing change in the competitive situation of the country. It is a monitoring unit, responsible for leading a constructive debate between all the social partners.

The principal goals of the *Observatoire de la Compétitivité* are as follows:

- Collect, analyze and compare existing data on the national, regional and international levels that relates to economic competitiveness
- Direct selected and processed information to appropriate entities that is useful in making strategic decisions
- Conduct or contract studies and research on competitiveness and its determinants, etc.
- Contribute to the deliberations and analyses of international organizations dealing with competitiveness such as the EU Council, the OECD, etc.

Frame 1: Extract from the 2009-2014 government program[1]

"*1. Promote competitiveness in Luxembourg's economy*

a. Competitiveness: Implementing an operational Competitiveness Scoreboard

The Government's permanent monitoring tool to track competitiveness and its related indicators is the Observatoire de la Compétitivité*. The* Observatoire *will monitor competitiveness in Luxembourg's economy and regularly inform the Government and the social partners, especially the Tripartite Coordination Committee, about changes in competitiveness.*

[1] For more details see:
http://www.gouvernement.lu/gouvernement/programme-2009/programme-2009/07-ecocomex/index.html

Competitiveness is measured by integrating social, ecological and economic criteria in accordance with the principle of sustainable development. For this purpose, various qualitative and quantitative indicators are intended to provide information about the competitiveness of the country's economy. Collaboration between the Observatoire *and the Luxembourg Central Statistics and Economic Analysis Office (STATEC) is therefore particularly important to ensure the quality of the factors forming the basis of these measures.*

The economic indicators used in the Grand Duchy Regulation dated 4 April 1985, in application of article 21, paragraph 6 of the amended law dated 24 December 1977 that authorizes the Government to implement measures intended to stimulate economic growth and maintain full employment, will be replaced by the Competitiveness Scoreboard, following consultations with the social partners represented in the Tripartite Coordination Committee.

The Competitiveness Scoreboard no longer includes several indicators that date from prior to the introduction of the euro and also from before the shift of Luxembourg's economy to a service oriented economy. These indicators did not take into account changes in assembling and processing statistics that have occurred in step with advances in information technologies. The Scoreboard integrates short term indicators that allow for rapid reaction to changes in the economy that are often subject to international occurrences, emphasizing the long term structural indicators. It ensures compatibility with sustainable development indicators.

Along with the High Council for Sustainable Development (CSDD) and the Economic and Social Committee (CES), the Observatoire de la Compétitivité *is developing a composite indicator for well-being above and beyond the standard GDP per capita indicator, intended to measure progress in society and well-being in the long term. This indicator, which takes into account international developments in the area, is being implemented based on official statistics and databases provided by STATEC. (…)*"

1.2 The Lisbon Strategy and the National Plan for Innovation and Full Employment

The Ministry of the Economy and Foreign Trade is responsible in Luxembourg for coordinating implementation of the Lisbon Strategy on the national level. In the autumn of 2005, the *Observatoire de la Compétitivité* was instructed to draw up a National Plan for Innovation and Full Employment, which was subsequently submitted to the European Commission as part of the renewed triennial Lisbon strategy (2005-2008)[2]. To optimize governmental coordination, ensure that consultation procedures are carried out and to guarantee assimilation of reforms nationally, the ad hoc "Lisbon Network" was set up at the inter-ministerial level in 2005. Coordination of this structure is handled by the *Observatoire de la*

[2] For more details, see : http://www.odc.public.lu/publications/pnr/index.html

Compétitivité of the Ministry of the Economy and Foreign Trade. This network brings together Lisbon Strategy coordinators within the ministerial departments and administrations concerned.

In 2006, the Luxembourg Government submitted its first implementation report to the European Commission. The report outlines the measures applied by the Government adapted from the major objectives set out in the 2005 National Plan for Innovation and Full Employment, following the integrated guidelines. This report also includes new political measures taken since that time as well as those agreed upon at the outcome of the April 2006 Tripartite Coordination Committee. In 2007, The Government submitted its second implementation report, which closed off the first triennial cycle of the renewed Lisbon Strategy. Then in March 2008, the Government of Luxembourg submitted the first national program for the new triennial cycle of 2008-2010. A bilateral meeting was held between Luxembourg and the European Commission in 2009 in order to prepare the second report for the new triennial cycle.

Frame 2 : Excerpt from the 2009-2014 government program

"b. Competitiveness and the Lisbon Strategy: coordination on the national level

Economic policy must contribute to maintaining a high level of competitiveness in order to increase growth and employment, ensure stability of prices and maintain positive trends in the areas of foreign trade and public finances. This becomes particularly important during periods of structural crisis. Thus competitiveness is a constant in Luxembourg economic policy considerations. The Government analyzes and models the relationships between competitiveness indicators, especially those in the Competitiveness Scoreboard, to evaluate the effectiveness of reforms implemented as part of its domestic reform program."

1.3 Events and publications in 2008-2009

One objective of the *Observatoire de la Compétitivité* is to keep both economic policy players and the general public informed on the subject of competitiveness. To achieve this, the *Observatoire* uses several communication methods, such as setting up public colloquia and conference events and publishing analytical documents relating to competitiveness. All information concerning events organized by the *Observatoire de la Compétitivité*, as well as its publications, can be downloaded from the Internet site http://www.odc.public.lu/

1.3.1 Colloquia and conferences

The communication strategy of the *Observatoire de la Compétitivité* goes hand in hand with its "competitiveness watch" mission and serves to launch public deliberations on the main themes that characterize the competitiveness of the Luxembourg economy and the Lisbon Strategy. Setting up public events is an integral part of this responsibility.

The *"En route vers Lisbonne"* Colloquium[3]

The broad success of the first Luxembourg colloquium on the Lisbon Strategy set up in 2004, and that of the succeeding edition in November 2006, served as a prelude to its third edition, which took place in early December 2008, sponsored by the Ministry of the Economy and Foreign Trade and set up by the *Observatoire de la Compétitivité*, STATEC and the CRP-HT. The colloquium brought together researchers and policy-makers to discuss central Lisbon Strategy themes such as the links between R & D, innovation, competitiveness, technology transfer, initial and continuing education, the dissemination and impact of ICT, immaterial capital and the management of knowledge and intellectual property. This event has grown into a major event that accommodates several hundred participants.

Luxembourg Economy Days – Entrepreneurship in Luxembourg and the Greater Region[4]

This event took place in February 2009 on the Chamber of Commerce premises. It was sponsored by the *Observatoire de la Compétitivité*, the Chamber of Commerce and FEDIL, in collaboration with PricewaterhouseCoopers (PwC)[5]. With the economic and financial crisis as a backdrop, the event organizers chose to concentrate resolutely on the future of Luxembourg and of the Greater Region in order to seek out the paths that lead to developing and diversifying the economy. Participants provided expertise on the future of trade, of cities and of the remunerative sectors of the economy. Among the speakers at the event, the Ministers of the Economy and Foreign Trade and the Minister of the Middle Classes,

[3] For more details see: http://www.tudor.lu/Lisbonne2008 et http://www.odc.public.lu/actualites/2008/12/
[4] For more details see: http://www.odc.public.lu/actualites/2009/02/11_12_jour_eco/index.html et http://www.odc.public.lu/publications/lettre_observatoire/lettre_Obs_Comp_N10.pdf
[5] For more details see : http://www.economydays.lu/

Tourism and Housing gave their vision of the economy and foreign trade as well as on business as a pillar of the economy. The Luxembourg Economy Days event was a veritable cross-border forum for bringing together the actors of the economy and urban development. The event also promoted a sharing of experiences with entrepreneurs and representatives of the governments of the Greater Region with the objective of better understanding the challenges facing each party. The first day was devoted to the broad outlines for trade and avenues of economic development, while the second day concentrated on the financial crisis and its consequences for the real economy.

Methodological seminar on the LSM (Luxembourg Structural Model) [6]

The seminar set up by the *Observatoire de la Compétitivité* in June, 2009 bore the title "How to Prepare for Economic Recovery: What the LSM Structural Model Shows". This seminar strove to methodically explore the measures most apt to prepare Luxembourg's economy for emerging from the current economic crisis. The LSM is a microeconomic dynamic stochastic general equilibrium (DSGE) model, that incorporates economic specificities of Luxembourg, meaning the specific functioning of the labor market that takes into account both resident and cross-border workers, the importance of negotiations between unions and companies and the fact that Luxembourg is a small, extremely open economy. In view of the emergency measures taken by European governments and the European Central Bank, the model analyzes the impact of various policies that could mitigate the negative effects of the crisis. Simulations were made of the repercussions of an increase in margin rates or replacement rates, as well as of decreases in social contributions, fiscal taxes and the VAT. To that end, the results produced by the LSM macro-econometric model, constructed by Professors Marcellino and Fontagné and introduced in the 2008 Competitiveness Report, can provide precious information for formulating future structural policies. The LSM model shows that reforms undertaken in an isolated fashion often have little or undesired impacts, while choosing a combination of scenarios is more reasonable and can produce positive effects for Luxembourg's economy. Professor Fontagné held that a good policy can offset negative impacts of another policy and that it is socially more equitable to spread the burden of adjusting to events among all the stakeholders within an economy. He

[6] For more details see: http://www.odc.public.lu/actualites/2009/06/index.html

stressed that a negotiated economic policy, such as within the framework of the Tripartite Coordination Committee, is the right path to choose.

Methodological seminar on the Real Estate sector: A Statistical and Economic Report [7]

Historically, financial crises have often been preceded by the bursting of a speculative bubble present in real estate markets. Statistics concerning the Luxembourg real estate market are rather meager and have many gaps, which precludes making viable analyses in an area crucial to the domestic economy. The *Observatoire de la Compétitivité* set up an initial seminar on the subject in June that included a good number of the players in this market. An expert from the housing division of the French INSEE institute gave a presentation on the system used to collect data on housing in France. STATEC then provided information from the various sources it uses to carry out analyses, such as surveys on household budgets or tax surveys, which notwithstanding were insufficient to provide data for obtaining a clear perspective to the real estate market situation. However, STATEC has recent quarterly figures of apartment prices from the files of the Administration of Records and Domains (*Administration de l'Enregistrement et des Domaines*) which shed new light on the market for apartments. The participants decided to cooperate more closely on this subject and to meet more regularly via a seminar to be dubbed "Real Estate Statistics and Economy" organized by the *Observatoire de la Compétitivité*. A round table discussion brought out the various viewpoints of each of the entities involved. A broad consensus was achieved on the fact that prices listed in media publications and those taken from completed sales are two very different measures and that one must not take them together as they are not intended for like purposes. This is true, even though they can provide additional information. All of the participants stressed the importance of producing official figures based on actual prices in order to be able to analyze the impact of the housing market on the overall economy. According to the Director of the Administration of Records and Domains and the Chairman of the Chamber of Notorial Solicitors, setting up a database for actual prices will be impossible in the absence of amendments to current legislation that results in Solicitors transmitting data on sales that is more both more detailed and harmonized in terms of surface areas and year of construction. Improved data

[7] For more details see: http://www.odc.public.lu/actualites/2009/06/30_seminaire_logement/index.html

will certainly make it possible to build models that can simulate supply and demand for products and real estate prices and to understand the impact of the sector on the economy.

The State of Working America Conference [8]

The *Observatoire de la Compétitivité*, the Chamber of Salaried Employees (CSL) and the Luxembourg Income Study (LIS) held a conference in July 2009 on America's Social and Wage Earning Status, with Lawrence Mishel, the President of the Economic Policy Institute (EPI) based in Washington D.C. This renowned economist is often asked to provide economic expertise before the U.S. Congress and is a regular commentator on economic matters in the written and audiovisual media. He recently sketched out an economic stimulation plan which has been widely adopted by Washington political leaders. According to Lawrence Mishel, in view of the current worldwide economic expansion, the increase of inequalities in wages and the profound changes in work methods and types, it is more crucial than ever that the voices of working people can be heard in economic policy debates. Lawrence Mishel's presentation highlighted the growing inequalities in salaries and the concentration of investment income in the pockets of a small proportion of the population - the Top 1% - in the United States. He also drew attention to the persistent inequality of income by gender. Still, changes in technology and lower qualification levels do not explain the gap between wages. There is a significant difference between productivity, in constant progression since 1995, and hourly compensation, which has been stagnant since 2002. According to Mishel, bubble economies will end up by bringing us to a recession with increasing unemployment. To end the session, Lawrence Mishel recommended solutions for addressing the immediate crisis by investing in shared prosperity with major social foundations.

1.3.2 Economic Policy Perspectives

Through its publication Economic Policy Perspectives, the *Observatoire de la Compétitivité* makes public the results of studies and/or sponsored research of university or contracting researchers, as well as the working documents drafted by members of the *Observatoire de la Compétitivité* of the Ministry of Economy and

[8] For more details see: http://www.odc.public.lu/actualites/2009/07/07__working_America/index.html

Foreign Trade. This publication also aims to disseminate reports on presentations, seminars and conferences that the Ministry of the Economy and Foreign Trade has held on economic policy themes. Lastly, the publication hopes to illuminate possible policy options, evaluate the effectiveness of certain measures, thus nourishing public debate on economic policy[9].

1.3.3 Newsletter: *La Lettre de l'Observatoire de la Compétitivité*

While the mission of "Economic Policy Perspectives" is to provide detailed analyses of certain scientific issues, the Observatoire de la Compétitivité newsletter seeks to inform the general public about the work being done within the department itself. This publication addresses both the economic actors and a wider audience[10].

1.3.4 The *Observatoire de la Compétitivité* web site

The *Observatoire de la Compétitivité* has maintained a web site at http://www.odc.public.lu since 2005, which carries all the information and publications concerning the competitiveness of the Luxembourg economy and the Lisbon Strategy. The site provides information about the competitiveness of the Luxembourg economy in foreign publications. It serves as a platform for communications to all the actors involved in implementing the Lisbon Strategy in Luxembourg and it makes available information in the Competitiveness Scoreboard. The site lists upcoming events and publications. Documents concerning conferences and seminars, as well as publications can be downloaded free of charge from the site.

1.4 An Outline of the 2009 Competitiveness Report

As part of its monitoring mission, the *Observatoire de la Compétitivité* closely follows the rankings of Luxembourg in the various composite indicators of competitiveness. **Chapter 2: Benchmarks and an Analysis of Competitiveness** discusses the performance of Luxembourg according to international competitiveness composite

[9] All issues of *Perspectives de Politique Economique* can be downloaded from the following site http://www.odc.public.lu/publications/perspectives/index.html.
[10] The *Lettres de l'Observatoire de la Compétitivité* may be downloaded from the following site : http://www.odc.public.lu/publications/lettre_observatoire/index.html.

indicators such as IMD and WEF, etc., and examines some ranking systems that are lesser known to the general public.

In **Chapter 3**, the **Competitiveness Scoreboard** of the *Observatoire de la Compétitivité* provides an analysis of Luxembourg's competitiveness vis-à-vis the other Member states of the European Union according to criteria established specifically for Luxembourg. Calculating a composite competitiveness index on the basis of this Scoreboard gives a good idea of the relative competitiveness of Luxembourg with relation to its partners.

Chapter 4: Prices, Wages and Competitiveness: the Real Effective Exchange Rate discusses real effective exchange rate trends, from the price and cost perspectives, which is a key tool for measuring competitiveness of Luxembourg's economy.

Lastly, the results of the studies carried out by the members of the *Observatoire de la Compétitivité* and those commissioned through agreements with the Henri Tudor public research center, STATEC and the *Observatoire de la Compétitivité*, are set out in **Chapter 5: Themed Studies** .

The taxi business is often extremely regulated, both in terms of the number of taxis allowed, their rates and conditions for getting into the profession. In spite of this, the industry does not always function at a satisfactory level. The objective of the section entitled **"The Taxi Sector : An Analysis of a Regulated Market"** is to describe the underlying philosophy of current regulations concerning the taxi business in a number of countries and cities in order to focus on some key features of the market, to summarize the multiple reforms being undertaken in the sector abroad and provide a peek at the current regulatory situation in Luxembourg, with a view to better understanding the structure and trends of prices in a regulated sector.

The section entitled "**Prices of Apartments in Luxembourg: Is the 2008 End-of-Year Trend Reversing?**" is based on official transactions figures for sales recorded in settlement attorneys' official acts. With the intent of improving availability of reliable, current and recurring market data, STATEC published a new quarterly statistical series in June 2009 containing prices recorded for apartment sales. These results are compared with statistics already established over several years by

various domestic players using prices offered for products over the Internet or in the local press. These two approaches shed additional light on the real estate market.

The next section deals with "**Knowledge Management Practices for Innovation Activities"** in Luxembourg. Considered a source of sustainable competitive advantage, the ability of companies to adopt systematic knowledge management practices is often considered as a crucial determinant of enterprise performance. Responses concerning knowledge management practices contained in the Community Innovation Survey (CIS2006) are linked to the propensity of companies to innovate, intended as their capacity to introduce new products.

For companies, upgrading their structures to meet standards is a costly process and entails rigid formalities and procedures that constrain their innovative capacities, while requiring adherence to a standard on a market results in diminishing competition and therefore incites companies to innovate. On the face of it, the two concepts appear antinomic. However, the use of standards is essential to creating and developing networks. It also increases the inventory and facilitates the transfer of codified and decodified knowledge through experts and the consultants that they employ, intensifies competition among companies entering new markets and accelerates the dissemination of innovation via all these channels. The latest Community innovation survey, CIS2006, was enriched with data concerning the ISO9000 certification in order to study the relationship between standards and innovation of the sampling, This includes all general directives applicable in all business sectors that aim at ensuring minimal quality levels. This issue is dealt with in the section entitled "**Standardization and innovation"**.

At once accelerators of technological and organizational innovations and constantly evolving technologies themselves, information and communications technologies maintain a complex relationship with innovation in general. The objective of the section entitled **"The impact of ICT on companies' capacity for innovation"** is to analyze the impact of information and communications technologies on companies established in Luxembourg.

2 Benchmarks and an Analysis of Competitiveness

2.1 Introduction

The debate about territorial attractiveness and competitiveness is regularly taken up on the national level through the publication of rankings and composite indicators of comparative competitiveness. While the determining factors of international competitiveness were generally to be found at the heart of economic policy discussions from 2000-2007, the issues of inflation and purchasing power had replaced them beginning from late 2007 and lasting through the autumn of 2008. The subject of prices as the focal point for discussions proved short-lived as, starting in September, 2008, the issue of what each country's ranking in terms of recession took the forefront, i.e. which have been the most severely affected by the world financial crisis born of the sub-prime mortgage fiasco in the U.S. This amounts to a ranking of public deficits, public debt and economic slowdown. Many European countries appear to have recently abandoned their structural reform efforts in an attempt to catch up with the emerging BRIC economies of Brazil, Russia, India and China, as well as to avoid being overtaken by the PIGS, Portugal, Italy, Greece and Spain[11]. Since the economic and financial crisis is the consequence of a collapse of demand, many politicians are concentrating their efforts on a demand policy for the short term, at the risk of endangering long term programs. The supply side remains essential to sustainable growth and employment, especially in a world economy that is increasingly globalized and integrated, and within which competition between production sites is accelerating[12].

What factors present the competitive edge for different territories? What are the strengths and weaknesses of a given territory? Comparative analyses of countries through benchmarks are instruments that provide elements of responses to these questions. These benchmarks provide a comparison of the best practices.

Composite benchmarks are used to group several indicators within a single value[13] that combines a variety of features and provides an overall image of an issue. This

[11] See HANDELSBLATT, *Angst vor der Pigs-Liga*, 1.4.2009
[12] BRUEGEL, Handle with care! Post-crisis growth in the EU, Bruegel policy brief, Brussels, April 2009
[13] For more details on composite indicators, see the Joint Research Center site of the European Commission: http://composite-indicators.jrc.ec.europa.eu/

could involve, say, the measures of competitiveness and attractiveness of a place as studied in this chapter, or the performance of a country's educational system[14], of its universities[15], of the competitiveness of business trip destinations,[16] etc.

Competitiveness benchmarks are therefore still a subject of prime importance because they provide useful information for governments and heads of corporations in determining the potential of sustainable development or, inversely, levels of volatility and consequently of risk, that countries can expect to face in the medium and long term[17]. These benchmarks also constitute an aid to better understanding the key factors behind economic growth and explaining why some countries do better than others in an increasingly globalized environment. These comparative analyses thus have two major objectives: first, to continuously underscore and recall the importance of structural economy issues and second, to identify barriers to increases in competitiveness so as to discuss strategies[18] to adopt on the basis of quantitative and statistical data.

The objective of this chapter is to provide a summarization as well as a descriptive analysis of the principal benchmarks among which Luxembourg is present, and which were published since the previous Competitiveness Report of October 2008.

2.2 Luxembourg's Rankings

In the debate over the determinants of territorial competitiveness, the best known benchmarks and rankings remain those of the World Economic Forum (WEF)[19] and the International Institute for Management Development (IMD)[20]. In addition to these, a multitude of others exist that are less known by the general public[21], such as the

[14] The best known ranking of countries in this area is the PISA list of the OECD. For more details see: http://www.pisa.oecd.org
[15] In this regard, consult the university rankings carried out by the University of Shanghai or the TIMES HIGHER EDUCATION. For more details see: http://www.arwu.org/rank2008/en2008.htm et http://www.timeshighereducation.co.uk/
[16] For more details see: http://www.economist.com/markets/rankings/displaystory.cfm?story_id=13934558&fsrc=rss
[17] See VARTIA P. NIKINMAA T., What do competitiveness comparisons tell us?, The Finnish economy and society 404, pp. 74-79. For more information see: http://www.etla.fi/eng/index.php
[18] One example of this is the annual *La Baule* discussions http://www.labaulewic.org/-Ernst-Young-Survey-.html
[19] For more information see: http://www.weforum.org/en/media/publications/CompetitivenessReports/index.htm
[20] For more information see: http://www.imd.ch/research/publications/wcy/index.cfm
[21] For more information see: http://www.odc.public.lu/indicateurs/etudes_internationales/index.html
Also see http://www.economist.com/rankings/

Doing Business Report[22] of the World Bank or the various composite indicators published by the Centre For International Competitiveness[23]. Apart from these various reports on the determinants for competitiveness, there are also benchmarks and rankings that concentrate on the capacity of a State to implement the reforms necessary to bolster these determinants[24].

The table below summarizes the rankings of the primary composite indicators for competitiveness and growth, in which Luxembourg can be found. Each of the indices represents the 25 highest ranking countries, highlighting the rankings of Luxembourg. Contrary to 2008, in which Luxembourg fell in the rankings of three out of four indices with respect to 2007, the country's position has changed differently over the last year depending on the indicator consulted. Luxembourg retained the same ranking in one listing, it fell in two other rankings and improved in one of the indicators.

[22] For more information see: http://www.doingbusiness.org/
[23] For more information see: http://www.cforic.org/downloads.php
[24] For more information see: http://www.sgi-network.org/

Table 1: Update of the principal composite indicators for competitiveness and growth compared to the 2008 Competitiveness Report

	N°	World Economic Forum	IMD	Heritage Foundation	European Commission
		GCI	*GCI*	*Economic freedom*	*SII*
		2009-2010	2009	2009	2008
+	1.	Switzerland	United States	Hong Kong	Switzerland
	2.	United States	Hong Kong	Singapore	Sweden
	3.	Singapore	Singapore	Australia	Finland
	4.	Sweden	Switzerland	Ireland	Germany
	5.	Denmark	Denmark	New Zealand	Denmark
	6.	Finland	Sweden	United States	Great Britain
	7.	Germany	Australia	Canada	Austria
	8.	Japan	Canada	Denmark	Ireland
	9.	Canada	Finland	Switzerland	Luxembourg (-2) [25]
	10.	Netherlands	Netherlands	Great Britain	Belgium
	11.	Hong Kong	Norway	Chili	France
	12.	Taiwan	Luxembourg (-7)	Netherlands	Netherlands
	13.	United Kingdom	Germany	Estonia	Cyprus
	14.	Norway	Qatar	Iceland	Iceland
	15.	Australia	New Zealand	Luxembourg (0)	Estonia
	16.	France	Austria	Bahrain	Slovenia
	17.	Austria	Japan	Finland	Czech Republic
	18.	Belgium	Malaysia	Mauritius	Norway
	19.	Korea	Ireland	Japan	Spain
	20.	New Zealand	China	Belgium	Portugal
	21.	Luxembourg (+4)	Great Britain	Macao	Greece
	22.	Qatar	Belgium	Barbados	Italy
	23.	United Arab Emirates	Taiwan	Austria	Malta
	24.	Malaysia	Israel	Cyprus	Hungary
-	25.	Ireland	Chile	Germany	Slovakia

Note: The figures in parentheses show the change in Luxembourg's rank with relation to its position in the previous year. Plus and minus signs indicate an advance or retreat in the rankings, while a 0 indicates no change.

2.2.1 The best known composite indicators and rankings

a. The World Economic Forum's Global Competitiveness Index (2009-2010)

The World Economic Forum (WEF) provides a holistic view of critical productivity growth determinants, and consequently of competitiveness, through its Global Competitiveness Index (GCI)[26]. The index takes into consideration that countries do not have the same levels of economic development and therefore that the relative importance of the various competitiveness factors depends on circumstances at the

[25] In the 2008 edition, several countries no longer belong to the SII ranking, including Israel, Japan and the United States. If these countries were also to be withdrawn from the 2007 edition, Luxembourg would rank 7th instead of 10th in 2007. So since Luxembourg occupies the 9th position in the 2008 edition, the country has actually dropped two positions with relation to the previous year.

[26] For more information see: http://www3.weforum.org/en/initiatives/gcp/Global%20Competitiveness%20Report/index.htm

outset[27]. This benchmark is based not only on indicators from official statistics sources but also on an opinion survey conducted annually by the World Economic Forum among corporate executives.

The latest report analyzed 131 countries throughout the world. Luxembourg is considered an innovation driven country, in the final phase of economic development and is ranked 21st in the report, up four places with relation to last year. Luxembourg was again outranked by its neighboring countries in the 2008-2009 versions: Germany holds the 7th slot in the report, with France 16th and Belgium 18th. Switzerland has replaced the U.S. at first place in the ranking. Eleven European countries, nine of which are E.U. members, are ahead of Luxembourg in ranking. Scandinavian countries once again are rated in top slots.

Countries are ranked according to the determination of an overall competitiveness index that takes into account a detailed analysis of three fundamentals for growth and competitiveness on the world scale. First, basic requirements are analyzed, with a look at public institutions, infrastructure, macroeconomic stability and health and primary education. Next, efficiency enhancers made up of higher education and training, goods and labor market efficiency, financial market sophistication, technological readiness and market size are considered. Lastly, the index studies the determinants of innovation and sophistication by assessing levels of business sophistication and degrees of innovation.

Luxembourg performed well in the basic competitiveness requirements phase. It holds the 7th rank overall because of its stable political environment, high quality infrastructure and excellent macroeconomic performance.

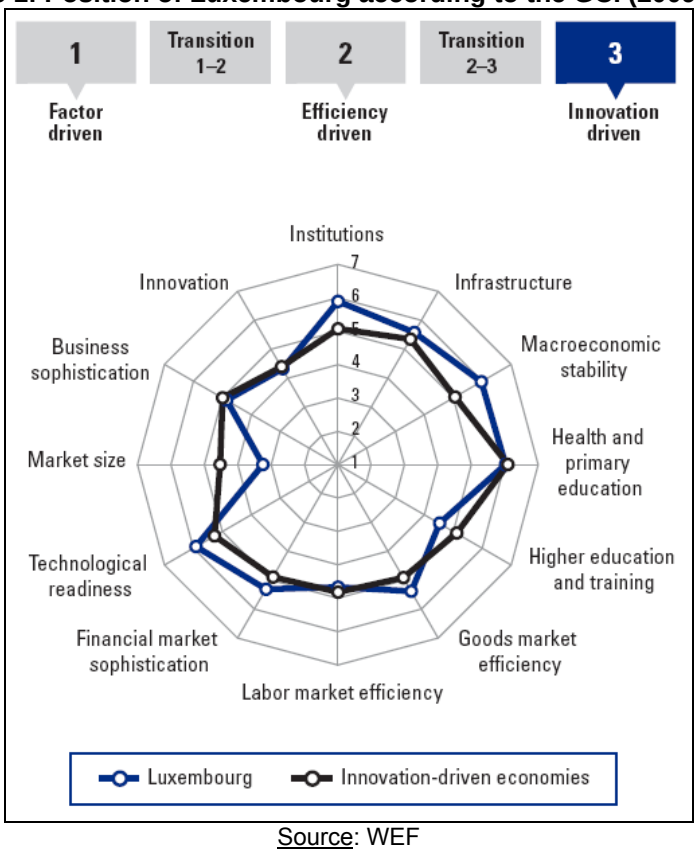
Luxembourg is ranked 23rd in terms of efficiency enhancers. This is due to poor results in higher education, low efficiency in the labor market and the size of the country's market. Weakness in the university system is largely a result of low rates of access to university studies, management schools of a lesser quality, etc. Lower labor market efficiency resulted from poor ratings for flexibility in wage determination, overly rigid hiring and firing practices, low female participation in the labor force and

[27] WEF also produces a second composite index called the Business Competitiveness Index. Luxembourg is not one of the countries analyzed in this index.

a poor pay to productivity ratio. In contrast, the country's ranking in goods market efficiency, sophistication of financial products and technological readiness is quite high.

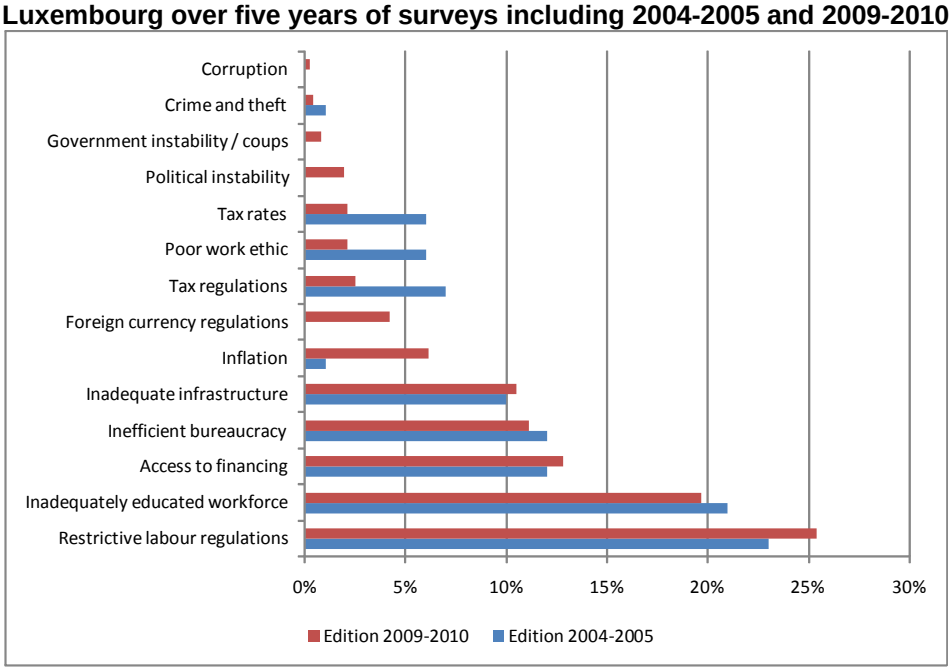
In the category of Innovation and sophistication factors, Luxembourg occupies the 22nd slot worldwide for business sophistication and 21st for innovation. The report pans the very mediocre performance in the availability of engineers and scientists, as well as the dearth of local suppliers.

Figure 1: Position of Luxembourg according to the GCI (2009-2010)



Source: WEF

Figure 2 : Comparison of the principal impediments to developing business affairs in Luxembourg over five years of surveys including 2004-2005 and 2009-2010



Source: WEF, *Executive opinion survey* 2004-2005 and 2009-2010

Remarks: The persons interviewed were asked to select the 5 most problematic factors from a list of 15 factors affecting doing business in their country and to rate them on a scale of one to five, with one presenting the most difficulties. The bars in this graph show the responses weighted according to their ranking. The category "Poor public health" of the 2009-2010 was not part of the 2004-2005 survey and has thus been removed from the rankings, and the 2009-2010 rankings were modified to take into account this change so as to make it possible to compare the two surveys.

An annual survey was conducted in each country among company directors regarding the major difficulties encountered in developing business activities in a given country, which helped identify the main factors blocking competitiveness[28]. By comparing results from the Luxembourg survey with those culled five years ago, it is clear that by far, the difficulties cited with the most frequency remain nearly identical and appear to be structural. These include the inflexibility of the Labor Code and a work force that too often displays inadequate levels of education and training. Difficulties in obtaining financing seem to have increased slightly in importance. Changes in prices, i.e. inflation, jumped significantly, in the minds of company directors, moving from 10th place in 2004-2005 (1%) to 6th place en 2009-2010 (6%).

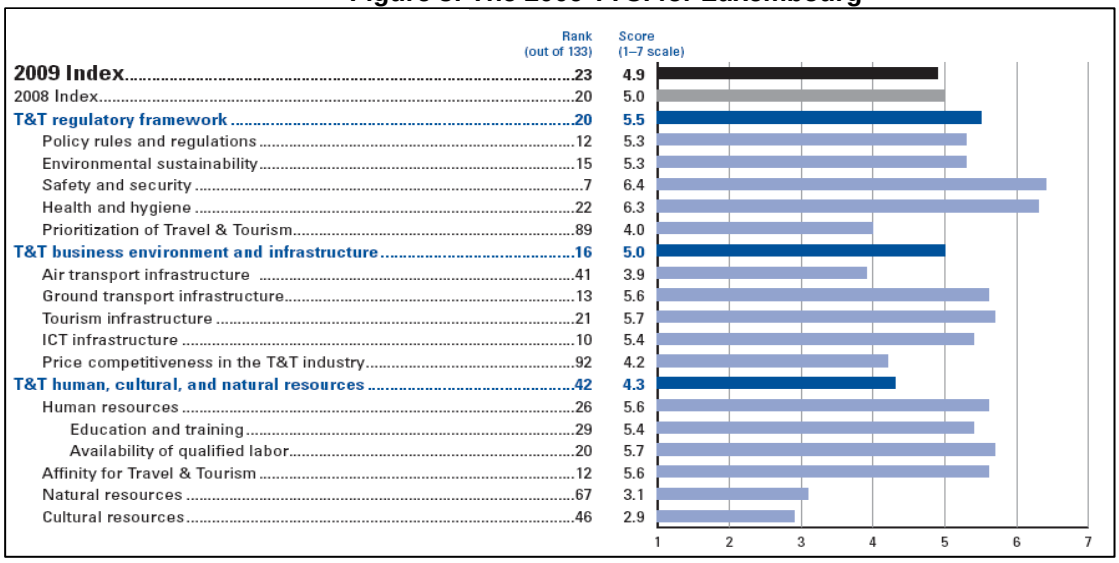
[28] Also see KPMG, LUXEMBURGER WORT, Luxembourg Business Compass, Luxembourg, May 2009. This is a bi-annual survey conducted for the first time in April 2009, involving 88 of the largest companies in Luxembourg. The study asked directors to express their views about the determinants of competitiveness of the Luxembourg economy, both past and present. The study also included a "Confidence Index" for the short and medium term. For more information see: http://www.kpmg.lu/

Frame 3 : Various sector and themed indices produced by WEF

In addition to its yearly Global Competitiveness Index publication, WEF also performs periodic sector and themed analyses in the area of competitiveness[29]. Among the sectors analyzed are Tourism, Information and Communications Technologies (ICT), International Business and the implementation of the Lisbon Strategy in the various Member States of the EU.

In 2009, WEF updated its sector index on the competitiveness of the tourism sector, baptized Travel & Tourism Competitiveness Index (TTCI). The objective of this index is to measure factors that determine competitiveness. It was determined that the key factors for success in this sector include a favorable regulatory framework, combined with high quality tourism and transportation infrastructure and a focus on human and natural resources. Switzerland is ranked first, followed by Austria and Germany. Luxembourg holds the 23rd position out of 133 countries analyzed, dropping three slots since the last publication in 2008.

Figure 3: The 2009 TTCI for Luxembourg



The WEF also publishes a periodic index that focuses on competitiveness in countries in terms of vitality in the use of Information and Communications Technology (ICT). In the 2008-2009 edition, the report covers 134 countries. The Network Readiness Index (NRI) characterizes the way in which countries are prepared for using ICT, examined through three dimensions: the business environment the institutional environment and infrastructures. The index measures the will of individuals, companies and the public sector to use ICT and the most recent use made of ICT. Denmark and Sweden are again at the top of the rankings in this index. Luxembourg is in 21st place, ranked three positions higher with respect to the previous year. France holds the 19th position, Germany is 20th and Belgium is 24th.

Lastly, the WEF published an update of its analysis of the international business sector and of *Global Enabling Trade Index* (GETI). In 2009, this index measured the ability of 121 countries to promote international trade, by considering factors with an impact on trade relations, including customs duties, efficiency of customs administration and the fluidity of transportation and communications infrastructures. Singapore headed the rankings, followed by Hong Kong and Switzerland. Luxembourg occupies the 13th slot in this world index, dropping one position compared to last year. In Europe, Luxembourg was outranked by Switzerland, Denmark, Sweden, Norway, Finland, Austria, the Netherlands and Germany. France and Belgium occupied the 17th and 21st positions respectively.

[29] For more information see: http://www.weforum.org/en/media/publications/CompetitivenessReports/index.htm

b. The IMD *Global Competitiveness Index* (2009)

The *International Institute for Management Development* (IMD) produces an annual competitiveness report in which it analyses each year the capacity of countries to establish and maintain an environment that supports competitiveness in companies. It is supposed that creating wealth is done at the level of companies that operate in a domestic environment that either facilitates or impedes competitiveness. The analysis is based on both quantitative indicators and the results of an annual opinion survey.

According to the 2009 report, Luxembourg is ranked 12th in the list of the 57 economies analyzed. Luxembourg dropped seven positions with respect to the 2008 ranking. There is relatively little change within the top ten in the 2009 edition, with the U.S. in first place, followed by Hong Kong and then Singapore. The four Scandinavian countries are ranked among the most competitive. France fell from the 25th to the 28th spot, while Belgium jumped from 24th to 22nd and Germany rose from the 16th rank to the 13th.

As in previous years, the IMD bases its analysis for the rankings on four indicator series: economic performance, government efficiency, business efficiency and infrastructure.

In this ranking, as during the previous year, Luxembourg holds the 4th place in economic performance on the world level. The country's good economic record is powered by a vigorous foreign trade sector, particularly in exports of services. Still, this high level of performance does not succeed in masking the structural weaknesses that persist. In spite of efforts to become specialized within various sectors, IMD stresses the country's very heavy reliance on the financial sector and a lack of diversification. Furthermore, Luxembourg has been severely smitten by the fading of demand internationally.

In the realm of public administration efficiency, IMD again notes a deterioration of performance in Luxembourg. Luxembourg fell in the rankings from 14th in 2008 to 16th in 2009. One of the country's principal weaknesses resides in its lack of flexibility on the labor market, which features a rigid labor rights system and an unemployment benefits package that does little to incite unemployed persons to find work.

Luxembourg has fallen again in the ranking for the category of business environment, dropping to the 9th position in 2008 to the 15th slot in 2009. The report praised the high level of labor productivity per employed person and the level of banking assets but panned the low percentage of women in the work force and excessive wage costs.

Lastly, the infrastructures indicator proved to be the category in which Luxembourg again registered the worst performance, although the country did move up one position with relation to 2008. Luxembourg indeed rose in the rankings from 18th to 17th in 2009. IMD notes that the number of patents, the extent to which the country is outfitted with IT equipment, the number of broad band subscribers and R&D personnel are all positive elements, while education, both in terms of initial training and continuing education is considered a weak point.

Frame 4: The Stress Test for Economic Recovery

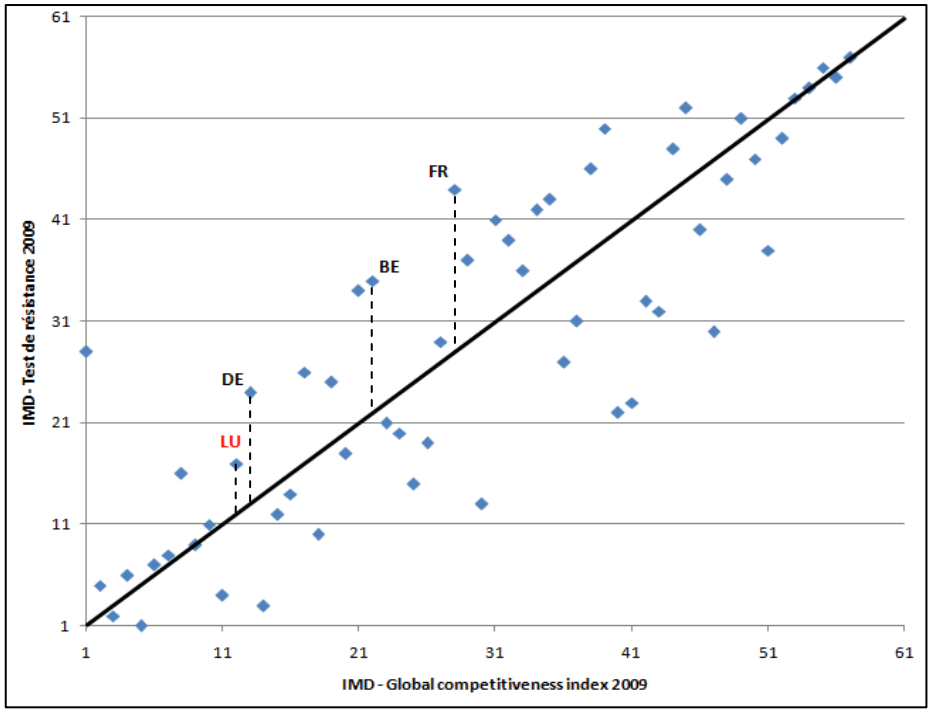
In the 2009 edition of overall competitiveness, IMD published a new composite index that measures the capacity of a country to emerge from the economic and financial crisis, which it calls the stress-test on competitiveness[30]. In contrast to the hundreds of indicators that underpin the traditional index, this stress test is comprised of only some twenty key indicators that include 2009 economic forecasts and expectations for the future. This stress test should therefore be considered as a precursor indicator and as such is not intended to replace the traditional index. It measures competitiveness in the short term, complementary to the traditional *Global Competitiveness Index,* which also takes into account the stocks of competitiveness factors that countries have accumulated over the years such as technology, infrastructure, etc.

Rankings can vary significantly from one approach to another. While the United States is the leader of the traditional ranking, it falls to 28th place in the new ranking. The new ranking features Denmark on the top, followed by other European countries such as the Netherlands, Sweden and Switzerland, and also some Asian countries including Singapore, Hong Kong, and Malaysia. According to this index, the small, export-oriented economies will emerge from the crisis in the best condition.

Luxembourg is ranked 17th in this index, Germany 24th, Belgium 35th and France 44th. The current position of the four countries in the traditional IMD competitiveness barometer seems more advantageous than what the crisis aftermath seems to indicate. According to these figures, Luxembourg appears to be better equipped than its neighboring countries for the post crisis era because the difference in rank between the two rankings is less pronounced.

[30] For more information see: http://www.imd.ch/news/IMD-WCY-2009.cfm

Figure 4 : Compared Rankings: IMD - GCI and Stress-Test on Competitiveness



c. The Index of Economic Freedom by the Heritage Foundation (2009)

The Heritage Foundation is a think tank that has been analyzing a large number of countries for fifteen years according to their degree of economic openness, using the Anglo-Saxon free enterprise approach to economics[31]. The 2009 version of the report analyzes 183 countries. Economic liberalism favors productivity, and therefore also growth, by encouraging corporate spirit and consequently the creation of added value. The more open the economy, the fewer barriers exist to free trade and the higher a nation's rank in the index.

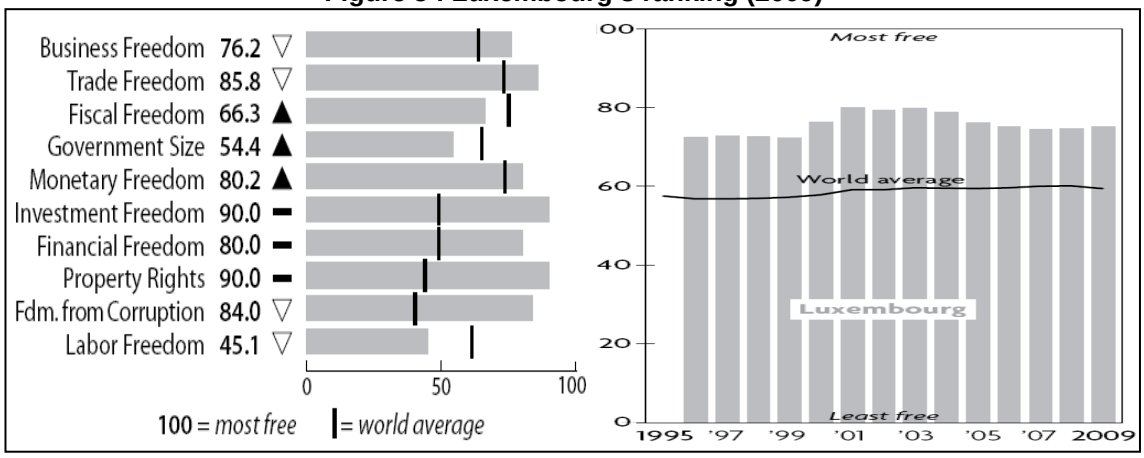
For some years now, this report has ranked Luxembourg's economy in the top twenty of the world's most open economies. In the 2009 report, Luxembourg was ranked 15th, the same position it occupied in 2008, when it dropped seven places with relation to the 2007 index[32]. Luxembourg had already lost a position between 2005 and 2006, where it was ranked 4th overall, and again it lost four places between 2006 and 2007. Belgium came in 20th, Germany 25th and France 64th, all far behind Luxembourg in the world rankings. Luxembourg was again ranked 8th in the regional

[31] Also see the Fraser Institute's Economic Freedom Index.
For more details see: http://www.fraserinstitute.org/researchandpublications/publications/6905.aspx
[32] For more details see: http://www.heritage.org/index/country.cfm?id=Luxembourg

European rankings, as in 2008, compared to 3rd in 2007, and Ireland, Denmark and Switzerland lead in the rankings.

The Heritage Foundation gave Luxembourg a good score in the areas of investments, international business, finance, intellectual property and in business environment. Its performance was deemed below world averages in the tax system, employment and the degree to which the economy is state controlled.

Figure 5 : Luxembourg's ranking (2009)



Source : Heritage Foundation

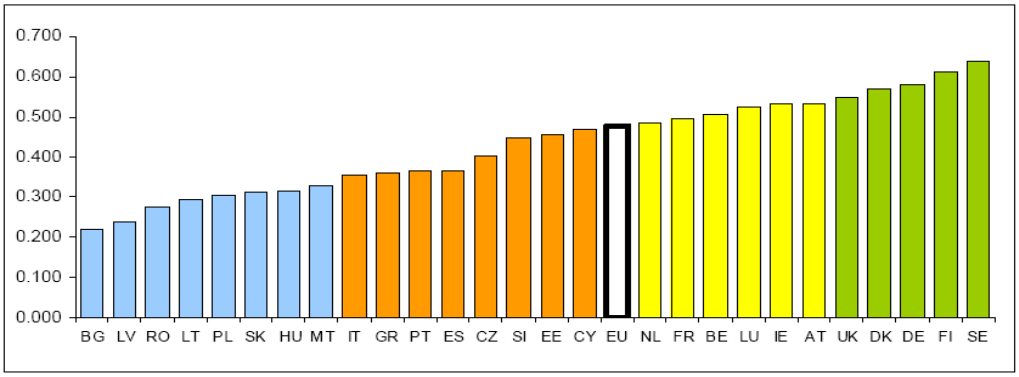
d. The European Commission's SII (2008)

The European Commission[33] publishes annually a report titled "European Innovation Scoreboard". This is an instrument that was developed as part of the Lisbon Strategy[34], in order to develop a comparison tool for performance of Member states in the area of innovation [35]. In January 2009, the European Commission published its 8th edition of this report, which includes an aggregate indicator called the Summary Innovation Index (SII) that reviews members' performance in innovation[36]. Several changes have been introduced this year with relation to prior years' analyses[37] in the SII index and in the categorizing of underlying indicators. Overall, Luxembourg occupies the 8th position in the EU for the SII-2008 among EU Member Nations, and

[33] For more information see: http://www.eis.eu/
[34] For more information see: http://ec.europa.eu/growthandjobs/index_fr.htm
[35] In this context, also see THE ECONOMIST, Global Innovation Index, April 2009. For more information see: http://graphics.eiu.com/PDF/Cisco_Innovation_Complete.pdf
Luxembourg is not included in the in this ranking calculated by EIU and related to innovation potential.
[36] Also see MINISTERE DE L'ECONOMIE ET DU COMMERCE EXTERIEUR, STATEC, LUXINNOVATION, *Les activités d'innovation et de recherche au Grand-Duché de Luxembourg - Etat des lieux et pistes de réflexion*, *Perspectives de politique économique n°5*, November 2005
http://www.odc.public.lu/publications/perspectives/index.html
[37] Israel, Japan and the United States are no longer included in the SII ranking for this edition of the Innovation Scoreboard, which means that it will not be possible to compare this year's rankings with last year's.

the 9th slot when the other countries of Europe such as Switzerland, Norway and others are included.

Figure 6: The SII-2008 for EU Member States



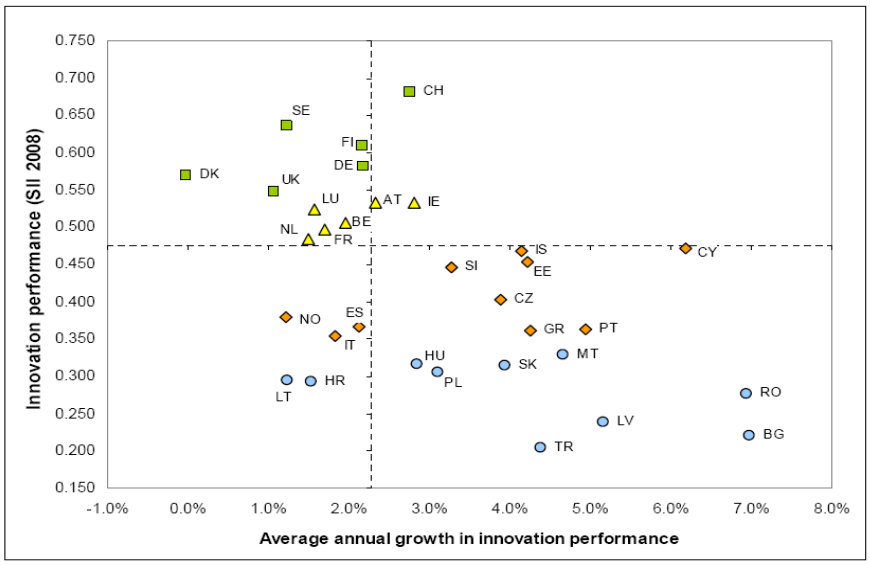
Source: European Commission

In this 2008 version, the twenty-nine indicators used to calculate the SII index have been classified into three major categories to better capture the various aspects of the innovation process.

The European Commission registered four categories of nations and called them Innovation leaders, Innovation followers, Moderate innovators and Catching-up countries. Luxembourg, together with Austria, Belgium, France, Ireland and the Netherlands are in the second category of countries, the Innovation followers.

In addition to measuring innovation performance, it is also useful to analyze performance over time. The figure below shows the convergence of nations' growth in SII innovation through time. Performance as measured by the SII is shown on the vertical axis while growth rates of SII are shown on the horizontal axis. The European Commission thus created four quadrants. Luxembourg is located in the quadrant with countries whose levels exceed the average for the EU, but is considered a slow grower, progressing at a slower rate than that of the Community average (upper left-hand quadrant).

Figure 7: Convergence in innovative performance



Source: European Commission

Luxembourg posts the most growth in the areas of finance and support measures in the EU and also in the category of creating intellectual property from the innovation process. In contrast, the country shows a significant decline in performance in the associations and Entrepreneurship category, and together with Belgium, Luxembourg is considered one of the countries with the weakest growth in human resources in the EU.

e. Correlation of rankings

Having reviewed these four benchmark index rankings, it is interesting to analyze the correlation between them all. The Kendall coefficient is ideal for this type of analysis. It measures the degree of agreement between several rankings, in this case four rankings. A correlation was calculated in 2009 on 26 countries for which the four rankings were available[38]. The Kendall coefficient takes a value between 0, when there is no relationship between the rankings, and 1, when there is full agreement between rankings and judges.

[38] Three countries had to be removed from the rankings this year with relation to last year because no data was available on them. However, two other countries were added.

Table 2 : Rectified Rankings for a Series of Countries Included in the Four Studies (2009)

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

Source: *Observatoire de la Compétitivité*

In the 2006, 2007 and 2008 reports, a strong correlation existed between the rankings of the four major institutes used at the time. The same is true in 2008, as the Kendall coefficient registers 0.87. There exists then, just as in the two preceding years, a correlation between the rankings made by different institutes [39]. Therefore, even though the four institutes claim to have come up with different composite indicators, overall the rankings are strongly correlated.

2.2.2 A set of less well-known rankings

a. The World Knowledge Competitiveness Index of the Centre for international competitiveness

[39] The Kendall coefficient was 0.86 for the same 27 countries in 2006 and 0.83 in 2007. Direct comparability of results for 2007 and 2008 with 2006 should be put into perspective because one ranking had been replaced by another in 2007.

The Centre for International Competitiveness published its 5th edition of the World Knowledge Competitiveness Index, which is a benchmark that measures how knowledge is transformed into economic value in the regions being analyzed[40]. The 2008 edition covers 145 regions and uses 19 benchmarks spread out in sub-categories related to human resources, knowledge, regional production, financial capital and sustainable knowledge.

Table 3: The Top 40 of the World Knowledge Competitiveness Index 2008

Rank		Knowledge Competitiveness Index 2008	Rank 2005	Change in Rank 2005-08	Rank		Knowledge Competitiveness Index 2008	Rank 2005	Change in Rank 2005-08
1	San Jose-Sunnyvale-Santa Clara, US	248.3	1	0	21	Minneapolis-St. Paul-Bloomington, US	131.7	13	-8
2	Boston-Cambridge-Quincy, US	175.3	2	0	22	Portland-Vancouver-Beaverton, US	129.7	18	-4
3	Hartford, US	175.1	4	1	23	Etela-Suomi, Finland	129.1	20	-3
4	Bridgeport-Stamford-Norwalk, US	174.7			24	Kanagawa, Japan	128.6	81	57
5	San Francisco-Oakland-Fremont, US	160.8	3	-2	25	Durham, US	127.7		
6	Stockholm, Sweden	151.8	8	2	26	Colorado Springs, US	124.4		
7	Seattle-Tacoma-Bellevue, US	151.3	5	-2	27	Singapore	123.1	78	51
8	Providence-Fall River-Warwick, US	147.1			28	Switzerland	122.5	44	16
9	Tokyo, Japan	147.0	22	13	29	Île de France, France	121.8	29	0
10	San Diego-Carlsbad-San Marcos, US	146.1	7	-3	30	Toyama, Japan	120.5	80	50
11	Los Angeles-Long Beach-Santa Ana, US	144.4	10	-1	31	Osaka, Japan	119.6	72	41
12	Shiga, Japan	140.9	57	45	32	Riverside-San Bernardino-Ontario, US	119.3	16	-16
13	Grand Rapids, US	140.0	6	-7	33	Philadelphia-Camden-Wilmington, US	117.7	17	-16
14	Iceland	139.8			34	Luxembourg	116.9	58	24
15	Detroit-Warren-Livonia, US	138.1	15	0	35	New York-Northern New Jersey-Long Island, US	116.8	12	-23
16	West, Sweden	137.9	37	21	36	Denmark	116.7	51	15
17	Oxnard-Thousand Oaks-Ventura, US	137.1			37	Tochigi, Japan	116.1	73	36
18	Sacramento--Arden-Arcade--Roseville, US	133.6	11	-7	38	South, Sweden	115.2	46	8
19	West, Netherlands	132.4	77	58	39	Greensboro-High Point, US	113.5	40	1
20	Pohjois-Suomi, Finland	132.1			40	Lansi-Suomi, Finland	112.5		

Source: Centre for International Competitiveness

Regions in the United States head up the rankings, notably San José and Boston. In Europe, the leading positions are occupied by Iceland (14th), Western Sweden (16th) and the Western part of the Netherlands (19th). Luxembourg holds the 34th rank in the 2008 edition, rising 24 positions with relation to the last publication in 2005. Particularly good performance was attributed to Luxembourg in the areas of private R&D expenditures per capita in Europe, labor productivity and the number of secure servers per inhabitant.

b. The Global Financial Centres Index of the City of London (2009)

In an increasingly globalized and interdependent world, due to information and communications technologies, financial centers are facing stiffer competition than

[40] For more information see: http://www.cforic.org/downloads.php

other sectors. Indeed, financial services are at the center of the world economy, acting as facilitators of international business and investments abroad.

The Global Financial Centres Index (GFCI) is a sector competitiveness index commissioned by the City of London. It has been published bi-annually since March 2007[41]. The most recent publication in March 2009 reviews 62 financial centers throughout the world. As defined by GFCI, competitiveness is comprised of five separate domains entitled "People", dealing with training, flexibility, etc. "Business Environment", dealing with taxes, regulations, etc., "Market Access", involving securitization, clustering, etc., "Infrastructure", concerning cost and availability of office space, etc. and "General Competitiveness", which involves the perception of cities as agreeable places to live, etc. The basic study uses two types of input. First, determining factors derived from quantitative data, such as the cost of office space and second, a continuously running online questionnaire provides financial center assessments from financial services professionals, giving a barometer of perceptions within the financial services industry. London and New York top the rankings in the first quarter of 2009, as they did in previous reports, followed by Singapore, Hong Kong and Zurich. Luxembourg is also featured in this ranking, situated in the 14th spot, gaining 12 positions since the March 2007 publication.

[41] ZYEN, CITY OF LONDON, THE GLOBAL FINANCIAL CENTRES INDEX 5, London, March 2009
For more information see: http://www.zyen.com/Activities/On-line%20surveys/GFCI.htm

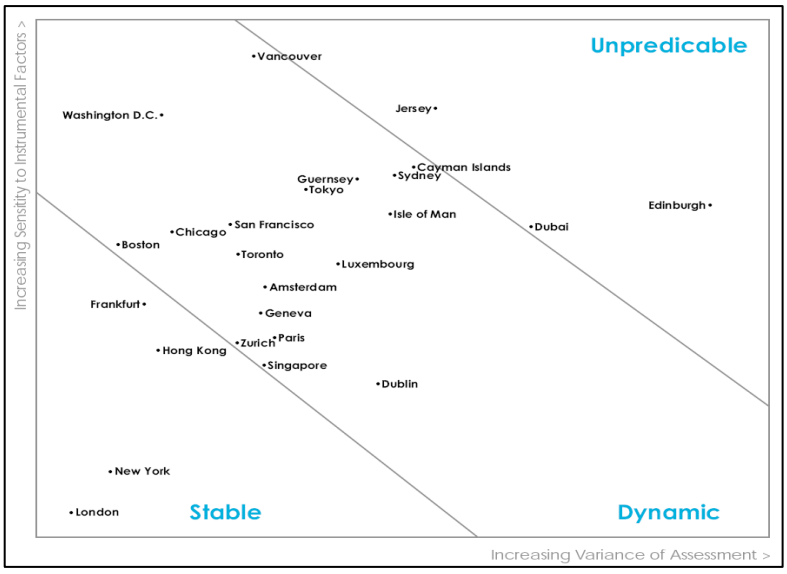
Table 4 : The Global Financial Centres Index (March 2009)

Financial Center	Rank (5th edition)	Change (Since the 4th edition)
London	1	0
New York	2	0
Singapore	3	0
Hong-Kong	4	0
Zurich	5	0
Geneva	6	0
Chicago	7	1
Frankfurt	8	1
Boston	9	2
Dublin	10	3
Toronto	11	1
Guernsey	12	4
Jersey	13	1
Luxembourg	14	1
Tokyo	15	-8
Sydney	16	-6
San Francisco	17	0
Isle of Man	18	1
Paris	19	1
Edinborough	20	-2

Source: ZYen, City of London

The study also focused on the stability of the rankings. It draws a distinction between three different groups of financial centers. The cities that represent the highest degree of volatility in their GFCI rankings, both in terms of their evaluations and instrumental factors, i.e. unpredictability, are located in the upper right-hand corner.

Figure 8 : Variance of Assessments versus Sensitivity to Instrumental Factors



Source: ZYen, City of London

The 'Stable' centers in the bottom left of the chart have a low sensitivity to changes in the instrumental factors and a lower variance of assessments. Luxembourg is situated in the central band, in a section characterized by an average sensitivity to changes in instrumental factors and an average variance in assessments. This section might be classed as the Dynamics and have a potential to move in either direction. Currently, with the financial crisis, financial centers located in the lower left bottom of the chart seem to represent the best security for investors.

c. The Innovation and Competitiveness Benchmark of the Information Technology and Innovation Foundation

The Information Technology and Innovation Foundation, with the assistance of the European-American Business Council, published a report on innovation and competitiveness benchmarking[42] in February, 2009. The report evaluates the competitiveness of 36 countries and 4 regions and is based on the analysis of 16 variable weighting indicators, grouped in six categories: Human Capital, Innovation Capacity, Entrepreneurship, IT Infrastructure, Economic Policy and Economic Performance.

Table 5: The Top 20 in the ITIF Ranking

Rank	Country
1	Singapore
2	Sweden
3	Luxembourg
4	Denmark
5	Korea
6	United States
7	Finland
8	United Kingdom
9	Japan
10	NAFTA
11	Netherlands
12	France
13	Ireland
14	Belgium
15	Germany
16	Canada
17	Austria
18	EU-15
19	Australia
20	EU-25

Source: ITIF

Luxembourg was ranked 3rd worldwide for innovation and competitiveness, thus improving its performance since the last study dating from 1999, when it ranked 6th.

[42] ITIF, The Atlantic Century Benchmarking EU&US-Innovation and Competitiveness, Washington, 2009
For more information : http://www.itif.org/index.php?id=226

The country was outdistanced by Singapore and Sweden, but ranked higher than Denmark, the United States, the Netherlands, France and Germany. A more in-depth analysis of the various categories evaluated reveals significantly less laudatory rankings for Luxembourg. Luxembourg occupied the 36th spot for public R&D investment and ranked 34th in scientific and technical publications. Luxembourg performed well in terms of broad band internet connectivity (15th position), number of researchers (14th position), e-Government (13th position) and the establishment of new companies (11th position). Luxembourg also took an excellent 2nd place in terms of trade balance and the country came in first in the area of GDP per adult worker and productivity.

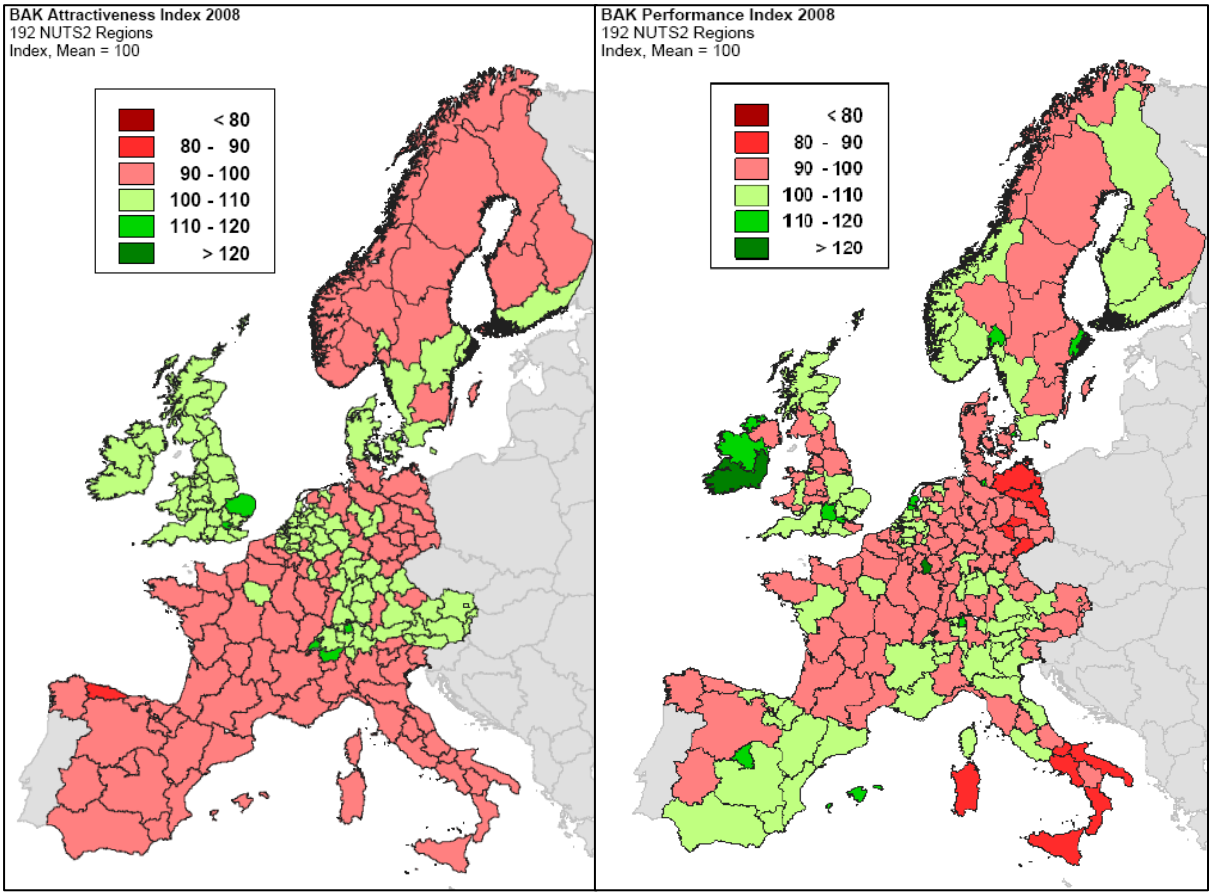
d. The BAK BASEL Economic Attractiveness Index and the Performance Index

A company called BAK Basel published two new indices in the fall of 2008 intended to measure the territorial attractiveness of countries from the point of view of taxation, accessibility, regulatory framework and innovation as well as economic performance in terms of GDP per capita, GDP growth and employment growth, spanning 192 regions in Western Europe[43].

In the BAK Attractiveness Index, Luxembourg comes in 57th rang in the regions analyzed. The ranking is headed by Zurich, London and Copenhagen. However, in the BAK Performance Index, Luxembourg is ranked 1st, before South-East Ireland and the Brussels region.

[43] BASEL ECONOMICS, BAK Economic Attractiveness Index & BAK Performance Index for 192 Western European, Switzerland, 4 September 2008. For more information see:
http://www.bakbasel.ch/downloads/services/news_media/media/medienmitteilungen/2008/20080904_mm_attractiveness_performance_index_en.pdf

Figure 9 : BAK Attractiveness Index and the BAK Performance Index (2008)



Source: BAKBASEL

e. Attempts at Evaluating the Lisbon Strategy [44]

A certain number of organizations and institutes make periodic attempts to measure the progress of the Member States of the EU in their implementation of the Lisbon Strategy[45], by means of composite indicators that lead to the rankings. The strategy is intended to "*Make the EU the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion*".

[44] See also ALLIANZ ECONOMIC RESEARCH & DEVELOPMENT, LISBON COUNCIL, European growth and jobs monitor 2009, 2009
For more information see: http://www.lisboncouncil.net/media/publications/egjm_2009.pdf
This report also makes an annual review of progress achieved by Member States in implementing their Lisbon objectives. However, this study is limited to the UE-14 and does not include Luxembourg.

[45] See the National Plan for Innovation and Full Employment submitted by the Luxembourg Government to the European Commission as part of the national implementation of the Lisbon Strategy.
http://www.odc.public.lu/publications/pnr/index.html

As an example, in 2008 the World Economic Forum published its 4th analysis entitled the "Lisbon Review Index". Its primary objective is to compare the performance of individual Member States in the implementation of their reforms, as well as to calibrate the performance of EU nations to international benchmarks such as the United States and the Asian countries. Apart from available public quantitative data, the study is based very broadly on the Forum's annual qualitative survey of corporate directors. As can be seen, Luxembourg occupies the 7th spot among the 27 Member Nations in the 2008 edition, moving up one slot with relation to the previous edition. Three Scandinavian countries head up the rankings. Luxembourg has especially good performance in the sub-indices of business environment and sustainable development, ranking 3rd in each category. A comparison of Luxembourg with the international benchmark countries in the various sub-indices shows that in the categories of the information society and Innovation and R&D, Luxembourg does perceptibly less well, while in the area of sustainable development Luxembourg performs better.

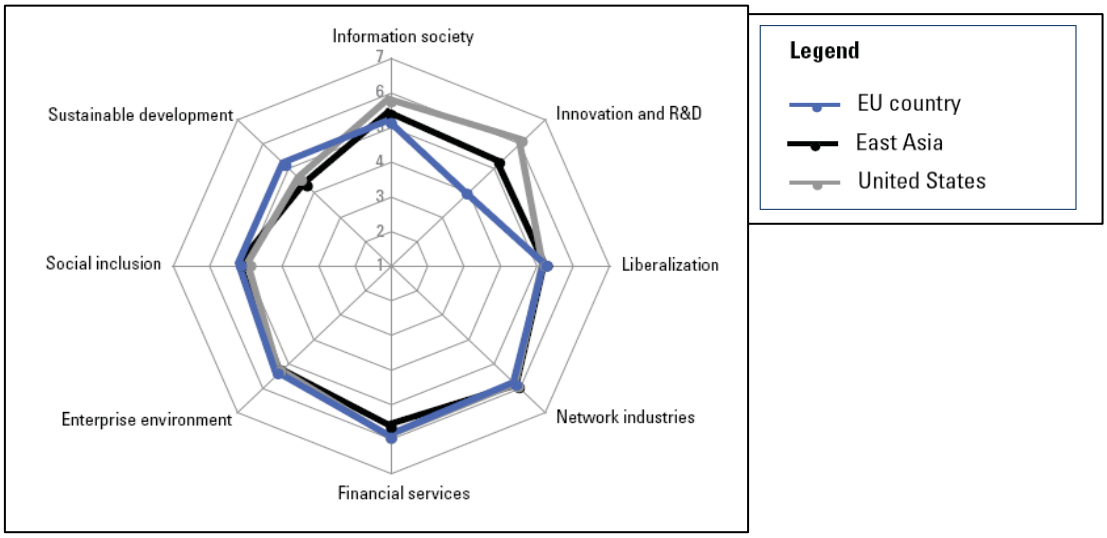
Tableau 6 : The Lisbon Review Index 2008

	Final Index		Subindexes															
			Information Society		Innovation and R&D		Liberalization		Network Industries		Financial Services		Enterprise Environment		Social Inclusion		Sustainable Development	
Economy	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Sweden	1	5.71	1	6.07	2	5.60	3	5.64	4	6.18	1	6.30	7	5.23	3	5.51	2	5.12
Denmark	2	5.64	3	5.71	3	5.30	4	5.61	2	6.26	2	6.17	6	5.28	1	5.74	4	5.03
Finland	3	5.64	7	5.27	1	5.95	6	5.51	6	5.99	4	6.08	1	5.48	2	5.67	1	5.13
Netherlands	4	5.44	2	5.76	5	4.86	1	5.70	7	5.91	3	6.11	5	5.28	4	5.33	7	4.56
Austria	5	5.34	6	5.30	8	4.69	2	5.66	5	6.05	5	6.05	11	4.94	6	5.15	6	4.91
Germany	6	5.34	9	4.96	4	5.08	5	5.60	1	6.47	9	5.91	15	4.70	9	5.02	5	4.96
Luxembourg	7	5.22	8	5.12	13	3.93	9	5.26	8	5.85	7	5.96	3	5.40	7	5.12	3	5.10
France	8	5.12	10	4.96	9	4.68	10	5.25	3	6.20	10	5.91	13	4.82	14	4.81	11	4.33
United Kingdom	9	5.12	5	5.42	7	4.70	11	5.16	9	5.81	11	5.82	8	5.06	15	4.69	12	4.28
Belgium	10	5.11	13	4.51	6	4.73	8	5.34	10	5.76	8	5.93	9	5.02	5	5.25	10	4.36
Ireland	11	5.03	14	4.44	10	4.44	7	5.38	16	5.13	6	6.01	2	5.46	10	5.01	9	4.40
Estonia	12	5.02	4	5.56	12	4.06	12	4.99	14	5.26	12	5.69	4	5.34	13	4.83	8	4.44
Cyprus	13	4.68	15	4.33	21	3.54	13	4.94	11	5.76	15	5.43	17	4.54	8	5.05	17	3.85
Portugal	14	4.61	16	4.32	16	3.87	18	4.70	12	5.58	16	5.42	16	4.62	18	4.34	15	4.01
Slovenia	15	4.58	12	4.71	11	4.12	19	4.43	18	5.11	21	4.90	20	4.47	16	4.61	13	4.28
Czech Republic	16	4.53	18	4.03	15	3.93	15	4.82	19	5.10	19	4.94	21	4.40	12	4.87	14	4.17
Spain	17	4.52	17	4.07	14	3.93	14	4.87	13	5.42	14	5.52	23	4.16	19	4.32	18	3.83
Malta	18	4.43	11	4.75	25	3.37	16	4.80	15	5.16	13	5.68	24	3.84	11	4.87	26	2.96
Lithuania	19	4.39	19	3.95	18	3.82	20	4.40	20	5.04	18	5.01	14	4.76	17	4.35	20	3.80
Slovak Republic	20	4.34	20	3.94	24	3.48	17	4.77	24	4.54	20	4.92	10	4.96	20	4.20	16	3.91
Latvia	21	4.25	21	3.93	23	3.48	22	4.38	23	4.55	22	4.87	12	4.87	21	4.07	19	3.83
Hungary	22	4.18	22	3.86	19	3.76	21	4.40	22	4.75	23	4.77	19	4.51	24	3.87	22	3.50
Greece	23	4.10	27	3.18	17	3.85	23	4.31	17	5.12	17	5.07	26	3.78	22	4.06	23	3.46
Italy	24	4.05	23	3.83	20	3.76	24	4.27	21	4.90	24	4.63	27	3.69	25	3.82	21	3.51
Romania	25	3.84	24	3.70	26	3.30	26	4.04	27	3.74	26	4.35	18	4.52	23	3.92	25	3.19
Poland	26	3.76	26	3.18	22	3.51	25	4.24	26	3.93	25	4.45	25	3.80	26	3.79	24	3.21
Bulgaria	27	3.68	25	3.57	27	3.04	27	3.90	25	4.08	27	4.12	22	4.21	27	3.59	27	2.89
EU27	-	4.73	-	4.53	-	4.18	-	4.90	-	5.32	-	5.41	-	4.71	-	4.66	-	4.11
United States	-	5.44	-	5.73	-	6.07	-	5.23	-	5.92	-	5.97		5.27	-	4.86	-	4.50
East Asia	-	5.26	-	5.36	-	5.20	-	5.28	-	5.98	-	5.65		5.26	-	5.09	-	4.26

* East Asia refers to the average of five competitive East Asian economies: Japan, Hong Kong, Republic of Korea, Taiwan and Singapore

Source : WEF

Figure 10 : Luxembourg's performance compared to benchmark countries



Source : WEF

The Think Tank Centre for European Reform[46] also publishes a Lisbon League Table that is based exclusively on a list of Eurostat structural indicators[47]. The Table measures the performance of Member States in the economic, social and environmental areas, to include employment rates, greenhouse gas emissions, expenditure on R&D, etc [48]. Unlike the World Economic Forum then, it does not use qualitative data from surveys of professionals. This Scoreboard is intended to provide a summary of the reforms that Member States have engaged on and to predict the capacity of UE nations, which have higher labor costs, to uphold their standard of living in a progressively globalizing world. In the most recent edition, Sweden and Denmark were once again ranked at the top. Luxembourg is in the middle of the table, at the 12th spot in this ranking, as in the previous year. Germany once again was ranked 8th, France in 10th drops one rank, and Belgium ranked 13th again.

[46] CENTRE FOR EUROPEAN REFORM, The Lisbon scorecard IX – how to emerge from the wreckage, London, February 2009. For more information see: http://www.cer.org.uk/

[47] For more information see: http://epp.eurostat.ec.europa.eu/

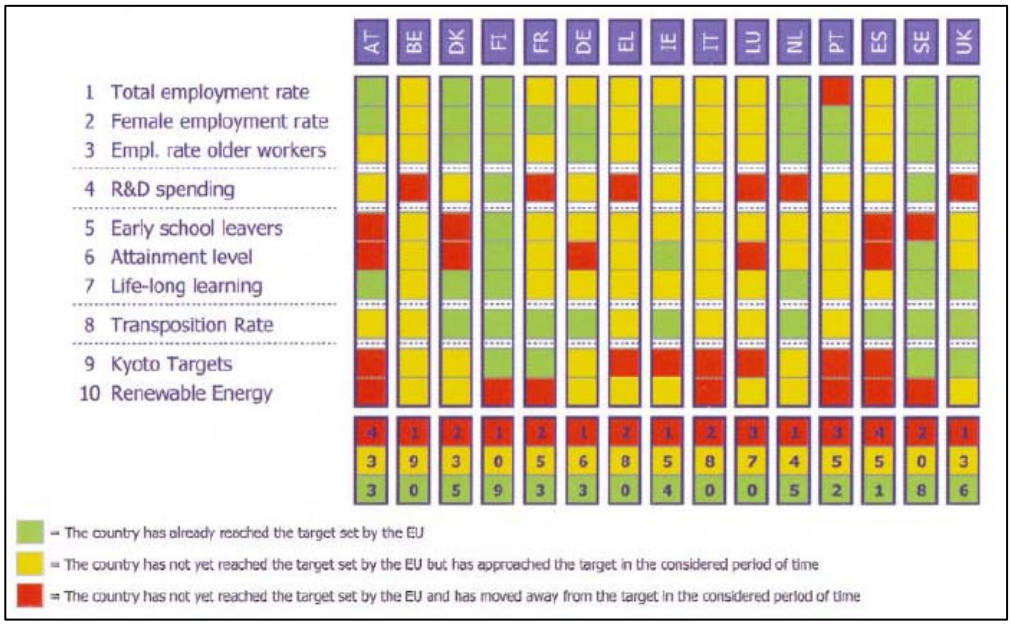
[48] As was already stated in the 2006 Competiveness Report, many of the structural indicators used as part of this study are not pertinent to the specificities of Luxembourg's economy. For example, the employment rate or the GDP per capita weigh heavily in rankings yet fail to take into account the significant cross-border flows in Luxembourg. For a critical perspective of these structural indicators relating to Luxembourg, see MINISTERE DE L'ECONOMIE ET DU COMMERCE EXTERIEUR, *Bilan Compétitivité 2006 - En route vers Lisbonne*, Luxembourg, September, 2006, pp. 33-38

Lastly, the consulting company European House & Ambrosetti[49] published its third bi-annual report in 2009 containing a Competitiveness Profile for the EU Member States indicating their levels of competitiveness, and a Speed Profile to evaluate the EU Member States' progress in the Lisbon Process. The competitiveness level of each Member State is put to test by evaluating their performance in a certain number of key indicators group into different categories with variable weightings. Luxembourg has excellent performance in the areas of labor, finance, state control, education, innovation, bureaucracy and health. Luxembourg is even rated the best in direct foreign investment and international business. Luxembourg scores average marks in the areas of taxes, demographic structure, citizen's security, social security and pension systems, posts relatively poor performance in energy and a very bad ranking in the area of environment[50]. The Speed Profile evaluates the ability of Member States to achieve various quantitative objectives set by the European Union. Luxembourg scored very poorly in this area, especially in the categories of R&D expenditures, youth education levels and greenhouse gas emissions, domains in which Luxembourg trails the rankings. Lastly, a benchmark is used to measure how quickly Member Nations achieve their objectives with the passing of time. Luxembourg, according to this index, is not exerting enough energy in implementing the necessary measures to achieve the objectives that have been set. The country is ranked last in the Very Slow group, along with Austria, Poland, Portugal, Italy, Greece, Rumania and Belgium. Luxembourg's relative performance has worsened even since the 2007 edition of the report where the country held the next to last place in the rankings.

[49] EUROPEAN HOUSE & AMBROSETTI, Observatory on Europe 2009 - Improving European Integration and Competitiveness, Italy, 2009. For more details see: http://www.ambrosetti.eu/english/

[50] Since once again data is missing for some of the sub-categories in the analysis, Luxembourg does not appear in the overall competitiveness ranking for 2009.

Table 7 : EU-15 league table (2009)



Source: EUROPEAN HOUSE & AMBROSETTI

In principle, the indices shown above should measure the same thing, progress achieved in implementing the Lisbon strategy.

Table 8: Comparative Rankings CER - WEF

	Lisbon scorecard Centre for European reform 2009	*Lisbon review* World Economic Forum 2008
1	Sweden	Sweden
2	Denmark	Denmark
3	Netherlands	Finland
4	Austria	Netherlands
5	Finland	Austria
6	Ireland	Germany
7	United Kingdom	**Luxembourg**
8	Germany	France
9	Czech Republic	United Kingdom
10	France	Belgium
11	Estonia	Ireland
12	**Luxembourg**	Estonia
13	Belgium	Cyprus
14	Slovenia	Portugal
15	Cyprus	Slovenia
16	Latvia	Czech Republic
17	Lithuania	Spain
18	Slovakia	Malta
19	Spain	Lithuania
20	Greece	Slovakia
21	Portugal	Latvia
22	Italy	Hungary
23	Hungary	Greece
24	Poland	Italy
25	Bulgaria	Rumania
26	Rumania	Poland
27	Malta	Bulgaria

Source: CER, WEF

The above table shows that rankings for most of the Member States upon comparison are relatively stable. The ranking is nearly the same among the five best performing and the five lowest performing nations. However, the rankings of some countries by the two institutes are more widely divergent: Ireland is ranked 6th and 11th, Latvia 16th and 21st, Luxembourg 12th and 7th, Malta 27th and 18th, Portugal 21st and 14th and the Czech Republic 9th and 16th.

f. The Knowledge Economy Index of the World Bank

The World Bank published a new edition of its Knowledge Economy Index (KEI)[51] in the fall of 2008, intended to help countries identify the challenges and opportunities facing them in their transition to a knowledge economy. The analysis uses 83 indicators, both quantitative and qualitative, and involves 140 countries. Denmark heads the ranking as the most developed knowledge economy in the world, followed by Sweden and Finland. Luxembourg is ranked 18th, and occupies the same rank it held in the 1995 publication. Germany is in 14th place, Belgium in 16th and France in 20th. A closer look at Luxembourg's performance compared to a sample of Western European countries shows that Luxembourg's performance is impressive in ITC and the area of Institutional Regime. In contrast, its performance appears to be average in the area of Innovation and even lower in Education.

Table 9: Top 20 of the World Bank Rankings and Luxembourg's Performance Compared to Western Europe

Country	2008 Rank	KEI 2008	1995 Rank
Denmark	1	9.58	1
Sweden	2	9.52	6
Finland	3	9.37	2
Netherlands	4	9.32	4
Norway	5	9.27	5
Canada	6	9.21	10
Switzerland	7	9.15	7
United Kingdom	8	9.09	8
United States	9	9.08	3
Australia	10	9.05	11
Ireland	11	8.92	15
Austria	12	8.89	12
Iceland	13	8.88	21
Germany	14	8.87	13
New Zealand	15	8.87	9
Belgium	16	8.73	14
Taiwan, China	17	8.69	24
Luxembourg	18	8.65	18
Japan	19	8.56	17
France	20	8.47	16

Source : World Bank
Note : Data are standardized on a scale of 0 to 10, and weighted by population.

[51] For more details see: www.worldbank.org/kam

g. The 2009 *Feri-Capital* Cities Ranking[52]

The Feri Institute was commissioned by the German economics magazine *Capital* to publish a ranking of cities with the best economic perspectives for the future, concentrating both and Germany and Europe. The ranking is based on economics, purchasing power, jobs and demography extending to 2015. With particular regard to the European rankings, Luxembourg occupies the 1st position, followed by Helsinki and Dublin.

Table 10: Ranking of Cities According to Economic Perspectives

Rank	City
1	Luxembourg
2	Helsinki
3	Dublin
4	Warsaw
5	Stockholm
6	Madrid
7	Budapest
8	London
9	Amsterdam
10	Prague

Source : FERI / CAPITAL

2.2.3 A Plethora of other "Pinpointed" Benchmarks

In addition to composite indices and rankings that measure competitiveness and attractiveness of places on an aggregate or overall basis, there exist a multitude of other reports that focus on more specific or directed determinants such as political stability, public governance, extent of internationalization, education and training of human resources, quality of life, degree to which foreign investors know the country, etc.

a. The Political Instability Index of the Economist Intelligence Unit *(EIU)*

The EIU published a study in March 2009 focusing on political instability in 165 countries throughout the world that could cause economic disarray and exert a negative impact on investors seeking stability, and consequently, an impact on the attractiveness of the country concerned[53]. This composite index is called the Political Instability Index and it exposes the risk posed to governments through social

[52] For more details see: http://www.capital.de/politik/100023570.html et http://www.hamburg.de/contentblob/1630620/data/capital-staedte-ranking.pdf

[53] EIU, Political instability index- *Aux barricades !*, The Economist, London, 25 March 2009
For more information see: http://www.economist.com/markets/rankings/displaystory.cfm?story_id=13349331&fsrc=rss

disturbances. The four pillars of the index that evaluate the extent of development measured child mortality rates, excessive cases of economic or political discrimination against minorities, situations in neighboring countries and the type of political regime in place. The index has 115 underlying indicators. Luxembourg is ranked 154th of the 165 countries reviewed, thus constituting one of the countries where the risk of political instability is very low. This ranking is better than those of Luxembourg's neighbors, where France is rated 110th, Belgium 146th and Germany 150th. Scandinavian countries are the most stable of all the nations in the analysis.

Table 11: The Political Instability Index

Economist.com rankings

Political instability

Countries, 2009-10 (2007 score, if different)

Most vulnerable			Least vulnerable		
Rank		Score*	Rank		Score
1	Zimbabwe	8.8	165	Norway	1.2 (0.2)
2	Chad	8.5 (7.5)	164	Denmark	2.2 (0.2)
3	Congo Kinshasa	8.2 (7.2)	163	Canada	2.8 (1.8)
4	Cambodia	8.0 (7.0)	161	Finland	3.2 (1.2)
	Sudan	8.0 (6.0)		Sweden	3.2 (1.2)
6	Iraq	7.9	160	Switzerland	3.4 (0.4)
7	Afghanistan	7.8 (6.8)	158	Costa Rica	3.5 (1.5)
	Central African Republic	7.8 (5.8)		Mauritius	3.5 (2.5)
	Côte d'Ivoire	7.8	154	Australia	3.6 (0.6)
	Haiti	7.8 (6.8)		Austria	3.6 (0.6)
	Pakistan	7.8 (5.8)		Luxembourg	3.6 (0.6)
	Zambia	7.8 (6.8)		New Zealand	3.6 (0.6)

*On a scale of 0-10 whereby 0=no vulnerability and 10=highest vulnerability

Source: Economist Intelligence Unit

Source : Economist Intelligence Unit

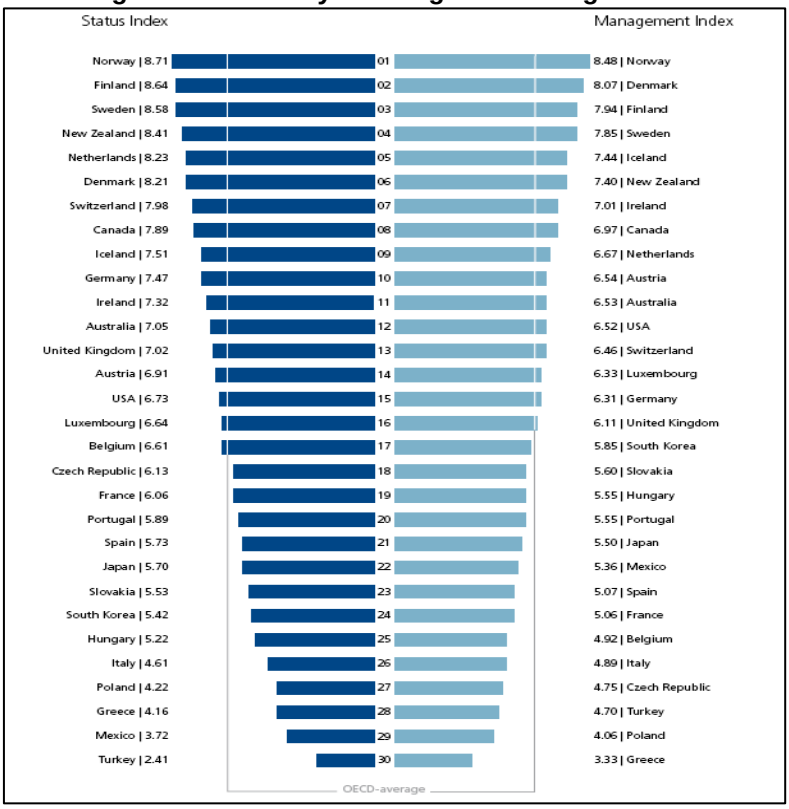
b. The Sustainable Governance Indicators by the Bertelsmann Foundation

In early 2009, the Bertelsmann Foundation published a study on the capacity of 30 OECD nations to undertake reform[54]. The domains that were analyzed include the environment, democracy, the economy, the labor market, health, education and immigration. The results obtained through this analysis were put into two composite indices dubbed Sustainable Governance Indicators (SGI), built on the basis of 149 underlying basic indicators. The first, the Status Index, analyzes the need for reform within a country, while the second, the Management Index, measures the capacity of the government in a given country to implement reforms.

[54] BERTELSMANN-STIFTUNG, Policy Performance and Executive Capacity in the OECD - Sustainable Governance Indicators 2009, Paris, 2009. For more information see: http://www.sgi-network.org/

According to the Foundation, this study differs significantly from other international benchmarks. Indeed, unlike the other studies, this one evaluates the capacity of a country to undertake reforms. Simultaneously, an analysis is done on countries' need to reform from the economic perspective, which also includes other dimensions such as education, environment, social aspects and security.

Figure 11 : Country Rankings According to the SGI



Source: Bertelsmann-Stiftung

Both rankings are dominated by the Scandinavian countries, with Norway, Finland and Sweden occupying the top three slots. Luxembourg comes in 16th in the Status Index. Germany ranks higher at 10th, while Belgium at 17th and France at 19th are ranked lower. Luxembourg is 14th in the Management Index, the one that measures a country's capacity to reform, scoring higher than neighboring Germany at 15th, France at 24th and Belgium, which ranked 25th.

One factor that came out in Luxembourg's country fact sheet was the Foundation's finding that integrating youth into the labor market is quite difficult, and the same applies to older workers. It found also that unemployment benefits appear relatively generous, which coupled with the high number of cross-border workers, could explain Luxembourg's relatively high unemployment rate that persists in the face of a

high rate of job creation. In addressing social policy, the Foundation recommends that political leaders review the health and retirement systems up close. The Foundation confirms that Luxembourg has expended enormous effort in the area of R&D with a view to achieving its Lisbon strategy goals. The Foundation attributes the worst ratings to the education and training policy in the country, which is shackled by persistent linguistic barriers in the education system. The Foundation finds that there is not an extensive ex-ante impact analysis system in place for newly introduced reforms. Neither is there an adequate ex-post follow-up for the period after reforms are implemented. The Foundation also observed that it is very difficult for the Government to touch the acquired benefits portions of the budget when seeking to reduce expenditures.

In conclusion, the Foundation poses the following challenges to Luxembourg: improve the integration of foreigners into society, implement a reform of the education system, heighten encouragement of developing human talent resources, diversify the national economy to a greater extent and set up a better monitoring system to illustrate the impact of policies.

c. The KOF Index of Globalization by the ETH of Zurich (2009)

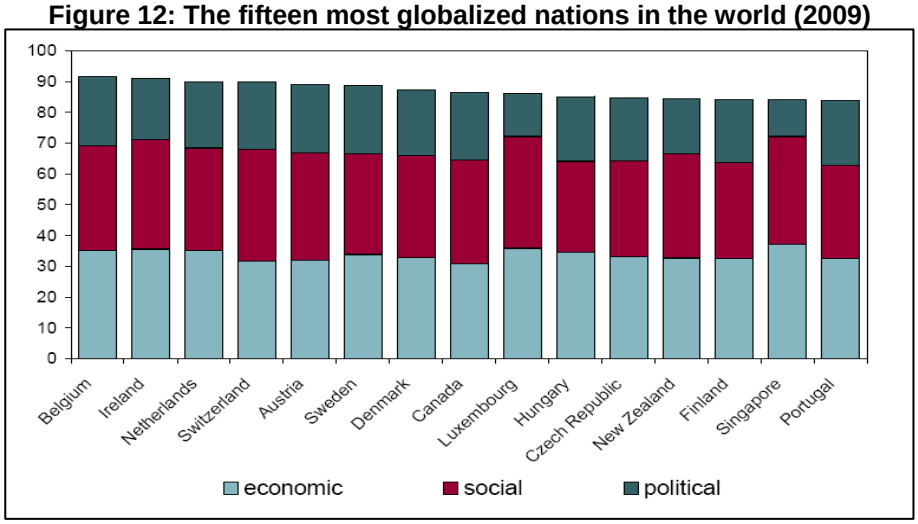
One consequence of globalization is that domestic markets for products, capital and labor are becoming more and more closely integrated. The dissolving of customs barriers, greater technical progress and lowering of transportation and communication costs are the principal motors behind this phenomenon. Direct international links are now being established in a durable fashion. Globalization, in the wake of the shifting of production abroad and the introduction of exotic products, and the inevitable requirement of countries to adapt to the new world order has lead to the appearance of the KOF Index of Globalization, put out by ETH of Zürich[55].

This index measures the economic, social and political dimensions of globalization as it affects 158 countries over a long period, based on 24 variables broken down into three dimensions. The economic dimension measures the flow of goods, services and capital, as well as information and perceptions related to commercial trade. It also measures the degree to which a country limits flows of capital and

[55] For more details see: http://globalization.kof.ethz.ch/

trade. The social dimension measures the dissemination of ideas and information, of images and persons, etc. The political dimension covers the distribution of a country's government policies, for example the number of embassies and consulates it establishes in foreign countries, or how the nation is represented in international organizations. Overall, Luxembourg is 9th among the most globalized countries in the world, compared to a ranking of 27th in 2007. First place in the 2009 ranking goes to Belgium, with Ireland in second place and the Netherlands in third. With regard to economic globalization, Luxembourg ranks second after Singapore. In the social dimension of globalization, Luxembourg leads in the ranking, followed by Switzerland and Ireland. Lastly, with regard to the globalization of politics, France is in the lead, followed by the Italy and Belgium. In this domain Luxembourg is ranked rather poorly in the 105 position.

Figure 12: The fifteen most globalized nations in the world (2009)



Source: ETH (January 2009)
Note: The KOF index measures globalization on a scale of 1 to 100. The more a country is deemed globalized, the closer its score will be to 100.

d. The "Who cares ? Who dares?" Report by the European Business Summit

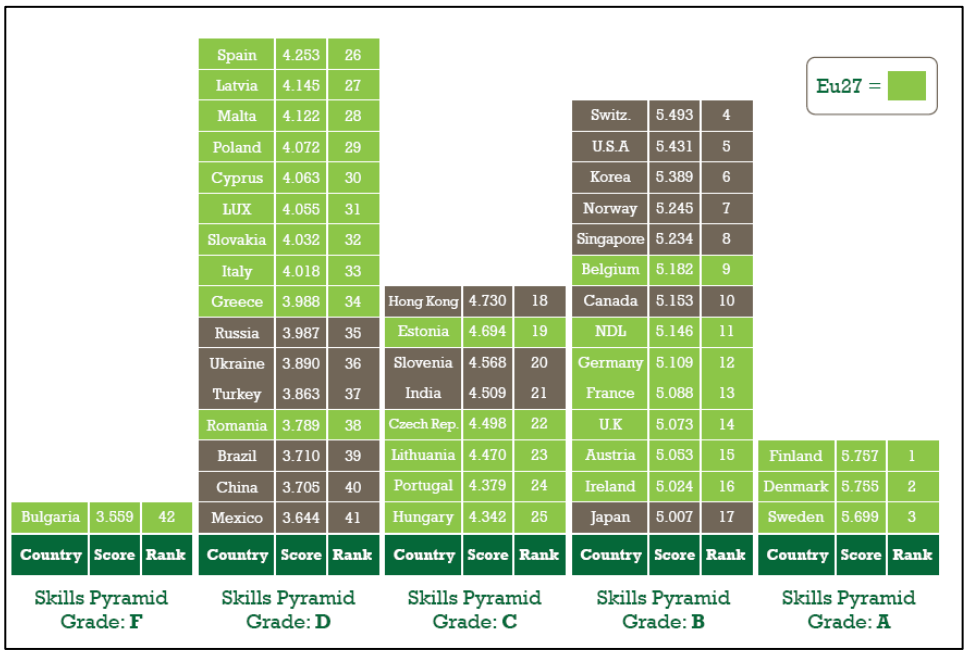
In the March 2009 European Business Summit, the *Fédération des entreprises de Belgique* presented a joint study with INSEAD on the subjects of qualifications of the future[56]. Skills and qualifications in the area of human resources are considered to be fundamental factors of competitiveness in a knowledge economy.

The study analyzes the qualifications levels of 42 countries, including the Member States of the EU. The data was obtained primarily from a qualitative survey done by

[56]For more details see: http://www.insead.edu/discover_insead/docs/WhocaresWhodares.pdf

the World Economic Forum and very few quantitative data are used. The study distinguishes between three levels, grouped in the form of a pyramid. These include basic qualifications, professional skills and skills acquired in the global knowledge economy.

Figure 13: Country Grade Scores



Source: European business summit / INSEAD

Luxembourg was graded in Skills Pyramid D, occupying the 31rd position in the rankings. The country has a less impressive grade than the Scandinavian countries that scored in the A pyramid, as well as that of our neighbors classed in the B pyramid. When the rankings are broken down to smaller elements, Luxembourg is graded D for its basic qualifications, a D for professional skills and a C for skills in the knowledge economy.

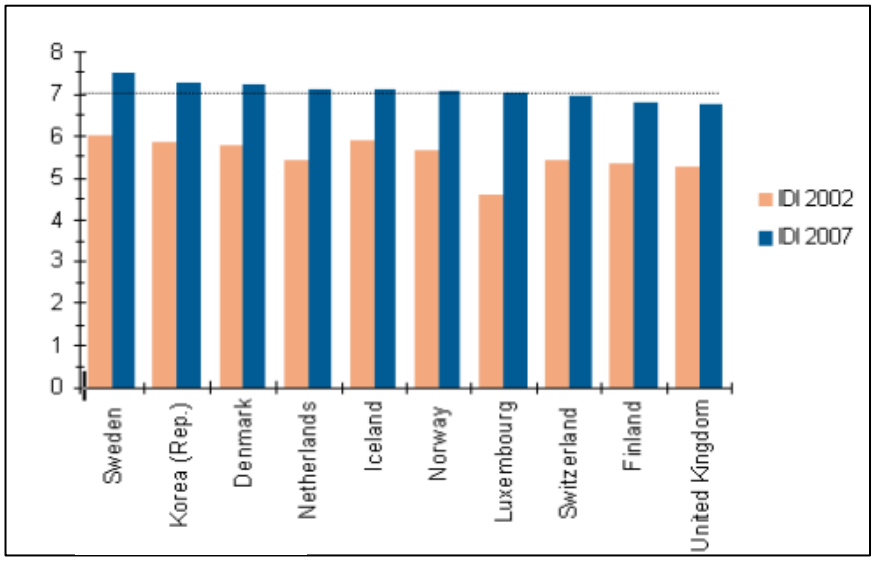
e. The International Telecommunication Union ICT Development Index

The ITU published a new edition of its ICT Development Index[57] in 2009, which analyzes the development of the information society in 154 countries throughout the world. This index combines 11 indicators that are lined to the access of ITC, skills, etc. The highest rank countries are in Northern Europe. Sweden heads the rankings, followed by Korea, then Denmark. Luxembourg comes in 7th, a considerable

[57] For more information see: http://www.itu.int/newsroom/press_releases/2009/07.html

improvement since the last publication of the index. Luxembourg's particularly good scores were in the category of communications costs, where it scored third after Singapore and the United States.

Figure 14 : The Top 10 countries in the ITU ranking



Source: ITU (2009, 2007 data)

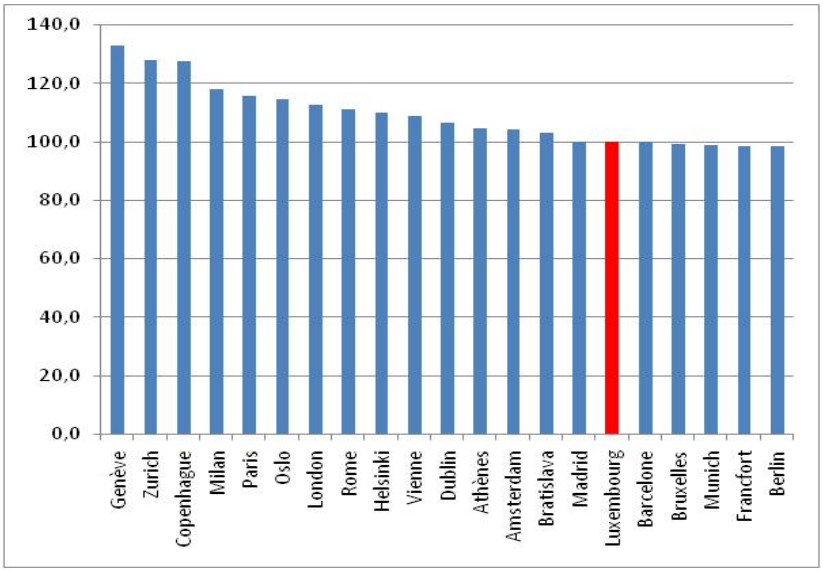
f. Cost of living, Purchasing Power and Quality of Life Indices

Cost of living, purchasing power and quality of life constitute major influencing factors in decisions concerning the location of businesses, particularly true with the phenomenon of globalization. It is therefore not surprising that many organizations publish country or city rankings based on composite indices rating cost of living, purchasing power and quality of life.

In the cost of living area, Mercer published an update of its study entitled Cost of Living[58] in 2009, which measures the cost of life in cities inhabited by expatriates throughout the world. This edition covers 143 cities on six continents and measures the cost of 200 products and services, to include housing, transportation, etc. Luxembourg occupies the 38th rank worldwide in the 2009 rankings, proving to be 17.9% less expensive than the city of New York, which is used as a benchmark. Using Luxembourg as the basis for comparing other European cities in Mercer's top 50 MERCER, Luxembourg appears to be relatively inexpensive with relation to these other cities.

[58] For more details see: http://www.mercer.com/costofliving

Figure 15 : Ranking of European Cities in the MERCER TOP-50 Cost of Living Index



Source : MERCER Calculations : LU = Base 100, *Observatoire de la Compétitivité*

GfK publishes an annual study on purchasing power in forty European countries [59]. Purchasing power is defined as nominal per capita income after taxes and including state allocations benefits. Lichtenstein leads in the ranking with €44,851, with Luxembourg at €28,192 and Switzerland boasting purchasing power of €26,842. France (9th), Germany (10th) and Belgium (12th) are also in the top tier of performers.

Table 12: Top 20 of the GfK Purchasing power Europe 2008-2009 ranking

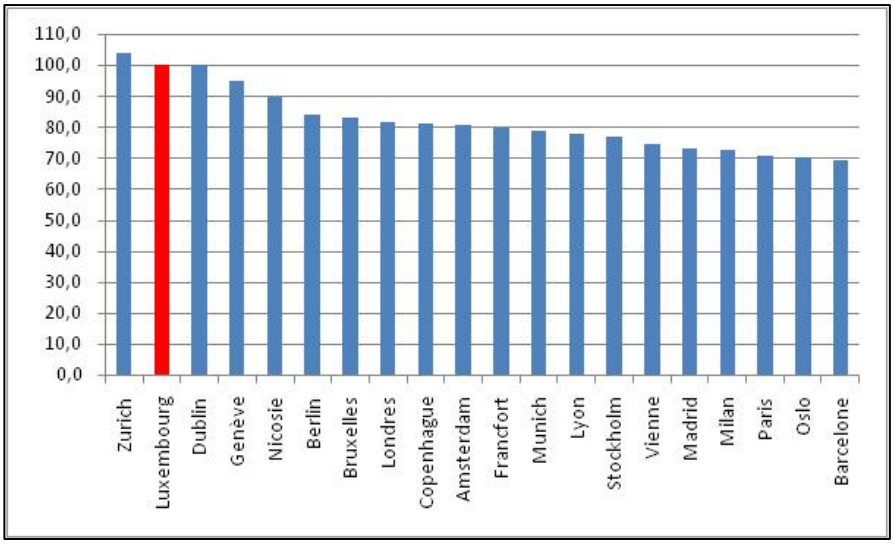
Country	2007 Rank	2008 Rank
Liechtenstein	1	1
Luxembourg	2	2
Switzerland	3	3
Norway	5	4
Ireland	6	5
Denmark	7	6
Iceland	4	7
Austria	9	8
France	10	9
Germany	11	10
United Kingdom	8	11
Belgium	12	12
Sweden	13	13
Finland	14	14
Italy	15	15
Netherlands	16	16
Spain	17	17
Greece	18	18
Cyprus	19	19
Portugal	20	20

Source: Gfk

[59]For more details see: http://www.gfk.com/group/press_information/press_releases/003201/index.en.html

UBS periodically publishes a report on prices and earnings throughout the world[60]. In the 2009 edition, Luxembourg occupies a very favorable position in a worldwide comparison of purchasing power in terms of net hourly earnings, garnering the third spot after Zurich and Sydney. In the area of net annual income, the rankings vary slightly against Luxembourg, which is bypassed by Dublin and three U.S. cities.

Figure 16: Net hourly wages, divided by the price of a basket of goods and services (excluding rents), for a series of European cities (Luxembourg = 100)



Source: UBS, *Calculation by the Observatoire de la Compétitivité*

In the area of quality of life, Mercer[61] has been conducting surveys on a large number of cities throughout the world for some years now[62]. Quality of life is analyzed through 39 indicators, grouped in ten categories. In the most recent edition, the rankings are dominated by Zurich, Vienna and Geneva. Luxembourg occupies the 19th rank worldwide.

Table 13: MERCER - The 20 cities with the highest quality of life throughout the world

City	2008 Rank	2009 Rank
Vienna	2	1
Zurich	1	2
Geneva	2	3
Vancouver	4	4
Auckland	5	4

[60] UBS, *Prix et salaires 2009*, Zurich, August 2009
For more details see: http://www.ubs.com/1/f/wealthmanagement/wealth_management_research.html
[61] MERCER, Quality of living global city rankings 2009, London, 29 April 2009
For more information see: http://www.mercer.com/qualityofliving
[62] Also see the two EIU and MONOCLE rankings:
ECONOMIST INTELLIGENCE UNIT, Liveability ranking, London, June 2009
FINANCIAL TIMES, The city of your dreams - MONOCLE 2009 Liveability rankings, London, 13-14 June, 2009

Düsseldorf	6	6
Munich	7	7
Frankfurt	7	8
Berne	9	9
Sydney	10	10
Copenhagen	11	11
Wellington	12	12
Amsterdam	13	13
Brussels	14	14
Toronto	15	15
Ottawa	19	16
Berlin	16	16
Melbourne	17	18
Luxembourg	17	19
Stockholm	20	20

Source : Mercer

ECA International also publishes an annual ranking of cities in which the quality of life is most agreeable[63]. This study evaluates several factors in order to provide a view of the quality of life in some 400 cities worldwide, drawing notably from comments by expatriates. Overall, European cities are well ahead in world rankings. Luxembourg is in 7th place worldwide among the Europeans in the 2009 rankings[64].

Table 14 : ECA - The 20 cities most agreeable to Europeans (2009)

City	2008 World Rank	2009 World Rank
Copenhagen	1	1
Antwerp	5	2
Brussels	5	2
Berne	3	2
Basel	3	5
Geneva	2	5
Bonn	9	7
Düsseldorf	8	7
Frankfurt	12	7
Luxembourg	5	7
Munich	9	11
Amsterdam	9	11
Hamburg	12	13
Vienna	17	14
Strasbourg	14	14
Berlin	14	14
Dublin	18	17
Zurich	18	18
Helsinki	19	19
Paris	20	20

Source : ECA International

[63] For more information see: http://www.eca-international.com/showpressrelease.aspx?ArticleID=6835

[64] The results of this survey vary depending on the ethnicity of the expatriates questioned. Indeed, Asian expatriates prefer localities other than those European expatriates favor. For example, only Copenhagen, the number 1 choice in the European ranking also appears in the top 10 of Asian choices. For more details see: http://www.eca-international.com/showpressrelease.aspx?ArticleID=6830

f. Prognos Corporation's "*Freihandels-und Investitionsindex*" Index (2009)

Prognos[65] published a new edition of its index dealing with trade relations and foreign investment of German companies in 2009. This index is supposed to provide German companies with reliable information about conditions in foreign markets. The index analyzes attractiveness and potential of one hundred foreign markets for German companies. Two sub-indices then review the current attractiveness and dynamics of these markets using the perspective that markets that are currently the most attractive do not necessarily show the greatest potential for growth. Rankings are based on economic, institutional and political indicators. In all there are thirty-four individual indicators assembled within nine separate categories. These are Market Size, Degree of Openness, Degree of Development, Institutions and Infrastructure, Business Environment, Stability, Training and R&D, Market Efficiency and Distance from Germany.

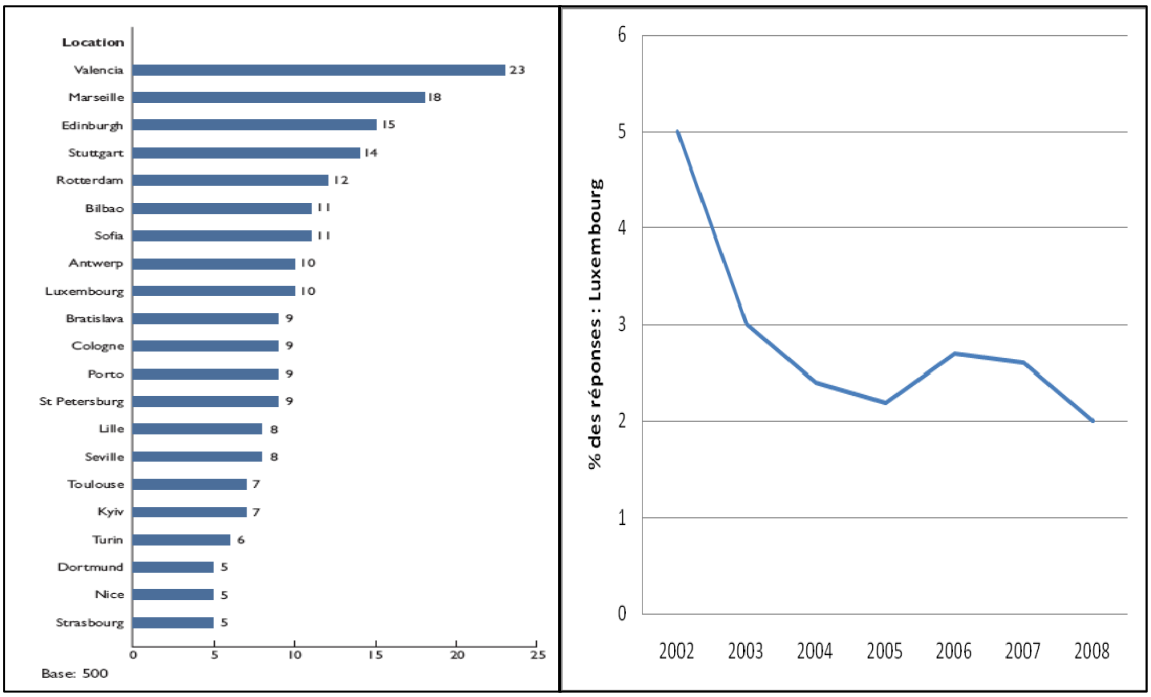
The EU, the United States and Singapore are the domestic markets[66] that are the most attractive to German companies. Luxembourg is ranked 15th, dropping seven places in the rankings with regard to the previous report. France is 6th and Belgium 12th, thus proving that their markets are more important for German companies and are also apparently more stable than Luxembourg's, in view of the fact that they have retained their position since the last report. In the static ranking, that is, the current level of a country's importance, Luxembourg is classed 15th, down two spots. This ranking is headed up by the EU, the United States and the United Kingdom. In the dynamics ranking, which measures future development potential, Luxembourg went into free fall, ranking 86th compared to its number 3 spot in the previous edition. Once again, Belgium 20th and France 77th prove to be more attractive markets for German companies than Luxembourg, and they have held relatively constant positions since the report's last edition. Here Hong-Kong, China and Panama are the countries with the best rankings.

[65] For more details see: http://www.prognos.com/Globalisierungsreport-2009.634.0.html
[66] The EU is ranked first, but of course is not a country in the strict sense of the term.

g. The European Cities Monitor by CUSHMAN&WAKEFIELD (2008)

CUSHMAN&WAKEFIELD publish an annual qualitative survey[67] on perceptions about the principal business cities in Europe [68]. In 2008, 500 managers chosen from among the largest companies in Europe were asked to give their opinions on the major business cities in Europe. London was ranked first among thirty-three cities undergoing an in-depth analysis, followed by Paris then Frankfurt, as in 2006 and 2007. Once again, the city of Luxembourg was not among the thirty-three cities analyzed in detail because too few managers could claim intimate knowledge of the city.

Figure 17 : «Are there other European cities which are important as business locations and which you know fairly or very well?». Survey responses 2008 & Response rate 02-08.



Source: CUSHMAN&WAKEFIELD Calculations: *Evolution LU* and *Observatoire de la Compétitivité*

Still, one question on the survey dealt with other business cities that are less well known. Of the managers who were contacted in 2008, only 2% were very or moderately familiar with the economic environment in Luxembourg. This rate, which seems to have stagnated since earlier editions, is a very low percentage compared

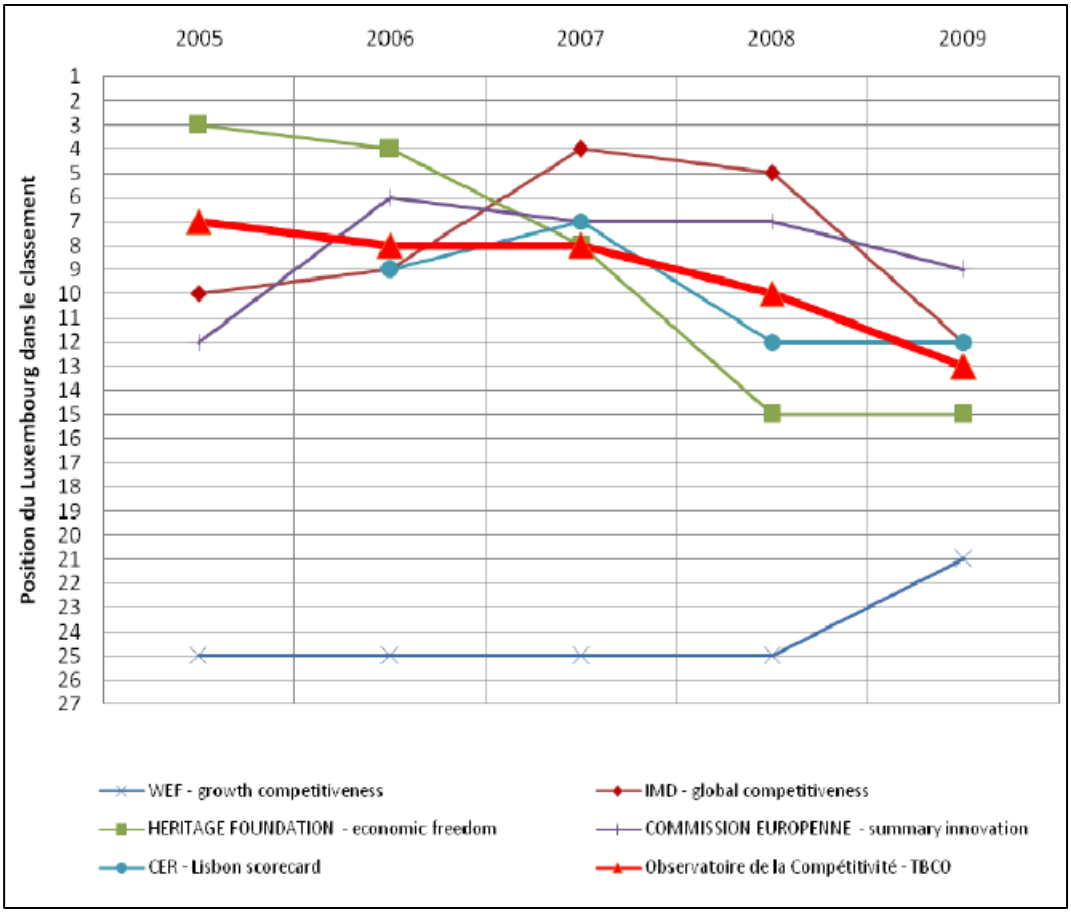
[67] For more information see: http://www.cushmanwakefield.com
[68] En matière de notoriété et d'attractivité perçue, cf. aussi aux rapports ERNST&YOUNG et GFK ROPER:
E&Y, Global Cities Attractiveness Survey 2008, Paris, 2008.
For more details see: http://www.labaulewic.org/IMG/pdf/Global_Cities_attractiveness_2008_EN.pdf
GFK ROPER, The Anholt-GfK Roper Nation Brands Index 2008 Report, New York, September 2008
For more details see: http://www.gfk.com/group/press_information/press_releases/003055/index.en.html

to other cities that are located near to us, such as Paris, which 77% knew well, Brussels (65%), Frankfurt (59%) and Amsterdam (51%).

2.3 Trends for Luxembourg in a Series of Rankings

An analysis of the ranks Luxembourg holds in the various rankings measuring competitiveness over the years indicates that since 2007 the comparative situation of Luxembourg's competitiveness appears to be worsening. Since the 2008 Competitiveness Report, Luxembourg's position has either stagnated or worsened in the majority of the composite indicators for which temporal series are available, excepting the WEF ranking, in which Luxembourg's ranking rose in 2009. The ranking calculated by the *Observatoire de la Compétitivité* has also worsened[69].

Figure 18 : Trend Showing Positions of Luxembourg in Various Rankings from 2005-2009



Notes : The horizontal axis refers the year of publication of a given report.
Ranking trends should be considered with some hindsight in view of the methodology changes introduced over time, as re-calculations of rankings are not necessarily done for all years of publication

[69] See Chapter 3 – Competitiveness Scoreboard 2009.

2.4 Conclusions

As we have demonstrated in this chapter and in *Bilan Compétitivité* drafted in previous years, numerous comparative studies on the subject of competitiveness, also referred to as comparative competitiveness, appear on an annual basis, concerning either countries, regions and even cities[70]. Although the world financial crisis has made it such that debate on economic policy has been concentrated more on anti-cyclic short-term measures than on structural issues since the autumn of 2008, interest for this type of study will rapidly resurface with rising competition among the territories. Indeed, the composite indicators of competitiveness make underlying structural dimensions completely visible.

There is no doubt that a country's ranking is the item that gets the most publicity in each report. Yet the interpretation of the results of these reports and benchmarks goes much further. In using these types of composite indicators, one must never lose sight of their inherent limitations, to whit the underlying data being used, the methodological differences between the various benchmark indicators and the methodological weaknesses related to this type of comparative exercise. In reality, these indices convey a much more complex story then their apparent simplicity projects after an initial perusal of the data.

First, with regard to the indicators, it should be noted that there is a time lag between many of the statistics used and the publication of composite indicators. The composite indicators used in the current edition of the Competitiveness Report often use 2007 or 2008 indicators, and therefore do not really account for the economic crisis. A composite indicator with rankings from a 2008-2009 report may be based on data culled in 2007. Benchmarks cannot therefore be considered as short-term forecasting tools, or as a short-term stress measuring instrument for a crisis. For example, through its new stress test appearing in the 2009 edition of its report, IMD shows that there is a substantial gap between the positioning of countries in its standard ranking and their positioning in the stress test for the post-crisis period.

Next, regardless of the attraction of their apparent simplicity, many indices display considerable conceptual differences. Even if they attempt to gauge the same

[70] It should be noted that, apart from those indicators enumerated above, there are a multitude of other indicators that were not included here. See also the *Bilan Compétitivité* for 2006, 2007 and 2008.

phenomenon - competitiveness - differences appear in the very definition of what is being measured. Thus while the World Economic Forum attempts to measure the capacity of a country to achieve sustainable growth, IMD is analyzing the capacity of a country to create and maintain an environment that sustains competitiveness of companies, since creating wealth is supposedly acquired by companies that operate in a domestic environment that more or less promotes their competitiveness. As we have seen, Luxembourg's ranking varies as strongly from one ranking to another depending on the methodology used. Indeed, while Luxembourg's IMD report ranking from a sampling of 57 countries is the 12th position, the country is ranked no better than 21st among the 133 pays analyzed in the recent World Economic Forum report.

Thirdly, there are regular criticisms that the various reports suffer from methodological weaknesses. The three areas in which the critiques arise are the quality of sources used, the choice of underlying indicators and the method of calculating the composite indicator. Therefore, in order to analyze the results of the various composite indices and country rankings, the first step is to perform a critical analysis of the methodologies used. This analysis should include a review of the quality of primary and secondary data sources, the potential for ideological bias, the manner used to calculate a composite index and the weightings of the various base indicators. As an example, the base indicators used as part of these benchmark indices are often inappropriate for Luxembourg's economy. The best-known indicator is the celebrated GDP per capita, which makes no provision for the significant flow of workers crossing into Luxembourg's territory each day, with the result of substantially inflating the country's performance in relation to other countries[71]. The BAK Basel index uses this GDP per capita indicator for its composite BAK Performance Index, allotting it a rating of 50% of the index. This could influence the fact that Luxembourg ranks 1st in this ranking. In addition, it is clear that some international organizations periodically change their methodology, which can have a significant impact on the position of a country in a ranking. As an example, the World Economic Forum

[71] For an example of this, see EUROSTAT, First estimates for 2008: GDP per inhabitant varied by one to six across the EU27 Member States, 94/2009, 25 June, 2009.
For more details see: http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/2-25062009-BP/FR/2-25062009-BP-FR.PDF
It would be more appropriate to refer to Revenue Per Capita for Luxembourg to get a more accurate accounting of the cross-border phenomenon, as is done in the Competitiveness Scoreboard.

changed its methodology in the 2007-2008 report. Using the old methods, Luxembourg occupied the 22nd position in the 2006-2007 ranking, while using the new method of calculation the country was retroactively ranked 25th for the 2006-2007 period in the 2007-2008 annual report. The following year, in the 2008-2009 report, the World Economic Forum announced the impending introduction of the New GCI composite index, which, according to the authors, will be methodologically sounder[72].

Fourth, details of countries analyzed in each report have an impact on direct comparisons between them. For example, in their recent editions the WEF compares 133 countries while IMD addresses only 57 and the *Heritage Foundation* manages 183, which obviously exerts an influence on the relative position of countries in the different rankings. Indeed, if we decided to compare only European countries in the rankings, Luxembourg's relative position would change. Luxembourg would move from 21st to 12th in the WEF index, from 12th to 7th in the IMD rankings and from 15th to 8th position in the Heritage Foundation index.

In view of the inherent weaknesses we have invoked above, what shall we think of the aggregate rankings and indices and, above all, how should we interpret them?

On one hand, despite the numerous limitations of these composite indices, it has nonetheless proven useful to monitor them. In the first place, when these rankings appear in the press, they have a significant impact on a country's image and may influence the perception that investors have of that country, especially foreign investors who generally have limited information on the country. Next, as has been demonstrated by the OECD 's PISA study in the area of education, it is possible that a ranking in "comparative competitiveness" could incite a country to accelerate its reforms on the grounds of augmenting national prestige. Indeed, as the European Commission reminds us, indicators that summarize important issues with a single figure are essential communication tools. They trigger policy debate and give people a feel for whether or not progress is on track[73].

[72] WORLD ECONOMIC FORUM, Moving to a new global competitiveness index, in Global competitiveness report 2008-2009, Suisse, pp. 43-63
[73] European Commission, GDP *and* beyond*:* Measuring progress in a changing world, COM(2009) 433 final, Bruxelles, 20 August, 2009, p.4

On the other hand, we must nevertheless avoid succumbing to a syndrome of having a ranking to have a ranking. These different rankings, composite indicators and other elements certainly provide useful indications on the competitiveness of a country, but they are not an end in themselves. We must not lose sight that the overall indications furnished in these types of reports often have too general a nature to be usable in the specific case of each type of activity and project. The composite indicators should be intended to focus attention and to attract a more rigorous and critical analysis. To this end, in 2003 the Tripartite Coordination Committee recognized the need for a wider scope of indicators in order to properly assimilate Luxembourg's competitiveness situation. It tasked Professor Lionel Fontagné of the *Université Paris I (Sorbonne)* with drawing up proposals on the subject. The Fontagné Report's[74] November 2004 recommendation was to set up a Scoreboard; this was done and the *Observatoire de la Compétitivité* periodically updates data and analyzes changes in the competitiveness situation. We must acknowledge that, as confirmed by the majority of benchmarks reviewed in the 2009 Competitiveness Report, trends in the domestic TBCO that is calculated using data taken from the Scoreboard show that Luxembourg appears to be lagging in international comparisons for the second consecutive year starting in 2008[75].

The European Commission's Joint Research Center aptly sums up the problematic concerning composite indicators: "*[…] it is hard to imagine that the debate on the use of composite indicators will ever be settled […] official statisticians may tend to resent composite indicators, whereby a lot of work in data collection and editing is "wasted" or "hidden" behind a single number of dubious significance. On the other hand, the temptation of stakeholders and practitioners to summarize complex and sometime elusive processes (e.g. sustainability, single market policy, etc.) into a single figure to benchmark country performance for policy consumption seems likewise irresistible*."[76]

[74] Fontagné L., *Compétitivité du Luxembourg : une paille dans l'acier*, Report for the Ministry of the Economy and Foreign Trade, Luxembourg, November 2004, pp.102-120
For more details see: http://www.odc.public.lu/publications/perspectives/PPE_3.pdf
[75] See Chapter 3 – The Competitiveness Scoreboard 2009.
[76] For more details see: http://composite-indicators.jrc.ec.europa.eu/

Table 15: 2009 Analysis of International Benchmarks (2005-2009)

	Luxembourg's ranking					Trend Over the two most recent editions	Number of countries, regions, cities involved	Position of neighboring countries in the most recent edition of rankings			Top 3 In the ranking for Countries, regions or cities (In order from 1st to 3rd)
	Year of publication										
	2005	2006	2007	2008	2009			BE	DE	FR	
Competitiveness Benchmarks											
OBSERVATOIRE DE LA COMPETITIVITE - TBCO	7.	8.	8.	10.	13.	-3	27	19.	8.	10.	SE, CZ, NL
CENTER FOR EUROPEAN REFORM - Lisbon scorecard	.	9.	7.	12.	12.	0	27	13.	8.	10.	SE, DK, NL
EUROPEAN COMMISSION - Summary of innovation	12.	6.	7.	7.	9.	-2	32	10.	4.	11.	CH, SE, FI
HERITAGE FOUNDATION - Index of economic freedom	3.	4.	8.	15.	15.	0	183	20.	25.	64.	HK, SG, AS
IMD - Global competitiveness index	10.	9.	4.	5.	12.	-7	57	22.	13.	28.	US, HK, SG
WEF - Growth competitiveness index	25.	25.	25.	25.	21.	+4	134	18.	7.	16.	CH, US, SG
WORLD BANK - Ease of doing business index	.	.	45.	53.	64.	-11	183	22.	25.	31.	SG, NZ, HK
BASEL ECONOMICS - Attractiveness index	.	.	.	57.			192	N/A	N/A	N/A	Zurich, Copenhagen, London
BASEL ECONOMICS - Performance index	.	.	.	1.			192	N/A	N/A	N/A	Luxembourg, South-East Ireland, Brussels
BERTELSMANN STIFTUNG - Status index	.	.	.	.	16.		30	17.	10.	19.	NO, FI, SE
CFORIC - European competitiveness index (nations)	2.	.	2.	.		0	27	11.	12.	10.	FI, LU, CH
CFORIC - European competitiveness index (regions)	6.	.	6.	.		0	118	N/A	N/A	N/A	Brussels, Uusimaa (FI), Ile de France (Paris region)
CFORIC - World knowledge competitiveness index	58.	.	.	34.	.	+24	145	N/A	N/A	N/A	San José, Boston, Hartford (US)
EUROPEAN HOUSE - Speedometer index	15. [77]	.	26.	.	27.	-1	27	26.	13.	18.	FI, SE, LT
ITIF - Innovation and competitiveness index	.	.	.	.	3.		36	14.	15.	12.	SG, SE, LU
UNIVERSITE DE VIENNE - European smart cities	.	.	1.	.	.		70	N/A	N/A	N/A	Luxembourg, Aarhus (DK), Turku (FI)
WEF - Lisbon review	.	8.	.	7.	.	+1	27	10.	6.	8.	SE, DK, FI
WEF - Travel & tourism competitiveness index	.	.	9.	20.	23.	-3	133	22.	3.	4.	CH, AT, DE
WEF - Network readiness index	.	.	.	24.	21.	+3	134	24.	20.	19.	DK, SE, US
WEF - Global enabling trade index	.	.	.	12.	13.	-1	121	21.	12.	17.	SG, HK, CH
ZYen / CITY OF LONDON - Global financial centre index	.	.	26.	17.	14.	+3	62	N/A	N/A	N/A	London, New York, SG
Benchmarks for purchasing power / quality of life											
Gfk - Purchasing power Europe	.	2.	2.	2.			41	12.	10.	9.	LI, LU, CH
UBS – Domestic Purchasing Power (net hourly income)	3.	5.	.	3.	3.	0	73	N/A	N/A	N/A	Zurich, Sydney, Luxembourg
ECA - best locations	.	.	2.	5.	7.	-2	254	N/A	N/A	N/A	Copenhagen, Antwerp, Brussels
MERCER - quality of living	.	18.	18.	17.	19.	-2	215	N/A	N/A	N/A	Vienna, Zurich, Geneva

Note: Summary of rankings by *Observatoire de la Compétitivité*. Where possible, methodology changes introduced over the years have been accounted for. N/A = Not Applicable

[77] At the time, this ranking was done with EU-15 as a basis.

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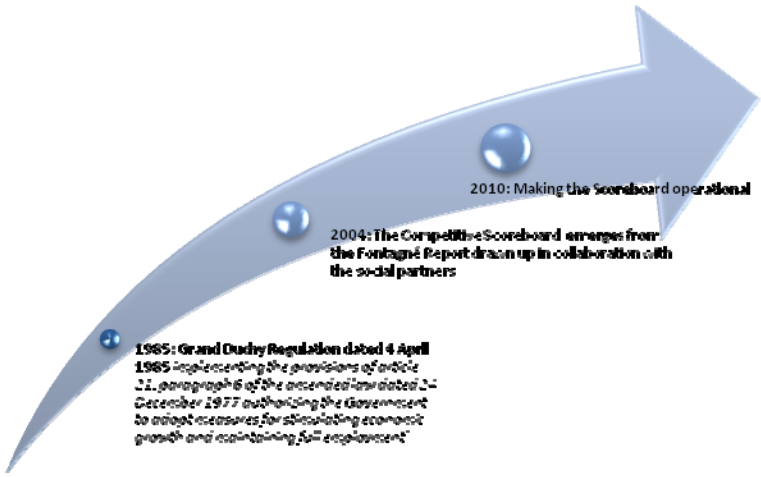
3 The Competitiveness Scoreboard

3.1 Toward an operational Scoreboard

The Government wishes to implement an operational Competitiveness Scoreboard. The coalition government program for the legislative period 2009—2014 calls for "*replacing the 'Grand Duchy regulation dated 4 April 1985 implementing the provisions of article 21, paragraph 6 of the amended law dated 24 December 1977 authorizing the Government to adopt measures for stimulating economic growth and maintaining full employment' by a Competitiveness Scoreboard based on consultations with the social partners and civil society, in the framework of the Lisbon Strategy, the work of the Economic and Social Committee, the National Council for Sustainable Development as well as the report prepared by the international expert, Professor Fontagné, on the competitiveness of Luxembourg's economy.*"

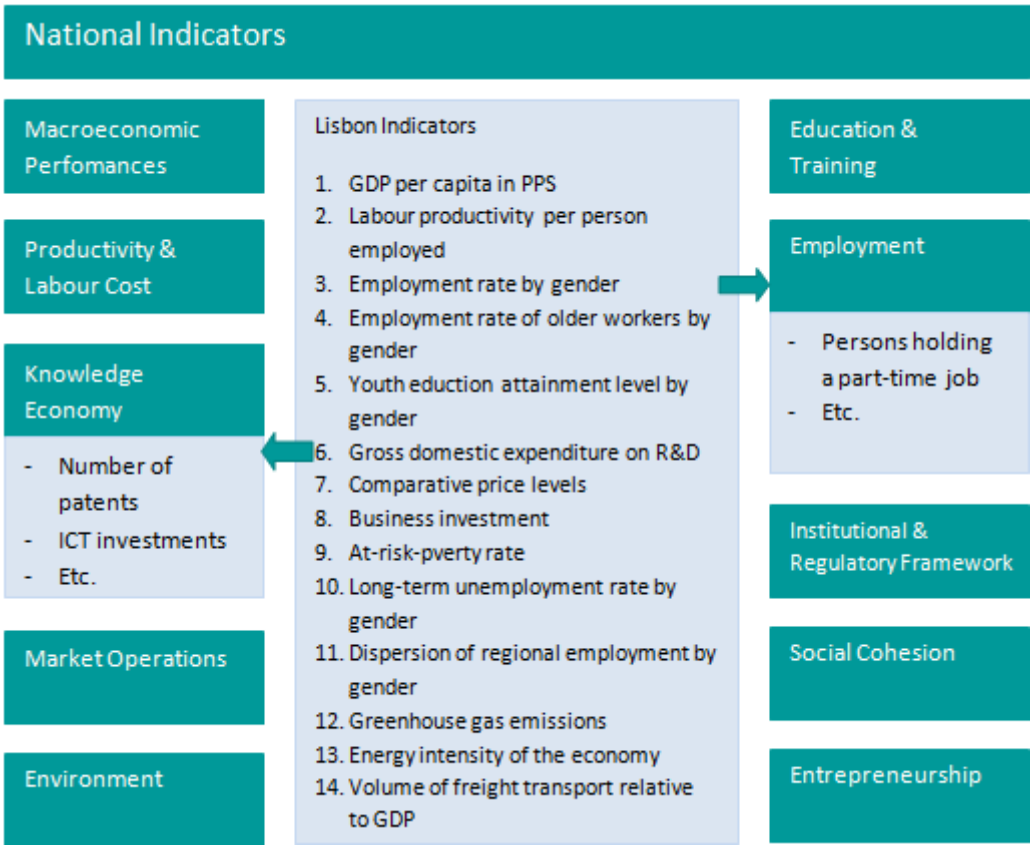
Figure 19 : Evolution of an instrument for monitoring competitiveness



Source: *Observatoire de la Compétitivité*

The Scoreboard, as sketched out in the Fontagné report "Une*paille dans l'acier" (2004)* is updated regularly by the *Observatoire de la Compétitivité* in its annual report and constitutes a good point of departure because it also includes the Lisbon indicators. These indicators provide a better picture of the economic situation in Luxembourg than the 1985 regulation, even though they are in some cases outdated or present gaps.

Table 16[78]: Lisbon and Domestic Indicators



Source: *Observatoire de la Compétitivité*

Competitiveness is measured by integrating social, ecological and economic criteria in conformity with the principle of sustainable development. To this end, multiple quantitative and qualitative indicators provide information on the competitiveness of Luxembourg's economy.

On one hand, the 79 indicators give a good perspective of the multiple facets of the very complex concept of competitiveness. A look at the term's definition: "*A country is competitive if a) its productivity increases at a rate similar or greater than that of its primary trading partners that have a comparable level of development, b) if it can maintain an equilibrium within the framework of an open economy and, c) if it is experiencing a high level of employment*". On the other hand, the high number of indicators makes in-depth analysis and updating of indicators unwieldy. Furthermore, this argument, in conjunction with others, was what spurred the calculation of a

[78] The scoreboard is made up of 79 indicators grouped in 10 categories. Four indicators of the scoreboard submitted with the initial Fontagné report have been withdrawn as they no longer exist.

composite indicator based on these same indicators but providing more of a summary view.

In addition, the Scoreboard is primarily made up of indicators that are not available in the very short term, in conformity with its structural view of the competitiveness of Luxembourg's economy.

This justifiable perspective will obviously result in the Scoreboard indicators not providing a genuine picture of the impact and consequences of the financial crisis before 2010. Changes in underlying trends of indicators must therefore be analyzed with greater detail than short term trends.

Some indicators could not be updated with the annual updates because the underlying data is no longer unavailable. It would be useful to review these indicators and consider replacing them by others backed by more available data. Clearly, any scoreboard mechanism designed to compare a country with its economic partners and competitors will always be subject to whether high quality international data can be obtained. Domestically, in order to ensure the quality of basic factors of these data, good collaboration with STATEC is particularly important.

All of these considerations explain why, if such an explanation were necessary, it is important to set up working groups on structural indicators among *Observatoire* de la Compétitvité and the social partners in upcoming months. It is essential to hold discussions on the Scoreboard with the social partners and to arrive at a consensus for overcoming these difficulties.

Table 17: Competitiveness Scoreboard

Category 1: Macroeconomic performance (13 indicators)

- **A1:**Gross National Income per capita (PPS) (2008)
- **A2:**Real growth rate of GDP (2008)
- **A3:**Growth in domestic employment (2008)
- **A4:**Unemployment rate as a percentage (2008)
- **A5:**Inflation rate as a percentage (2008)
- **A6:**Public balance as a % of GDP (2008)
- **A7:**Public debt as a % of GDP (2008)
- **A8:**Gross fixed capital formation of the public administration (2008)
- **A9:**Terms of trade (2008)
- **A10:**Real effective exchange rate (1995=100) (2008)
- **A11:**Diversification – entropy coefficient (2008)
- **A12:**FDI inflows and outflows (2007)

Category 2: Employment (9 indicators)

- **B1:**Employment rate (Total) (2008)
- **B2:**Employment rate (Men) (2008)
- **B3:**Employment rate (Women) (2008)
- **B4:**Long-term unemployment rate (2008)
- **B5:**Persons holding a part-time job (2008)
- **B6:**Unemployment rate of persons under 25 (2008)
- **B7:**Employment rate of persons aged 55 -64 (total) (2008)
- **B8:**Employment rate of persons aged 55- 64 (Men) (2008)
- **B9:**Employment rate of persons aged 55 - 64 (Women) (2008)

Category 3: Productivity & Labor Costs (5 indicators)

- **C1:** Trends in total factor productivity (2008)
- **C2:** Trends in apparent work productivity (2008)
- **C3:** Productivity per hour worked as a percentage of U.S. figures (2008)
- **C4:** Changes in unit labor costs (2008)
- **C5:** Costs / Revenue ratio in the banking sector (2006)

Category 4: Market Operations (10 indicators)

- **D1:** Percentage of full-time workers on minimum wage[79] *
- **D2:** Price of electricity (ex-VAT) – industrial users (2008)
- **D3:** Price of gas (ex-VAT) - industrial users (2008)
- **D4:** Market share of the primary operator in the cellular telephone market (2006)
- **D5:** Composite basket of fixed and cellular telecommunications (ex-VAT) (2004)
- **D6:** Composite basket of cellular telephone royalties (ex-VAT) (2006)
- **D7:** Broad band Internet access rates (2007)
- **D8:** Basket of domestic royalties for 2Mbits leased lines (ex-VAT) (2006)
- **D9:** Public markets – value of public markets using open procedure procurement (2007)
- **D10:** Total of State aid as a % of GDP (excluding horizontal objectives) (2007)
- **D11:** Market share of the primary operation in the fixed telephony market[80]*

Category 5: Institutional and Regulatory Framework (11 indicators)

- **E1:** Corporate taxes (2008)
- **E2:** Taxes on physical persons (2007)
- **E3:** Standard VAT rate (2009)
- **E4:** Tax wedge: Single, without children (2008)
- **E5:** Tax wedge: Married, with 2 children, one wage-earner (2008)
- **E6:** Administration efficiency index (2008)
- **E7:** Rule of law index (2008)
- **E8:** Regulatory quality index (2008)
- **E9:** Degree of sophistication of online public services (2007)
- **E10:** Public services fully available online
- **E11:** Public sector payroll costs*

Category 6: Entrepreneurship (4 indicators)

- **F1:** Propensity for Entrepreneurship (2007)
- **F2:** Self-employed jobs as a percentage of total employment (2008)
- **F3:** Net change in number of companies (start-up rate less close-down rate) (2005)
- **F4:** Volatility among companies (start-up rate plus close- down rate (2005)

[79] "*Eurostat would like to inform countries that the table "Full-time employees on minimum wage" has been deleted on Eurostat's website as the methodological concept needs to be developed"*

[80] Indicators marked with an asterisk could not be updated

Category 7: Education & Training (8 indicators) ➢ **G1:** Annual cost per student in public educational facilities (2006) ➢ **G2:** Portion of) the population aged 25-64 with a secondary education (2008) ➢ **G3:** Portion of the population aged 25-64 with a university education * ➢ **G4:** Percentage of human resources in scientific and technological fields as a % of total employment (2007) ➢ **G5:** Lifelong learning (participation of adults in training and teaching programs) (2008) ➢ **G6:** Secondary school dropouts ➢ **G7:**Percentage of foreign nationals in S&T human resources* ➢ **G8:**Percentage of highly qualified workers (ICT) in total employment figures*	**Category 8: Knowledge economy (15 indicators)** ➢ **H1:** Internal R&D expenditure (2007) ➢ **H2:** Public R&D budget credits (2007) ➢ **H3:** Portion of public research financed by the private sector (2007) ➢ **H4:** 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 (2007) ➢ **H6:** Scientific publications per million inhabitants (2005) ➢ **H7:** Number of patents USPTO per million inhabitants (2008) ➢ **H8:** Number of patents OEB per million inhabitants (2006) ➢ **H9:** Use of Internet by companies (broad band) (2008) ➢ **H10:** Investment in public telecommunications as a percentage of gross fixed capital formation (2005) ➢ **H11:** Percentage of households that have Internet access at home (2008) ➢ **H12:** Number of fixed or cell phones per 100 inhabitants (2005) ➢ **H13:** Percentage of households that have broad band Internet access (2008) ➢ **H14:** Number of secure web servers per 100,000 inhabitants (2006) ➢ **H15:** Percentage of total employment in medium or high technology sectors (2007)
Category 9: Social Cohesion (6 indicators) ➢ **I1:** Gini Coefficient (2007) ➢ **I2:** At-risk of poverty rate after social transfers (2007) ➢ **I3:** At persistent risk of poverty rate (2004) ➢ **I4:** Life expectancy at birth (2007) ➢ **I5:** Wage gap between men and women (2006) ➢ **I6:** Serious work accidents (2005)	**Category 10: Environment (7 indicators)** ➢ **J1:** Number of ISO 14001 (2007) ➢ **J2:** Number of ISO 9001 (2007) ➢ **J3:** Total greenhouse gas emissions (2007) ➢ **J4:** Percentage of renewable energy sources (2007) ➢ **J5:** Volume of municipal waste generated (2007) ➢ **J6:** Energy intensity of the economy (2007) ➢ **J7:** Modal split in transportation choice- percentage of car users as transportation method (2007)

Source: Fontagné (2004)

3.2 Methodology and Comparison at the Community Level

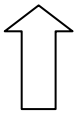
Indicators are analyzed from two perspectives. First Luxembourg is considered with relation to European averages.

If a score for Luxembourg is 20% better or equal to the EU-x average, the indicator is classified as green, or favorable.

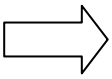
When a score for Luxembourg is between +20% and -20% of the EU-x average, the indicator is classified orange, or neutral.

If a score for Luxembourg is 20% lower or equal to the EU-x average, the indicator is classified as red, or unfavorable.

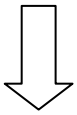
Next, changes in Luxembourg's performance are analyzed over time, meaning the most recent data is compared with that of earlier years. Arrows are used to indicate the tendency of the most recent changes, be it an improvement or worsening of indicator data.



If Luxembourg's performance in an area has improved since the last scoreboard was published, the indicator under review is designated by an upward pointing arrow.



If Luxembourg's performance in an area is unchanged since the last scoreboard was published, the indicator under review is designated by a horizontal arrow.



If Luxembourg's performance in an area has worsened since the last scoreboard was published, the indicator under review is designated by a downward pointing arrow.

In addition to comparison with the European average, Luxembourg also undergoes a comparison with the best and worst UE-X results. The following acronyms are used to represent the EU countries:

Table 18 : Acronyms

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

Source: Eurostat

Overall, between 2001 and 2004 the number of indicators in red gradually diminished and the number of indicators in green has increased. Between 2005 and 2008 this trend reversed itself.

However, this constant can vary from one category to another. A detailed analysis of each category of indicators in given in sections 3.2.1- 3.2.10 below, which helps put the overall discouraging figures in perspective by signaling the details of indicator trends in the various categories.

Table 19: Comparison of Competitiveness Indicators: 2000-2008

		2000	2001	2002	2003	2004	2005	2006	2007	2008
Macroeconomic performance	Green	8	8	8	8	8	8	8	8	7
	Orange	1	1	2	2	2	2	1	2	2
	Red	1	1	0	0	0	0	1	0	2
Employment	Green	2	2	2	2	1	1	1	1	1
	Orange	3	3	3	4	5	5	5	5	5
	Red	4	4	4	3	3	3	3	3	3
Productivity and Labor Costs	Green	2	1	1	2	2	4	5	3	2
	Orange	1	1	2	1	2	1	0	0	0
	Red	0	3	2	2	1	0	0	2	3
Market Operations	Green	4	4	4	3	6	5	5	4	4
	Orange	2	2	2	3	2	2	1	2	2
	Red	4	4	4	4	2	3	4	4	3
Institutional and Regulatory Framework	Green	5	5	6	6	5	5	5	5	5
	Orange	2	2	2	2	4	3	3	4	3
	Red	3	3	2	2	1	2	2	1	2
Entrepreneurship	Green	1	1	0	1	0	0	0	0	1
	Orange	2	2	3	2	3	3	3	2	1
	Red	1	1	1	1	1	1	1	2	2
Education and Training	Green	0	0	0	2	2	1	1	1	0
	Orange	3	3	4	1	2	3	3	2	4
	Red	3	3	2	3	2	2	2	3	1
Knowledge Economy	Green	5	5	5	5	6	6	6	6	4
	Orange	3	3	3	3	4	3	2	2	5
	Red	6	6	6	6	4	5	6	6	6
Social Cohesion	Green	0	0	1	1	1	0	0	0	0
	Orange	5	5	4	4	4	5	5	5	5
	Red	0	0	0	0	0	0	0	0	0
Environment	Green	0	0	0	0	0	0	0	0	0
	Orange	2	2	2	3	3	2	2	2	3
	Red	4	4	4	3	3	4	4	4	3
Total	Green	27	26	27	30	31	30	31	28	24
	Orange	24	24	27	25	31	29	25	26	29
	Red	26	29	25	24	17	20	23	25	26
Indicator total		77	79	79	79	79	79	79	79	79

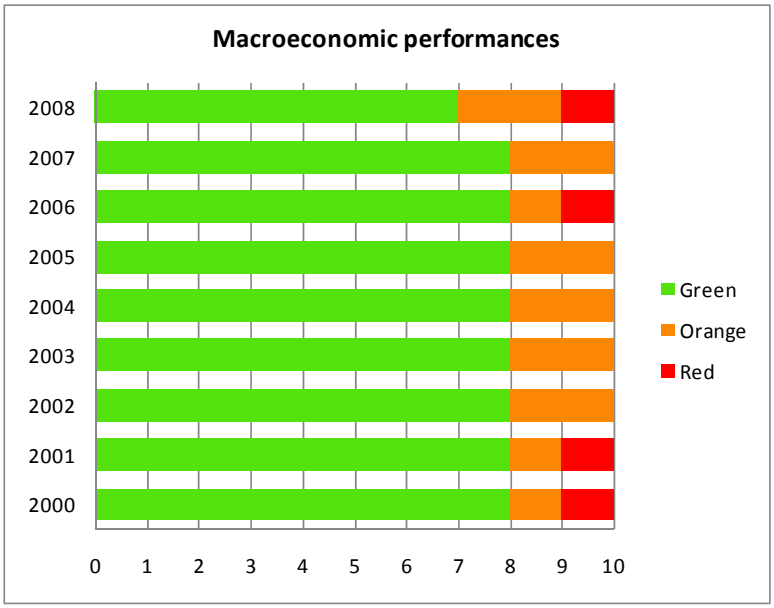
Source: *Observatoire de la Compétitivité*

3.2.1 Macroeconomic Performance

Table 20 : Category A Macroeconomic performance

Code	Indicator		LU[81]	UE-27	DE	FR	BE	MIN	MAX
A1	Gross National Income at market price, per inhabitant in PPS (2007)	↓	258	100	116	108	119	BU 39	LU
A2	Real Growth Rate of GDP in % (2007)	↓	-0.9	0.9	1.3	0.4	1.1	LV -4.6	RO 7.1
A3	Growth in domestic employment, in % (2007)	↑	4.7	0.9	1.4	1.2	1.6	HU -1.4	LU
A4	Unemployment rate (2007)	↓	4.8	7	7.3	7.8	7	NL 2.8	ES 11.3
A5	Inflation, in % (2007)	↓	3.4*	3.7	2.8	3.2	4.5	NL 2.2	LV 15.3
A6	Public balance as % of GDP (2007)	↓	2.6	-2.3	-0.1	-3.4	-1.2	IR -7.1	FI 4.2
A7	Public debt as % of GDP (2007)	↓	14.7	62.2	65.9	68.1	89.6	EE 4.8	IT 105.8
A8	Gross fixed capital formation as % of GDP (2007)	↑	3.94	2.65	1.52	3.17	1.63	AT 1.03	EE 5.62
A9	Terms of trade (2007)	↑	102.6	:	99.8	98.5	96.6	FI 88	RO 132.9
A10	Real Effective Exchange Rate using Index 2000=100 (2007)	↓	108.6	109.4**	106.6	106.1	108.3	NL 105.4	HU 119
A11	Diversification – Entropy coefficient (2007)	↑	0.7	0.82	0.81	0.79	0.80	LU	RO 0.88
A12	Market integration (2006)	↑	435	3.4	3.3	7.4	13.4	GR 1.2	LU

*EU-15; Inflation rate LU: NCPI, others HCPI; Harmonized unemployment rate EUROSTAT/BIT



The majority of the macroeconomic indicators have worsened in the wake of the crisis, although most remain in the green area, which serves to remind us that this is a relative classification linked to a changing average and that our European partners

[81] In order to better distinguish orange boxes from green ones in a black and white version of the Report, the indicators in green zones are marked with a "V", for *Vert*, or Green.

are obviously in the throes of the same crisis. GDP for the EU-27 rose by 0.9% in 2008. In Luxembourg, the GDP fell 0.9% because of the financial and economic crisis, while in the neighboring countries it rose by 0.4% in France, 1.3% in Germany and 1.1% in Belgium.

Most Member States put recovery plans into effect in 2008. In Luxembourg, public debt rose from 9% to 14.75% of GDP. According to the administration's internal group of experts,[82] most of this is due to the rapid drop in core tax revenues linked to the financial and economic crisis.

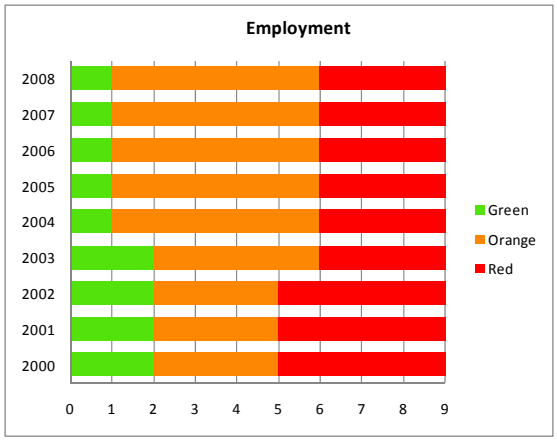
Inflation has largely receded because of the negative impact on the price of raw materials, with oil leading the pack, but this will not cause great increases in consumption because of the worsening of the labor market and the wage moderation trends that are accompanying it.

3.2.2 Employment

Table 21: Category B Employment

Code	Indicator		LU	UE-27	DE	FR	BE	MIN	MAX
B1	Employment rate, in % (2008)	↓	63.4	69.9	70.7	65.2	62.4	MT 55.2	DK 78.1
B2	Employment rate—Men (2008)	↓	71.5	72.8	75.9	69.8	68.6	HU 63	NL 83.2
B3	Employment rate—Women (2008)	↓	55.1	59.1	64.4	60.7	56.2	MT 37.4	DK 74.3
B4	Employment rate of persons aged 55 - 64, in % (2008)	↑	34.1	45.6	53.8	38.3	34.5	MT 29.1	SE 70.1
B5	Employment rate of persons aged 55 - 64, Women (2008)	↑	29.3	36.9	46.1	36.1	26.3	MT 12.4	SE 66.7
B6	Employment rate of persons aged 55 - 64, Men (2008)	↑	38.7	55	61.8	40.6	42.8	HU 38.5	SE 73.4
B7	Unemployment rate of persons under 25, in % (2008)	↓	16.8	15.4	9.8	18.9	18	NL 5.3	ES 24.6
B8	Long-term unemployment rate, in % (2008)	↓	1.6	2.6	3.8	2.9	3.3	CY 0.5	SK 6.6
B9	Persons holding a part-time job, in % (2008)	↑	18	18.2	25.9	16.9	22.6	BU 2.3	NL 47.3

[82] Memo by the Administration's internal experts: http://www.gouvernement.lu/gouvernement/programme-2009/programme-2009/annexe-2009.pdf



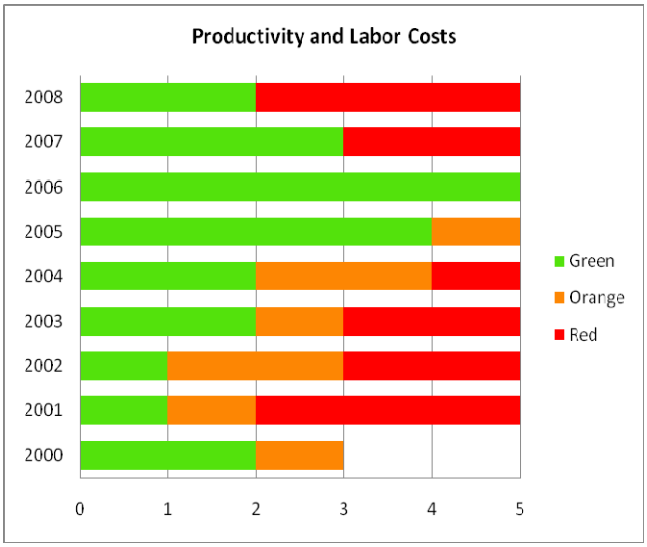
In the EU, employment has receded since the 3rd quarter in the euro zone and this trend will surely extend throughout 2009 and likely through into 2010. The zone's unemployment rate was near 9.5% for 2009, as opposed to 7.5% in 2009, and could reach 12% by 2016. Spain and Ireland are affected significantly more than the other Member States with regard to unemployment, principally because of the brutal turn-around in the real estate market and the widespread loss of jobs in the construction sector.

3.2.3 Productivity and Labor Costs

Table 22: Category C Productivity and Labor Cost

Code	Indicator		LU	UE-27	DE	FR	BE	MIN	MAX
C1	Trends in total factor productivity (2008)	↓	-6.01	-0.48*	-0.22	-0.57	-0.95	LU	GR 1.12
C2	Trends in apparent labor productivity (2008)	↓	-5.64	0.66	-0.14	0.15	-0.45	LU	RO 6.37
C3	Productivity per hour worked as a percentage of U.S. figures (2008)	↓	97.44	63.33	81.05	95.35	93.66	RO 16.53	LU
C4	Changes in real unit labor costs (2008)	↓	5.227	0.726	0.506	0.256	1.938	CY -1.813	EE 9.668
C5	Costs/Income ratio in the banking sector (2006)	↑	42.94	57.35**	65.19	60.56	54.19	EE 29.55	BU 73.2

*UE-15; **UE-25



Most of the indicators in this section are economic indicators and fully reflect the impact of the financial crisis. The “Productivity and Labor Costs” category worsened significantly between 2007 and 2008 with respect to the EU- average.

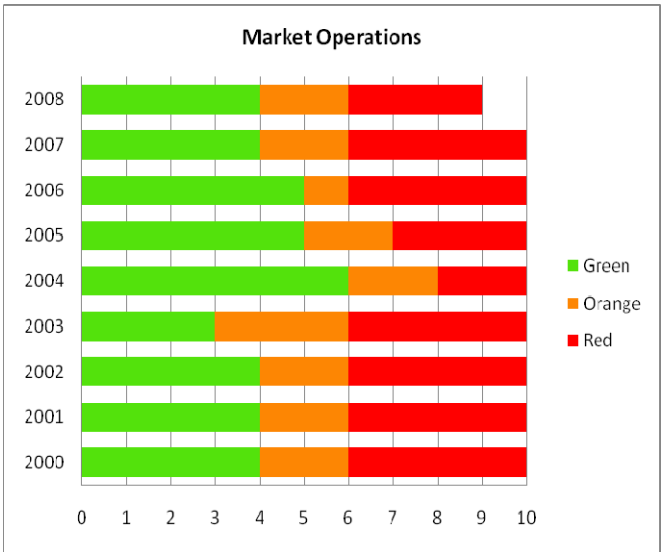
While the ratio of costs to income in the banking sector is in the green area at present, this has not been updated since 2006.

3.2.4 Market Operations

Table 23: Category D Market Operations[83]

Code	Indicator		LU	UE-19	DE	FR	BE	MIN	MAX
D2[84]	Price of electricity (ex-VAT) –industrial users, in € per 100kw hours (2008)	↓	0.0999	0.0880	0.0929	0.0590	0.0988	EE 0.0514	CY 0.1405
D3	Price of gas (ex-VAT) –industrial users, in € per GJ (2007)	↓	11.3	8.868	11.280	9.030	8.98	BU 5.716	SE 12.49
D4	Market share of the leading operator in the mobile telecommunication in % of total market telephone market (2006)	↑	51	39	37	46	45	UK 26	CY 90
D5	OECD basket of mobile telephone rates for large consumers, VAT included – Total in USD (2006)	↑	795 V	1380	1214	1150	1256	DK 731	PO 2613
D6	OECD composite telephone charges, professional subscribers, ex-VAT - Total in USD (2004)	↑	400 V	635	703	620	651	DK 184	CZ 1066
D7	Broadband internet access rates in USD PPP/MB (VAT included) (2007)	↓	50.8	47	32.2	36.7	46.1	FI 31.2	CZ 88.9
D8	OECD composite of domestic rates for 2Mbit leased lines, ex-VAT – in USD (2006)	↑	11376 V	576560	15716	22043	18905	DK 4174	SK 6957370
D9	Public procurement- value of public procurement which is openly advertised, as % of GDP (2006)	↓	1.24	3.05	1.12	3.38	3.15	DE	LV 12.34
D10	Total state aid for horizontal objectives as a % of GDP (2007)	↑	0.2	0.53	0.67	0.51	0.33	LU	HU 1.42

* UE-18; **UE-25 ; ***UE-24 ; ****UE-15



[83] Data for the countries BU, CY, EE, LV, LT, MT, RO, SL, PO, SK, CZ are not yet available for category 04 “Market Operations”.

[84] Indicator D1 has been momentarily withdrawn from the table as it is no longer available on the Eurostat site: "*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.*"

Five indicators out of ten improved for Luxembourg, and four worsened, including energy prices for electricity and gas for industrial users and broadband rate. Note that the indicator "Full-time employees on minimum wage" is no longer monitored by Eurostat due to methodology problems. For this reason the indicator does not appear on the above graph.

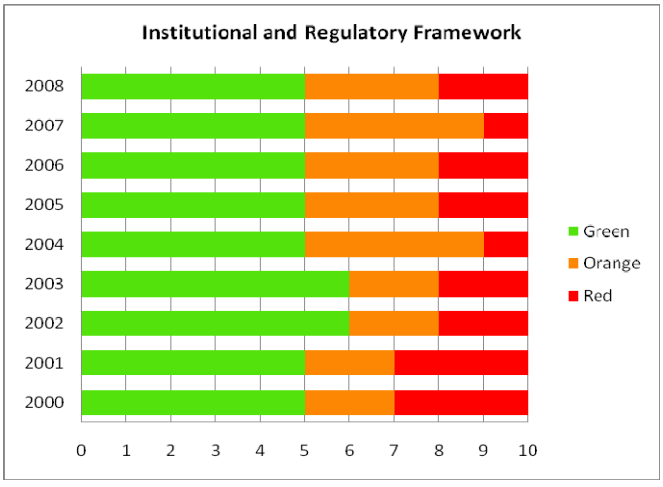
The indicator "Market share of the leading operator in the mobile telecommunications market" fell from 58% in 2005 to 51% in 2006. Lastly, "Total state aid for horizontal objectives" increased between 2006 and 2007 to 0.2%. Luxembourg achieved the best possible score in that area. The "Value of public procurement which is openly advertised" dropped to 1.24% in 2007.

3.2.5 Institutional and Regulatory Framework

Table 24 : Category E Institutional and Regulatory Framework[85]

Code	Indicator		LU	UE-27	DE	FR	BE	MIN	MAX
E1	Corporate tax rate, as a % (2008)	→	29.63	23.2	29.51	33.33	33.99	BU 10	MT 35
E2	Personal income tax rate, as a % (2006)	↓	38.9	41.6*	47.5	47.8	53.5	SK 19	DK 59.7
E3	Standard VAT rate in % (2008)	→	15	19	19	19.6	21	LU	SE 25
E4	Tax wedge – Single, without children, % (2008)	↓	38.85	42.75**	52.02	49.28	55.97	IR 22.93	BE
E5	Tax wedge – Married, with 2 children, one wage-earner (2008)	↓	12.81	32.03**	36.42	42.10	40.76	IR 5.49	HU 43.93
E6	Government effectiveness index (2008)	↓	1.646	1.152	1.706	1.652	0.098	SK -0.142	DK 2.188
E7	Rule of law index (2008)	↓	1.815	1.144	1.918	1.722	-0.121	BE	DK 1.921
E8	Regulatory quality index (2008)	↓	1.714	1.287	1.459	1.255	1.48	RO 0.534	IR 1.915
E9	Degree of sophistication of online public services, in % (2007)	↑	67	76*	84	87	80	PO 53	AT 99
E10	Full online availability of public services, as a percentage (2007)	↑	40	58*	75	70	60	BU 15	AT 100

***UE-25; **UE-19**



[85] The indicator "Public sector payroll costs" was withheld from the TBCO because data concerning it was unavailable.

A slight worsening occurred in this category, with six of the ten indicators falling away. These include notably the “Regulatory quality index”, the “Government effectiveness index”, the “Rule of law index”, “Tax wedge – Single, no children”, “Tax wedge – Married, with 2 children, one wage-earner” and “Tax rate on physical persons”.

Luxembourg ranked in the red for two indicators: “Full online availability of public services, as a percentage”, while showing an increase, still put Luxembourg in the cellar with regard to the UE.

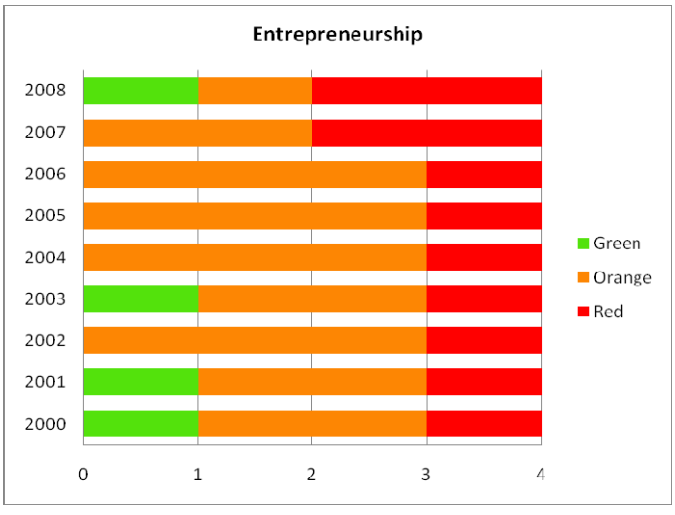
The corporate tax rate indicator remained stable, however, despite the recent fiscal reform, this indicator now puts Luxembourg in the red with relation to the EU average.

3.2.6 Entrepreneurship

Table 25: Category F Entrepreneurship

Code	Indicator		LU-27	UE-27	DE	FR	BE	MIN	MAX
F1	Propensity for entrepreneurialism as a % (2007)	↓	35	44*	41	41	30	CZ 30	LT 58
F2	Self-employed as a percentage of total employment (2008)	↑	6	15	11	12	16	SE 5	GR 35
F3	Net change in number of companies, as a % (2005)	↑	2.84	1.23**	-	2.62	-1.64	DK -7.16	RO 9.35
F4	Volatility among companies, as a % (2005)	↑	19	19**	-	16	16	SE 13	PT 28

* UE-15; **UE-25



This category has had indicators in only the red or orange zones since 2003. In 2008 it achieved one green, one orange and two red scores.

The indicators "Propensity for Entrepreneurship[86] as a percentage of employment", "Net change in number of companies" and "Volatility among companies" all improved and are situated respectively in the red, green and orange zones. The new Member Nations are performing rather well in these indicators but are currently concentrating on attaining EU levels, thus improving the relative position of Luxembourg. All indicators in this category are nonetheless subject to certain methodological doubts with regard to their true capacity to assimilate the corporate spirit, be it in Luxembourg or in another country. One notable shortcoming of these indicators is the incapacity to distinguish between forced and voluntary Entrepreneurship and they cannot account for the underlying economic variables that can explain significant disparities. In addition, there subsists a certain methodological vagueness when attempting to statistically quantify corporate spirit as a specific concept. For this reason the *Observatoire de la Compétitivité* in cooperation with the *Comité National pour l'esprit d'entreprise* (CNPEE) has ordered up a study to clarify this difficult issue from the conceptual and statistical perspective[87].

[86] See *Lettre de l'Observatoire de la Compétitivité N°4 « Entreprendre : entre volonté et réalité. Un paradoxe luxembourgeois ?»*
[87] The full study will be published shortly on the CRP-HT web site. For more details see: www.tudor.lu

3.2.7 Education and Training

Table 26 : Category G Education and Training[88]

Code	Indicator		LU	UE-27	DE	FR	BE	MIN	MAX
G1	Annual cost per student in public educational facilities, in PPS (2006)	↓	14041	5748	5992	6737	7541	RO 1450	LU
G2	Percent of population achieving at least the second cycle of secondary education (2008)	↑	67.9	71.5	85.3	69.8	69.6	MT 27.5	CZ 90.9
G4	Percentage of human resources in science and technology (HRST), as a percentage of total employment (2007)	↑	43.35	39.25	43.74	41.88	46.69	PT 22.1	NL 49.85
G5	Life-long learning as a % of the population aged between 25-64 years (2008)	↑	8.5	10.1	7.9	7.2	6.8	BU 1.4	SE 32.4
G6	Percentage of school dropouts (2007)	↑	15.1	15	12.7	12.7	12.3	SL 4.3	MT 37.3

This category displays no change with relation to the situation in 2005, when the situation had somewhat worsened.

Luxembourg is the country with the highest expenditures in the red listed indicator "Annual cost per student in public educational facilities". It should be noted that a high level of expenditure in public teaching establishments is fully justifiable when they are made in adherence to the principle of efficiency[89].

The indicator "Percentage of human resources in science and technology (HRST), as a percentage of total employment", which was not updated, is in the orange zone, with a rate of 43% in 2007. Still, Luxembourg's good performance in this indicator is primarily due to the presence of foreign nationals in the field of science and technology.

[88] The indicators "Percent of foreign nationals in ST human resources" and "Percentage of highly qualified ICT workers in total employment figures" are not evaluated in the Scoreboard because data for them was unavailable.

[89] See OECD Economic Studies – Luxembourg, volume 2006/9, Paris, July 2006, focused on the theme of education.

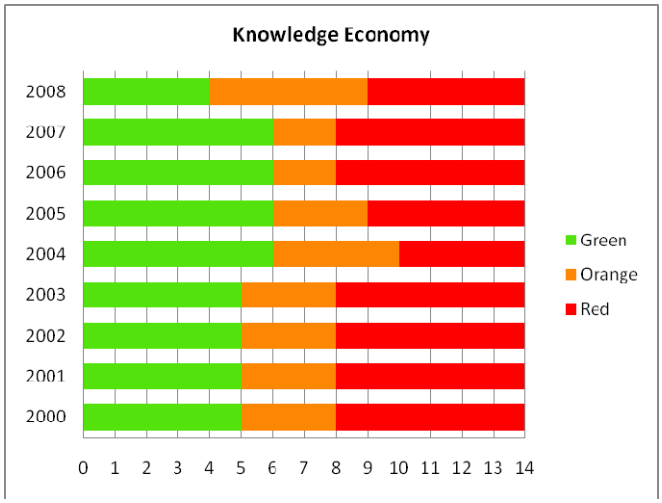
The indicators “Life-long learning” and “School dropouts” improved again, although they remain in the orange zone.

3.2.8 Knowledge Economy

Table 27: Category H Knowledge Economy[90]

Code	Indicator		LU	UE-27	DE	FR	BE	MIN	MAX
H1	Internal R & D expenditure under Lisbon accords, as a % of GDP (2007)	↓	1.63	1.83	2.53	2.08	1.87	CY 0.45	SE 3.64
H2	Public R & D budget credits, as a % of GDP (2006)	↑	16.6	34.2	27.8	38.4	24.7	LU	CY 66.5
H3	Portion of public research financed by the private sector, as a % of GDP (2007)	↓	3.9	8.7	10.5	8.1	9.2	DK 1	NL 16.1
H4	Percentage of sales allocated to the introduction of new products on the market (2003)	↑	5[V]	6**	8	6	5	HU 1	SK 19
H5	Number of researchers per 1,000 employed persons, public and private sectors taken together (2007)	↑	6.5	6.1	7.2	8.3	8.3	CY 1.43	FI 15.6
H6	Scientific publications per million inhabitants (2005)	↑	127	477	535	482	653	RO 41	SE 1109
H7	Number of patents awarded by the USPTO per million inhabitants (2008)	↓	49.14	43.89	108.55	49.5	48.01	LT 0.44	FI 155.1
H8	Number of patents submitted to the OEB per million inhabitants (2006)	↑	228.3	106.72	275.05	125.26	129.89	RO 1.35	DE
H9	Use of broadband connections by companies as a % (2008)	↑	91	87	89	97	95	LT 60	MT 97
H10	Investment in public telecommunications as a percentage of GFCF(2005)	↓	0.77	2.24**	1.69	1.86	1.60	LU	SK 3.62
H11	Percentage of households that have internet access at home (2008)	↑	80	60	75	62	64	BU 25	NL 86
H12	Number of cell phones per 100 inhabitants (2005)	↑	225.46	155.39**	156.23	136.75	149.19	SK 103.67	LU
H13	Percentage of households that have broadband internet access (2008)	↓	76	80	73	92	95	RO 45	BE 95
H14	Number of secure web servers per 100,000 inhabitants (2006)	↑	54,93	37.37**	33.11	8.98	14,02	SK 2.62	LU
H15	Percentage of total employment in medium-high or high technology sectors (2007)	→	1.08	6.69	10.72	6.35	6.31	CY 0.9	CZ 10.85

* UE-25 ; ** UE-19,



[90] Data for BU, CY, EE, LV, LT, MT, RO, SL, PO, SK and CZ are not always available in category 8, “Knowledge Economy”.

According to the OECD, the perspectives for the Information and Communications Technology (ITC) sector are much less favorable than those of recent years. The worsening of the economy, the recession in the OECD zone and the strong drop in consumer and corporate confidence have made it necessary to significantly reduce worldwide projections for ITC investments. [91]

The situation has worsened slightly in this category since 2004. It is important to note that four of the fifteen indicators could not be updated. These include “Percentage of sales allocated to the introduction of new products on the market”, “Scientific publications per million inhabitants”, “Investment in public telecommunications as a percentage of GFCF” and “Number of cell phones per 100 inhabitants”.

In the “Knowledge Economy” category, six of the eleven indicators that could be updated have improved. “Public R & D budget credits, as a % of GDP” improved again, “Number of researchers per 1,000 employed persons” shows an upward trend, as did “Number of patents submitted to the OEB per million inhabitants”, which rose to 228 in 2006, compared to the European average of 106. The indicator “Use of broadband connections by companies” increased to 91% in 2008, although Luxembourg remains in the orange zone for this indicator. The indicator “Internal R & D expenditure” worsened.

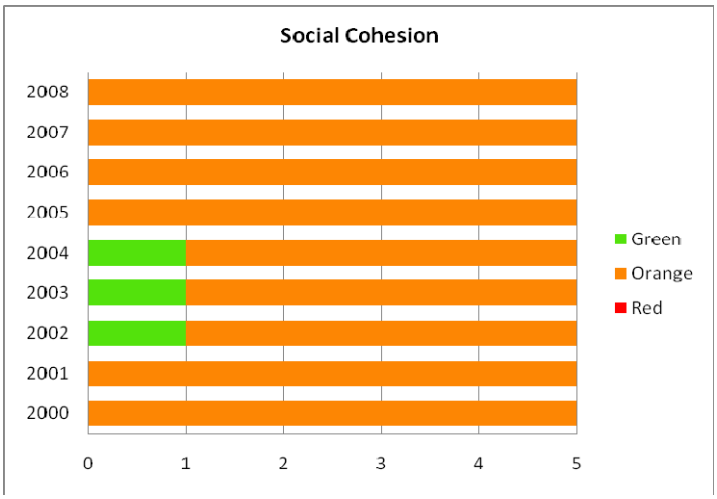
[91] OCDE, OECD Information Technology Outlook 2008, June 2009

3.2.9 Social Cohesion

Table 28: Category I Social Cohesion

Code	Indicator		LU	UE-27	DE	FR	BE	MIN	MAX
I1	Gini Coefficient (2007)	↓	27	30**	30	26	26	SL 23	PT 37
I2	At-risk of poverty rate after social transfers, as a % (2007)	→	14	16	15	13	15	NL 10	LV 21
I3	At persistent risk of poverty rate, as a % (2001)	↓	9	9*	9	9	7	DK 6	PT 15
I4	Life expectancy at birth (2007)	↑	80	79	80	81	80	LT 71	SE 81
I5	Gender pay gap, as a % of gross hourly wages of male employees (2006)	→	14	15	22	11	7	MT 3	EE 25
I6	Serious accidents at work , using a base year index of 1998=100 (2005)	↑	72	78	65	90	62	SK 52	EE 126

*UE-15; **UE-15



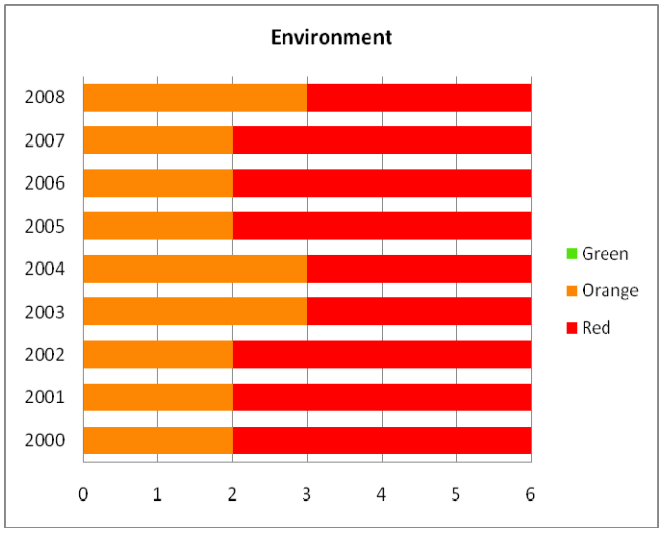
There have been only orange indicators in this category since 2005. In Luxembourg only two of the 6 indicators used, “Life expectancy at birth” and “Serious accidents at work” improved, while two indicators, “At-risk of poverty rate” and the “Gini Coefficient” fell away. Two other indicators, “At persistent risk of poverty rate” and “Gender pay gap” have not been updated, the first since 2001, and the second since 2006.

The indicator “Serious accidents at work”, expressed as the total number of serious work accidents using a base year rate of 100 in 1998 improved between 2004 and 2005, falling from 94 to 72 serious accidents.

3.2.10 Environment

Table 29: Category J Environment

Code	Indicator		LU	UE-27	DE	FR	BE	MIN	MAX
J1	Number of ISO 9001 certifications per millions of in habitants (2007)	↑	410	776	549	361	454	LV 150	IT 1943
	Number of ISO 14001 certifications per millions of inhabitants (2007)	↑	83	121	59	55	59	MT 15	SE 415
J2	Total greenhouse gas emissions: Base index 1990=100 (2007)	↑	98	91	78	94	90	LV 47	CY 185
J3	Electricity generated from renewable energy (2007)	↑	3.7	15.6	15.1	13.3	4.2	CY 0.0	AT 59.8
J4	Volume of municipal waste generated in kg per person, per year (2007)	↓	694	522	564	541	492	CZ 294	DK 801
J5	Energy intensity in kg of oil equivalent per thousands of euros (2006)	↑	159	169	151	165	199	IR 103	BU 1016
J6	Breakdown by passenger transportation method – Percentage of car users in passenger kilometers (pkm) (2007)	↑	89	94	96	93	96	SK 67	LT 137



Luxembourg is still unable to score in the green for Environment category of the 2009 scoreboard. Nonetheless, with the exception of the "Volume of municipal waste generated in kg per person, per year" indicator, all other indicators improved in Luxembourg.

In the wake of a worsening of the greenhouse gas emissions situation between 2000 and 2005 when output rose from 75.7 to 101.7, Luxembourg's position improved, with a reduction in emissions since 2005 recorded at 101 in 2006 and 98.1 in 2007. As part of the Kyoto protocol, in effect since 16 February 2005, Luxembourg is committed to achieving a 28% reduction in greenhouse gas emissions during the period 2008-2012, with relation to their 1990 levels. This level is widely exceeded

today, principally because of CO^2 emissions generated by vehicle combustion, by the coming on-stream of the TGV-Turbine-Gas-Steam electricity production plant in Esch/Belval which generates certain types of greenhouse gas emissions and the strong increase in sales of fuel to cross-border registered vehicles. Even though the fuel is burned outside of Luxembourg territory, the emissions resulting from these sales are attributed to the country. The indicator "Energy intensity of the economy", meaning the degree to which the Luxembourg economy depends on the energy factor, has decreased since 2004, falling from 185.36 in 2004 to 158.53 in 2007.

Luxembourg was able to clearly improve its position in the area of ISO 9001 and 14001 certification, moving from 307 ISO 9001 certifications per million inhabitants and 38 ISO 14001 certifications in 2006 to 410 of the 9001 certificates and 83 of the 14001 certificates in 2007. With regard to certification, following the recent establishment of ILNAS, the Luxembourg Institute of Standardization, Accreditation, Security and Quality of Products and Services[92], all interested parties, especially SME, can attain certification status.

3.3 The TBCO Composite Indicator

"An imperfect, yet meaning filled initial synopsis" (J. Gadrey, 2006)

The strongest feature of composite indicators is their capacity of summarizing the performance of a country in a complex area using a single figure. There are a multitude of methods for making calculations for which the choice depends on hypotheses and on what one wishes to express through a composite indicator. The *Observatoire de la Compétitivité* analyzes competitiveness of the Luxembourg economy through a battery of indicators known as the Competitiveness Scoreboard, which is based on a competitiveness report produced by Professor Fontagné[93]. The Composite Indicator Luxembourg Competitiveness is used to summarize the indicators found in the Competitiveness Scoreboard. Indeed, the advantage of the composite indicator is its strength in summarizing Luxembourg's performance in the area of competitiveness using a single figure. However, it is still essential to perform a detailed analysis of the basic indicators of the Scoreboard and to discuss why

[92] For more details see: http://www.ilnas.public.lu
[93] The Fontagné Report (2004)

Luxembourg has gained or lost in competitiveness with relation to other Member nations.

3.3.1 Results of the TBCO indicator

Table 30 : Ranking of the Competitiveness Composite Indicator for 2000 to 2008

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

Source: *Observatoire de la Compétitivité*[94]

In 2008, Luxembourg was in the 13th position thus ceding 3 positions compared to 2007. The Scandinavian countries and the Netherlands remain the favorites in the ranking and have been for nine consecutive years. Luxembourg's three bordering countries were all able to improve their standings as well. Germany rose from the 11th to the 8ith position, Belgium from the 20th to the 19th and France from the 13th to the 10th slot. Since the 2004 Fontagné Report, Luxembourg's overall standings have deteriorated from the 7th to the 13th position. This finding should nonetheless be put into perspective through a detailed analysis of Luxembourg's ranking by categories.

[94] Here the so-called "central scheme" method of calculation in use since 2005 is introduced. The method calls for an equal weighting of the ten categories, with the indicators standardized by the min-max method without imputing the missing values.

The World Economic Forum confirms these results. According to WEF, the Czech Republic is the highest placed country from the East, in 31st place. In the *Observatoire de la Compétitivité* ranking, the Czech Republic is classed in the top five countries. Its stellar performance is explained primarily by the proper functioning of its markets, a favorable institutional and regulatory framework and the country's efforts in the area of innovation and R&D. As with the WEF ranking, the Baltic nations took a severe beating from 2007 to 2008, with Estonia, Lithuania and Latvia losing respectively 3, 7 and 9 positions in the ranking.

3.3.2 Luxembourg versus Ireland. What lessons may be drawn?

The Celtic Tiger, Ireland, has caught up with the most advanced countries in the EU between 1988 and 2007 becoming along the way one of the richest countries in the EU, going from a GDP that was only 58% of the EU average in 1988 to 150.4% in 2007. Over the period 1997-2007, Ireland's average growth rate was nearly 7%. It did not suffer a recession in the early 2000s, as did the U.S. and many other countries in continental Europe.

Nonetheless, the scope of this growth can be seen from several perspectives, starting with the size of Ireland's economy. Just like Luxembourg, Ireland has a small economy of 3.85 million inhabitants and growth is propelled principally by direct foreign investment. Ireland is very open to the exterior, to such an extent that many now view it as one of the most globalized economies in the world.

A look at the share of sectors in gross value added at basic prices in Ireland reveals that construction, real estate, leasing and business services represent a rather large part, 27.4% as compared to 25.9% in Luxembourg. Financial businesses represent only 10.6% of gross added value in Ireland, while in Luxembourg they account for 27.3%. Manufacturing also carries heavy weight in Ireland at 21.9%, in contrast to 8.6% in Luxembourg.

In 2008, Ireland, the prodigal son of Europe's Economy, bore the full brunt of the international financial crisis that had been developing since the summer of 2007 in the United States. The crisis was caused by a domestic real estate crash that came on top of the sudden braking of the world economy and by the international business situation in the wake of the international financial crisis.

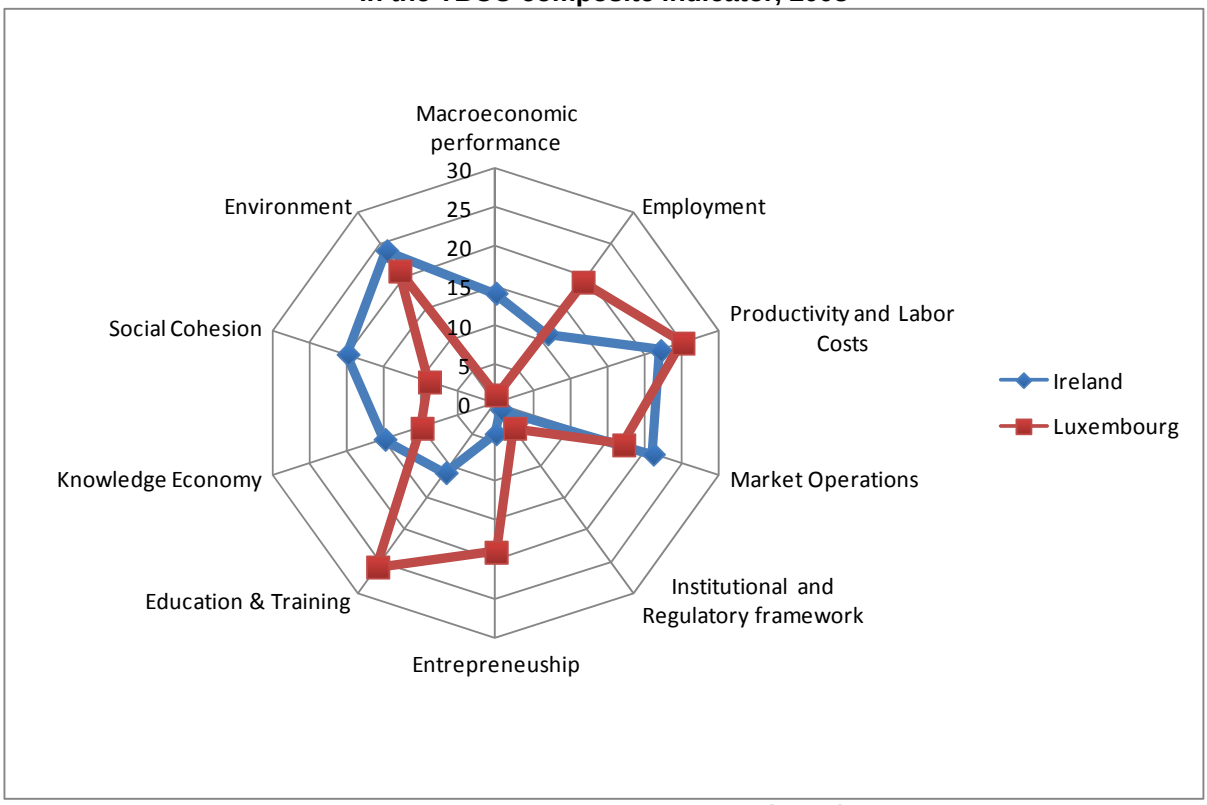
According to “The Economist”, over the past decade ending in 2006, residential real estate prices in Ireland have increased more than in any other developed economy. The explanation for this phenomenon was a very strong demand for real estate, fueled by impressive increases in employment and population. An increase in private credit facilities also accelerated between 2003 and the end of 2005, the result of a phenomenal expansion in mortgage loans and loans to companies in the real estate sector. Mortgage loans rapidly increased the indebtedness of households in recent years, to the extent that it is now among the highest of OECD countries. In conjunction with the significant proportion of variable rate loans, Ireland is more sensitive to changes in interest rates than any other euro zone country.

After the real estate bubble burst, construction, which represented one quarter of the country’s production, shed a considerable number of jobs because of the drop in business. Furthermore, annual residential construction fell from 90,000 new homes to fewer than 45,000 in one year. Real estate agents had great difficulties in selling new products in spite of reductions in price of 30%.

Let us compare structural competitiveness of Ireland with that of Luxembourg using the Competitiveness Scoreboard.

An analysis of Ireland and Luxembourg using the TBCO composite indicator ranks Luxembourg higher in the categories of Macroeconomic Performance, Market Operations, Knowledge Economy, Social Cohesion and Environment. In the areas of Regulatory Framework and Productivity and Labor Cost the two countries’ performance is similar. Ireland ranks higher than Luxembourg in the areas of Employment, Education and Training and Entrepreneurship.

Figure 20 : Rankings of Ireland and Luxembourg
In the TBCO composite indicator, 2008



Source: *Observatoire de la Compétitivité*

a. Macroeconomic performance

According to European Commission forecasts, Ireland's business community will experience a clear slowdown in 2009, registering a 9% drop in the real GDP growth rate, while during the period of 2000 to 2007, its lowest rate of growth was 4.5%.

The unemployment rate went from under 5% to over 6% in 2008, essentially because of layoffs in the construction sector. According to the OECD, the increase in unemployment should ease off; however the listlessness in the economy will likely bring on clear emigration movements.

In the area of public debt, Ireland appears to have arrived at a record deficit of €12.7 billion in 2008, which amounts to 6.8% of GDP. One particularly disquieting occurrence is the decline in tax revenue. The largest drops in revenue occurred in VAT receipts, which fell 26%, a 22% drop in Capital Gains Tax revenue, the Corporation Tax, which retreated 20% and a 15% diminution of Stamp Duties receipts; Income Tax revenue fell only 9%. With regard to expenditures, increases are primarily in the area of social costs, namely unemployment benefits. This

significant worsening of the public accounts situation is reflected by a soaring public debt to GDP ratio, which has progressed from 25% at the end of 2007 to 41% by the end of 2008.

The extent of openness of the Irish economy is nearly 100 %. In this context, growth in Ireland is, from the accounting perspective, very sensitive to exports, even before considering the slightest macroeconomic domino effect. When comparing this trend to other small OECD countries such as Luxembourg, one must remember that the singularity of Ireland does not lie in the extent of openness of its economy in 1970 or in 2001, but rather in the strong increase of the extent of this openness between these two dates.

The risks of relocation related to losses in competitiveness were even higher since Ireland's development was from the beginning very dependent on investments by major international groups. Firstly, the decision making centers for these groups are not located in Ireland and are probably little attached to the prospect of continuing operations there. Then, those businesses currently located in Ireland generally make up only a very small part of the overall production process. This is very clearly the case for businesses that outsource services. Lastly, companies do not choose to locate in Ireland in order to penetrate the Irish market, or the UK market for that matter, but to export to the entire EU, as it is now possible to do from Central and Eastern Europe. According to the foreign direct investment agency (IDA), 48% of this type of investment originates in the United States and 43% in the European Union.

b. Employment

Ireland has attracted a large number of Eastern European immigrants with its open borders policy and its flexible labor market. Still, according to the OECD, immigrants have not supplanted the local population from the job market. Proof of this resides in the fact that the unemployment rate has fallen, going from 16 % in 1993 to around 5% 2007. On the contrary, immigration has allowed a full employment economy to continue to grow.

In the wake of the financial crisis of 2008, the number of EU-12 migrants began to fall. With this situation, housing prices, which were soaring before the crisis, are now falling off.

c. Productivity and Labor Costs

In a memo to Eurogroup, the European Commission describes the weaknesses of Ireland as follows: "*Price and wage inflation pressures together with a decline in productivity growth have gradually eroded Ireland's competitive position and the external deficit has been on the increase since 2004. This weakened competitive position has increased the vulnerability of the economy to the slowdown in Ireland's main trading partners (...). The recent deterioration in the external position mainly reflects recent overinvestment in the non-productive housing sector. Ireland's successful catching-up is strongly linked to exploitation of her competitive advantages (...). While for internationally-traded services labor costs proper may be less important, an adjustment to restore wage competitiveness is necessary for the economy as a whole. (...) The pay pause included in the most recent agreement between the social partners is a first step in addressing the current misalignment between wage growth and productivity growth (...)*".

In this memo, the European Commission also addresses the issue of competitiveness in Luxembourg, noting a worsening of the situation: "*The cost competitiveness of Luxembourg has deteriorated since 2000, due to a faster rise in labor costs that in its main trade partners. The latter is the result of both a stronger increase in wages (...) and a slower rise in productivity (...). The deterioration played an important role in the decline of the country's goods export performance, partially compensated by a favorable composition of the exports basket but reinforced by an unfavorable geographical distribution of exports. No similar decrease can be observed in Luxembourg's export performance of services (...)*".

Initially, exports were perceived as a way to get out of the this crisis because they make up a large part of the domestic economy through the significant numbers of multinationals that use Ireland as a port of entry into Europe. Now the financial crisis has engendered an economic slowdown, particularly in the real economy, in the main destination markets for Irish exports, which has naturally slowed exports from Ireland. Another factor has entered into play on top of the slowing of external demand: rising costs and wages and the slowing of productivity in Ireland have brought on a drop in the country's cost competitiveness situation, which delivered a further blow to Irish exports.

d. Institutional and Regulatory Framework

In Ireland, the tax system is very favorable in the housing area and there has been an increase in the tax deduction ceiling for first-time buyers. The elimination of duties for first-time buyers and the rationalization of these duties in other cases, which result in lower payments for most home buyers, will be beneficial to the efficiency and flexibility of the housing market. Grants for low income persons are primarily for new housing. This option is costly and only provides help to a limited group of people. Demand was pulled along by investors buying housing to subsequently rent, who in 2003 accounted for some 20% of new mortgage loans. The boom was sparked by tax incentives re-introduced by the government in 2002, after having been stopped in 1998. They made it possible to deduct interest on loans, implemented a reduction of registration fees for transactions, and lowered the capital gains tax.

Corporate tax rates for 2008 were very low in Ireland at 12.5%. In contrast, the rates in Luxembourg were 29.6%, higher yet than the EU average of 23.6%. In Ireland, social contributions are at about one half of the Community's average.

e. Education & Training and Knowledge Economy

Ireland has become a European platform for the worldwide computer industry and a zone for sub-contracting related services, such as call centers or software translation. In ICT sectors, direct foreign investment originating in the U.S. has been massive since the end of the 80s and has contributed to Irish economic performance.

Forty percent of all of Ireland's high technology exports are directed to destinations outside of the EU, while this is true for only 2% of Luxembourg's high tech exports. The situation is reversed with regard to imports. Seventy-five percent of Luxembourg's imports in the area of high technology come from countries outside of the EU while this is true for only 38% of Irish high tech imports.

The following report appeared in Figaro magazine: "As from 8 January 2009, the U.S. computer giant Dell decided to transfer its operations to Poland and therefore closed its manufacturing facility in Ireland. Dell has been the largest exporter to Ireland since 1990. All the other major computer manufacturers, Apple, HP, Wang and Digital, have already shut down operations in Ireland to find cheaper labor in

Eastern Europe. In addition to the 1,900 layoffs at Dell, some 1,500 other jobs with sub-contractors who work almost exclusively with the factory around Limerick are directly threatened. In addition, some 3,000 other jobs will be impacted by the drop in activity in the region. These are colossal figures for the 90,000 inhabitants in Limerick. “

f. Social Cohesion and Environment

Ireland has a high rate of owner occupants of properties, which is partly due to the social and cultural preferences of the country. The impressive expansion of the residential real estate sector is due to the fact that all the factors that bear a positive influence on the demand for housing were present in recent years, including the relaxation of credit requirements, tax incentives, investor demand and demographic and socio-economic factors.

The consequence has been strong pressure on prices and an impact on the Irish financial system, with 50% of bank portfolios tied up in the real estate sector.

The impact on household consumption is two pronged. First an indirect impact has been felt with the slowing of economic activity, falling prices, repercussions on employment and income, all of which impact consumption. Then a direct impact struck, with a large portion of household wealth tied up in real estate that drops in value with the fall in prices. No other OECD country has managed to retain the range of tax advantages that Ireland holds in the housing sector.

The private sector’s debt ratio was at 216 % of GDP at the end of 2006, as opposed to 100% in the late 90s. This is one of the highest ratios in the European Union. The rapidity with which this evolved is an additional worry. The Central Bank & Financial Services Authority of Ireland (CBFSAI) also stressed that the excessive percentage of real estate operations in income and loan portfolios of banks, the lowering of net interest rate margins, a prospective reduction of reserves and a growing dearth of financing sources are all equally elements that serve to aggravate vulnerabilities. Financing requirements are met largely by issuing securities and loans on the interbank market. Increases in this are disquieting, because financing in this manner is more costly than financing with customer deposits, which reduces revenue, as interbank market financing is more susceptible to blows impacting confidence than financing with deposits. Liquidity risk is attenuated by the fact that a large number of

these debt obligations have medium term maturities and because of the relatively wide scope of financing options available to the domestic banking sector.

3.3.3 Results for the 10 categories

In the ten categories, Luxembourg is poorly placed in Category C - Productivity and Labor Costs, Category B – Employment, Category F – Entrepreneurship, Category G - Education and Training and Category J - Environment.

Luxembourg can defend its number one spot in Macroeconomic performance. The Institutional and Regulatory Framework category is favorable to Luxembourg compared with other Member States: Luxembourg holds the 6th place out of 27. Knowledge Economy is currently developing in Luxembourg, although more effort is needed in this category: Luxembourg is placed 6th in this area.

France has had poor performance in the area of employment, with an 18th place ranking in Category B Employment. The same observation could apply to Belgium and to Luxembourg. Germany has scored well in the Knowledge Economy category and holds the 6th place in the *Observatoire de la Compétitivité* ranking. Belgium is ranked first in Social Cohesion. WEF has just confirmed these ranking results in its 2009-2010 report.

Table 31: The 2008 Composite Indicator by Category

2008	Cat. A	Cat. B	Cat. C	Cat. D	Cat. E	Cat. F	Cat. G	Cat. H	Cat. I	Cat. J
Austria	10	9	6	12	8	23	13	8	6	8
Belgium	19	22	7	15	27	25	15	7	**1**	18
Bulgaria	3	16	26	11	20	7	20	22	13	23
Cyprus	11	5	8	27	7	6	17	23	21	27
Czech Republic	22	4	**1**	3	4	8	8	3	23	12
Denmark	8	2	18	2	12	27	3	6	5	16
Estonia	17	6	23	**1**	**1**	16	14	13	27	13
Finland	4	8	15	5	14	24	2	**1**	12	10
France	16	18	4	7	16	17	18	9	7	17
Germany	14	7	12	21	13	21	9	4	15	15
Greece	24	20	5	6	24	**1**	22	25	18	21
Hungary	27	27	22	24	23	15	19	16	14	5
Ireland	15	11	20	19	2	5	16	14	19	25
Italy	23	24	16	9	25	10	25	15	17	2
Latvia	26	10	27	4	18	11	12	26	26	11
Lithuania	18	13	11	17	17	9	5	24	25	24
Luxembourg	**1**	**19**	**24**	13	6	**18**	**24**	10	9	**22**
Malta	20	26	13	25	5	14	26	18	2	26
Poland	7	25	25	14	26	3	11	21	20	19
Portugal	21	14	17	22	10	4	27	20	22	20
Rumania	12	23	3	26	22	13	7	12	11	7
Slovak Republic	13	21	21	18	21	2	23	27	24	9
Slovenia	2	15	19	23	3	19	6	11	3	4
Spain	25	17	2	16	11	12	21	17	16	6
Sweden	6	3	9	10	15	26	**1**	2	4	**1**
Netherlands	5	**1**	10	8	9	20	4	5	8	14
United Kingdom	9	12	14	20	19	22	10	19	10	3

Note: Cat. A Macroeconomic Performance, Cat. B Employment, Cat. C Productivity and Labor 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
Source: *Observatoire de la Compétitivité*

In order to analyze the impact of the financial crisis on the performance of Member States, it is useful to analyze gains and losses in rankings by category between 2007 and 2008. The above table shows changes in rankings from 2007 to 2008 by country indicating improvements and drops in the rankings by category of each Member state with + or - signs. Comparing data from one year to the next makes it possible to locate the categories that are comprised essentially of economic indicators. Rankings in the categories fluctuate significantly from one year to another. There are major variations apparent in rankings in Categories A (Macroeconomic Performances) and C (Productivity and Labor Costs).

Table 32 : Difference between the 2007 and 2008 rankings

2008-2007	Cat. A	Cat. B	Cat. C	Cat. D	Cat. E	Cat. F	Cat. G	Cat. H	Cat. I	Cat. J
Austria	6	2	-1	4	0	-1	0	-1	0	0
Belgium	1	-1	3	-3	0	0	0	1	0	0
Bulgaria	11	3	1	0	0	0	0	-1	0	0
Cyprus	2	0	6	-1	0	-1	-1	2	0	0
Czech Republic	0	0	1	7	2	0	0	1	0	0
Denmark	0	-1	7	1	-2	0	0	-3	0	0
Estonia	-7	1	-14	0	0	-3	0	0	0	0
Finland	-1	1	-12	-1	0	0	0	0	0	0
France	5	0	14	-2	0	0	0	1	0	0
Germany	9	3	3	-2	0	0	0	1	0	0
Greece	2	0	7	0	0	0	1	2	0	0
Hungary	0	-2	2	0	-1	0	0	0	0	0
Ireland	-13	-5	-16	-1	0	1	1	3	0	0
Italy	1	-1	3	8	0	0	0	-1	0	0
Latvia	-15	-2	-5	-2	0	0	0	-2	0	0
Lithuania	-14	-1	0	-10	0	0	0	-1	0	0
Luxembourg	**0**	**-2**	**-18**	**0**	**-1**	**0**	**0**	**-1**	**0**	**0**
Malta	-2	-2	3	0	-2	0	0	1	0	0
Netherlands	0	1	7	1	0	0	0	1	0	0
Poland	5	2	-2	1	0	1	-1	1	0	0
Portugal	4	-1	-4	-1	1	-1	0	0	0	0
Rumania	5	3	-2	1	1	3	0	0	0	0
Slovak Republic	6	1	5	5	0	0	-1	-1	0	0
Slovenia	4	1	-11	-3	1	0	0	0	0	0
Spain	-10	-2	18	-2	1	0	0	-2	0	0
Sweden	1	0	12	-2	0	0	0	0	0	0
United Kingdom	0	2	-7	2	0	1	1	-1	0	0

Source: *Observatoire de la Compétitivité*

There are few changes in the other categories. These categories are made up primarily of structural indicators. The presence of structural and economic indicator categories, the cells in the above tables are colored in red and green, when rankings have fallen or risen by three positions or more. Light pink indicates that the rankings have not moved.

It is interesting to note that Ireland has lost the most in rankings in the two economic categories. In Macroeconomic performance, Ireland lost 13 positions in the ranking and in Productivity and Labor Costs, the country dropped 16 positions. Luxembourg is able to hold its leading slot in the Macroeconomic performance category. This ranking is primarily due to indicator scores in GDP per inhabitant, public debt, public deficits and direct foreign investment. These indicators have worsened in Luxembourg, but are still favorable. In Productivity and Labor Costs, Luxembourg lost 18 positions.

The following table shows the differences in ranking of the Member States between 2004 and 2008. One can see that there are slight differences in the more structural categories, even though these are more moderate than those in the cyclical categories. This shows how much time is needed for a reform or a structural policy such as implemented since the 2004 Fontagné report to bear fruit and to be reflected in the statistical indicators.

Table 33: Differences between the 2004 and 2008 rankings

2004-2008	Cat. A	Cat. B	Cat. C	Cat. D	Cat. E	Cat. F	Cat. G	Cat. H	Cat. I	Cat. J
Austria	10	1	-3	0	1	-3	-3	0	2	0
Belgium	-3	-2	-5	1	0	-2	-1	0	0	2
Bulgaria	2	9	0	-10	-3	0	0	1	1	1
Cyprus	-7	0	9	0	-1	-1	2	1	-2	0
Czech Republic	-5	-1	18	1	0	3	-4	3	0	-1
Denmark	5	-1	-13	6	-5	0	0	-3	-3	-2
Estonia	-14	5	-14	1	0	-7	1	-1	0	2
Finland	2	0	-8	8	-3	1	0	1	-5	0
France	7	-4	6	2	3	0	-1	0	2	-1
Germany	13	2	-6	-2	3	3	-1	1	-4	4
Greece	-5	-1	9	4	-2	1	1	1	0	0
Hungary	-12	-4	-1	1	2	-1	-3	2	1	0
Ireland	-13	-5	0	5	0	1	2	3	2	0
Italy	3	0	2	9	-1	0	0	1	-1	2
Latvia	-16	2	-16	2	2	2	0	1	-2	-4
Lithuania	-6	2	5	-10	-7	-1	2	-2	1	-6
Luxembourg	**0**	**-2**	**-12**	**-2**	**-3**	**-3**	**-2**	**0**	**1**	**1**
Malta	4	-4	11	1	7	4	0	-7	4	0
Netherlands	9	3	-2	6	-1	2	1	-1	-4	8
Poland	18	2	-12	9	0	1	2	-2	0	-6
Portugal	-3	-7	10	-5	4	-1	0	0	0	-3
Rumania	10	3	12	-4	1	3	2	1	2	-1
Slovak Republic	8	0	-20	-15	-3	-1	1	-2	1	0
Slovenia	6	3	4	-2	2	2	0	3	2	-2
Spain	-16	-1	23	-1	4	0	0	-2	1	6
Sweden	1	-1	-5	-5	-2	0	0	-1	-1	0
United Kingdom	2	1	8	0	2	-3	1	2	2	0

Source: *Observatoire de la Compétitivité*

Naturally, one must keep in mind that the rankings are relative. A gain or drop in the rankings can be due to an improvement or worsening of the situations in other Member States.

Luxembourg dropped 3 positions in Category E between 2004 and 2008. A look at the indicators within the category brings to light several factors. The Corporate Taxes indicator is stable in Luxembourg between 2004 and 2008, while in other Member

States like Germany, Austria, Bulgaria, Denmark, Cyprus, Spain and the Netherlands all greatly reduced taxes on companies.

Luxembourg has made significant progress in public services available through the Internet indicators since 2004. Yet in terms of levels, Luxembourg's performance is somewhat thin. Luxembourg recorded a score of only 40% compared to Austria's 100% of public services available on the Internet. Luxembourg has good rankings—in the green zone—in the three World Bank indicators that measure regulatory quality, rule of law and efficiency in the administration compared to other Member States, yet these indicators have worsened since 2004 in Luxembourg, while many other States' indicators have improved over the same period.

Luxembourg dropped 12 positions in the rankings for the Productivity and Cost of Labor indicator between 2004 and 2008.

3.3.4 Alternative Methodology and Schemes

As it is impossible to furnish a pre-determined methodology for setting up an indicator, the OECD has proposed in its manual dedicated to the construction of composite indicators guidelines to follow. Each calculation method offers hypotheses supporting one or another of the methods. Now results can be influenced depending on the calculation method employed. In order to test the solidity of the composite index, the *Observatoire de la Compétitivité* requested an audit of the composite indicator by European Commission experts so as to highlight both the weaknesses and strengths of the competitiveness composite indicator. With this analysis, the *Observatoire* is presenting the TBCO indicator calculated using the method used since 2005, which has subsequently come to be called the central scheme. Subsequently, other methods are introduced to show the potential impact of changes on final results.

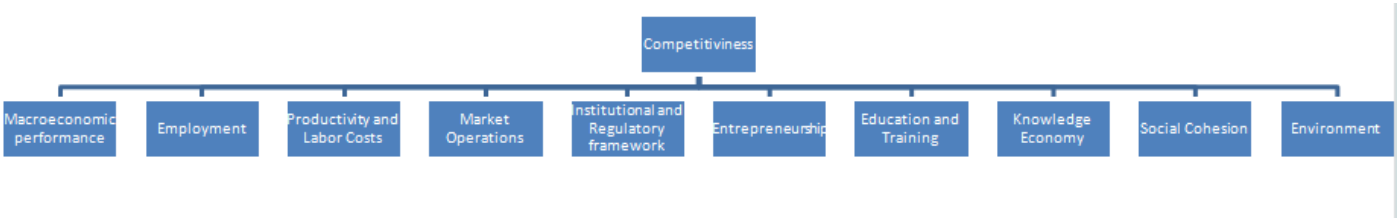
3.3.4.1 The Theoretical Framework

In the first stage of building a composite indicator, it is important to understand the phenomenon or concept. We are concerned with a composite indicator for measuring the competitiveness of Luxembourg with respect to that of the other Member States.

To define the concept of competitiveness, the *Observatoire de la Compétitivité* refers to the definition provided by the Economic and Social Council (ECS): "*(...) the primary role of the State is to contribute to the attainment and maintenance of a tenable and elevated quality of life for the population of a country*." According to ECS, competitiveness is therefore the means and the existence of conditions that make it possible to achieve these objectives: "*A country is competitive if a) its productivity increases at a rate similar or greater than that of its primary trading partners that have a comparable level of development, b) if it can maintain an equilibrium within the framework of an open economy and, c) if it is experiencing a high level of employment*."

This definition was also used in the Fontagné report. It was using this as a basis that Fontagné developed the Competitiveness Scoreboard in conjunction with the social partners, from which the composite index is taken. The 79 indicators that were selected for the Fontagné report should reflect all the elements of the definition of Competitiveness. These elements have been classified into 10 categories.

Figure 21:The 10 categories of the Competitive Scoreboard



Source: *Observatoire de la Compétitivité*

3.3.4.2 Selection of data

Good quality basic indicators are important for establishing a quality composite indicator. The majority of the indicators used come from the Eurostat, OECD or World Bank databases. These institutions guarantee the harmonization and quality of these data through the application of a good practices code.

3.3.4.3 Imputation of Missing Data

The series for most of the indicators are complete. With the exception of OECD data, some data for EU Member States that are not OECD members are lacking. These data are not attributed in the central scheme. In an alternative scheme, the missing

data are replaced by average UE-27 values, average UE-25 values, average OECD values or average UE-15 values.

3.3.4.4 Standardization

There exist several standardization methods. The OECD has recommended several methods, explaining their benefits and disadvantages. The *Observatoire de la Compétitivité* chose to employ a simple min-max or re-scaled values method. In their initial stages, base indicators were standardized. Each indicator *i* is transformed using the following formula according to country *j* over time *t*.

$$y_{ij}^{t} = \frac{x_{ij}^{t} - Min(x_{j}^{t})}{Max(x_{j}^{t}) - Min(x_{j}^{t})}$$

Another method would be to apple the z-score method, subtracting the average for each indicator and dividing by the standard deviation of the series.

$$y_{ij}^{t} = \frac{x_{ij}^{t} - Average(x_{ij}^{t})}{\sigma_{ij}^{t}}$$

The composite index *CI* of the category of sub-indicators at moment *t* is calculated using a weighted average of sub-indicators in the new scale:

$$CI_{i}^{t} = \frac{\sum_{j=1}^{m} q_{j} y_{ij}^{t}}{\sum_{j=1}^{m} q_{j}},$$

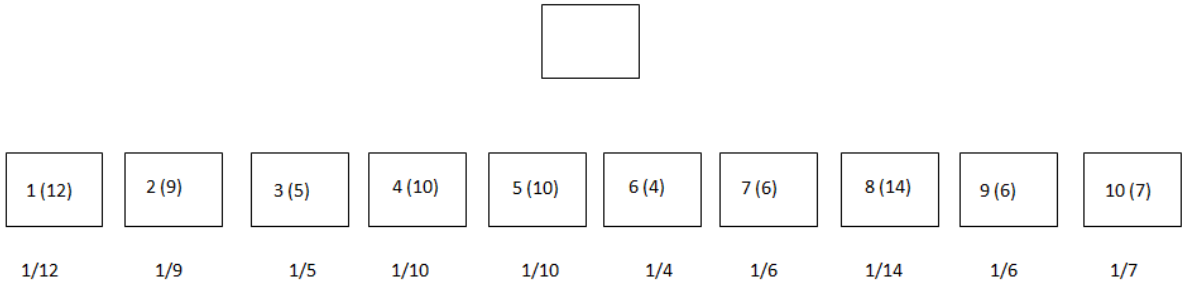
To analyze the soundness of the results obtained using this method, we compare the results obtained through the min-max method with those obtained by applying another standardization method, that of the z-scores.

3.3.4.5 Weighting and Aggregation

Each sub-category in the TBCO composite indicator has the same weighting in that we are working from the principle that each category contributes to competitiveness in an equal fashion. Given that the number of indicators per category varies from one category to the next, there exists an ‘implicit’ weight of indicators. The indicators from

the first category have a weighting of 1 to 12 in the TBCO composite indicator, those in category 2 have a 1 to 9 weighting, those in category 3 a 1 to 5 weighting and so on.

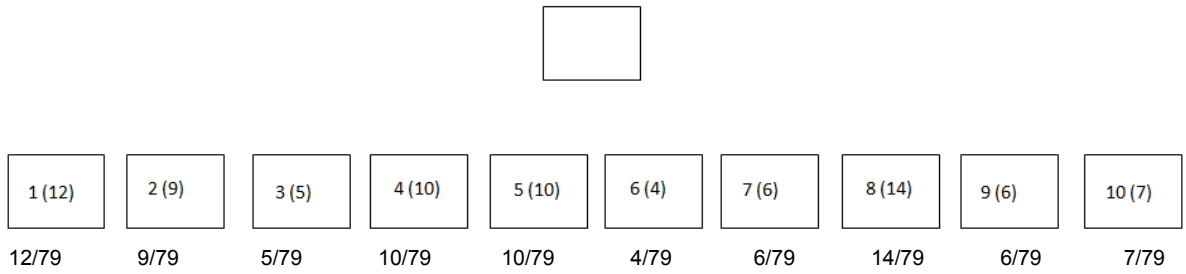
Figure 22: Equal weighting of the categories versus weighting of indicators



Source: *Observatoire de la Compétitivité*

To provide equal weighting of indicators, the TBCO indicator would have to be calculated by taking the average of the 79 base indicators which would implicitly involve over-weighting some categories. The first category contributes 15% (12/79) to Competitiveness while the sixth category, for example, contributes only 5% (4/79) weight, and so on. The layout below clarifies this aspect.

Figure 23: Equal weighting of the indicators versus weighting by categories



Source: *Observatoire de la Compétitivité*

The central scheme assumes that each category contributes in the same manner to competitiveness. This scheme, which has been the one chosen for use since the first Competitiveness Report published since 2006, was introduced above, and the alternative scheme and the equal weighting perspectives will be analyzed below.

3.3.5 Soundness Analysis

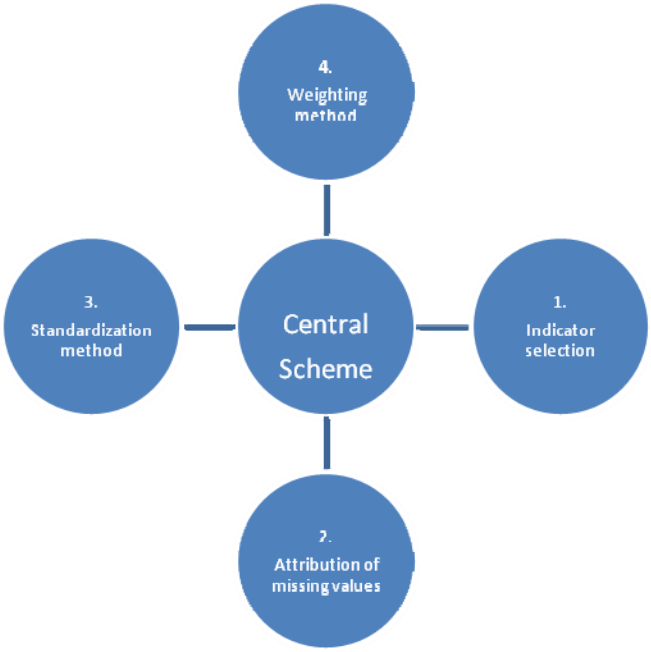
The *Observatoire de la Compétitivité* defines the central scheme as follows:

- 79 indicators from the Competitiveness Scoreboard
- No attribution of missing values

- Use of the min-max method
- Equal weighting of the ten categories

In the soundness tests, we try to discern the difference in results when one of the options below is changed. This increases the number of alternative schemes.

Figure 24 : Soundness Analysis



Source: *Observatoire de la Compétitivité*

Impact of the selection of indicators used

A comparison of the central scenario results with those obtained when removing an indicator from each iteration makes it possible to measure the impact of a choice of indicators against the overall result. In this way, we can get 79 alternative schemes to compare with the central scheme. To facilitate the comparison, results must be presented in terms of distribution of rankings. The table is read as follows: Luxembourg is ranked 13th using the assumptions of the central scheme. By removing an indicator at each simulation, one can see that in 63% of the simulations Luxembourg's rank remains unchanged with regard to the central scheme. In 23% of the simulations, Luxembourg lost one position with relation to the central scheme

and in 6% of the simulations, Luxembourg moved up one position. In 7% of the cases, Luxembourg lost more than one position with regard to the central scheme.

One can see that rankings remain stable for Germany, Austria, Denmark, Finland, Ireland, Slovenia, Sweden, Poland, Portugal and Latvia, when one indicator is removed from each simulation. This occurs generally with those ranked between the 1st and 9th position and the 22nd and 27th position.

Table 34 : Impact of choice of indicators on overall ranking for 2008

	Central Scheme	Rank <Rank CS-1	Rank = Rank CS-1	Rank = Rank CS	Rank= Rank CS+1	Rank> Rank CS+1
Austria	6	0%	0%	**100%**	0%	0%
Belgium	19	5%	21%	**57%**	15%	2%
Bulgaria	16	6%	5%	**44%**	29%	16%
Cyprus	17	7%	29%	**40%**	15%	9%
Czech Republic	2	0%	0%	**78%**	22%	0%
Denmark	5	0%	2%	**98%**	0%	0%
Estonia	12	1%	5%	**83%**	10%	1%
Finland	4	0%	0%	**98%**	2%	0%
France	10	0%	1%	**68%**	29%	1%
Germany	8	0%	4%	**93%**	4%	0%
Greece	15	2%	12%	**72%**	10%	4%
Hungary	26	0%	0%	**79%**	21%	0%
Ireland	9	1%	2%	**90%**	5%	1%
Italy	21	1%	20%	**44%**	30%	5%
Latvia	25	0%	4%	**96%**	0%	0%
Lithuania	22	4%	37%	**59%**	1%	0%
Luxembourg	13	0%	6%	**63%**	23%	7%
Malta	27	0%	21%	**79%**	0%	0%
Pays-Bas	3	0%	22%	**78%**	0%	0%
Poland	23	0%	6%	**90%**	4%	0%
Portugal	24	0%	4%	**93%**	4%	0%
Rumania	18	13%	21%	**48%**	13%	5%
Slovak Republic	20	10%	13%	**59%**	13%	5%
Slovenia	7	0%	0%	**95%**	4%	1%
Spain	14	5%	18%	**63%**	10%	4%
Sweden	1	0%	0%	**100%**	0%	0%
United Kingdom	11	5%	26%	**66%**	4%	0%

Source: *Observatoire de la Compétitivité*

Impact of missing values

The method used for attributing values can also have an effect on the final result of the composite indicator. In the central scheme, missing values are not attributed. When an indicator is absent for a country, the ranking is obtained without the indicator for the country. Where intermediary values for a sequential series of an indicator are missing, these values are replaced by a simple average.

Table 35 : Impact of the attribution method used on the overall rankings in 2008

	Central Scheme	With Attribution of Averages	Gain or Loss of Position
Austria	6	6	0
Belgium	19	20	-1
Bulgaria	16	14	+2
Cyprus	17	12	+5
Czech Republic	2	2	0
Denmark	5	5	0
Estonia	12	13	+1
Finland	4	4	0
France	10	10	0
Germany	8	8	0
Greece	15	23	-8
Hungary	26	27	-1
Ireland	9	11	-2
Italy	21	21	0
Latvia	25	22	+3
Lithuania	22	18	+4
Luxembourg	**13**	**15**	**-2**
Malta	27	25	+2
Netherlands	3	3	0
Poland	23	24	-1
Portugal	24	26	-2
Rumania	18	19	-1
Slovak Republic	20	17	+3
Slovenia	7	7	0
Spain	14	16	-2
Sweden	1	1	0
United Kingdom	11	9	+2

Source: *Observatoire de la Compétitivité*

The simplest method can also be used, known as attribution of the average, in which a missing value is simply replaced by the average value of the EU-27. A comparison between the central scheme and attribution of averages scheme shows that for the majority of new Member States, rankings increase when missing values are replaced by the average values of the EU-27, EU-15, EU-25 or the OECD average. The disadvantage of this attribution method is that in replacing missing values with average values, the performance of new Member States is often overstated. In the table above, it is clear that new Member States pick up between one and five positions in the overall ranking. Luxembourg loses positions with the missing values attribution system.

The Standardization Impact

Not all indicators have the same consistency. One must therefore standardize the base indicators before calculating a composite indicator. The original scheme is calculated using the Min-Max method, while the alternative scheme uses the z-score method. The z-score method consists in subtracting the average from each indicator and dividing it by the standard deviation.

Table 36 : Impact of the Standardization Method on Overall Rankings for 2008

	Central Scheme	Standardization = z-score	Difference
Austria	6	6	0
Belgium	19	21	-2
Bulgaria	16	13	+3
Cyprus	17	19	-2
Czech Republic	2	2	0
Denmark	5	5	0
Estonia	12	12	0
Finland	4	4	0
France	10	11	-1
Germany	8	8	0
Greece	15	16	-1
Hungary	26	27	-1
Ireland	9	10	-1
Italy	21	22	-1
Latvia	25	24	+1
Lithuania	22	20	+2
Luxembourg	13	17	-4
Malta	27	26	+1
Netherlands	3	3	0
Poland	23	23	0
Portugal	24	25	-1
Rumania	18	18	0
Slovak Republic	20	14	+6
Slovenia	7	7	0
Spain	14	15	-1
Sweden	1	1	0
United Kingdom	11	9	+2

Source: *Observatoire de la Compétitivité*

The disadvantage of the Min-Max method is that outliers influence results. With the z-score, indicators with high values are those that most strongly impact the composite indicator. The standardization method has no genuine impact on most members' rankings, however, for Bulgaria, Cyprus, the Slovak Republic and Luxembourg it affects rankings by 3 to 6 positions.

Impact of Weighting

Initially we will attempt a comparison between the results for the central scheme and those for the alternative scheme known as “Weighting Where all Indicators Have the Same Weight”.

Table 37 : Impact of Weighting on overall rankings for 2008

	Central Scheme	Each Indicator Has the Same Weighting	Difference
Austria	6	6	0
Belgium	19	17	+2
Bulgaria	16	16	0
Cyprus	17	15	+2
Czech Republic	2	5	-3
Denmark	5	4	+1
Estonia	12	10	+2
Finland	4	3	+1
France	10	12	-2
Germany	8	7	+1
Greece	15	25	-10
Hungary	26	27	-1
Ireland	9	11	-2
Italy	21	20	+1
Latvia	25	22	+3
Lithuania	22	19	+3
Luxembourg	13	9	+4
Malta	27	26	+1
Netherlands	3	2	+1
Poland	23	23	0
Portugal	24	21	+3
Rumania	18	18	0
Slovak Republic	20	24	-4
Slovenia	7	8	-1
Spain	14	14	0
Sweden	1	1	0
United Kingdom	11	13	-2

Source: *Observatoire de la Compétitivité*

Greece and the Slovak Republic get good scores in the categories using this calculation method, picking up nine and eight positions respectively.

Next, we compare the results of the central scenario with the alternative scheme “With approximately same weighting as central scheme weighting”.

Table 38 : Impact of Weighting on Overall Rankings for 2008

	Central Scheme (CS)	Ranking < Ranking CS-1	Ranking = Ranking -1	Ranking = Ranking CS	Ranking = Ranking CS +1	Ranking > Ranking CS +1
Austria	6	0%	0%	**100%**	0%	0%
Belgium	19	0%	0%	**81%**	19%	0%
Bulgaria	16	0%	0%	**55%**	36%	9%
Cyprus	17	0%	44%	**40%**	16%	0%
Czech Republic	2	0%	0%	**92%**	8%	0%
Denmark	5	0%	0%	**100%**	0%	0%
Estonia	12	0%	0%	**100%**	0%	0%
Finland	4	0%	0%	**100%**	0%	0%
France	10	0%	0%	**75%**	25%	0%
Germany	8	0%	0%	**100%**	0%	0%
Greece	15	0%	0%	**100%**	0%	0%
Hungary	26	0%	0%	**96%**	4%	0%
Ireland	9	0%	0%	**100%**	0%	0%
Italy	21	0%	2%	**64%**	34%	0%
Latvia	25	0%	0%	**100%**	0%	0%
Lithuania	22	0%	34%	**66%**	0%	0%
Luxembourg	13	0%	0%	**86%**	14%	0%
Malta	27	0%	4%	**96%**	0%	0%
Netherlands	3	0%	8%	**92%**	0%	0%
Poland	23	0%	0%	**100%**	0%	0%
Portugal	24	0%	0%	**100%**	0%	0%
Rumania	18	1%	24%	**75%**	0%	0%
Slovak Republic	20	0%	19%	**79%**	2%	0%
Slovenia	7	0%	0%	**100%**	0%	0%
Spain	14	0%	14%	**86%**	0%	0%
Sweden	1	0%	0%	**100%**	0%	0%
United Kingdom	11	0%	25%	**75%**	0%	0%

Source: *Observatoire de la Compétitivité*

Take the results for Luxembourg: by slightly changing the weighting, in 86% of calculations the ranking remains identical to that in the central scheme. In the remaining 14% of calculations, Luxembourg would lose one slot in the ranking. The conclusion to be drawn from this is that Luxembourg benefits from applying the central scheme method. When the weighting is changed slightly, Luxembourg's ranking worsens. The same applies for Bulgaria, Belgium, France and Italy. This contrasts with Rumania, the United Kingdom, Lithuania, Cyprus and Poland, which suffer when the central scheme is used. In fact, by slightly changing the weighting of the indicators, there is a strong chance that these countries gain a position rather than losing one.

These initial tests for determining how sound the system is make it possible to analyze the impact of a change in methodology on the final result of a calculation.

Experts in the area of composite indicators will take these analyses further by doing a full audit on the composite indicator.

3.4 The ISSL: Luxembourg Social Health Index

"*For years we told people whose lives were becoming more and more difficult that their living standards were rising*", stated Professor Stiglitz in his "Report by the Commission on the Measurement of Economic Performance and Social Progress", in September 2009[95].

The idea of setting up a Social Health Index came to the front during a conference organized by the *Observatoire de la Compétitivité* in 2006[96] together with the *Chambre des salariés* (Employees Chamber), formerly known as the *Chambre des employés privés* or the Private Sector Employees Chamber. The *Observatoire* had emphasized the importance of measuring the social progress of a nation—the area which extends beyond simple GDP figures—by setting up a conference entitled "Toward New Indicators of Wealth". During this conference, international experts discussed the limits of GDP as a measure of national wealth and decided to choose other indicators focusing more on households and individuals.

Since this conference, the *Observatoire* has published a Social Health Index annually that is based on a subset of indicators that concentrate more on social than economic well-being, yet which still originate from the Competiveness Scoreboard.

[95] For more details see: http://www.stiglitz-sen-fitoussi.fr/en/index.htm
[96] For more details see: http://www.odc.public.lu/actualites/2006/07/12_ind_rich/index.html

Table 39: Building a Social Health Index for Luxembourg

Categories	Indicators
Unemployment	Unemployment rate
	Youth unemployment rate
	Long-term unemployment
	Unemployment women / men
	Employment rate men / women
Health	Life expectancy at birth
Working conditions	Work accidents
Inequalities	Gini Coefficient
	At-risk of poverty rate
	At persistent risk of poverty rate
	Wage gap between men and women
Environment	Energy intensity
	Share of renewable energy sources
	Greenhouse gas emissions
	Volume of waste generated
Education	Secondary school dropouts
	Percentage of people 25-34 with a university degree
	Percentage of people 25 to 64 with at least a secondary education

Source: *Observatoire de la Compétitivité*

The composite indicator for Social Health in Luxembourg, or the ISSL, is calculated on the basis of indicators from the Competitiveness Scoreboard using the same methodology as the Competitiveness and TBCO composite indicator.

Table 40: Overall Ranking of the ISSL from 2000 to 2008

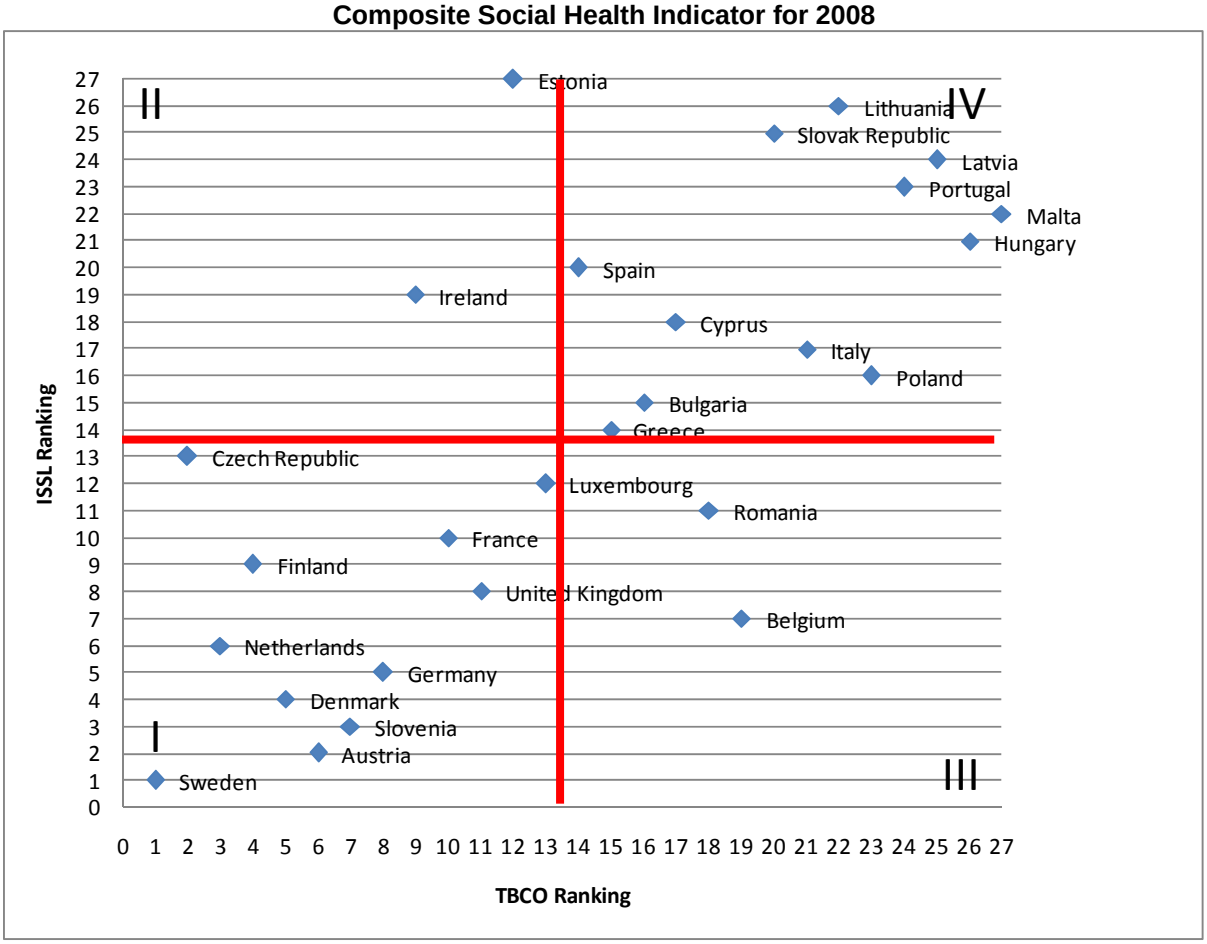
	2008	2007	2006	2005	2004	2003	2002	2001	2000
Germany	5	6	5	5	6	6	5	5	5
Austria	2	2	2	2	2	2	1	1	1
Belgium	7	7	7	7	7	7	6	8	6
Bulgaria	15	19	19	20	22	24	25	26	26
Cyprus	18	18	18	19	20	17	12	20	23
Denmark	4	4	3	3	3	3	3	2	2
Spain	20	15	15	16	17	18	20	17	21
Estonia	27	27	27	27	27	27	27	27	27
Finland	9	9	8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

Source: *Observatoire de la Compétitivité*

Luxembourg ranks 12th in the social health index and has been losing ground consistently since 2005. Sweden, Austria, Slovenia and Denmark have garnered the top slots in this ranking. The Czech Republic, which achieved a number two rank in the Competitiveness index, could only manage 13th in the area of social health.

This comparison can also be done with all of our economic partners and is succinctly summarized in the chart below.

Figure 25 : Ranking of the Composite Competitiveness Indicator Versus Ranking of the Composite Social Health Indicator for 2008



Source: *Observatoire de la Compétitivité*

To better determine the relative position of Luxembourg in the two TBCO and ISSL indicators, the vertical axis of the above graph represents the SHI ranking of the EU countries and the horizontal axis shows the TBCO ranking.

In general, the countries place in quadrant I are those with good performance in the area of social health. Note that Luxembourg is in this group of good performers, along with the Nordic countries, the Netherlands, Austria, the Czech Republic, France and Slovenia. Nonetheless, in contrast with the Nordics, Luxembourg is the country closest to the limit in the area of social health, with a considerably worsened position with regard to previous years. The Czech Republic is ranked in the first quadrant of competitive countries, and is better positioned than Luxembourg in competitiveness and worse so in the area of social health.

Countries situated in the second quadrant are less competitive but perform better in the area of social health. Observe the presence here of Ireland and Estonia.

Quadrant three countries are less competitive but perform better in terms of social health and quadrant four countries have relatively poor performance in both indicators.

Frame 5 : A glimpse at indicators of social well-being in the world

Luxembourg was ranked 12th by its own composite indicator that measures social health in 2008. How does Luxembourg fare in the rankings of international indicators in the area of social well-being?

1) The OECD Global Project: Measuring the Progress of Societies and the Istanbul Declaration

Through the Global Project "Measuring the Progress of Societies" publication, which addresses all levels of society, the OECD aims to promote the implementation of a group of key indicators in the economic, social and environmental areas to provide a global image of the way society is evolving.

It was implicitly understood during the twentieth century that growth was synonymous with progress. The basic principle was that if GDP grew, living conditions would improve. Now, in spite of high levels of growth experienced in many countries, a large number of specialists believe that we are not satisfied, or happy, in our lives as we were fifty years ago, that people have less confidence in others—and in their governments—then before, and that the increase in income comes with a cost that can be measured in terms of insecurity, working time and in heightened complexity. A large part of the world's population is now in better health and people live longer compared to just a few years ago, but environmental problems such as climate change throw a shadow over an uncertain future. Indeed, we have the impression that for each action indicating progress in society, there is another completely inverse action that emerges to offset the gain.

The Project will help us better understand how to measure progress, with the collaboration of experts from the entire world, especially in new and complex areas where no statistical standards yet exist. Data on progress will not be used unless they are reliable, accurate and objective. As a result, the Project will set out quality principles to apply to tools that measure progress and that will later be used to judge whether such or such a recommended indicator series can be accepted or not within the framework of the Project. Accessing reliable data is fundamental in judging our political leaders and demanding accountability from them.

2) Global Footprint Network and the Ecological Footprint of Luxembourg

The ecological footprint of a nation measures the requirements of human ecological activity and how much time this activity remains within the regenerative capability of the biosphere. These measurements help individuals, organizations and governments to set objectives and to move toward sustainability. The most important components of ecological footprints are land used to grow food crops, trees and bio-fuels, ocean domains for fishing and above all land mass required to sustain the vegetation necessary to absorb and capture emissions of CO^2 from the burning of fossil fuels. A country's footprint is therefore taken as a measure of its consumption and environmental impact in the world.

Table 41: Ecological Footprint Results

	Population (million)[6]	Total Ecological Footprint	Cropland Footprint	Grazing Footprint	Forest Footprint[1]	Fishing Ground Footprint	Carbon Footprint[2]	Built-up Land[3]	Total Biocapacity	Cropland	Grazing Land	Forest	Fishing Ground	Built Land	Ecological (Deficit) or Reserve
UE-27	**487,3**	**4,7**	**1,17**	**0,19**	**0,48**	**0,11**	**2,58**	**0,17**	**2,3**	**1,00**	**0,21**	**0,64**	**0,29**	**0,17**	**(2,4)**
Austria	8,2	5,0	1,02	0,26	0,39	0,03	3,07	0,21	2,9	0,67	0,27	1,70	0,00	0,21	(2,1)
Belgium	10,4	5,1	1,44	0,18	0,60	0,03	2,51	0,38	1,1	0,40	0,12	0,23	0,00	0,38	(4,0)
Bulgaria	7,7	2,7	0,83	0,14	0,25	0,01	1,30	0,18	2,8	1,44	0,31	0,76	0,10	0,18	0,1
Republic	10,2	5,4	1,12	0,00	0,69	0,01	3,33	0,20	2,7	1,38	0,16	1,00	0,00	0,20	(2,6)
Denmark	5,4	8,0	2,49	0,00	1,00	0,67	3,53	0,34	5,7	3,03	0,05	0,25	2,02	0,34	(2,3)
Estonia	1,3	6,4	0,84	0,14	2,37	0,08	2,79	0,18	9,1	1,33	0,41	2,69	4,48	0,18	2,7
Finland	5,2	5,2	1,24	0,06	1,96	0,15	1,68	0,16	11,7	1,53	0,10	7,22	2,73	0,16	6,5
France	60,5	4,9	1,28	0,32	0,39	0,17	2,52	0,25	3,0	1,55	0,34	0,73	0,17	0,25	(1,9)
Germany	82,7	4,2	1,21	0,09	0,36	0,04	2,31	0,21	1,9	1,01	0,11	0,53	0,08	0,21	(2,3)
Greece	11,1	5,9	1,48	0,33	0,27	0,06	3,63	0,09	1,7	0,93	0,32	0,11	0,24	0,09	(4,2)
Hungary	10,1	3,5	1,48	0,00	0,38	0,01	1,49	0,20	2,8	1,99	0,15	0,47	0,01	0,20	(0,7)
Ireland	4,1	6,3	0,65	0,50	0,46	0,38	4,03	0,24	4,3	0,89	1,08	0,19	1,86	0,24	(2,0)
Italy	58,1	4,8	1,19	0,22	0,43	0,06	2,77	0,10	1,2	0,70	0,14	0,22	0,06	0,10	(3,5)
Latvia	2,3	3,5	0,84	0,11	1,77	0,16	0,51	0,10	7,0	1,11	0,85	2,92	2,00	0,10	3,5
Lithuania	3,4	3,2	1,00	0,13	0,81	0,14	0,95	0,17	4,2	1,81	0,57	1,35	0,28	0,17	1,0
Netherlands	16,3	4,4	1,31	0,09	0,36	0,16	2,29	0,18	1,1	0,31	0,08	0,08	0,48	0,18	(3,3)
Poland	38,5	4,0	1,10	0,16	0,52	0,04	2,06	0,08	2,1	1,14	0,17	0,59	0,11	0,08	(1,9)
Portugal	10,5	4,4	0,93	0,40	0,20	0,30	2,58	0,04	1,2	0,28	0,36	0,47	0,08	0,04	(3,2)
Romania	21,7	2,9	1,20	0,05	0,31	0,02	1,13	0,17	2,3	1,01	0,23	0,76	0,09	0,17	(0,6)
Slovakia	5,4	3,3	0,96	0,03	0,58	0,01	1,52	0,19	2,8	1,14	0,18	1,31	0,00	0,19	(0,5)
Slovenia	2,0	4,5	0,87	0,29	0,50	0,01	2,68	0,11	2,2	0,27	0,32	1,49	0,00	0,11	(2,3)
Spain	43,1	5,7	1,30	0,33	0,35	0,31	3,41	0,04	1,3	0,73	0,32	0,18	0,06	0,04	(4,4)
Sweden	9,0	5,1	0,95	0,31	2,59	0,10	0,95	0,20	10,0	1,42	0,34	5,39	2,63	0,20	4,9
Kingdom	59,9	5,3	0,87	0,21	0,46	0,08	3,51	0,20	1,6	0,64	0,17	0,09	0,55	0,20	(3,7)
Norway	4,6	6,9	0,78	0,44	0,63	3,35	1,55	0,17	6,1	0,78	0,43	2,78	1,96	0,17	(0,8)
Switzerland	7,3	5,0	0,66	0,18	0,27	0,03	3,73	0,14	1,3	0,31	0,18	0,64	0,01	0,14	(3,7)

Source: Ecological footprint; http://www.footprintnetwork.org

Luxembourg is not yet included in the rankings despite having been analyzed in order to calculate its ecological footprint. The Henri Tudor Public Research Center's Resource Center for Environmental Technologies (CRTE), working under the direction of the High Council for Sustainable Development (CSDD), is preparing the report together with the Global Footprint Network. This work is being done in close collaboration with the University of Luxembourg and the Center for Population, Poverty, and Socio-Economic Policy Studies (CEPS).

3) UNPD – HDI

The UNPD publishes a human development indicator known as the Human Development Index (HDI) annually. The indicator brings three dimensions of human development to play, including longevity and health measured in terms of life expectancy, education measured by literacy among adults and school enrollment in primary, secondary and higher education and decent standards of living, to include income, measured in purchasing power parity.

Luxembourg is ranked 14th in this index. An analysis of the difference between the ranking of Luxembourg in terms of HDI and in the area of per capita GDP, appearing in the last column of the table below, shows that Luxembourg's ranking would increase by 13 positions if the human development indicator were measured solely on the basis of per capita GDP.

As in the ranking using the Luxembourg composite indicator, the Scandinavian countries lead the pack. The New Member States posted rather poor performance, ranking between positions 18 to 30.

Table 42 : Results of the 2008 HDI

	Human development index (HDI) value 2005	Life expectancy at birth (years) 2005	Adult literacy rate (% aged 15 and above) 1995-2005	Combined gross enrolment ratio for primary, secondary and tertiary education (%) 2005	GDP per capita (PPP US$) 2005	Life expectancy index	Education index	GDP index	GDP per capita (PPP US$) rank minus HDI rank
1 Iceland	0.968	81.5	..	95.4	36,51	0.941	0.978	0.985	3
2 Norway	0.968	79.8	..	99.2	41,42	0.913	0.991	1.000	0
3 Ireland	0.959	78.4	..	99.9	38,505	0.890	0.993	0.994	0
4 Sweden	0.956	80.5	..	95.3	32,525	0.925	0.978	0.965	6
5 Switzerland	0.955	81.3	..	85.7	35,633	0.938	0.946	0.981	0
6 Netherlands	0.953	79.2	..	98.4	32,684	0.904	0.988	0.966	3
7 France	0.952	80.2	..	96.5	30,386	0.919	0.982	0.954	6
8 Finland	0.952	78.9	..	101.0	32,153	0.898	0.993	0.964	3
9 Spain	0.949	80.5	..	98.0	27,169	0.925	0.987	0.935	7
10 Denmark	0.949	77.9	..	102.7	33,973	0.881	0.993	0.973	-4
11 Austria	0.948	79.4	..	91.9	33,7	0.907	0.966	0.971	-4
12 United Kingdom	0.946	79.0	..	93.0	33,238	0.900	0.970	0.969	-4
13 Belgium	0.946	78.8	..	95.1	32,119	0.897	0.977	0.963	-1
14 Luxembourg	0.944	78.4	..	84.7	60,228	0.891	0.942	1.000	-13
15 Italy	0.941	80.3	98.4	90.6	28,529	0.922	0.958	0.944	0
16 Germany	0.935	79.1	..	88.0	29,461	0.902	0.953	0.949	-2
17 Greece	0.926	78.9	96.0	99.0	23,381	0.898	0.970	0.910	0
18 Slovenia	0.917	77.4	99.7	94.3	22,273	0.874	0.974	0.902	1
19 Cyprus	0.903	79.0	96.8	77.6	22,699	0.900	0.904	0.905	-1
20 Portugal	0.897	77.7	93.8	89.8	20,41	0.879	0.925	0.888	1
21 Czech Republic	0.891	75.9	..	82.9	20,538	0.849	0.936	0.889	-1
22 Malta	0.878	79.1	87.9	80.9	19,189	0.901	0.856	0.877	0
23 Hungary	0.874	72.9	..	89.3	17,887	0.799	0.958	0.866	0
24 Poland	0.870	75.2	..	87.2	13,847	0.836	0.951	0.823	3
25 Slovakia	0.863	74.2	..	78.3	15,871	0.821	0.921	0.846	-1
26 Lithuania	0.862	72.5	99.6	91.4	14,494	0.792	0.965	0.831	0
27 Estonia	0.860	71.2	99.8	92.4	15,478	0.770	0.968	0.842	-2
28 Latvia	0.855	72.0	99.7	90.2	13,646	0.784	0.961	0.821	0
29 Bulgaria	0.824	72.7	98.2	81.5	9,032	0.795	0.926	0.752	1
30 Romania	0.813	71.9	97.3	76.8	9,06	0.782	0.905	0.752	-1

Source: UNPD, Recalculated Rankings for Europe by the *Observatoire de la Compétitivité*

4) Happy Planet Index[97]

The Happy Planet Index (HPI) is the first index to combine environmental impact with well-being to measure environmental efficiency in which, country by country, people lead long and happy lives. The nations that rank highest in this index are not the happiest places in the world, but are nonetheless those that score well through a combination of long and happy lives without excessive consumption of the planet's resources. The index also reveals that there are different paths for achieving comparable levels of well-being. The model adopted by the West may provide widespread longevity and variable levels of satisfaction with life, but only at a high cost in terms of consumption of resources that is ultimately counterproductive.

The index emerging from the study involving the 178 countries for which data are available, shows that generally speaking, the world has a lot of ground to cover. No single country is able to achieve a high score in the index and naturally, no country performs well in all three indicators.

[97] For more details see: http://www.happyplanetindex.org/

Table 43: Results Happy Planet Index 2008

	Life Satisfaction	Life Expectancy	Carbon Footprint	HPI
1 Iceland	8.0	79.6	1.1	72.3
2 Sweden	7.8	80.1	1.6	63.3
3 Norway	7.5	79.5	2.0	56.0
4 Switzerland	8.1	80.5	3.0	51.6
5 Cyprus	7.2	79.1	2.3	51.3
6 Denmark	8.4	77.4	3.2	49.8
7 Malta	7.4	78.7	2.5	49.4
8 Slovenia	6.9	76.4	2.1	48.5
9 Netherlands	7.5	78.5	2.8	48.4
10 Austria	7.5	78.7	2.8	47.9
11 Latvia	5.1	70.7	0.4	47.5
12 Spain	7.2	79.6	2.7	47.4
13 Ireland	7.7	78.2	3.1	46.5
14 Italy	6.8	79.6	2.5	46.4
15 Germany	7.0	78.5	2.6	46.3
16 Finland	7.8	78.4	3.4	45.7
17 Belgium	7.4	78.7	3.0	45.5
18 France	6.6	79.3	2.5	44.8
19 Poland	6.1	74.6	1.8	43.9
20 Romania	5.4	71.5	1.1	43.7
21 United Kingdom	7.2	78.4	3.3	42.3
22 Portugal	5.7	77.3	2.0	41.8
23 Slovakia	5.5	73.8	1.6	40.8
24 Czech Republic	6.4	75.3	2.7	39.7
25 Lithuania	5.1	71.9	1.3	39.0
26 Hungary	5.5	72.4	1.9	38.3
27 Greece	6.3	78.8	3.2	38.3
28 Bulgaria	4.1	72.1	1.6	29.7
29 Luxembourg	7.7	77.9	6.9	29.6
30 Estonia	5.6	71.3	3.5	29.3
European mean	6.7	77.8	2.5	45.1

Source: Happy planet index

None of the countries appearing in the Happy Planet Index has everything right. We must acknowledge at once that while some countries are more efficient than others at providing long, happy lives for their populations, each country has its share of problems and no nation is performing as well as it could. Still, it is possible to discern emerging trends of how we could improve the chances of long and happy lives for all, while confining our lives to the possibilities of the environment. The challenge consists in knowing whether we can learn the lessons provided by the HPI and apply them.

Luxembourg holds the 29th position among the countries of Europe. Luxembourg has weak performance in the carbon footprint rating. Iceland, Norway and Switzerland are among the top four countries in the HPI ranking.

5) **The Stiglitz Commission**

PIB vert, indicateur développement humain et indicateur d'empreinte écologique) et Conseil économique, social et environnemental français (logique Tableau de Bord)

For a long time now, questions have been mounting about the pertinence of current methods for measuring economic performance, especially those based on GDP figures. Furthermore, calling these figures into question has the broader aim of challenging their validity as measures of social well-being, as well as of sustainable development on the economic, ecological and social fronts.

To formulate a response to these questions, French President Nicholas Sarkozy decided to establish a commission to examine all of the issues that have been raised, thus increasing the scope of OECD work being carried out in parallel. Its purpose is to determine the limits of GDP as an indicator of economic performance and social progress, to study what additional information is required to produce a more pertinent image of these phenomena and to verify the feasibility of the instruments of the recommended measures. The work of this commission is not limited to France, or to other developed nations. The results of the commission's work will be made public so that all countries or groups of countries concerned can draw inspiration from it.

In setting up its work path, the Commission selected three major avenues of approach that examine the three basic processes already identified for explaining the gap between measuring and perception of the phenomena:

(i) The Classical GDP issues: In response to the question of limits of GDP as an indicator of socio-economic progress or economic performance, it is appropriate to widen the scope or rethink the current conceptual framework

(ii) Sustainable development and environment: Sustainability is one of the primary preoccupations with regard to current measures of economic performance and social progress, while the environment is one of the domains where this issue is addressed with the most acuity

(iii) Quality of life: This area concerns a measure of social progress that would take into account the concept of well-being based on a broader perspective, namely using indicators that incorporate statements of citizens concerning their state of well-being.

Since the report presented by Joseph Stiglitz, Chairman of the Commission on the Measurement of Economic Performance and Social Progress, social well-being indices have gained new importance. The presentation and analyses of the Luxembourg social health index will certainly reopen the debate with the social partners on the social aspect and competitiveness, while keeping in mind that the debate remains open and could in the future be even more significantly influenced by environmental factors. The *Observatoire de la Compétitivité* intends to collaborate with the CRTE[98] of the CRP-HT on this subject and will present more detailed analyses in this area in the future. Nonetheless, as from now we should note the multitude of "alternative" indicators that appear in the frame above, some of which will be published by internationally renowned institutions.

[98] For more details see: http://www.crte.lu/

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4 Prices, Wages and Competitiveness: The real effective exchange rate (REER)

4.1 Introduction

In order to document, observe and analyze the country's competitive position, the *Observatoire de la compétitivité* has applied a broad definition of competitiveness approved by the social partners. This definition is based on the three pillars of sustainable development, the economy, the social aspect of nations and the environment. The definition thus stipulates that competitiveness is not an objective in of itself but rather a means of sustainably improving everyone's standard of living. The alternative concept of measuring wealth that has become quite stylish in this time of crisis was adopted by the *Observatoire* a long time before others have done so[99].

Nevertheless, however wide the conception and definition of competitiveness in Luxembourg may be, it is impossible to deny that a preeminent place has to be reserved for cost and price competitiveness, as these are essential determinants of economic activity and of foreign trade of Luxembourg companies, exclusive of all non-price and non-cost factors like the quality and innovation levels of products on the market[100]. None can deny that changes in inflation and prices in Luxembourg as well as in wages will have repercussions on the competitiveness of the country's companies.

Economists use the real effective exchange rate (REER) to measure price and cost competitiveness. REER makes it possible to evaluate the competitive position of a country with relation to its main trading partners. It is done by comparing relative price, cost and exchange rate trends wherever necessary among these partners.

[99] See also Chapter 3 for a detailed description of the renewed interest for alternative indicators following the Stiglitz Report, which is presented with a history of the *Observatoire's* activities in this area and the introduction of the Luxembourg Social Health Indicator (ISSL).

[100] For a more in-depth discussion of this issue, see Lionel Fontagné (2008), *Prix compétitivité et indexation : implications pour le Grand-Duché*, in the 2008 Competitiveness Report, Economic Policy Perspective, Minister of the Economy and Foreign Trade, Vol. 11, October 2008.

The analysis of cost and price competitiveness of the Luxembourg economy highlights a continued loss of competitiveness. Price competitiveness trend has continued to worsen, influenced by the country's flagship sector, services, with a strong drop in price competitiveness observed in the Luxembourg's industrial sector as well toward the end of the observation period. The cost competitiveness situation has continued to worsen since 2000, impacted by the situation in the industry and services sectors, which accelerated at the end of the observation period. While before the loss of competitiveness was less evident in the industrial sector, the real effective exchange rate indicates that cost competitiveness worsened significantly at the end of the period.

4.2 The Real Effective Exchange Rate of Luxembourg

The exchange rate is an important competitiveness variable. A fall in the exchange rate improves a country's competitiveness by making its products cheaper abroad and making its competitors' products more expensive on the domestic market. However, in an increasingly globalized world, a bilateral, two-currency exchange rate gives only a very partial image of competitiveness.

To address this issue, a nominal effective exchange rate (NEER) acts as a weighted average of the various bilateral exchange rates between a country's domestic currency and the foreign currency of its major trading partners. Its weighting is based on the relative importance of each of these partners in the exchange of goods and services with Luxembourg companies.

The real effective exchange rate (REER) can provide a macroeconomic comparison of domestic and foreign prices expressed in a common currency and thus serves as a measure of competitiveness[101]. Depending on whether one deflates the NEER by a price or cost indicator, this provides a measure of price or cost competitiveness.

[101] The importance of a single composite indicator to monitor competitiveness of a country compared to that of its principal trading partners is clearly illustrated in *The effective exchange rates of the euro* by Buldorini L., Makydakis S., Thimann C. in the *Occasional paper series N*°2, BCE, Frankfurt, *February* 2002. In Luxembourg, STATEC was the pioneer in this area and regularly publishes the STATEC/CREA competitiveness indicator (see Schuller G., Bley L., "*Les indicateurs synthétiques de compétitivité 1995-2006*", ECONOMIE ET STATISTIQUES, N°20/2007, STATEC, Luxembourg 2007).

Luxembourg is a member of the European monetary union among whose members exchange rates are fixed. The main competitors of Luxembourg[102] are also part of this union. Because of this, the adjustment mechanism applied by competitiveness gaps is essentially based upon market forces that act as a stabilizer against price and cost differentials. In particular, within a monetary union, if one country is experiencing lower than average inflation it becomes more competitive with regard to the other countries[103].

For the price perspective of the real effective exchange rate, the REER is deflated by a price indicator providing a comparison between the price of domestic goods and services and prices of the main competing countries. From the cost perspective, the unit labor cost (or the cost of labor per unit of real value added produced domestically), is compared to that of the reference country's main trading partners.

4.3 Methodology

The real effective exchange rate is put together using currencies of the principal trading partners of Luxembourg, including Germany, Belgium, France, Italy, the Netherlands, the United States, Great Britain and Switzerland. A weighting is assigned to each bilateral exchange rate that reflects the relative importance of the country in question within the structure of economic trade in Luxembourg.

Obviously, a different weighting structure must be applied for the overall economy, for the industrial sector and for the services sector. This reflects a different geographic breakdown of the exchanges of goods and services. The weightings used in calculating the real effective exchange rate—which reflect the relative importance of the principal partners in Luxembourg's exports—are adjusted each year to take into account changes in the geographic structure of Luxembourg's exports.

[102] See Chapter 4.3.a below for a detailed presentation of relative weightings of our 8 principal trading partners for Luxembourg's exports, as well as relative trends of these weightings.
[103] For a more detailed presentation of this issue, see the 2007 and 2008 Competitiveness Reports, *Observatoire de la Compétitivité*, Ministry of the Economy and Foreign Trade.

The various weightings used in building a real effective exchange rate originate with Luxembourg Foreign Trade Statistics published regularly by STATEC[104] and presented below.

4.3.1 Weightings of Goods and Services

In calculating price competitiveness of the entire economy, we base our analysis on the relative importance of each of our eight principal trading partners, measured by the share of these countries in exports of Luxembourg's goods and services. The graph below shows trends for these weightings.

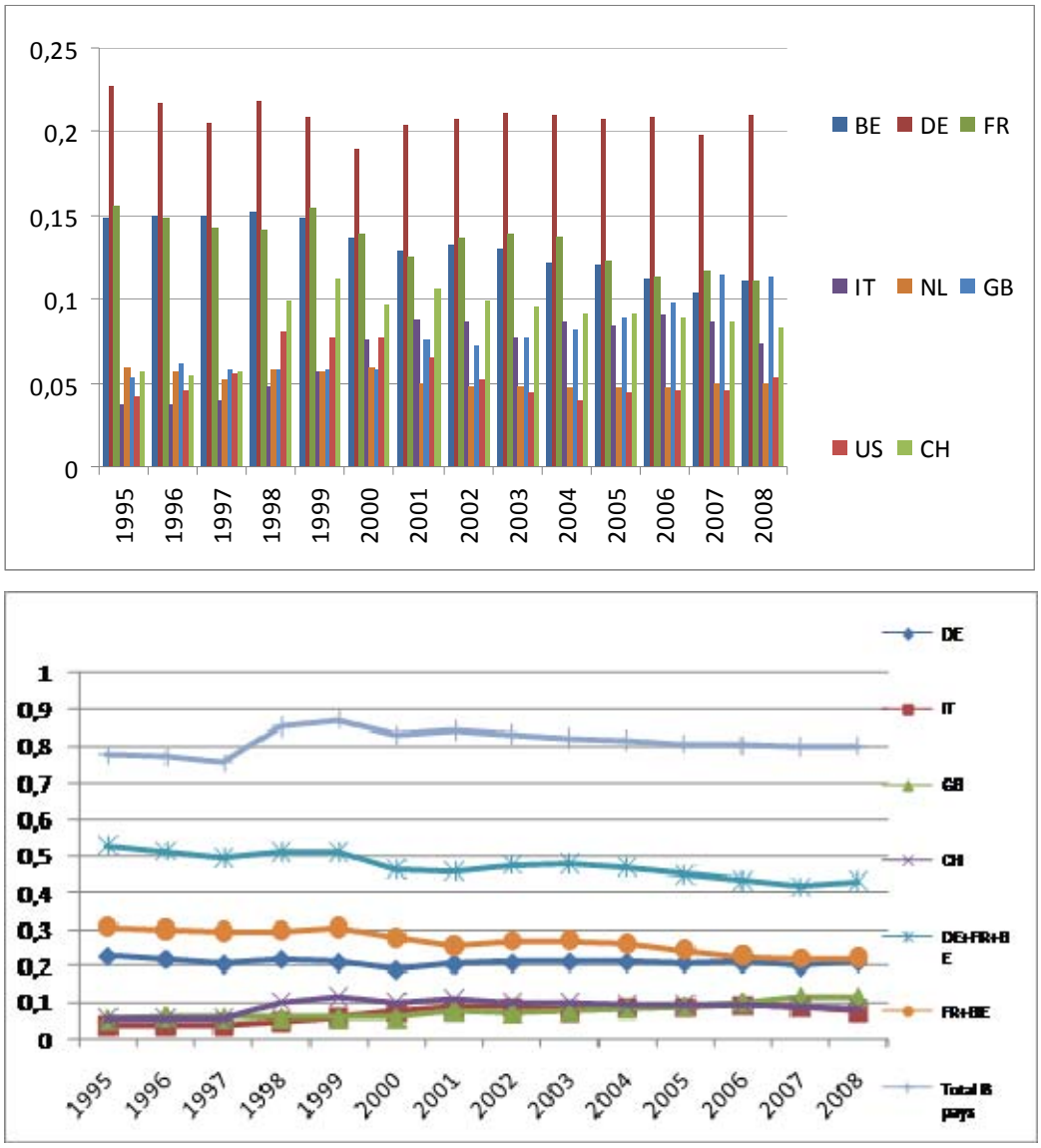
One can see that the share of these eight partners in total exports of Luxembourg's economy has remained more or less stable at 80%. It is also clear that our closest geographical neighbors, Germany, France and Belgium are still as always our most important economic partners, even though their weight in exports has dropped 53% in 1995 to less than 45% in 2008. While Germany's share of our exports remained more or less at 20% between 1995 and 2008, it is true that France and Belgium's relative importance in the exchange of goods and services between 1995 and 2008 has continued to recede, to such an extent that Germany's share of the exports of Luxembourg companies' goods and services is now nearly equivalent to that of the other two countries combined[105].

Other countries increased their relative shares, such as Great Britain, Switzerland and Italy, all of which now have doubled their share in Luxembourg's exports.

[104] For more details see: www.statec.lu

[105] Remember, here the important point is to illustrate variable weightings over the observation period that serves as a basis for calculating REER. For a detailed discussion of Luxembourg's foreign trade, especially recent changes in it, see Schuller G., Bley L., Haas C., Schuster G. and Weyer N., « *La balance courante du Luxembourg de 2002 à 2008 : Premiers effets de la crise sur les échanges extérieurs* », STATEC Bulletin N° 2-2009, STATEC, 2009.

Figure 26: Relative Share in Exports of Goods and Services
(8 Principal Trading Partners)



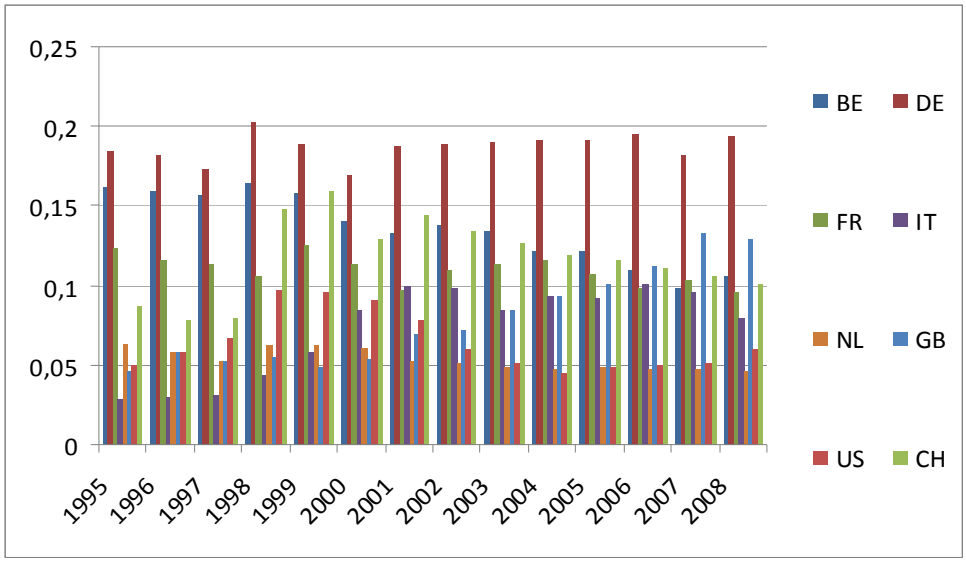
Source: STATEC, *Observatoire de la Compétitivité*

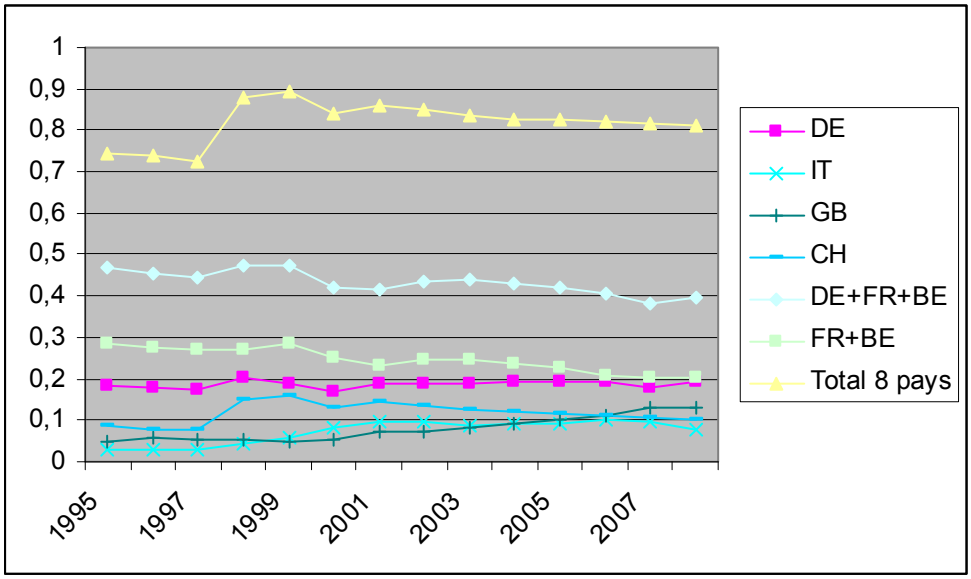
Results are different when the industrial and services sectors are analyzed separately.

4.3.2 Weightings of Services

In calculating price competitiveness in services, we use relative shares as a basis, which vary over time among the eight principal "client" countries of Luxembourg goods and services. The graph below traces trends in the relative importance of each of our eight principal trading partners for goods and services.

Figure 27: Relative Share in the Export of Services
(8 Major Trading Partners)





Source: STATEC, *Observatoire de la Compétitivité*

The share of exports of goods and services sent by Luxembourg companies to the eight major trading partners between 1995 and 2008 rose slightly, from 74% to 81%. As with for the overall economy, Germany, France and Belgium remain the most important trading partners for the export of services from Luxembourg. Unlike Germany, France and Belgium's share in exports of services has nonetheless continued to decrease. Other countries have increased their weight in the export of services from Luxembourg, principally Great Britain.

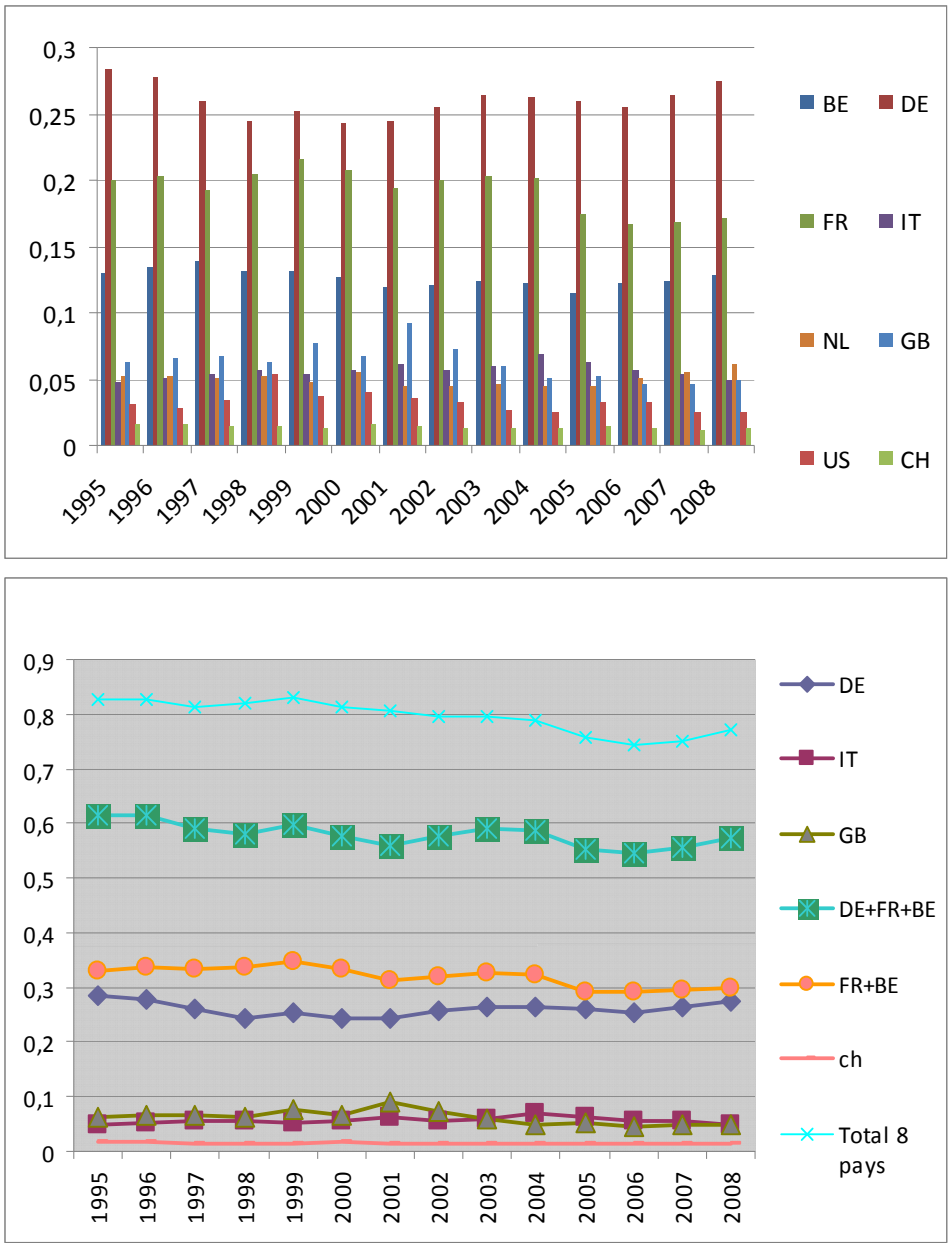
The similarity in trends of the share of each country in total exports of goods and services with that in the exporting of services is yet one more reminder that our economy continues to convert into a services economy where the share of exchanges of goods is progressively shrinking to be replaced by services, a phenomenon that will also be apparent in REER results. As we shall see below, the weightings of exported goods have undergone various changes over the course of the observation period.

4.3.3 Industry weightings

In calculating the price competitiveness in the industrial sectors, we use relative shares of the eight principal “client” countries of Luxembourg goods as a basis. The graph below traces trends in the relative importance of each of our eight principal trading partners receiving exports of Luxembourg goods between 1995 and 2008.

Note that an inverted trend is apparent for the export of goods where the totals share of the eight principal trading partners has slightly dropped to be substituted by Luxembourg’s new trading partners. Helped along by globalization, other countries such as China and Poland assumed greater shares toward the end of the observation period. The share of our three neighbors in Luxembourg’s exports of goods has remained stable, in contrast to services, where only Germany kept a high share of these exports.

Figure 28 : Relative Share in the Export of Goods
(8 Major Trading Partners)



Source: Statec, *Observatoire de la Compétitivité*

The real effective exchange rate with variable weightings could thus account for relative variations in weighting originating from the statistics of Foreign Trade over the years, to better discern Luxembourg's relative competitiveness situation with its principal trading partners.

4.4 The Real Effective Exchange Rate

Data used to calculate the REER comes for the European Commission's AMECO database. It should be noted that the Commission uses information relayed to it from

the statistical offices of Member States in this database. Data provided by Luxembourg is therefore based on STATEC-originated information. This analysis, as with all empirical analysis, is obviously dependent on the quality of data in the database. Now these data undergo major revisions and in this period of heavy turbulence, it is expected that the revisions will be very significant[106]. Under these circumstances it is better to follow medium and long-term trends without concentrating on spot observations.

4.4.1 The Price Perspective of the Real Effective Exchange Rate

The price perspective of the real effective exchange rate measures the relationship between domestic prices and foreign prices in euros. We understand the price concept to be the value added implicit price. Prices abroad are obtained by branch, through multiplying the added value price index per branch by the weighted exchange rate. Into this calculation must be inserted the nominal exchange rate for currencies that are not part of the euro zone such as the USD, GBP and CHF weighted by the relative importance of the country in terms of exports from Luxembourg.

The graph below traces price competitiveness trends as measured by REER to include the relationship between domestic prices and foreign prices expressed in euros. A drop in REER indicated by a downward curve should be considered as an improvement in price competitiveness for Luxembourg because domestic prices change less rapidly than they do foreign prices in euros. In contrast, an upward moving curve indicates a rise in REER and indicates a lowering of competitiveness.

[106] The next AMECO update is to be done in October, 2009. Between 2008 and 2009 major revisions were observed, especially on data concerning France. These revisions will also have an impact on the REER of Luxembourg as France is one of our principal trading partners.

Figure 29 : Price Competitiveness: Real Effective Exchange Rate Indicators for Luxembourg (8 Major Trading Partners, Variable Weightings 1995=100)

(*Value added deflator: Industry Value added deflator: Services GDP deflator: Goods & Services Weighting*)
Source: AMECO, STATEC, *Observatoire de la Compétitivité*

Luxembourg's price competitiveness is down as shown by the upward curve, and this trend is essentially due to the services sector, as we were previously able to ascertain in earlier editions of the Competitiveness Report. The drop in competitiveness is reflected in the strong upward movement in the graph of the REER price curve, essentially since 2002. The loss of price competitiveness in the economy should evidently be connected to the predominant position of financial services in the services sector and to the use of an invoicing system often based on the *ad valorem* principle.[107] Now this result is also regularly illustrated by other organizations that publish price version REER competitiveness indicators[108].

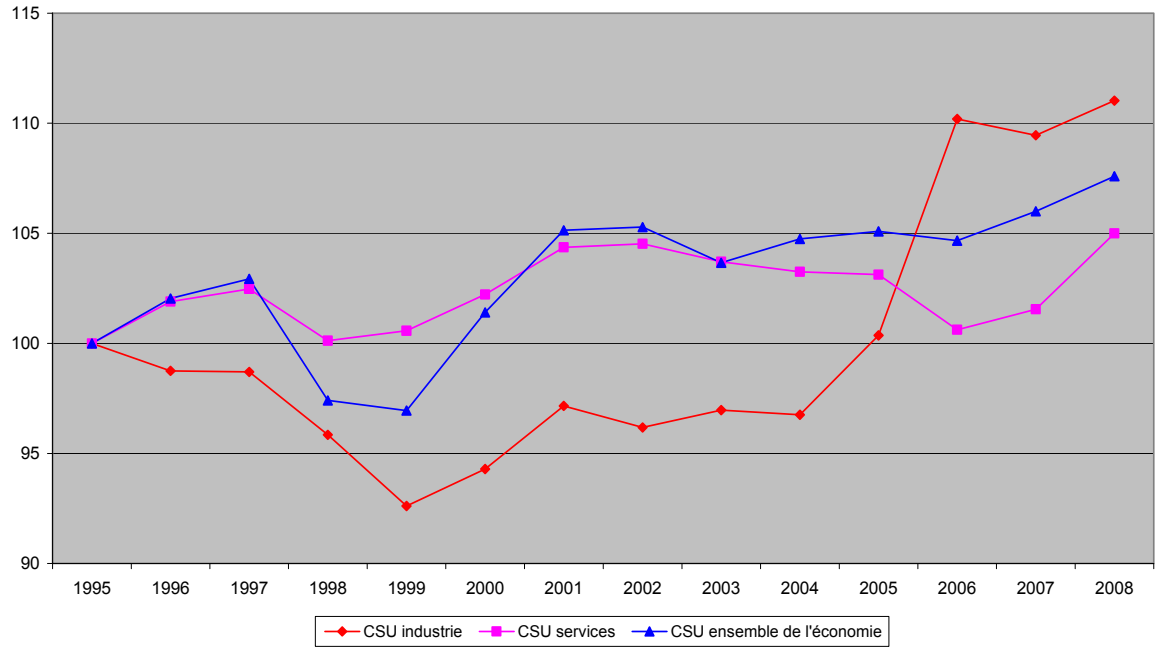
Nevertheless, as in contrast to the remarks appearing in preceding Competitiveness Reports, a significant worsening of price competitiveness is apparent in Luxembourg's industrial sector where previously competitiveness had improved.

[107] See the 2007 Competitiveness Report for a detailed analysis of the impact of the financial sector and of *ad valorem* invoicing on Luxembourg's price competitiveness indicator.
[108] See www.ocde.int, www.bce.eu and www.bcl.lu for a detailed discussion of the various methodologies used by these institutions in obtaining REER values can be found in the chapter of the 2008 Competitiveness Report written by Professor Fontagné.

4.5 Cost Competitiveness

With the cost version of REER, we compare nominal unit labor costs domestically, or the unit labor cost per unit of value added produced, to the same costs our economic partners are facing. Unit labor costs (ULC) include two different aspects of competitiveness, wage costs and productivity. Although changes in labor costs could explain a loss of competitiveness measured by the cost side of the real effective exchange rate, changes in productivity levels contribute as well.

Figure 30 : Cost Competitiveness: Real Effective Exchange Rate Indicators for Luxembourg (8 Major Trading Partners, Variable Weightings 1995=100)



Source: AMECO, STATEC, *Observatoire de la Compétitivité*

In observing the REER curves for costs in the above graph, a worsening of the cost competitiveness situation is apparent in Luxembourg's economy lasting some ten years now. The drop in competitiveness indicated by the upward curve, which appeared to be flagging after 2003 has since regained strength from the joint impulse of events in the industrial and services sector. The industrial branches where cost competitiveness had momentarily improved are displaying a rapid worsening at the end of the observation period.

4.6 Conclusion

An analysis of price and cost competitiveness illustrates that Luxembourg continues to lose competitiveness with relation to its main trading partners. The loss of competitiveness is strongly influenced by trends in the services sector but at the end of the period we can see significant worsening of the price and cost competitiveness of the Luxembourg's industrial base.

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5 Themed Studies

5.1 Taxis: an Analysis of a Regulated Market

5.1.1 Introduction – Why perform this analysis?

Among the multiple objectives behind the regulation of taxi services are the need to provide security for the public, to protect consumers and to ensure good economic performance, to mention a few. The taxi market is extremely complex and is often perceived as emblematic of the effects of an ill-conceived regulation effort. For this reason, regulatory efforts in this sector are the target of critique from all sides. A large part of the political debate surrounding whether or not it is necessary to regulate the sector is nonetheless ideological and biased. Thus, over the course of decades, there have been many attempts to deregulate the taxi industry throughout the world.

The purpose of this section is two-fold: in the first place, it will describe the overall framework and philosophy that underpins existing regulations in a sampling of countries and cities in order to highlight certain key characteristics of this market such as price, access to the market, quality of service, etc. Next it will give a brief perspective of the regulatory situation of Luxembourg's taxi sector so as to better understand price structures and trends in a regulated industry[109]. As it is the case in many countries, in Luxembourg administrated prices and regulated professions are often the focus of debates on changes in price and purchasing power.

5.1.2 International experience in regulation and deregulation

The taxi industry is one of the only sectors where rates and quantitative regulations remain widely disparate throughout the world. Comparisons on the international level show that regulations vary considerably from one country to another and even from one city to another[110]. Since taxis operate essentially on local and domestic markets the sector has developed in extremely divergent directions, as follows:

[109] Especially as part of the "Action Plan Against Excessive Inflation" implemented by the Government. For more details see point 1.c on the following site:
http://www.gouvernement.lu/gouvernement/programme-2009/programme-2009/07-ecocomex/index.html

[110] For more details see: TRANSPORTOKONOMISK INSTITUTT, *Réglementation des taxis en Europe*, *Rapport commandé par l'Union internationale des transports routiers*, Oslo, December 2003

- Different cities or countries have established barriers to accessing the industry by limiting the number of taxis that may operate and authorizing sales of licenses[111].

- Other countries have put up indirect barriers to accessing the profession by imposing various obligations on taxi drivers and operators.

- There are fewer divergences when it comes to fares. Most cities at least have a fare ceiling scheme[112], but others have set up a dual system that allows some entities in the sector to set fares without restrictions provided certain conditions are met.

Frame 6: Results of an international survey conducted among taxi users (2007) [113]

A 2007 survey conducted of a sampling of some two thousand persons in Paris, London, New York, Amsterdam and Lisbon, describes the importance of taxis as a hybrid mode of transportation, often complementary to other transportation options of daily life. The results of the survey show that four key factors currently appear to be impeding the use of taxies in cities: the high cost and a perceived too low value for the money, inconsistent travel times and lack of punctuality, accessibility, availability and means of payment. These circumstances don't allow for dedicated use of this transportation manner.

Regardless of the city, a large majority of people questioned favor the intervention of the state to increase using taxis and above all to build a transportation mode more amenable to their expectations.

The persons questioned in each town had high and specific expectations in terms of accessibility, quality of service and fares, as follows:

- Paris: Increase the number of taxis at all hours and locations and establish even more bus and taxi lanes to increase better flowing circulation in town. Also, require taxis to accept short rides.

- London: Increase the number of taxis and require licenses for mini cab operators, authorize shared rides and make fares uniform.

- New York: Make all payment options valid. It should be noted that New Yorkers are distinguished by the fact that they request lower fares only one half as much as elsewhere.

- Amsterdam: Apply stricter rules for obtaining licenses and improve quality of service through better qualifications and training for drivers.

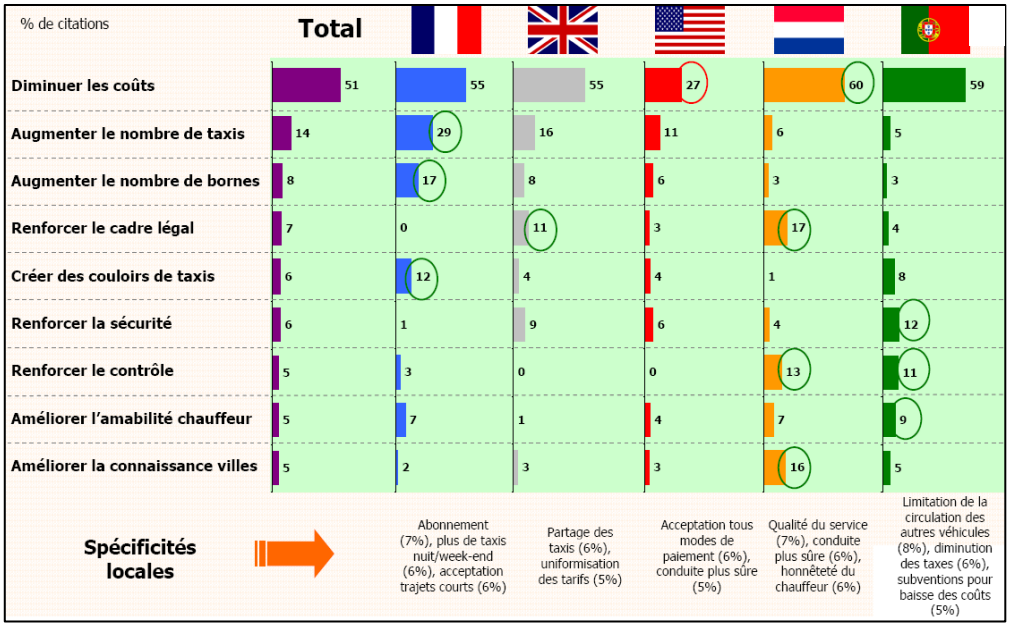
- Lisbon: Improve safety and heighten checks on drivers.

[111] France, some U.S. cities such as New York and Ireland up to 2001.

[112] One example of this is Germany, where fares can vary significantly from one city to another. There are more than 800 different fare schedules for taxis that depend on geographic, economic and social factors. A member of the German Taxi Federation, *Taxi Verband Deutschland*, drew up a list compiling all of these fares. For more details see: http://www.hale.at/tarife/taxitarife.html. The same is true for fares in France. For more details see: http://www.taxis-de-france.com/professionnel/tarifstaxis.htm

[113] GfK, INSTITUT POUR LA VILLE EN MOUVEMENT, *Le taxi au sein des déplacements urbains: pratiques, positionnement et pistes de développement*, in Festival Taxi Lisbon, 2007.
For more information see: http://www.ville-en-mouvement.com/taxi/index.html

Table 44: Measures requested by persons questioned (by city)



Source: GfK France

5.1.2.1 A comparison of regulatory schemes in Paris, London and New York[114]

Regulators in New York, London and Paris have very different models for their taxi industries, in terms of organization, access and rates.

In London, the regulatory authority deemed it necessary in 2002 to allow more competition and decided to add a reservation system for mini cabs by telephone or internet, in addition to the standard system of hailing black cabs on the street[115]. In New York, regulators gave the telephone market solely to for hire vehicles so taxis with vehicle borne telephones were forced to give them up. However to offset this regulators stepped up enforcement of the quota system. In Paris, the regulating authority extended the monopoly of taxis to the telephone market by progressively eliminating for hire cars.

Licenses for operating cabs are bound strictly to the quota system in Paris and New York. Owners of such licenses are allowed to sell them on the market. Because of the quota system, licenses have become rare, with the result that these licenses can

[114] For more details see: OCDE, (De)regulation of the Taxi industry, *Conférence européenne des Ministres des Transports* – Round Table 133, Paris, 2007, pp. 131-146

[115] For more information concerning the Taxi industry in Great Britain see: OFFICE OF FAIR TRADING, The regulation of licensed taxi and PHV services in the UK, OFT676, London, November 2003 http://www.oft.gov.uk/shared_oft/reports/comp_policy/oft676.pdf

be very expensive. In Paris, such licenses are allocated without charge by a tripartite commission heavily represented by the taxi union. These free licenses can eventually be sold for large sums; candidates abound and the wait list is long. A license can be sold for a high price because buyers thus avoid having to wait several years until one comes free. In New York, there is no wait list as the licenses are auctioned off. This method of allocating licenses has three advantages over the French system. Favoritism is excluded, there is no injustice to taxi drivers who had to buy their license on the market and the collectivity recovers income from the monopoly created by the rarity of licenses. In London, there is no taxi quota. Licenses for registering for hire vehicles are not subject to quotas in any of the cities. However, in France, applications for the for hire vehicles must be approved by the same commission as taxi applications, and the Prefects that chair the commissions have been instructed to discourage such applications.

With regard to vehicle quality, features of vehicles intended for use as taxis are subject to very specific restrictions in London relating to spaciousness, maneuverability, etc., which renders taxis immediately recognizable. In New York, taxis need not have specific restrictions, but do have the requirement that they all be painted yellow to distinguish them from limousines and that they be less than five years old. In Paris, vehicles used as taxis are also without the restrictions found in London, though they must be no older than seven years and are subject to yearly inspections. For hire vehicles are not subject to any particular requirements in any of the three cities, other than yearly inspections in Paris and London and thrice yearly inspections in New York. In Paris, it is illegal for these vehicles to have distinctive, commercial or advertising markings visible from the exterior. The trade of taxi driver requires a special qualification in all three cities, obtained by passing an exam. In London, prospective cab operators are subject to a very difficult test. There are no particular requirements for driving limousines in any of the three towns apart from an operator’s license, although in London and New York drivers must have clean police records.

Taxi fares are administered in all three cities. The fares are composed of three different elements, to include the ride fee, a distance rate and a time rate, which is

substituted for the distance rate when the vehicle is stopped or when it does not exceed a certain speed. Fares for the for hire cars are unrestricted.

As a result, the performance of the regulatory systems in Paris, London and New York may be evaluated according to several criteria. The table below summarizes the impact of the system on performance in several key areas

Tableau 45: Evaluation of the systems in Paris, London and New York

	New York	London	Paris
Diversity of offer	+	++	--
Good value for users	++	+	-
Mobility into difficult neighborhoods	++	++	--
Employment	+	+	--
Traffic	+	+	?

Note: Positive impact (+),Negative impact (-), Impact unknown (?)
Source: Adapted from OECD charts (2007), p.142

5.1.2.2 Deregulation of the taxi industry in Ireland[116]

Deregulation of the taxi industry in Ireland was more striking than in the other countries and as such constitutes an interesting case study. The number of taxis tripled on the average in the largest cities with deregulation, a testimony to the heavy restrictions that weighed down access to the industry prior to the reform in 2000. Deregulation of the taxi industry in Ireland came about after a High Court decision in favor of new potential entrants onto the market and against those who wished to preserve the value of their licenses resulting from their rarity. This trend was predictable because in the past income from the monopoly of licenses for taxis in Ireland had reached the highest levels in the world. Another thing that brought the public to support deregulation was the significant drop in waiting time. Ireland restored a national regulatory entity for the taxi industry that was made responsible for setting requirements concerning driving aptitude, excellent overall local knowledge, standards for the vehicles and even a dress code. There does not seem to have been any withdrawal of vehicle standards or driver qualifications following the reform.

5.1.2.3 Recent attempts to reform the taxi industry in France [117]

A recent analysis by Cahuc and Zylberberg in 2009 puts its finger on the principal

[116] For more details see: OECD, op. cit., pp.147-166
[117] CAHUC P., ZYLBERBERG A., *Hep taxi!*, in *Les réformes ratées du Président Sarkozy*, Flammarion, Paris, 2009

failures of the French system, where the offer is considered largely inadequate, especially in large cities. In France, to become a taxi driver, one must sit an exam, possess a clean police record and above all obtain a license. There are two ways to accomplish this. Either a license may be purchased from a driver leaving the profession, or applicants enter their names on a waiting list to obtain one of the new licenses allocated in France each year, which are very small in number but nonetheless free of charge. The number of new licenses is set annually by the authorities, after consulting an "activity index" that is supposed to measure economic growth in a given area. So it is not demand as expressed by users that determines how many licenses will be distributed, but rather an administrative procedure that is based on a supposedly objective index.

The authors of this analysis have also formulated a series of recommendations for reforming the taxi industry in France. On one hand, to increase the number of vehicles available for service, registration of Small Hire Cars (VPR) must be increased, allocated by administrative authorization. These vehicles would not be permitted to park on public roads, nor could they pick up passengers freely, like a standard taxi. The only fares they could take would be those arranged in advance[118]. On the other hand, the authors explored the effect of abolishing the quota for distributing licenses. This action should be accompanied by a fair financial settlement for the holders of licenses so as to avoid an uproar by taxi drivers[119].

The 2008 Attali Report also recommended that the taxi industry be reformed in order to free up economic growth in France[120]. This report also recommended that the market be completely opened up. Furthermore, it recommended that VPR use be developed extensively and that all applicants for taxi licenses on the lists at the end of 2007 be distributed licenses free of charge over the next two years. There is no provision for compensating current license holders at all. The purpose of these two measures was to considerably reduce the value of licenses. An uproar in the taxi

[118] As we have seen, in New York this type of market segmenting model has been adopted. Taxis operate under a quota system and have the monopoly of fares hailed on the street, which adds value to licenses, whereas VPRs are not subject to quotas and have the monopoly on telephone requested fares, where fare rates are unrestricted. This system ensures that the demand for transportation by taxi is met.
See the previous chapter in this report "A comparison of regulatory schemes in Paris, London and New York."

[119] Change was implemented in Ireland at the end of the nineties in this manner and the population of taxis increased by 150% between 2000 and 2003.

[120] ATTALI J., *300 décisions pour changer la France*, *La Documentation française*, January 2008. For more details see: http://lesrapports.ladocumentationfrancaise.fr/BRP/084000041/0000.pdf

industry soon resulted and many cities were blocked off in January, 2008 by taxi drivers. The French government ended up rejecting the recommendations of the Attali report. The principle of ending the quota system by paying out compensation to the owners of taxi licenses was also rejected. The authors of this analysis of the taxi industry arrived at the following conclusion: "*The episode sparked by the recommendations of the Attali report on the taxi industry proved that a profession that is well organized can, like judokas, parry attacks from adversaries and turn them to their advantage. (...) The only realistic option in France consists in purchasing all existing licenses at a price that is not prejudicial to the owners and then to open up the taxi market to competition. (...)*".

5.1.2.4 Economic considerations of deregulating the taxi industry

As illustrated above, international comparisons between taxi industries show that regulations vary considerably from country to country. A comparison of the various regulatory systems provides a better understanding of the complexity of the taxi industry. There exists an international entity for discussion that seeks to develop thinking on long term trends in the transportation industry and to carry out in-depth studies on the functioning of this sector. This organization is the International Transport Forum[121]. During the organization's latest round table dedicated to the taxi industry, the forum addressed the issues of regulation and deregulation of the industry and provided for an exchange of experience that went much farther than that related in the few examples above.

It is possible to draw several conclusions from all this. In as much as the market for taxi services includes a large number of suppliers and consumers, it is to be expected that a competitive market emerge, in which services would be provided to customers at the lowest price possible. Nevertheless, some of the conditions

[121] For more details see: OECD, op. cit., pp.171-185.
The International Transport Forum is a global platform and meeting place at the highest level for transport, logistics and mobility. Key figures from government and politics, business and industry, research and civil society will meet in Leipzig each year to debate a transport topic of worldwide strategic importance. The engagement and involvement of such a broad range of actors makes the International Transport Forum truly unique. Transformed from the European Conference of Transportation Ministers, the International Transport Forum is an inter-governmental organization within the OECD family. Its members include all OECD countries, as well as many countries in Central and Eastern Europe, and India. In addition, China and Brazil are being invited to participate in the Forum. The involvement of more than 50 Ministers of Transport ensures direct links and strong relevance to policy making at both national and international levels. The aim of the Forum is to foster a deeper understanding of the essential role played by transport. For more details see: http://www.internationaltransportforum.org/

required for a perfect market are left unfulfilled in the case of taxi services. For example, for there to exist a perfectly competitive market, producers and consumers must have available complete information concerning the quantity and quality of services provided, and moving from one supplier to another must be possible without heavy expense to a consumer. A closer analysis of the different features of the market brings out the following observations:

- “Access to the market”: reducing the number of suppliers, i.e. potential supply through regulatory means brings about many consequences, both positive in that there is greater utilization of production capacity, and negative because of increases in wait times. Nonetheless the arguments in favor of restricting access to the taxi market hardly justify the effective level of restrictions.

- “Quality of taxi services”: taxi patrons cannot gauge service quality beforehand, and consumer protection has proven to be a very important aspect of the issue.

- “Search costs and competition through price”: in a market of cruising taxis, the need to find one can engender high costs. Search costs include the cost in time to look for a taxi and the wait for a second one in the event of a customer refusing the first to come along. Furthermore, as from the moment the taxi halts to pick up a patron, the service supplier has the monopoly and can impose rates far greater to what would correspond to a competitive lever because of the superior bargaining position, which could lead the supplier to discriminate against consumers through price. As such, problems of imperfect or asymmetric information are frequent.

Consequently, the taxi industry is generally regulated by three types of different regulations: i) a quantitative regulation that provides monopoly rights through direct barriers to industry access ii) setting entry conditions through indirect barriers to industry access, and iii) rate controls in the form of rate regulations. Direct barriers to accessing the industry tend to limit the size of the market through the number of operators or the number of taxis per operator. The conditions under which taxi drivers exercise their profession constitute the most widespread indirect barrier to the industry. As a rule, taxi driver candidates must be able to justify certain

qualifications, such as knowledge of the area, a clean police record, etc. The other conditions regarding quality and service concern the vehicles, drivers and operators. Regulation of fares is a source of controversy. The approach to the problem varies from one country or city to another. The differences among policies for setting fares and freedom to set fares are significant, but there are also other intermediary formulas, such as minimum and maximum fares to be considered. Unbalanced information is a key dimension of this issue. Competition through price is not in theory logical unless consumers can have prior knowledge of prices and be able to compare them. This is rarely possible in some segments of the taxi markets.

Experts have also been able to ascertain that over the course of recent decades, numerous countries have in one manner or another managed to deregulate the industry. Deregulation has been more significant in the area of access to the market, but some countries have also ventured into deregulating fares. In some cases, deregulation of access to the market has been accompanied by stricter regulations in quality of services provided. In all cases where access to the market was deregulated, a substantial increase in the number of drivers was registered. The greatest increases in vehicle numbers occurred in areas such as airports and train stations, where wait times were already quite short. With the sometimes massive increase in competitors, the number of operating hours per vehicle has diminished. In as much as a major portion of vehicle and salary outlays are fixed costs, the cost per hour of services actually provided has risen. This means that deregulating access to the market can only be effective if it is also accompanied by regulation of fares. There are strong arguments in favor of implementing some kind of regulation of fares. These refer to the lack of negotiating power of consumers and the grip of companies on the market. When massive numbers of drivers enter the market following an opening of up the industry, an overall drop in quality has been observed. This brings on increased regulation in the form of stricter standards to govern the quality of service. Little margin for maneuver is apparent because in several countries regulatory action to improve quality has resulted in stricter regulation of access.

5.1.2.5 Lessons to be drawn from international experiences

As a whole, experiences taken from the international scene concerning deregulation of the taxi industry highlight a number of general lessons[122]:

- An economic analysis provides good grounds for justifying deregulation in the taxi industry, on several levels. Theoretical approaches however, provide no clear recommendations on how to more perfectly organize the industry.

- Generally speaking, the results of the diverse deregulatory and free play of competition experiences seem to have been limited with relation to what had been hoped for. For example, a study clearly illustrated that *"a gap exists between the hoped-for impact of the changes, which are primarily based on a theoretical analysis, and reality. Theories should therefore be regarded with caution. They do provide valuable information but very often significant aspects of the real situation are not considered in the framework of analysis and thus conclusions have only limited practical value*". The block-out of numerous French cities following the "theoretical" recommendations of the Attali report in 2008, coupled with the overall resistance to reforms affecting a well organized entity are a factor to be considered when attempting to transpose theoretical models into reality. An analysis of documentation of deregulatory experiences in other countries seems nonetheless to allow us to conclude that we should first increase the qualitative requirements that taxi operators and drivers must meet and abolish the quantitative part and, secondly, regulate the fare system by setting maximum levels at least for hailed cabs and establishing a dual system involving called fares if necessary. For the taxi industry is not homogenous. The primary segments of the market are reservations, fares picked up on public roads and taxi stands. Malfunctioning in the market is most apparent in the taxi stands and with taxis roaming for fares. Economists studying the regulation of the industry rapidly confirmed that the hailed taxi market requires regulation, while in contrast, the reservations market needs little other than that in force for the majority of

[122] TRANSPORTOKONOMISK INSTITUTT, op. cit., pp. 76-78

other businesses. Yet, as the Norwegian Institute of Transport Economics states: "*There exists no proper organization of the industry*".

- Differences between geographic locations vary widely. Before implementing change, it will be necessary to analyze the markets in different cities and countries. Generalizations are marginally useful when there exists such variance among geographic locations.

- Costs incurred by introducing regulations must be compared against the benefits obtained, and should they exceed the expected benefits, any change ought to be called in question even if it proves to be highly effective.

5.1.3 The situation of the taxi industry in Luxembourg

5.1.3.1 Introduction

In Luxembourg, the taxi industry is frequently the target of all-around criticism. One source of criticism emanates from the Luxembourg Consumer Union (ULC), which has many times manifested dissatisfaction with the current fare system as well as the degree of transparency apparent in the industry[123]. The Luxembourg Automobile Club (ACL) also chimed in on this subject: "*The exorbitant fares in effect for taxis…put the service out of reach for a very large number of potential users. These high fares are the result of artificial strangling of free enterprise imposed by a law as well as inadequate local government regulations that disproportionally benefit the interests of some taxi operators to the detriment of consumers and thus to overall mobility (...)*"[124]. Lastly, at the inauguration of Luxembourg's new airport in 2008, the Prime Minister's comments indicated his feeling that fares are too high in the nation[125]. It appears that fares within the country are perceived as very high by Luxembourg citizens in comparison to those practiced in other countries.

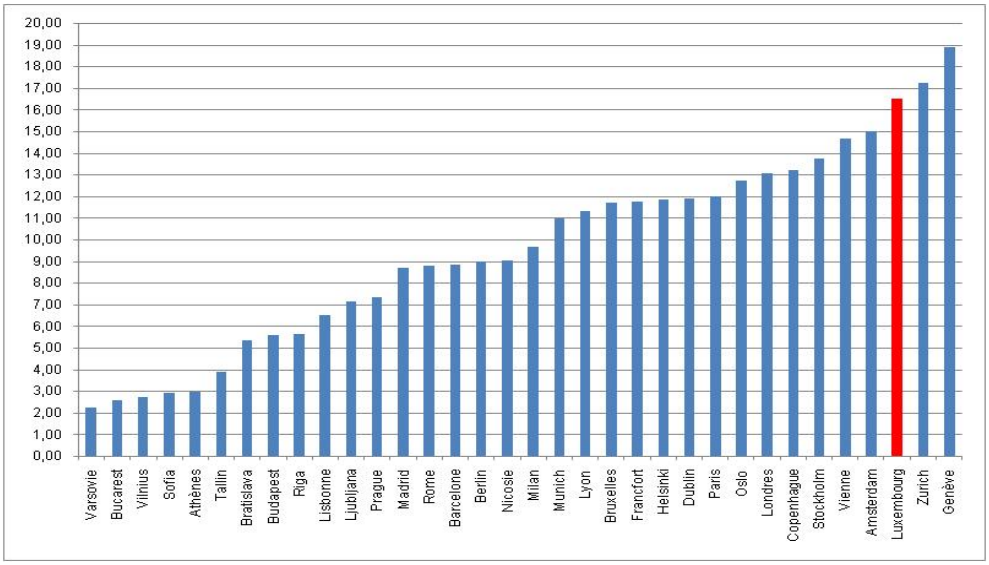
Frame 7: Comparison of fares for a taxi trip among several European cities

A 2009 UBS study[126] showed that significant disparities exist throughout cities in the world for trips in taxis. Among the cities surveyed throughout the world, Geneva takes first place with a fare of € 18.90 for a 5 km daytime trip in urban traffic, including tip. With a fare of € 16.50 for the same distance, Luxembourg is the third most expensive city in Europe, following Geneva, which is 15% higher and Zurich, which is 4% higher. A like trip

[123] See ULC, *Communiqué de presse - L'ULC exige la transparence sur le marché des taxis*, Luxembourg, 30 January 2007
[124] LETZEBUERGER JOURNAL, *Secteur des taxis - L'ACL plaide pour une réforme rapide*, 4 August, 2007
[125] Question asked in Parliament n°2702 by Mr. Xavier Bettel concerning taxi fare structures.
[126] UBS, *Prix et salaires 2009*, Zurich, August 2009, p.20
For more details see: http://www.ubs.com/1/f/wealthmanagement/wealth_management_research.html

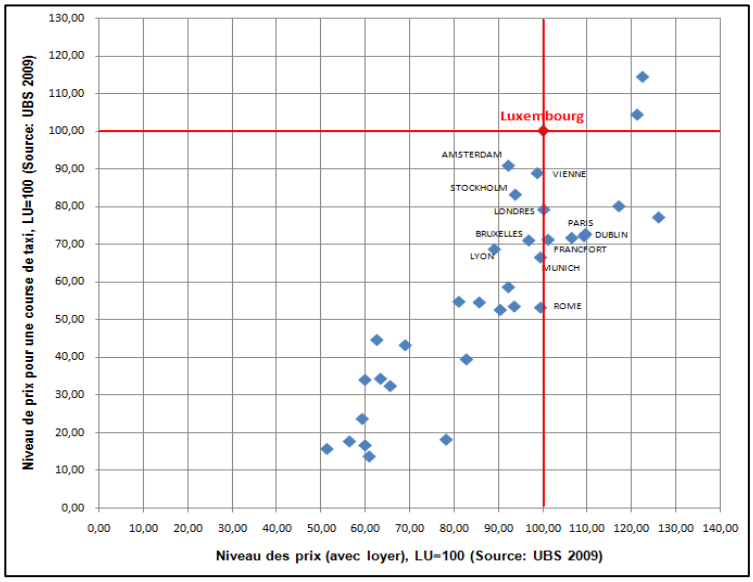
is 21% less expensive in London, 27% less in Paris and 29% lower in Frankfurt and Brussels than what a customer pays in Luxembourg. The average fare in Europe for this trip is around € 9.50, 42% lower than the highest fare. According to *Luxemburger Wort*[127] fares practiced in Luxembourg are also relatively high compared to those in nearby cities such as Trèves or Metz. The "regulated" fare per kilometer[128] in Luxembourg for a similar taxi trip, i.e. a round trip at the maximum fare per kilometer would be 1.36 times that of a fare in Trèves and about 1.55 times that of a fare in Metz.

Figure 31: Fares paid in a series of European cities for a taxi trip of 5 km (3 miles)



Source: UBS (2009)
Note: Fare for a 5 km, or 3 mile fare daytime trip in urban traffic, including tip.

Figure 32: Price levels and fares paid for a taxi trip, by European city



Fare for a taxi ride Luxembourg= 100 UBS 2009 Prices (Rents included) Luxembourg = 100 UBS 2009)
Source: UBS (2009), Calculated by *Observatoire de la Compétitivité*
Notes:
Fare for a 5 km, or 3 mile fare daytime trip in urban traffic, including tip. Luxembourg = 100.
These price levels are taken from the cost of a basket of 122 goods and services made up by UBS and weighted according to consumer habits in Western Europe.

[127] LUXEMBURGER WORT, *Taxipreise unter der Lupe*, Luxembourg, 19 December, 2007
[128] Taxi fares are currently regulated in Luxembourg, as are prices for petroleum products and medications. MEMORIAL, *Journal Officiel du Grand-Duché de Luxembourg*, Law dated 17 May 2004 on Competition, *RECUEIL DE LEGISLATION*, A - N° 76, 26 May 2004.

The UBS study also links data concerning a fare for a taxi trip and overall prices in a city. Several points can be made by comparing overall prices to a taxi fare using two variables and a base rate of 100 for Luxembourg, as follows:

- In cities where life in general is more expensive than in Luxembourg, only two have higher taxi fare rates. However, the gap between these two cities and Luxembourg is higher in the domain of overall prices than in that of taxi fares. In Zurich, there is a 21% difference with Luxembourg in overall prices, yet taxi fares are only 4.5% higher. In Geneva, the difference in overall prices compared to Luxembourg is 22.5%, while taxi fares are 14.5% higher. The other cities that have higher prices overall than Luxembourg post taxi fares that are significantly lower than those in Luxembourg, such as Paris, where prices in general are 10% higher, yet a taxi ride is lower by 27%, or Dublin, where life is 9% more dear on the general level and a taxi ride costs people 28% less.

- All cities where overall prices are close to those in Luxembourg and consequently near the base rate of 100 boast fares much lower than those practiced in Luxembourg: Vienna's fares are 10% lower, those in London are 20% lower, in Frankfurt the difference is 29%, in Munich it is 33% and in Rome 47%.

According to the UBS data, in a European comparison, the fare for a taxi trip in Luxembourg is relatively high with relation to the city's overall level of prices, all things being equal otherwise.

The representatives of the industry are not satisfied either. In its written opinion of draft law 5683 to amend the law dated 17 May 2004 on competition "*The Chamber of Trades formally requests that taxi fares be allowed free play of competition and thus requests the cancellation of the Grand Duchy Regulation setting maximum rates on taxi fares. Taxi companies could then engage in a pricing policy that would take into account economic and social changes on the ground, without being tied to public policy decisions in the area (...). Should the authorities determine that the maximum fare principle be maintained, the Chamber of Trades, as a subsidiary entity, insists that legislative changes under consideration be accompanied by a significant adaptation of these rates (...)*"[129]. So while the general public deems current fare structures overly high, the industry itself is requesting authorization to increase maximum fares.

A look at the regulatory situation as it prevails now in Luxembourg will highlight the factors impacting the structure of the taxi industry and those that influence fare policies.

[129] AVIS DE LA CHAMBRE DES METIERS, *Projet de loi n°5683 portant modification de la loi du 17 mai 2004 relative à la concurrence*, Luxembourg, 27 March, 2007, p.3

5.1.3.2 The current regulatory situation in Luxembourg

a. Access to the market and quality of services

The supply of taxi services on the market and geographic distribution of the market itself are prescribed by law[130]. The law providing for the regulation of taxi services imparts shared authority among the State and the municipalities. Licenses are allotted by the municipalities, which assess a municipal tax[131]. There is currently no existing uniform regulation setting a maximum number of taxis, terms of sale of licenses, etc.[132]. With regard to qualitative conditions for accessing the profession, a distinction must be drawn between the professional features of operators involving honorability and qualifications[133] and those of drivers, to include licenses, familiarization internships and absence of other requirements[134]. Selection criteria concerning vehicles to be used are not numerous[135].

b. Fares for taxi journeys

As illustrated by the comparative international analysis in the preceding section, the regulatory approach for fares varies from one country or even one city to another. Differences between policies for setting fares and setting fares without restrictions are major. In the area of regulated pricing policies, apart from fixed fares there are other intermediary formulas, such as the maximum and minimum fares. It is precisely the lack of consistent information in this market that forms the basis of the need for regulation of fares, because in theory, competition by prices has no meaning if consumers do not know prices in advance so as to be able to compare. In Luxembourg, the law states that "*prices for goods and services are determined freely, through the free play of competition. However, where competition by price is inadequate in given sectors either because of market structure or because consumers cannot profit from the advantages of the market, either legislative acts or Grand-Duchy regulations may set prices on the applicable margins for goods,*

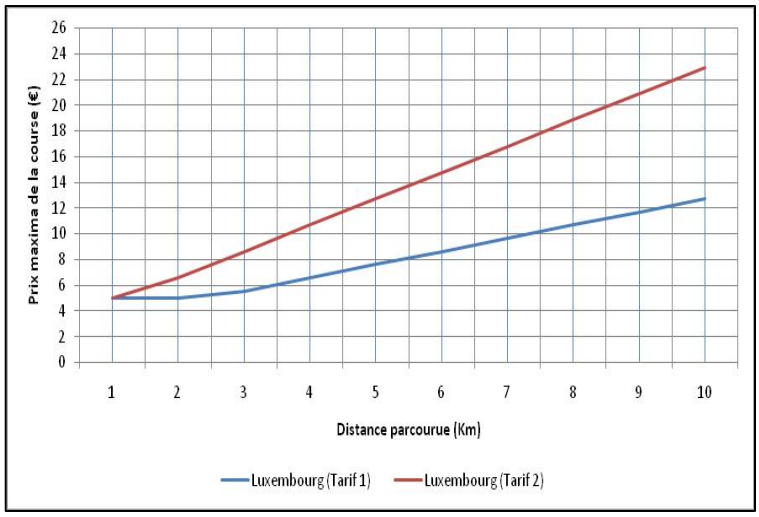
[130] MEMORIAL, *Journal Officiel du Grand-Duché de Luxembourg*, *Loi du 18 mars 1997 portant réglementation des services des taxis*, RECUEIL DE LEGISLATION, A - N° 29, 28 April 2007
[131] Without affecting other authorizations, taxi operators must nonetheless submit a written application for an authorization to operate at the Luxembourg airport to the Ministry of Transportation. For more details see: http://www.mt.public.lu/transports/aviation/taxi_aeroport/index.html
[132] As an example, see City of Luxembourg Regulation concerning Taxi services dated 8 February 1999.
[133] Conditions per the law dated 28 December 1988 regulating the access to the profession of craftsman, store owner, industrial entity as well as some professional occupations.
[134] Conditions per Grand-Duchy Regulation dated 27 March 1997.
[135] Conditions per Grand-Duchy Decision dated 23 November 1955.

products or services"[136]. Legislators deemed that the features of the domestic market for taxi services were not conducive to setting fares through the free play of competition. Therefore, a regulation was adopted for this market to set fares. Maximum fares were adopted by a Grand-Duchy regulation[137] for ordinary fares, night rates in effect between 22h00 and 06h00, trips outside of the country, and hourly rate and Sunday fares. The regulation also set a minimum fare per journey. A distinction was drawn between Class 1 fares for round trips and Class 2 fares for one-way trips.

Frame 8: Simulation of fares for taxi trips in Luxembourg

Fares for taxis are determined by Grand Duchy regulation, which sets the minimum fare per trip of € 5 and a maximum fare per kilometer carried, which is of course variable. Using an ordinary round trip fare in mid-week, during the day with no wait, we find that a round-trip fare totaling 10 km is around € 13 at a Class 1 rate, as is a one way trip of 5 km under a Class 2 rate. We have assumed a pick-up fee of € 2.5. The difference apparent between the two curves at the beginning of their paths can be explained by the minimum trip fare.

Figure 33: Graph of maximum fare for taxi trips of 1 to 10 km



Note: Calculations by the *Observatoire de la Compétitivité*

(Maximum price for the trip *Distance of trip in kilometers)*

c. Other determinants having an impact of the market for taxi services

Apart from the quantitative, qualitative and fare regulations, there also exist a certain

[136] MEMORIAL, *Journal Officiel du Grand-Duché de Luxembourg, Loi du 17 mai 2004 relative à la concurrence*, RECUEIL DE LEGISLATION, A - N° 76, 26 May 2004 and MEMORIAL, *Journal Officiel du Grand-Duché de Luxembourg, Loi du 11 mars 2008 portant modification de la loi du 17 mai 2004 relative à la concurrence*, RECUEIL DE LEGISLATION A - N° 35, 28 March 2008

[137] MEMORIAL, *Journal Officiel du Grand-Duché de Luxembourg, Règlement grand-ducal du 9 juillet 2004 fixant des prix maxima pour courses en taxi*, RECUEIL DE LEGISLATION A - N° 127, 16 July 2004
Although a Grand Duchy Regulation in this area was adopted on 9 July 2004 in application of Article 2 of the law, several taxi companies do not adhere to the set maximum fares while others do conform to the regulation, which has skewed competition in the market. For more details see: *MEMORIAL Journal Officiel du Grand-Duché de Luxembourg, Loi du 11 mars 2008 portant modification de la loi du 17 mai 2004 relative à la concurrence*, RECUEIL DE LEGISLATION A - N° 35, 28 March 2008

number of factors that impact the supply and demand for taxi services in Luxembourg. These are to be found in the following regulations:

- The geographic limits of the area for picking up fares. This regulation expressly prohibits taxi companies - with certain exceptions - to take on fares in a municipality that has granted authorizations for taxi services unless the taxi company holds such an authorization from that municipality[138]. As such, taxis are restricted to certain geographic zones.
- A limiting of the pickup area. Customers in general can only get into taxis where the vehicles are authorized to park while awaiting customers[139].
- The system forcing customers to take the taxi at the head of the line, which deprives them of the right to choose their taxi, thus eliminating price competition[140].

d. The Competition Council analysis

The Competition Council issued an opinion on the industry[141], more particularly on the issue of whether taxi customers where not to be considered a captive clientele that is obstructed from enjoying the advantages of the market, something that would justify legally setting prices[142]. According to the Competition Council, the legal and regulatory apparatus does not allow for the free play of competition due to several factors. These include the limited number of competitors which is controlled by municipalities, the geographic limitation into pickup zones, which works to the detriment of other competitors and the regulated elimination of choice of consumers at taxi stands. Practically all local regulations on the municipality level oblige taxi riders and drivers to adhere to the head of line or first taxi available system. Lastly,

[138] The law dated 18 March, 1997 for regulating taxi services, RECUEIL DE LEGISLATION, A - N°29, 28 April 2007. There are only two circumstances that allow for an exception to this rule. The first concerns the situation of those municipalities that have not adopted a ruling for taxi services, in which case all taxis are free to pick up customers in these municipalities. The second exception concerns called taxis, where a taxi that does not possess the municipality authorization where it will pick up its fare may still seek its fare in that community. It is however prohibited from the use of taxi parking areas or taxi stands, which are reserved for authorized taxis.

[139] Article 56 of the Grand Duchy regulation dated 23 November, 1955. This restriction does not apply if a pickup occurs at least 50 meters from any taxi stand.

[140] This would be less of a problem in a system of fixed fares.

[141] COMPETITION COUNCIL, *Avis N° 2007-AV-02 du Conseil de la concurrence du 15 novembre 2007 relatif à une demande d'avis de Monsieur le Ministre de l'Economie et du Commerce extérieur concernant l'application de l'article 2, alinéa 2 de la loi du 17 mai 2004 relative à la concurrence au marché des services de taxis*, Luxembourg, 15 September, 2007. For more details see: http://www.concurrence.public.lu/

[142] On the basis of Article 2, paragraph 2 of the law dated 17 May 2004 on competition.

the Competition Council stated that the current state of legislation in Luxembourg and the market's characteristics do not allow unrestricted setting of fares nor does it allow for the free play of competition[143]. As a consequence of this, the market fulfills the conditions for allowing the adoption of a regulation to set fares and margins.

5.1.3.3 Towards a reform of the taxi industry in Luxembourg

The Government has ordered a complete study of the taxi industry. The objective of this study is to determine how to optimize its overall functioning through improvements in the current regulatory system. First, a new regime in the area of market access and quality of service that is intended to further open up the market and thus render it more competitive is currently being drafted. Secondly, the analysis includes a new fare system based on a cost study and on costs in the industry.

[143] From Article 2, Paragraph 2 of the law dated 17 May 2004 on competition.

Frame 9: Statistics relating to the taxi industry

1. Jobs, employees and sales figures in the taxi transportation industry

According to STATEC, as of 1 January 2008 there were 118 taxi companies operating actively in the taxi industry[144]. In 2007, the taxi transportation industry recorded sales of around 23.5 million euros in Luxembourg. The sector employed 449 persons, 394 of which in the status of wage earners[145]. Taking this last figure as an approximation to determine the number of taxi drivers in these companies, thus excluding administrative personnel, and adding those companies with no workforce on the books that recorded sales in 2007 and are thus supposed to be owner-operators, the density of taxis in Luxembourg is estimated to be 0.9 taxis per 1,000 inhabitants in 2008. These rates are relatively low, taken in an international comparison and assuming like for like comparisons.

	Densité (Taxis par 1000 habitants)	
Pays	Moyenne nationale	Moyenne dans la capitale
Irlande	3,6	7,3
Espagne	1,8	3,3
Finlande	1,8	2,4
Norvège	1,7	4,4
Suède	1,6	2,9
Autriche	1,2	2,5
Royaume-Uni	1,0	2,2
Luxembourg	0,9	n.d.
France	0,7	2,5
Pays-Bas	0,7	1,8
Allemagne	0,7	2,0
Belgique	0,4	1,3

Density
(Taxis per 1,000 inhabitants)
Country *Nation average* *Average in the capital city*

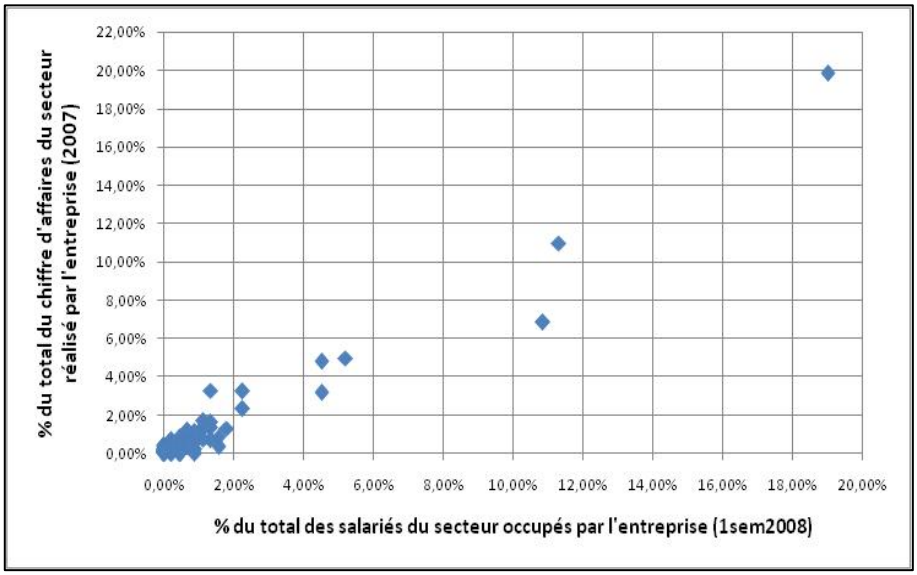
Source: TRANSPORTOKONOMISK INSTITUTT (2003)
Note: The density for Luxembourg was calculated by *Observatoire de la Compétitivité* (2008)

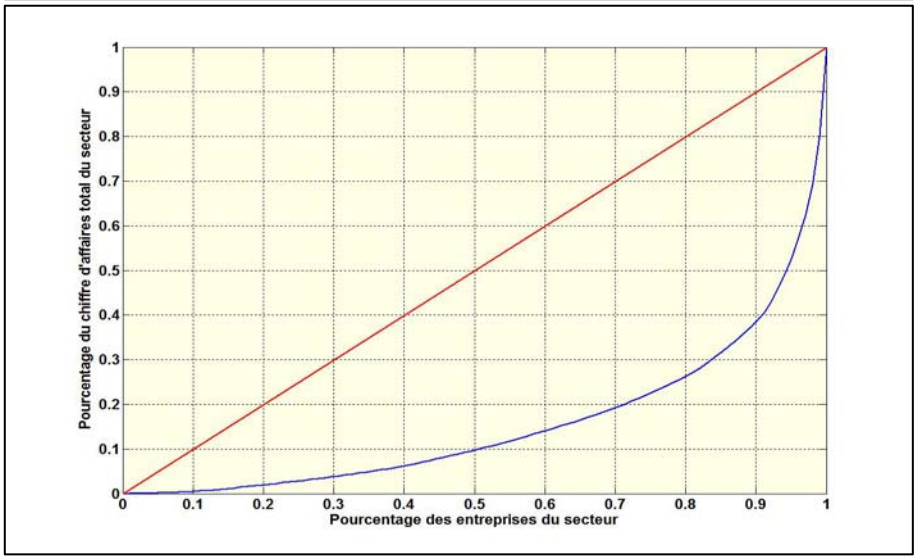
On the national level, the market leader employs 19% of total employees, which represents around 17% of the industry's total jobs,[146] and takes in around 20% of total sales. Together, the three largest companies account for 38% of total industry sales and employ 41% of salaries, or 38% total employment. The shape of the Lorentz curve below also provides information on the level of concentration of the industry. The diagonal axis represents the breakdown, meaning that x% of total employment or sales are concentrated near x% of companies in the sector. For example, the chart illustrates that 50% of the companies account for 10% of total sales in the industry, and that 90% of companies account for 40% sales. The concentration in the industry can also be estimated through calculating the Gini index[147]. It varies between 0 representing no inequality and 1 representing extreme inequality. As part of this analysis, the estimated Gini coefficients for total sales and total employment, at 0.69 and 0.65, in the industry, are relatively similar.

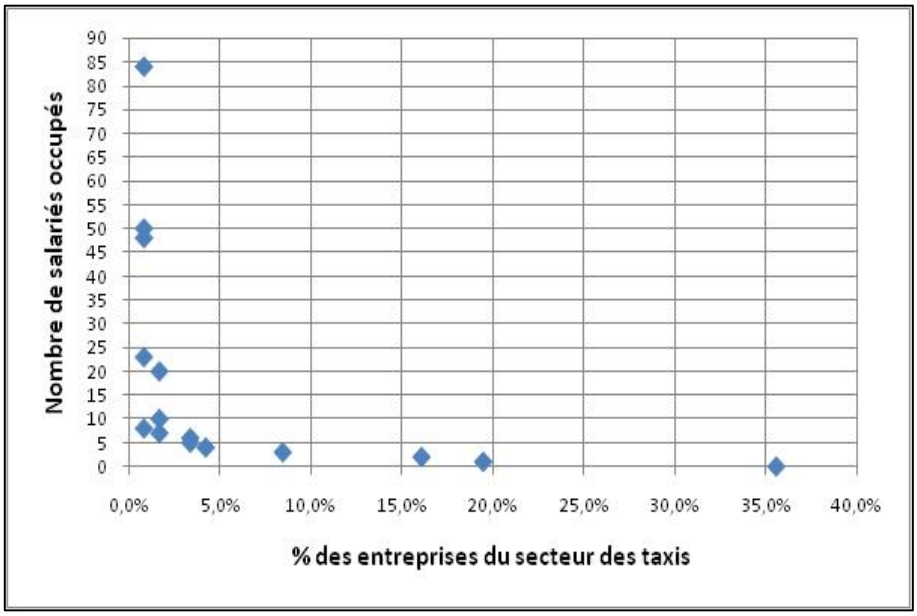
Generally speaking, company sizes are quite small. Only 6.8% of the companies in the industry employ 10 or more persons, and around 55% of companies in the industry have at least one employee. Nearly 36% of companies do not employ even one person and approximately 8.6% of total employment in the industry is thus presumed to comprise owner-operators with no employees, having no administrative or production employees, thus assuming that the single job in the company is operated by this person.

[144] NACE Rev. 2 49.320: Transport of persons by taxi, from data available as from August, 2009. Regarding companies with businesses in both the taxi services and ambulance transport sectors, those whose main activity is taxi services appear under heading 49.320, while the others are listed under heading 86.909.
[145] This data appeared prior to the introduction of the single status, thus before the distinction between wage earners and salaried employees.
[146] The total number of industry employees including wage earners and administrative personnel should not be confused with the total number of persons employed in the industry, which also includes taxi employers. In fact, the assumption is that if a company with sales in the industry has no workforce, then only one person worked in that company: the taxi owner-operator. Total employment = Σ wage earners + Σ salaried employees + Σ taxi owners-operators.
[147] Which corresponds to two times the area between the equi-repartition and the Lorentz curve?

Figure 34: Jobs, employees and sales in the taxi industry in Luxembourg





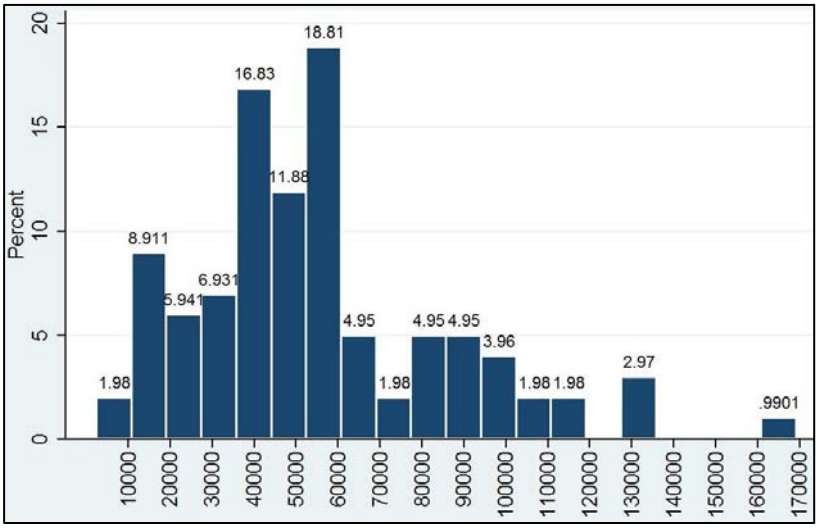


Source: Data by STATEC, calculations by the *Observatoire de la Compétitivité*

(CHARTS: Top chart: Side—% of total sales in the industry recorded by company in 2007; Bottom—% of total industry workers employed by the company in the first half of 2008.
Middle chart: Side—Percentage of total industry sales; Bottom—Percentage of companies in the industry
Bottom chart: Side—Number of persons employed; Bottom—% of companies in the taxi industry)

Annual sales per person employed[148] in the industry were around € 55,000 in 2007, roughly € 4,600 in monthly sales. Nearly half of the companies had annual sales of between € 35,000 and € 60,000, which includes roughly 47% of the companies in the industry. However, some companies recorded relatively high sales with relation to others: around 3% had sales of € 130,000 and an additional 1% took in nearly € 160,000.

Figure 35: Distribution of annual sales per person employed in 2007

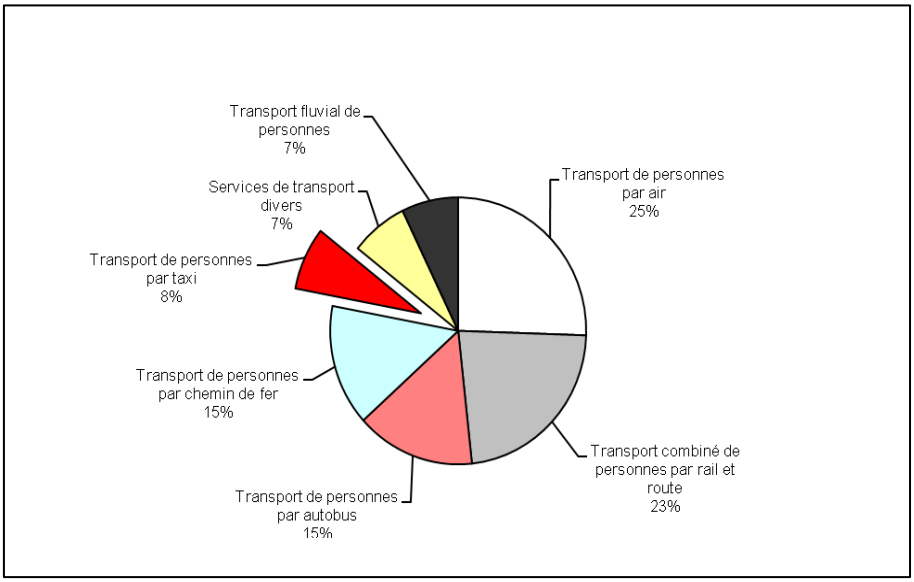


Source: data by STATEC, calculations by the *Observatoire de la Compétitivité*

2. The consumer viewpoint – share of household budget dedicated to taxi transportation

Taxi trips by people in Luxembourg account for around 8% of household transportation budgets. This rate is relatively small compared to other expenditures for transportation.

Figure 36 : Breakdown of household transportation expenses



Source: STATEC (EBM)

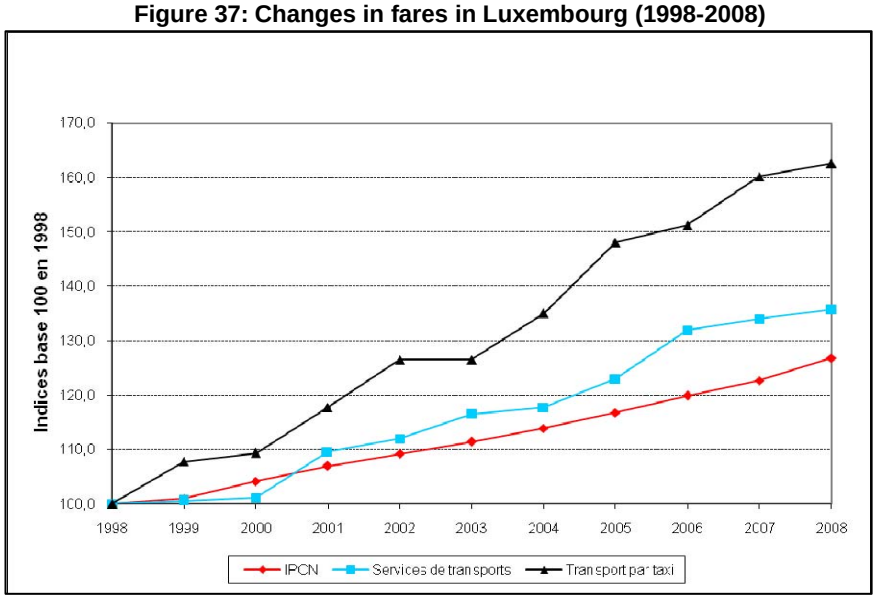
[148] Simple average for companies in the industry for which sales data in 2007 are available, with data concerning persons employed dating from the first half of 2008. Where a company hired no employees in 2008, it is assumed that only a single person worked in the company as an owner-operator, as with the estimate done on total employment in the industry.

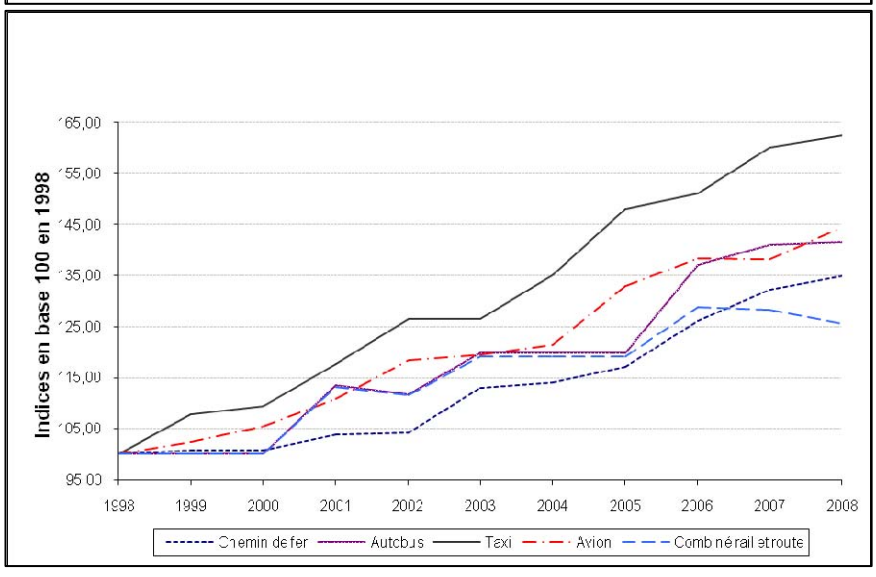
Figure 36: Clockwise from top—Air transportation, 25%; Combined transportation by road and rail, 23%; Transportation by bus, 15%; Transportation by rail, 15%; Transportation by taxi, 8%; Miscellaneous forms of transportations, 7%; River transportation, 7%)

3. Changes in fares for taxi trips

An examination of taxi fares in Luxembourg using a sampling of fares compiled by STATEC over past years brings to light several interesting observations. First, over the past ten years, taxi fares have increased much faster than prices for other general transportation services or than prices in the IPCN consumer price index. By 2008, the fare for a taxi ride had increased over 60% with relation to 1998, and fares have also risen significantly despite the law and Grand Duchy regulation setting maximum fares for taxi rides[149].

Figure 37: Changes in fares in Luxembourg (1998-2008)





Source: STATEC

Top chart, side: Index base = 100 in 1998 ; Bottom: IPCN consumer price index
Bottom chart, side: Index base = 100 in 1998 ; Bottom: Rail Bus

Among prices for all types of transportation services, taxi fares are also those that increased the most between 1998-2008. Increases are significantly higher for taxis than for air, bus or rail tickets. While with relation to 1998,

[149] Also see the MEMORIAL the Official Journal of the Grand-Duchy of Luxembourg, Law dated 11 March 2008 amending law dated 17 May 2004 on Competition, RECUEIL DE LEGISLATION A - N° 35, 28 March, 2008

the price of a taxi ride increased 60% by 2008, only a 45% increase was registered by air, 42% for bus tickets and 35% for railway tickets.

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5.2 Sales prices for apartments in Luxembourg: Is the trend reversing in 2008 ?

Indicators on changes occurring in the real estate sector are essential to better understand, analyze and predict the economic and financial environment. Often, the origin of financial crises can be traced down to the bursting of a speculative real estate bubble. In order to improve availability of reliable, timely and frequent data on the real estate market in Luxembourg, STATEC has been publishing a new quarterly statistics series since June, 2009 that concentrates on sales prices of apartments[150].

Apartments are a crucial segment of the country's real estate market. Many households' first real estate acquisition is an apartment. In addition, the construction of apartments is the principal growth driver in the housing offer. According to the latest figures regarding completed buildings[151], nearly 1,600 new apartments came on-stream in 2006, compared to only 660 single family homes that were completed that year, which indicates that 70% of new dwellings are in apartment units. In the future, it will be essential to be able to measure the impact of these new units on prices, especially since the Housing Pact, adopted by Parliament in 2008[152], is intended precisely to increase the supply of new housing units in order to reduce their price.

It has become possible to produce statistics on sales prices of apartments after the *Administration de l'Enregistrement et des Domaines* (AED) made a new data file available. The file consists of official transaction prices recorded in notary deeds. These statistics are supplemented by data coming out of another administrative register (Cadastre vertical) concerning the surface area and description of apartments.

5.2.1 Average prices recorded in 2008

The average sales price of an apartment in 2008, of which there were some 3,000 transactions, amounted to € 290,000. While this figure does give an idea about

[150] Tables of statistics may be downloaded free of charge at the following address: http://www.statistiques.public.lu/fr/publications/series/Indicrapides/index.html
[151] See *Les bâtiments achevés en 2006* (Structures Completed in 2006), STATEC Bulletin October, 2008.
[152] *Loi du 22 octobre 2008 portant promotion de l'habitat et création d'un pacte logement avec les communes*

prices for apartments, it still hides major disparities among individual unit prices. The price of a housing unit depends strongly on the unit's features, so a more detailed analysis is necessary than a simple average of housing prices.

Pre-construction purchase (*Vente en état futur d'achèvement*) remains a very popular method of acquiring an apartment, accounting for one third of recorded transactions. This type of transaction is regulated by a specific piece of legislation[153] and concerns sales of apartment units for which construction, or a part of the construction is not complete at the settlement date. Buyers initially become owners of the land on which the building will be constructed as well as all parts of the building completed at the purchase date. Sums are due as work progresses. While these progress payments are often index-linked, the price recorded in the AED database only represents the amount paid at settlement, thus excluding future potential price increases caused by the index mechanism. In addition, often the 3% VAT super rate is directly applied to the part of the sum recorded in the act, instead of the standard 15%. Lastly, the transaction date is set at the date of settlement of the purchase, and not at the date the construction is complete.

According to 2008 figures, the average price of a newly built apartment is €351 000, compared to an average price for existing apartment of € 271 000. An additional factor affecting sales prices of older units is the date the unit was built, or the date of the last major renovation. In general, the value of an apartment decreases with its age.. Unfortunately, the AED file does not contain data on the age of its contents and it is consequently still not possible to break down sales prices by the age of housing units.

Clearly, the price of a dwelling depends also on its size measured for instance in terms of number of rooms or surface area. Nonetheless, as long as no harmonized definition of the living area of a dwelling exists, surface areas advertized should be interpreted with caution. In France[154] for example, the 1996 introduction of the Carrez law making it compulsory to indicate surface areas according to a formal definition resulted in a drop in average square meters of some 4% for apartment

[153] *Loi du 29 décembre 1976 relative aux ventes d'immeubles à construire et à l'obligation de garantie en raison de vices de construction* .

[154] See "*Correction des effets de loi Carrez"*, in *Les indices Notaires Insee de prix des logements anciens*, INSEE Méthodes N° 111.

units. Prior to the implementation of this law, some owners could also have been tempted to overstate the size of their property. The figures published by STATEC are based on the concept of "utilizable" floor space, determined by the *Administration du Cadastre et de la Topographie* an based on a very precise definition[155]. This concept does not necessarily coincide with that of living area but at present there exists no other administrative data to describe the size of a housing unit.

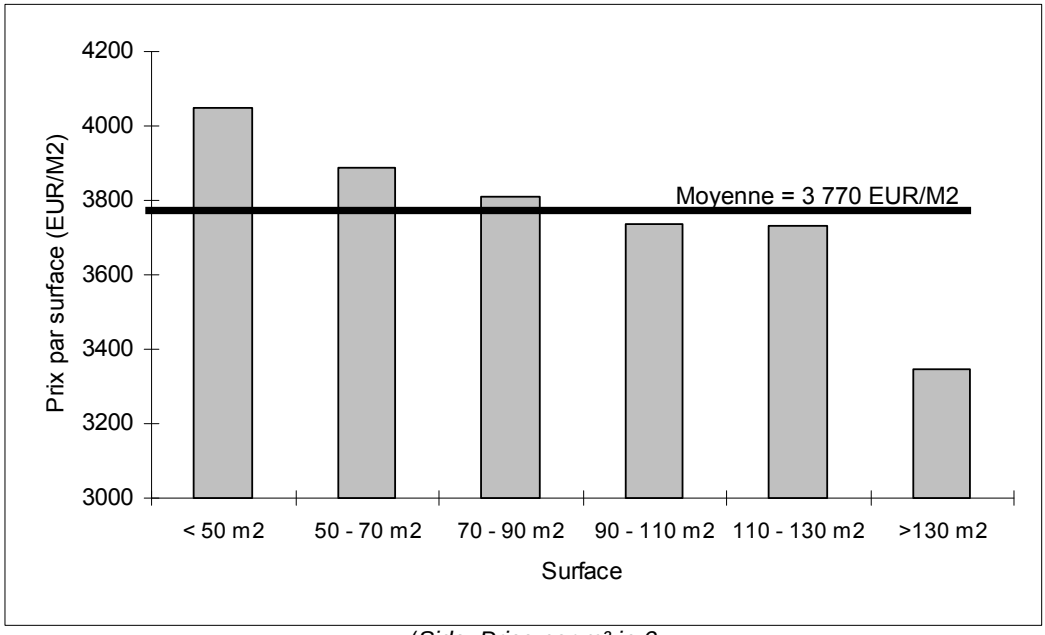
As a convention, we shall assume that the surface area of an appartment corresponds to its utilizable floor space and does not include the area of any garages or cellar storage space that may go with the property. Using this definition, it is possible to come up with a square meter price. Over the year 2008, the average price amounts to € 3,770 per m^2. Furthermore, this square meter price diminishes progressively as the unit's surface increases (see graph below) or, in other words, price increases diminish as surface area rises.

Another determining factor in housing unit prices is a property's geographical location. Overall, real estate prices diminish progressively as the distance increases from the city of Luxembourg. This geocentric phenomenon also appears in prices for apartments (see graph below). Changes in price can thus vary by -17% to -27% in terms of lower square meter prices between the Center and other regions of the country. For apartment buyers then, there clearly exists a trade-off between being close to Luxembourg city and real estate prices. The regional grouping presented here, which is based on cantons[156], is nonetheless very rudimentary, and major differences can exist within regions. Further research is necessary to properly quantify the spatial aspects of the issue.

[155] See Article 3 of the *Règlement grand-ducal du 22 juin 1988 concernant la publicité en matière de co-propriété.*

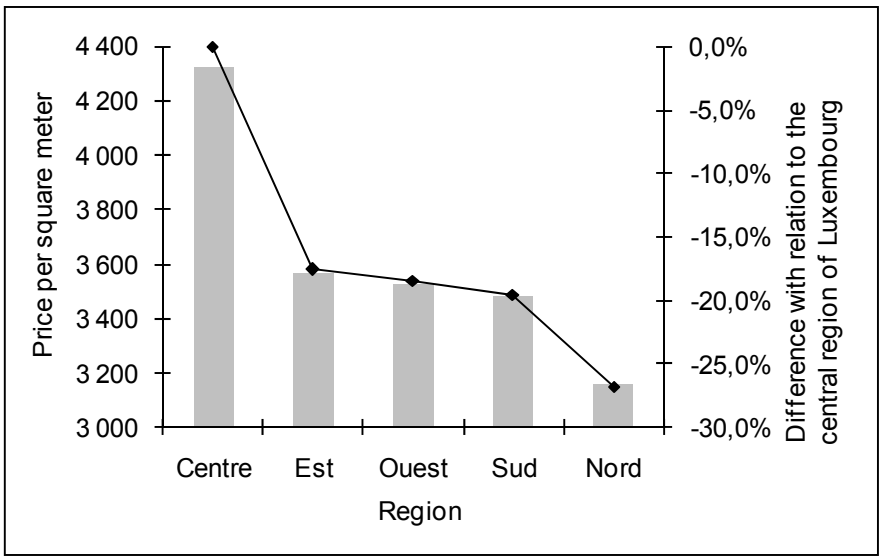
[156] Center: Luxembourg, Mersch; South: Esch-sur-Alzette; East: Echternach, Grevenmacher, Remich; West: Redange-sur-Attert, Capellen; North: Clervaux, Diekirch, Vianden, Wiltz.

Figure 38 : Square meter prices by apartment size in 2008



(*Side: Price per m² in €*
Bottom: surface area *Average = € 3,770/m²*)
Source: AED data file – Calculations by STATEC

Figure 39: Square meter prices based on region in 2008



Source: AED data file – Calculations by STATEC

5.2.2 Changes in prices as measured by hedonic indices

In view of all the different factors that influence the price of housing, it is a delicate exercise to compare average prices over time. Indeed, a part of the price development can be explained by the strong differences between the characteristics of units sold during two given comparison periods. To avoid that such differences in

samplings blur price changes, the use of hedonic indices is recommended[157]. These indices are based on a method using econometric models that attempt to explain housing unit prices through the unit's characteristics. It is possible to neutralize differences in quality of housing units sold at different times, thus measuring pure prices changes. This is done by estimating regression coefficients known as implicit prices. This type of technique was used to analyze sales prices of apartments in the AED database, incorporating surface area, location, transaction type (new construction or existing unit) and whether or not a cellar, garage or other annex was included with the apartment.

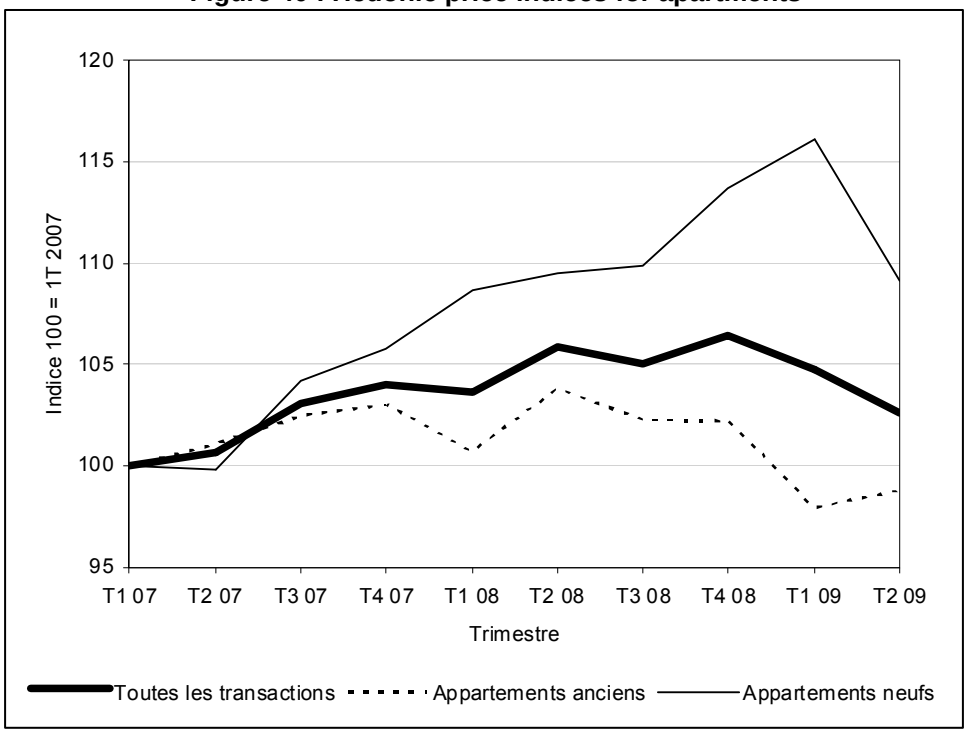
The hedonic indices derived from this analysis[158] appear in the graph below. Existing apartment prices remained nearly stable for the period 2007-2008, except for a dip during the first quarter of 2008. It was not until the first quarter of 2009 that prices have reacted to the difficult economic environment, plunging 4.4% compared to the fourth quarter of 2008. In contrast, prices for new construction units continued to rise without interruption up till the first quarter of 2009, with 2008 prices 7.5% higher compared to 2007. Thus the difference in price levels between new and existing constructions has increased more during this period. The price trend for new units finally reversed in the second quarter of 2009, lagging a full quarter behind the slump in prices for existing units. In fact, prices for new units dropped by 6% compared to the previous quarter, and thus returned to levels of the third quarter of 2008.

By aggregating[159] the series for new and existing apartments, an annual increase of 3.2% is observed for apartment prices in 2008 compared to 2007, which corresponds with the overall rate of inflation experienced in Luxembourg as measured by the national consumer price index over the same period. Therefore, in real terms, prices for apartments in 2008 remained stable. As from the final quarter of 2008, prices began to adjust progressively downward. In the second quarter of 2009, the hedonic index was 3.1% lower with respect to the same quarter of the previous year. As shown in the graph below, purchase prices of apartments

[157] See Eurostat (2009), Draft Technical Manual on Owner-Occupied Housing, http://epp.eurostat.ec.europa.eu/portal/page/portal/hicp/documents/Tab/Tab/03_METH-OOH-TECHMANUAL_V1-8.pdf
[158] Provisional figures for the second quarter of 2009
[159] The weighting is based on the sum of sales transactions recorded in 2007 and 2008.

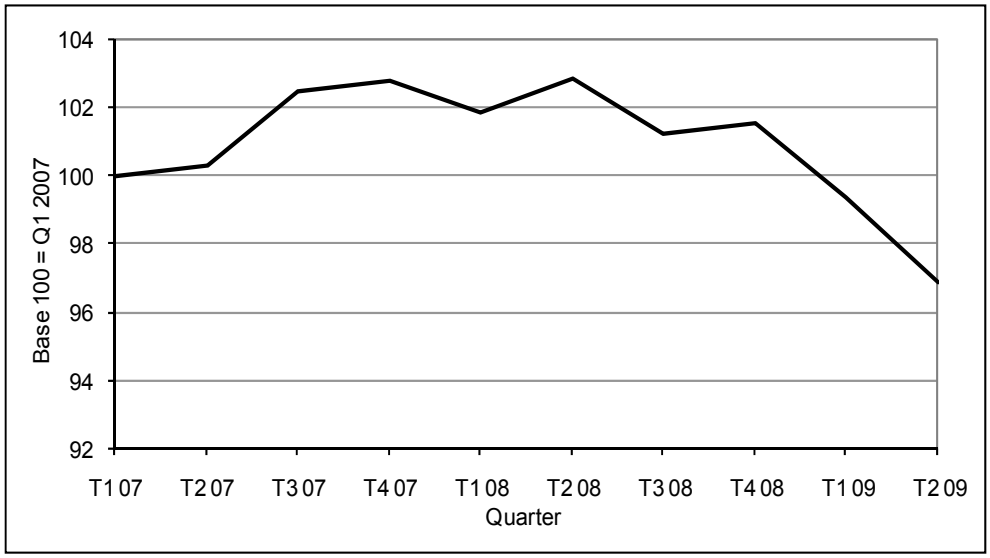
increased overall at the same rates as rents[160] during the period extending from the fourth quarter of 2007 to the fourth quarter of 2008. This price equilibrium between purchase prices and rental rates began to fall away in early 2009 as sales prices started dropping.

Figure 40 : Hedonic price indices for apartments



Source: AED data file – Calculations by STATEC

Figure 41 : Ratio between purchase prices and rents for apartments

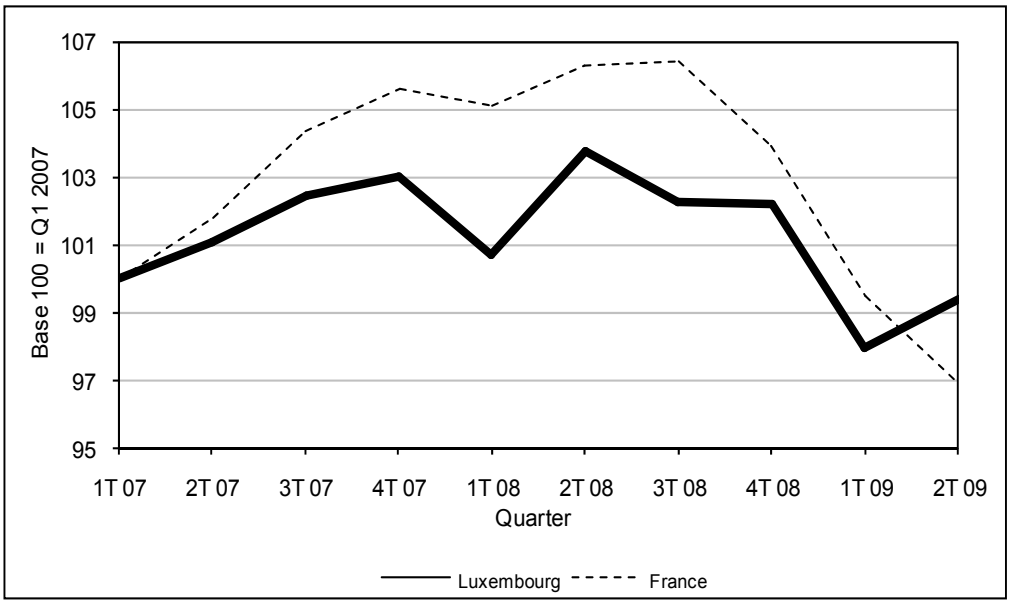


Source: AED - IPCN – Calculations by STATEC

[160] A sub-series entitled "Apartment rents" of the domestic consumer price index.

The question arises concerning the extent to which prices may continue to fall, as price levels are generally perceived as being high in Luxembourg and that other real estate markets in Europe, such as in Great Britain or Spain, are showing signs of caving in. It is true that Great Britain and Spain experienced much higher price increases than in Luxembourg and one may speak of a genuine bursting of the real estate bubble in those countries. With relation to the country's synchronization with European markets, a study by the Luxembourg Central Bank (BCL)[161] concluded that over the period of 1975-2003, Luxembourg's real estate cycles have most closely correlated with those of France and Belgium. At least over the period during which data are available for Luxembourg, price trends for existing apartments are similar to those observe in France by the French statistics institute INSEE (see graph below), which confirm the BCL conclusions.

Figure 42 : Hedonic price indices for existing apartments, comparison between Luxembourg and France



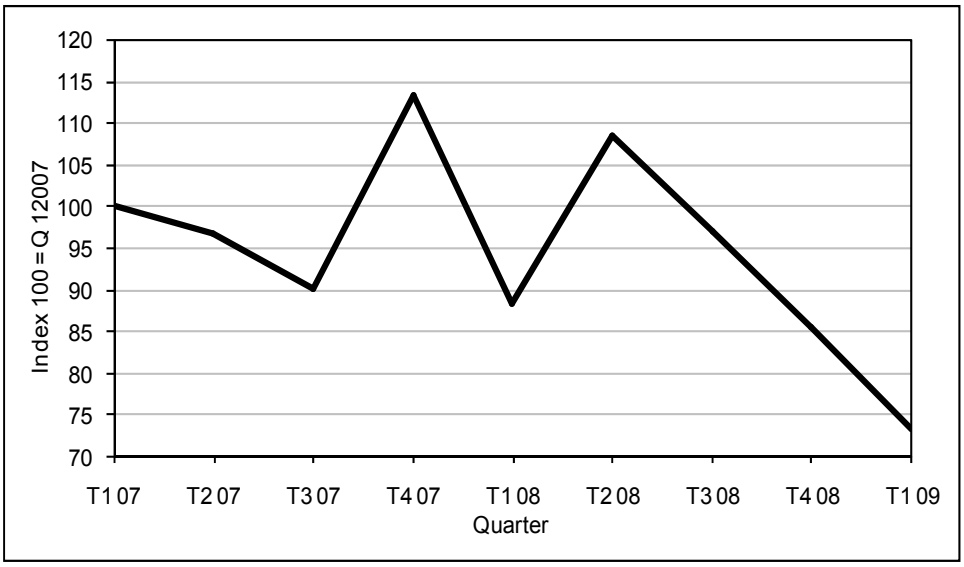
Source: AED data file – Calculations by STATEC

Apart from prices, which were roughly stable over 2008 and began to fall as from the first quarter of 2009, the number of transactions is dropping beginning with the second half of 2008, as illustrated in the graph below. In fact, this expresses a 'wait

[161] BCL (2006). *L'évolution récente des prix immobiliers au Luxembourg est-elle exceptionnelle ?* BCL Bulletin 2006/1.

and see' attitude on the real estate market. As potential buyers put off purchasing housing in anticipation of lower prices, sellers were not yet ready in 2008 to significantly lower their offer prices, hoping that the market would take off again. The number of transactions appears overstated at the end of 2007 and understated at the beginning of 2008. In fact, transactions were more numerous because of a preferential tax scheme for capital gains on real estate. This scheme was established in 2002 but was not renewed at the end of 2007[162]. Hence sales occurring before January 1st 2008 were still treated according to the old legislation.

Figure 43 : Number of transactions



Source : AED data file- Calculations by STATEC

5.2.3 Recorded prices and advertised prices

As we have just seen, using the AED data file, it is possible to produce price statistics based on finalized transactions. Several domestic organizations such as *At Home* and the *Observatoire de l'Habitat* have also been publishing statistics established from advertised prices found in announcements published on the internet and in the local press. At a methodological seminar on the real estate sector hosted by the *Observatoire de la Compétitivité*[163], one subject of discussion was the

[162] *Loi modifiée du 30 juillet 2002 déterminant différentes mesures fiscales destinées à encourager la mise sur le marché et l'acquisition de terrains à bâtir et d'immeubles d'habitation* .

[163] Presentations made during this seminar may be downloaded at the following address: http://www.odc.public.lu/actualites/2009/06/30_seminaire_logement/index.html

comparison between official prices recorded and advertised prices. All participants[164] at the seminar agreed that the two approaches provided complementary information about the real estate market.

An administrative source presents the advantage of accounting for recorded real estate transactions in an exhaustive manner. In general, prices recorded in these transactions effectively correspond to the amounts paid by home buyers. From another perspective, attempting to interpret advertised prices is difficult as these prices can incorporate such diverse phenomena as unrealistic expectations of sellers, the anticipatory impact, or the existence of offers by sellers who can ask abnormal high prices and who are not under time pressure to lower their prices immediately. However, because advertising prices can be ahead of the market, they can contain a forecasting component and are thus somewhat useful for economic analysis.

In general, there is a gap between prices asked upon the initial offering on the market by sellers and the closing price. This difference in level can depend on a number of factors, such as the economic situation, the type of real estate product, the buyer or seller either of whom may be a professional or not, or the cultural attitude with relation to negotiations in general. An initial glance at the table below seems to indicate a difference of some 10%-12% between the advertised and recorded prices for apartments in Luxembourg[165].

Table 46 Comparison between the average advertised price and the average recorded price for apartments

	2007	2008
Average asking price	334,800	333,800
Average price at settlement	294,000	299,000
Difference	*-12%*	*-10%*

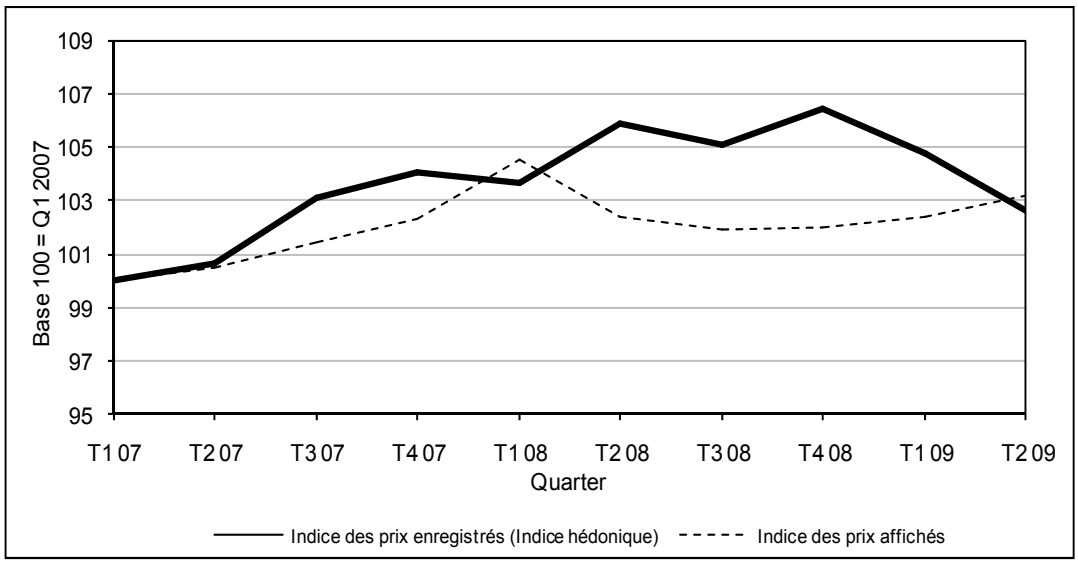
Source: AED data file - *Observatoire de l'Habitat* – Calculations by STATEC

[164] The Luxembourg Central Bank, the *Chambre immobilière* (Real Estate Chamber), Athome.lu, the *Chambre des Notaires*, the *Administration de l'Enregistrement et des Domaines*, STATEC and the *Observatoire de l'Habitat*.

[165] This comparison does not take into account the difference of apartment features when computing an average advertised price or an average transaction price.

When comparing the series of advertised and recorded prices in time, one must also take into account the time lag between the moment when the dwelling came on the market and when the purchase actually occurred. Additionally, the length of this lag can vary in time, as with longer periods during economic recessions, which complicates further an analysis of the relationship between advertised and recorded prices. In the graph below, the hedonic index established using recorded prices is compared to the index put out by the *Observatoire de l'Habitat*, which is based on asking prices. According to both indices, there are increases in 2007, although advertised prices rise less quickly than recorded prices. The temporary drop in sales prices in the first quarter of 2008 does not seem to appear in the *Observatoire de l'Habitat* series. As from the second quarter of 2008, a stabilizing of prices can be discerned according to both perspectives. Lastly, when the second quarter of 2009 is compared to the first quarter of 2007, we see an increase of around 3% for both advertised and recorded prices.

Figure 44 : Comparison between the index of recorded prices (STATEC) and the index of advertised prices (*Observatoire de l'Habit*at)



Source : AED data file - *Observatoire de l'Habitat* – Calculations by STATEC

5.2.4 Conclusion

In conclusion, sales prices for apartments in Luxembourg appear indeed to be adapting to the careful behavior of buyers. As from the second quarter of 2008, demand ebbed significantly on the market, resulting in a saturation of apartments on

offer. Although prices held firm throughout 2008, they finally succumbed to downward pressure, first for existing appartments and then for new constructions. On the average, prices fell again during the second quarter of 2009, settling at a level close to that seen in 2007.

Any complete overview of residential real estate prices should include single family homes and building land in addition to apartment units. For the moment, available administrative sources cannot yet produce reliable statistics in this area, although this could improve in the future. The 2009-2014 government plan calls for this: "…*in order to improve transparency on the real estate market and to satisfy the requirements of the European statistical system, indications and descriptions to be recorded concerning real estate transactions shall be set out and standardized*." Unless legislation is undertaken to ensure this, missing information can only be obtained through additional surveys.

5.2.5 References

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Loi du 29 décembre 1976 relative aux ventes d'immeubles à construire et à l'obligation de garantie en raison de vices de construction.

Loi modifiée du 30 juillet 2002 déterminant différentes mesures fiscales destinées à encourager la mise sur le marché et l'acquisition de terrains à bâtir et d'immeubles d'habitation

Loi du 22 octobre 2008 portant promotion de l'habitat et création d'un pacte logement avec les communes

Règlement grand-ducal du 22 juin 1988 concernant la publicité en matière de co-propriété.

Internet Sites

http://www.statistiques.public.lu/fr/publications/series/Indicrapides/index.html

http://www.odc.public.lu/actualites/2009/06/30_seminaire_logement/index.html

5.3 Measuring and Understanding Knowledge Economy

The GRIPS team (Innovation and Productivity Research Group for Services) is the research unit located at STATEC and is the fruit of a longstanding relationship between STATEC and the *Observatoire de la Compétitivité* of the Ministry of the Economy and Foreign Trade and the Henri Tudor public research center (CRP). The work carried out by this unit is structured around applied research themes that relate to measuring and indentifying the determinants of productivity and competitiveness, especially innovation and its determinants. The aim of the studies presented below is to operate and enrich the data gathered during the latest Community survey on innovation (CIS2006) and in particular, to clarify the relationship between the propensity of Luxembourg companies to innovate and their practices of knowledge management and certification and utilization of information and communication technologies.

Knowledge Management practices and innovation activities: The ability of companies to adopt systematic knowledge management strategies is a determining factor in their performance and is considered a source of lasting competitive advantages. Responses related to knowledge management practices collected from the Community CIS2006 innovation survey characterize their link with the propensity of companies to innovate, intended as as their capacity to create new products. In a representative sampling of the companies with more than 10 employees, 70% of them implement at least one practice relating to knowledge management and 25% have a written policy in the area on file. The results of the analysis show that these activities positively influence the probability of innovation. Importance of impacts varies strongly depending on the company's economic sector. In particular, companies in Knowledge Intensive Business Sectors (KIBS) and in the financial sector display similar behavior in the area of implementing more structured knowledge management strategies and more active external know-how management.

Standardization and innovation: Meeting standards is a costly process for companies which entails rigid formalities and procedures that constrain innovative capacities. On the same time, implementation of coherent norms and standards

eliminate competitors and therefore incites companies to innovate. On the face of it, the two concepts appear antinomic. However, the use of standards is essential to creating and developing networks. It also increases the inventory and facilitates the transfer of codified and decodified knowledge through experts and the consultants that they employ, intensifies competition among companies entering new markets and accelerates the dissemination of innovation via all these channels. The latest CIS2006 survey on innovation was enriched with information concerning the ISO 9000 certification process in order to study the relationship between standards and innovation, directives that are generally applicable in all sectors aiming at minimum quality. It appears that certified companies have a significantly higher propensity to innovate than those that are not certified. In conformity to results obtained from other countries, small companies with fewer than fifty employees and large companies with more than 250 employees are less likely to be certified than medium sized companies. Lastly, there is a non linear relationship between competitive intensity and the propensity to obtain certification.

The impact of ITC on capacities for innovation: Information and communications technologies are at once accelerators of technological and organizational innovations and technologies in perpetual motion, and as such they maintain a complex relationship with innovation. The objective of this section is to analyze the impact of information and communications technologies on the capacity of companies operating in Luxembourg to innovate. A sampling of some 300 companies was set up to this end, derived from the merger of the latest CIS2006 innovation survey and the ITC 2007 annual survey on IT usage. A probit model of dichotomies is estimated for each technological and non-technological innovation type, in which the decision to innovate is explained by how companies acquire and use ITC equipment and by other features of individual companies. The initial results of the analysis show that : 1) Innovative companies maintain equipment levels and utilization rates of the equipment significantly higher than those that do not innovate, and 2) The link is nonetheless not a direct one. The impact of ITC should be researched through combinations of equipment acquisition and utilization intensity optimized through the construction of composite indicators. 3) Each type of technological and non-technological innovation is significantly impacted by the various indicators.

5.3.1 Knowledge management practices and innovation activities in Luxembourg

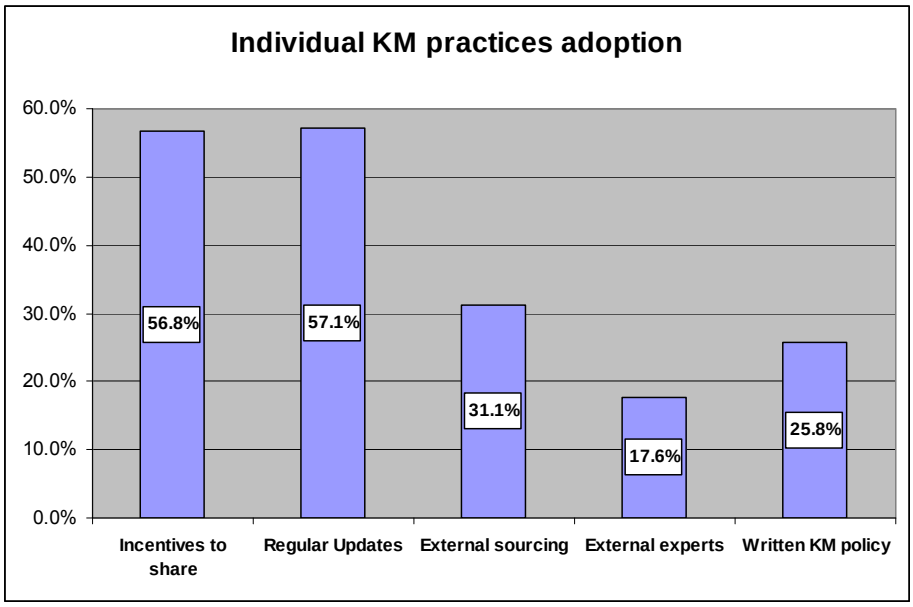
Summary: Knowledge management and innovation activities practices

In a knowledge-based economy, the ability of companies to adopt systematic knowledge management strategies is considered a source of sustained competitive advantage and is often described as a crucial determinant of enterprise performance.

This section concentrates on the relationships between Knowledge Management and performance in the area of innovation, which has a proven impact on productivity and economic growth. The effectiveness of knowledge management strategies measured by their capacity for innovation is evaluated by means of estimating an econometric model. This quantitative analysis is based on data from the Community Innovation Survey (CIS2006) for Luxembourg. The responses about KMpractices available in the survey are linked to the propensity of companies to innovate, intended as their capacity to create new products.

Considering both individual KM practices and the total number of practices adopted , defined as KM intensity by Kremp and Mairesse (2004), the analysis investigates the pattern of KM practices adoption, the tendencies in KM intensity by size and sector and, finally, the correlation between KM activities and innovation propensity. In the representative sample of companies with more than ten employees covered by the CIS 2006, 70% of companies implement at least one KM practice. As for the adoption pattern, incentives to knowledge sharing and regularl update of codified knowledge databases are the two most frequently implemented practices. They also appear as essential elements of any KM strategy, while explicit management of external knowledge tends to be associated with more articulated KM strategies.

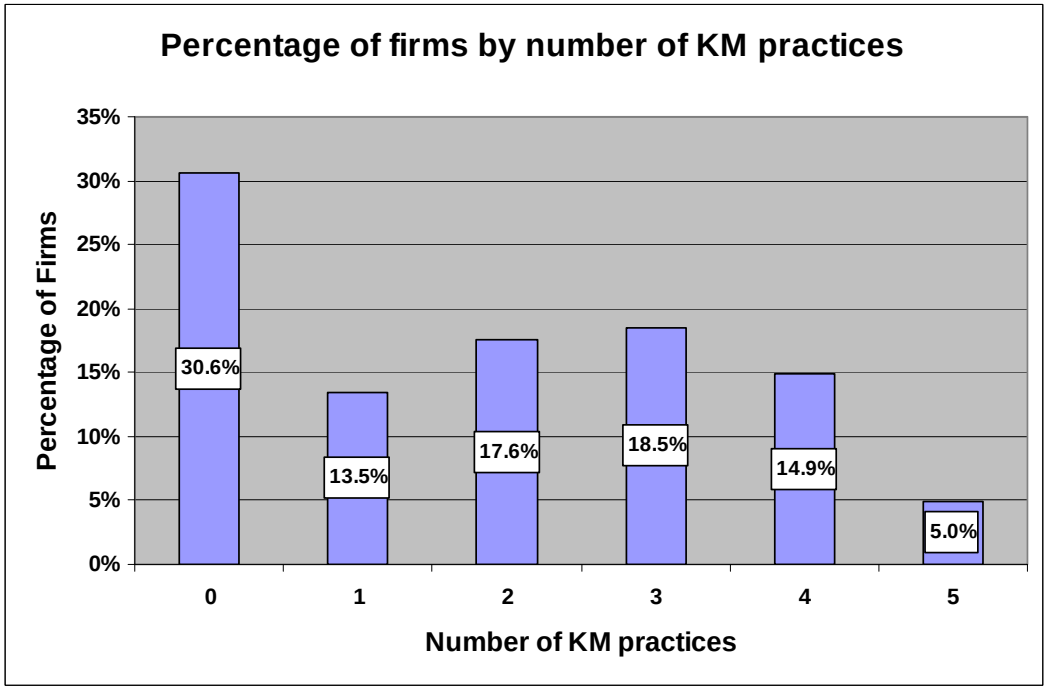
Figure 45 : Percentage of companies per type of KM practices adopted



Incentive to share knowledge – Regular updating – Formal monitoring – External experts brought in – Written KM policy

Source: STATEC CIS2006 Survey –Calculations by the author of this segment

Figure 46 : Percentage of companies per number of KM practices



Number of KM practices

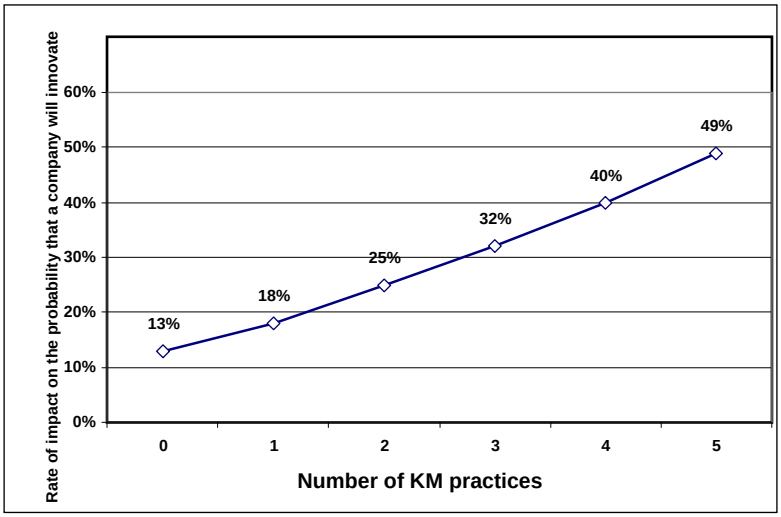
Source: STATEC CIS2006 Survey –Calculations by the author of this segment

The results suggest that larger companies tend to adopt more articulated KM strategies. In line with results obtained by Earl and Gault (2003) , there seems to be stronger need for systematic KM in bigger firms.

Other differences exist with respect to the sector of activity under consideration. In particular, companies in Knowledge Intensive Business Sectors (KIBS) and in the financial sector tend to behave in a similar fashion, implementing more artiulated KM strategies and managing external knowledge more actively. Furthermore, the increased complexity is more weakly related to company size and more inherent to the type of business a company is operating in.

Finally, KM activities are positively linked to the probability of a company to innovate. This confirms findings from a similar study conducted by by Kremp and Mairesse (2004) on the French manufacturing and extends its validity to services for Luxembourg.

Figure 47 : Impact of the intensity of KM practices on the probability of a medium-sized company to innovate



Source: STATEC CIS2006 Survey –Calculations by the author of this segment

The impact remains significant also when considering other factors typically affecting the probability to innovate, such as size, sector of activity, group affiliation and competitive indicators. With regard to the business sector, the impact is the strongest for financial sector, whereas business services and industry have slightly smaller and very similar coefficients.

5.3.1.1 Introduction

For the purpose of the OECD Knowledge Management Survey, knowledge management (KM) "*involves any activity related to the capture, use and sharing of knowledge by the organization*" [Earl and Bordt (2003), page 191].

Knowledge is considered as a key source of sustained competitive advantage (Nonaka 1991) and the adoption of systematic knowledge management strategies becomes a crucial determinant of corporate performance. Empirically, the evaluation of the impact of KM strategies on performance poses considerable challenges. These challenges are chiefly related to the fact that KM practices are difficult to observe and to measure (Foray and Gault, 2003). Mostly as a consequence of this, the firm-level empirical analysis of KM is still at an initial stage of development (Hall and Mairesse, 2006).

The OECD effort to overcome lack of empirical evidence in this emerging field of enquiry has resulted in the production of preliminary methodological guidelines for a statistical survey on KM (OECD 2003). Also as a consequence of this effort, the Community Innovation Survey (CIS 2006) for Luxembourg includes a set of questions on KM that are going to provide the data support for the analysis.

This research contains some highlights on the patterns of adoption of KM practices and investigates their relationship with innovation propensity, intended as the likelihood of delivering product innovations, as a key aspect of corporate performance. The analysis reveals that KM activities are positively related to the probability of innovation and that this association varies considerably by sector of economic activity. In addition, companies in Knowledge Intensive Business Sectors (KIBS) and in the financial sector tend to implement more articulated KM strategies and manage external knowledge more actively than other sectors of the economy.

The document is organized as follows. The first section presents some summary statistics and explores the adoption pattern of KM practices that characterizes the underlying KM strategies. The second section investigates the relationships between KM and innovation propensity following the methodology proposed by a similar study for France conducted by Kremp and Mairesse (2004) and compares the results obtained for Luxembourg. Conclusions are presented in the third section.

5.3.1.2 KM practices: pattern of adoption, intensity and complexity

This section briefly describes the data and discusses the KM practices included in the CIS 2006 survey. The concept of KM intensity is introduced and its relationships

with company size and industrial sectors are briefly investigated in order to highlight and systematic patterns.

The data for the analysis come from the Fifth Community Innovation Survey (CIS 2006). The survey covers the years 2004-2006 and includes companies with more than 10 employees. Detailed statistics for the main variables included in the CIS 2006 can be found in Gomez Ferreira (2009), therefore the descriptive statistics presented here concentrates on the main aspects related to KM strategies variables.[166]

The Table 47 : below presents the industry and size distribution of the population.[167] The industrial sector distribution highlights the preponderance of the service sector, within which Financial and IT and business services account for about 50% of the total.[168]

Table 47 : Industry and size distribution

Industry	Percent	Cumulative		Employees	Percent	Cumulative
Manufacturing	**22.0%**	**22.0%**		10-19	**39.4%**	**39.4%**
Wholesale trade	**19.7%**	**41.7%**		20-49	**33.4%**	**72.9%**
Transport	**22.2%**	**63.8%**		50-99	**13.5%**	**86.4%**
Financial	**20.4%**	**84.2%**		100-249	**8.4%**	**94.8%**
IT services	**15.8%**	**100.0%**		250-	**5.3%**	**100.0%**
Total	**100%**			Total	**100%**	

Source: STATEC CIS2006 – Calculations by the author of this segment

The NACE 1.1 nomenclature defining the IT consulting and other business services for the purpose of the CIS 2006 survey largely overlaps with the proposed classification for knowledge–intensive business services (KIBS), intended as those services providing knowledge–intensive inputs to the business process of other organizations. According to indicators for 2001, the share of KIBS in service activities

[166] The statistics presented in this paper refer to the estimation sample for the probit model discussed in Section**5.3.1.3**. Although the estimation sample almost overlaps with the total survey sample, some minor differences in the resulting statistics should be expected.

[167] The industry classifications based on NACE 1.1 is reported below.

- Manufacturing: manufacturing (NACE 15-37); excluded electricity, gas and water supply (NACE 40-41);
- Wholesale trade: NACE 51
- Transport: transport, storage and communication (NACE 60-64)
- Financial: financial intermediation (NACE 65-67)
- IT consulting and other business services: computer and related activities (NACE 72), architectural and engineering activities (NACE 74.2) technical testing and analysis (NACE 74.3), research and development (NACE 73).

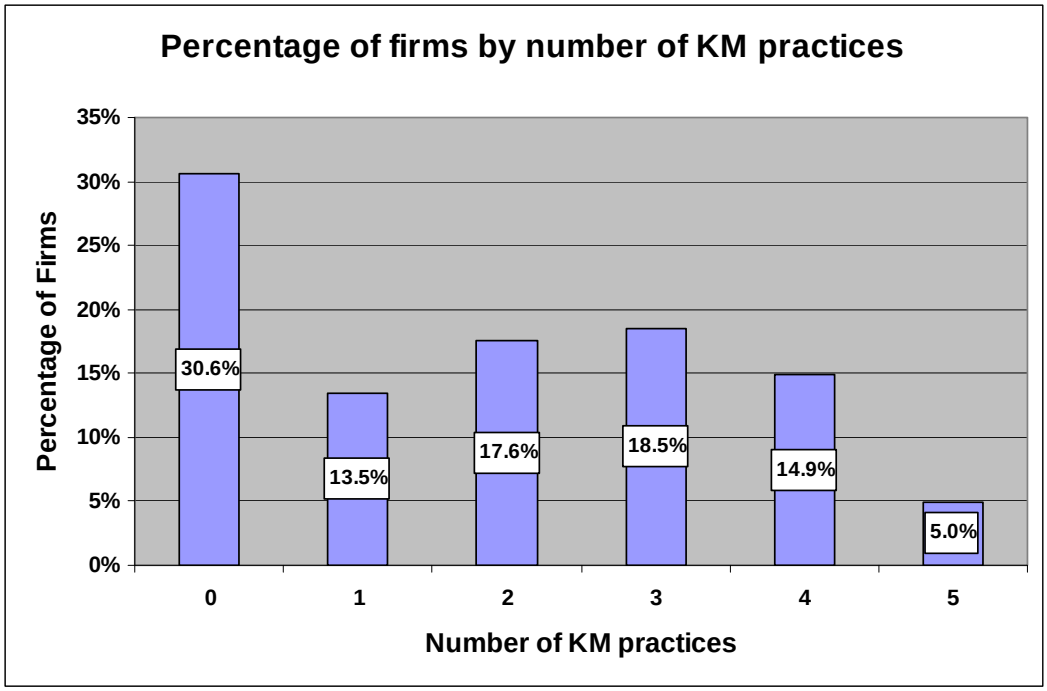
[168] This reflects the well documented peculiarities of the Luxemburgish economy. For a cross-country comparison, see Asikainen and Dubrocard (2008).

for Luxembourg is well above the EU average. This highlights their importance both in terms of direct contribution to the domestic economy and in terms of performance of the organizations that rely on their inputs.[169]

The CIS 2006 survey includes five questions about practices aimed at capturing, using and sharing knowledge within the organization.[170] These practices refer to the adoption of a written KM policy, to the presence of dedicated resources to obtain knowledge from outside the enterprise, to the existence of a policy to bring in external experts, to the presence of incentives to share knowledge within the company and, finally, to a practice of regular updates of internal databases or manuals of good work practices, lessons learned, or expert advice.

The figure below shows the distribution of firms in the population according to the total number of practices implemented, which can be interpreted as a KM intensity indicator (KMI).[171] The figure below shows the percentage of firms in the population adopting each of the five practices.

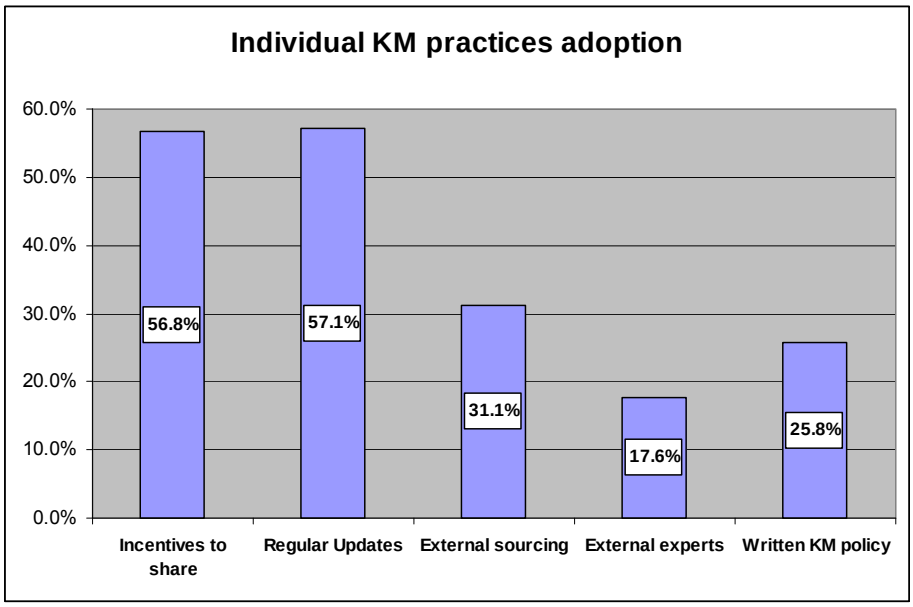
Figure 48 : Percentage of firms by number of KM practices



Source: STATEC CIS2006 – Author's calculations

[169] For details on these points, see EMCC (2005).
[170] Mostly, these questions appear to follow specific examples from the second part of the definition proposed for the *OECD Knowledge Management Survey* [Earl and Bordt (2003)].
[171] The indicator is defined in Kremp and Mairesse (2004). Its use takes into account the complementarity in adoption of KM practices.

Figure 49 : Individual KM practices adoption

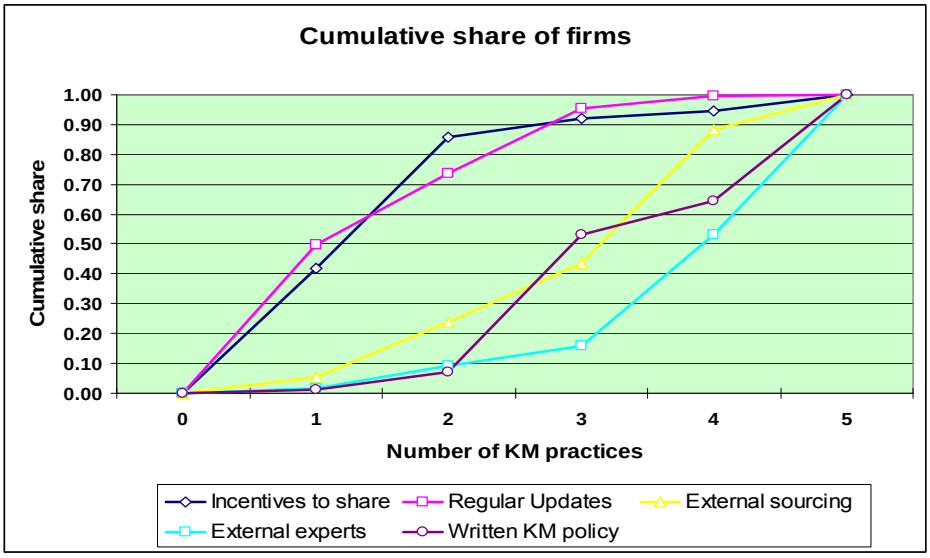


Source: STATEC CIS2006 – Author's calculations

The figure above indicates that around 70% of companies implement at least one of the five practices. When considered individually, the figure directly above shows that incentives to share and regular updates are the most frequently implemented practices, followed by external sourcing, adoption of a written KM policy and, lastly, involvement of external experts.

For each of the five KM practices, the figure below shows the share of firms implementing a given practice over the total number of firms with the same level of KM intensity.

Figure 50 : Cumulative share of firms by practice



Source: STATEC CIS2006 – Author's calculations

The figure above indicates that incentives to share and regular updates are the two most frequently adopted practices at any level of KM intensity. For firms with three practices, their adoption rate is above 90%. They also appear as basic KM practices, since they are implemented by respectively 42% and 50% of companies with only one practice, far more frequently than any other practice at the same level of intensity. External sourcing becomes somehow relevant when two practices are present, but it is only with three practices that its role becomes substantial, with around 43% adoption. A written KM policy also starts playing a role when three practices are adopted, while involvement of external experts emerges only when four practices are present, with around 53% adoption.

Incentives to share and regular updates appear therefore as essential elements of any KM strategy. Management of external knowledge emerges instead at a relatively high level of KM intensity, suggests association with a higher degree of KM complexity.

The remaining part of this section investigates KM intensity by industry and size, starting with the table below.

Table 48 : KM intensity by industry

Industry	Percentage of KM-active firms	Average KM intensity
Manufacturing	**65%**	**2.55**
Wholesale trade	**60%**	**2.14**
Transport	**58%**	**2.65**
Financial	**89%**	**3.01**
IT services	**79%**	**3.08**
All sectors	**69%**	**2.72**

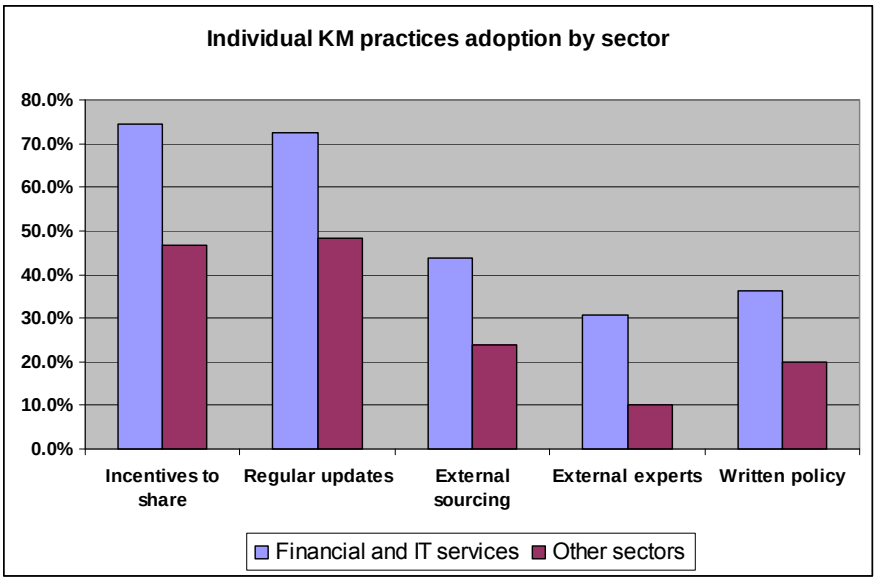
Note: KM-active firms are those implementing at least one KM practice
Source: STATEC CIS2006 – Author's calculations

As shown in the table above, Financial and IT service sectors appear as the most knowledge intensive with 89% and 79% of firms implementing at least one KM strategy, against a range of 58% to 65% for the remaining sectors. The same pattern emerges from the average KM intensity, although the relative ranking of the least knowledge intensive sectors differ slightly. It is interesting to note that KM-active firms implement on average at least two strategies, with Financial and IT services using at least three. In other words, KM-active companies tend to combine KM practices, signaling complementarities in adoption.

The higher number of individual KM practices implemented by the Financial and IT service sectors also signals higher complexity in their KM strategies and, as documented in the figure above, more intensive use of the external KM whose diffusion becomes relevant at higher levels of KMI. Confirmation of this tendency is provided by the figure below, which clearly shows higher reliance on external sourcing, external experts and formal policies for financial and IT services in comparison with all other sectors of the economy.[172]

[172] The patterns within the two groups are relatively homogenous, although some differences are indeed present.

Figure 51 : Individual KM practices adoption by sector



Source: STATEC CIS2006 – Author's calculations

As for size, the table below shows that 93% of firms with more than 250 employees implement at least one KM strategy against 60% for companies with 10-19 employees, indicating a clear tendency for bigger firms to be more knowledge intensive. The same pattern emerges from the indicators based on average intensity.

Table 49 : – KM intensity by size classes

Size	Percentage of KM-active firms	Average KM intensity
10-19	**60%**	**2.64**
20-49	**73%**	**2.62**
50-99	**69%**	**2.58**
100-249	**85%**	**3.06**
250-	**93%**	**3.33**
All groups	**69%**	**2.72**

Note: KM-active firms are those implementing at least one KM practice
Source: STATEC CIS2006 – Author's calculations

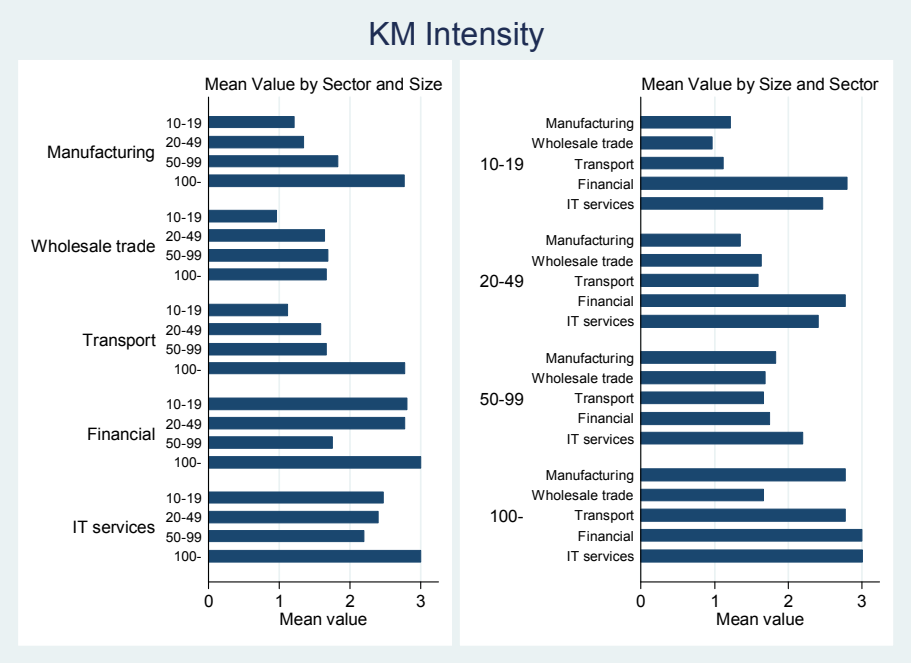
This confirms the positive relationships between size and KM intensity documented by other researches end explained by the stronger need for systematic KM in bigger firms [Earl and Gault, (2003)].

The figure below provides some deeper insight into the relationships of KM intensity with size and industry by showing the size distribution of intensity within industries

(left-hand chart) and the industry distribution of intensity within size classes (right-hand chart).[173]

The left-hand chart indicates that the size effect is less pronounced for Financial and IT services than it is for the remaining sectors, particularly for manufacturing. In particular, with the exception of one size class for the financial sector, the average KM intensity is well above two in each size class for both Finance and IT services. In the inter-industry comparison, this weaker relationship between size and intensity translates into higher KM intensity for small IT and financial companies, as shown on the right-hand chart particularly for enterprises with less than 50 employees.

Figure 52: KMI distribution by sector and size



Source: STATEC CIS2006 – Author's calculations

This weaker relationship between size and intensity suggests that higher KM complexity in financial and IT services is more intrinsic to the nature of their operations. For the IT and other business services, their substantial correspondence with KIBS is the most likely explanation, particularly considering that mainly small firms are present in this sector. If KMI can therefore be considered a good indicator

[173] Companies with 100-249 employees and those with more than 250 are grouped together to avoid potential data disclosure. Results remain unaffected.

for KIBS activities, it clearly appears that the typical financial sectors activities share the same knowledge-intensive features.

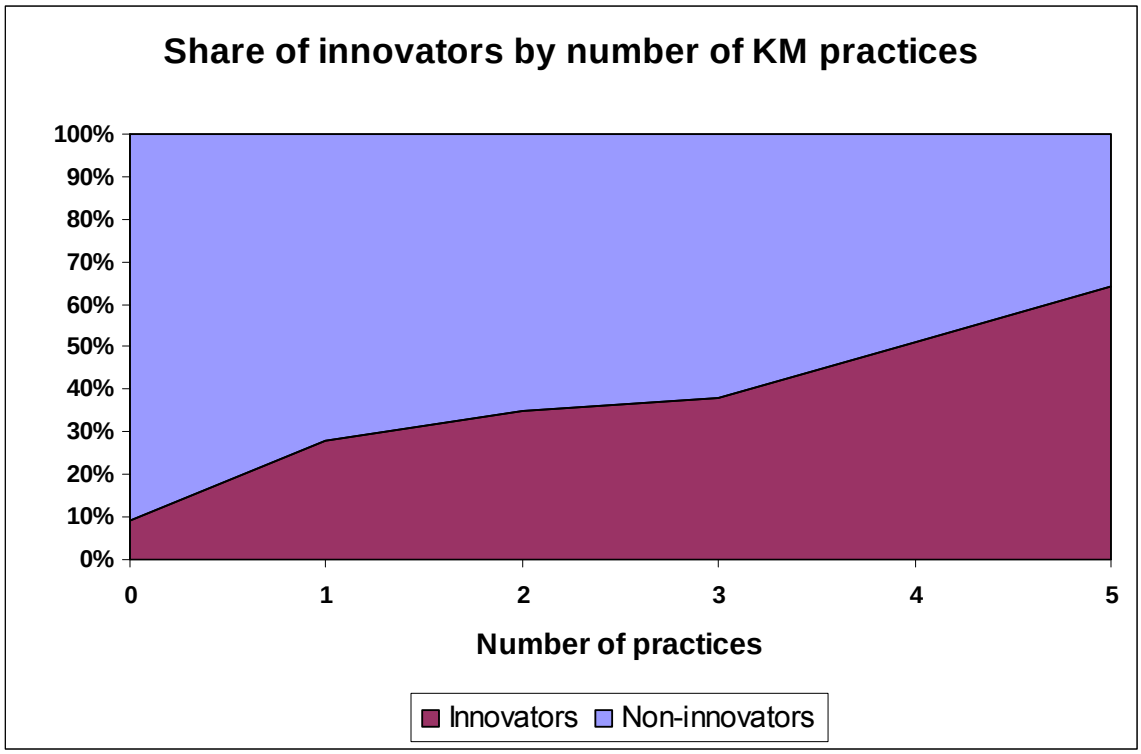
The findings presented in this section about KM adoption patterns and KMI tendencies by size and sector can be summarized as follows. As for the pattern of KM adoption, incentives to share and regular updates are the two most frequently adopted practices, constituting basic and essential elements of any KM strategy. External KM emerges at relatively high level of KM intensity, suggesting association with a higher degree of complexity. Looking at KMI sectoral patterns, financial and business services are the most knowledge intensive, being also characterized by stronger reliance on external KM practices. Comparable intensity levels and adoption patterns in KIBS and financial companies suggest similarities in their internal KM process. As for size, a positive relationship between size and intensity is in line with previous findings and justified by the stronger need for systematic KM in bigger companies.

5.3.1.3 KM and innovation propensity

This section investigates the relationships KM intensity and innovation propensity. The analysis is formalized following the methodology of a similar study conducted by Kremp and Mairesse (2004) for French manufacturing.

For the purpose of this work, innovators are those reporting product innovations and having positive R&D expenditures. Based on this definition, one can show some insights on the relationship between KM intensity and innovation propensity, intended as the likelihood of belonging to the innovators group.

Figure 53 : Percentage share of innovators by number of KM practices



Source: STATEC CIS2006 – Author's calculations

By reading the percentage shares of innovators as conditional probabilities, the figure above suggests a positive association between number of practices and probability of belonging to the innovators group.[174] The association is more noticeable in the change from zero to one practice, which signal the effect of entering the KM-active group, and when going above three practices, which corresponds to increased probability of activating external knowledge acquisition channels.

In order to consider the joint impact of other factors relevant for innovation probability, this analysis can be further formalized along similar lines as Kremp and Mairesse (2004).[175] In their work, the impact of four KM practices on several aspects of innovation has been investigated using data from the French 1998-2000

[174] The percentage of innovators, conditional upon the number of practices, increases monotonically from around 9% for zero practices to around 64% for five practices. The statistical association between the variables is highly significant, as shown by the Pearson coefficient (p=0.00).

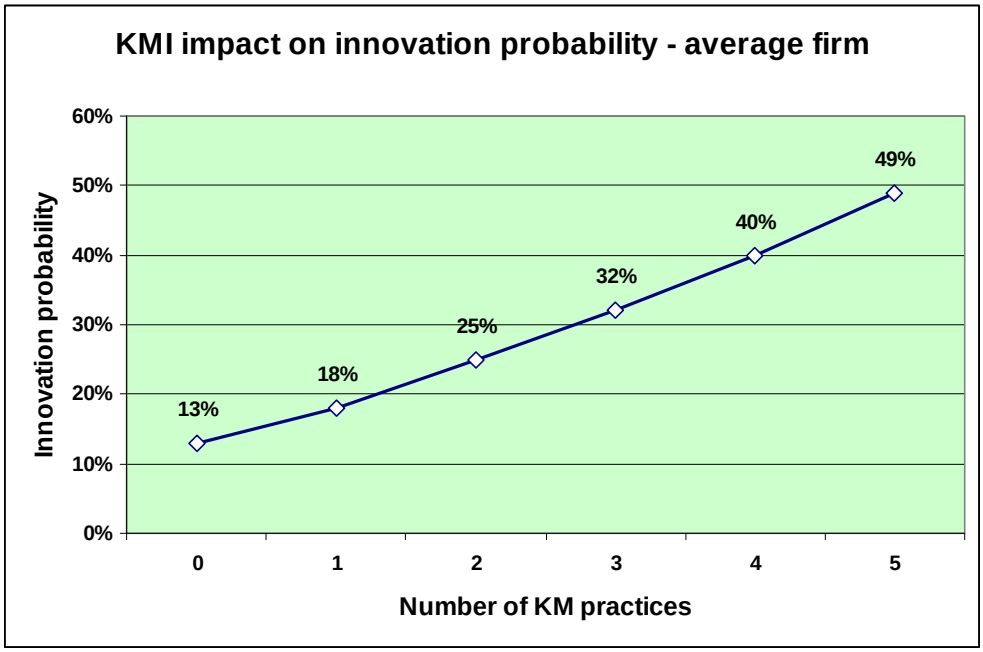
[175] Implicit in this KMI analysis is the assumption that practices are substitutable and that their individual impact on innovation is equal and cumulative. In other words, the KMI takes into account only the number of KM practices implemented, without considering which specific practices are adopted and in which combination. In addition, the simplifying hypothesis of a linear impact of KMI on innovation propensity is made. It is worth stressing that in Kremp and Mairesse (2004) the validity of these hypotheses has been tested econometrically against alternative specifications, whereas here the simplifying linearity assumption is made at the outset in order to obtain a comparable set of results. It is therefore entirely possible that a different set of hypotheses on the impact of KM practices provides a superior representation.

Community Innovation Survey. Their research concentrates on manufacturing companies with at least twenty employees.

The impact of KMI on probability of innovation is analyzed using a probit model. The analysis controls for a number of factors whose role in innovation success is documented by analogous research for Luxembourg.[176] These include company size, industrial sector, group affiliation and start-up status, together with indictors for intensity of price competition and competitive pressure from technological advance.[177]

The estimation results indicate that the impact of KMI on the probability to innovate is positive and statistically significant, in line with the results obtained by Kremp and Mairesse (2004). In the current research, the linearity of the impact of KM practices finds part of its rationale in the augmented complexity that accompanies an increase in the number of practice adopted.

Figure 54 : KMI impact on innovation probability for average firm



Source: STATEC CIS2006 – Author's calculations

[176] See A. Asikainen (2008) and I. Gomez Ferreira (2009).
[177] The model is estimated on 1406 weighted observations. Estimation results are available upon request. Electricity, gas and water supply sector (NACE 40-41) is excluded from the sample due to the small number of observations.

The figure above shows that the impact of KM intensity on innovation probability for the average firm is quite substantial. Innovation propensity increases monotonically from 13% for an average firm with no KM practices to 49% for the same firms implementing five practices. The table below shows that the impact of KM practices on innovation probability varies considerably by sector.

Table 50 : KM impact on innovation probability by sector

		Probability of innovation			Average KM intensity
		Average firm	Additional KM practice*	Total	
Current study					
	Total sample	**23.8%**	**6.9%**	**30.7%**	**1.89**
	Manufacturing	**35.8%**	**8.3%**	**44.2%**	**1.65**
	Wholesale trade	**9.3%**	**3.7%**	**13.0%**	**1.27**
	Transport	**7.8%**	**3.2%**	**11.0%**	**1.53**
	Financial sector	**49.2%**	**8.9%**	**58.0%**	**2.68**
	IT services	**36.8%**	**8.4%**	**45.2%**	**2.45**
Kremp and Mairesse (2004)					
	Manufacturing (at least 20 employees)	**-**	**4.0%**	**-**	**-**

Notes:* Marginal effect at the conditional mean for the average firm
Source: Kremp and Mairesse (2004) - STATEC CIS2006 - Author's calculations

For the whole sample, the marginal effects evaluated at the sample mean indicate that one additional KM practice increases the probability of innovation of approximately 6.9 percentage points, bringing the probability of innovation of the average company from 23.8% to 30.7%.[178] For the average firm in manufacturing, one additional KM practice increase innovation probability by 8.3 percentage points, from 35.8% to 44.1%. For the average financial firm, one additional practice increases probability of innovation from 49.2% to 58.1%, or 8.9 percentage points. Figures the IT and business services are very similar to those for manufacturing. The impact of KM in the remaining sectors is considerably lower, as it is their probability of innovation.

The comparison with the results from Kremp and Mairesse (2004) is more appropriate with reference to manufacturing. The comparison reveals considerably

[178] The discrete change in KMI is approximated by the marginal effect. However, the differences appear negligible since the results are almost identical to those presented when the number of practices increases from two to three.

stronger impact of KMI for the Luxembourgish manufacturing companies, pointing therefore to a more important role of KM for innovation. However, a cautious approach is required since differences may be linked to a number of factors. First of all, the work of Kremp and Mairesse (2004) excludes enterprises with less than twenty employees, typically less innovative, which account for around 40% of the current sample. In addition, the number and type of KM practices included is different. Finally, the different econometric specifications are likely to affect the results.

5.3.1.4 Conclusions

An important result is that KM activities are positively related to the probability of innovation. This confirms findings from a similar study conducted by Kremp and Mairesse (2004) on the French manufacturing sector and extends its validity to services. The results holds also after taking into account other factors typically affecting the probability to generate innovative products, such as size, industry, group affiliation and competitive indicators, whose role in innovation success is documented by other research for Luxembourg. From this perspective, the financial sector reveals itself as the most dynamic, while IT and business services appear as effective as manufacturing in supporting innovation success.

When looking at the pattern of KM practices adoption, size and industry are related to KM intensity and complexity. Larger firms tend to adopt more articulated strategies most likely justified by the need for systematic KM, as previous OECD research suggests [Earl and Gault, (2003)].

Incentives to share and regular updates are the most frequently adopted practices at any level of KM intensity. Companies in the financial and business services sectors also tend to implement more articulated KM strategies and tend to manage external knowledge more actively than other sectors of the economy. In addition, this increased complexity is more weakly related to company size and more intrinsic to the nature of their operations.

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5.3.2 Standard and Innovation: preliminary results from Community Innovation Survey 2006 and ISO 9000 certification

"*The Commission and the Council of the European Union have identified standardization as key instrument for improvements in order to foster innovation*".
(Communication from the Commission, number 133, 2008).

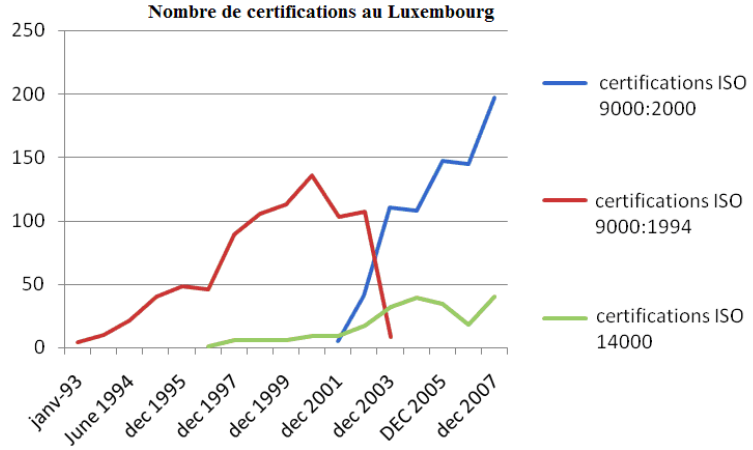
Summary: Standardization and Innovation

For companies, upgrading their structures to meet standards is a costly process and entails rigid formalities and procedures that constrain their innovative capacities, while requiring adherence to a standard on a market results in diminishing competition and therefore incites companies to innovate. On the face of it, the two concepts appear antinomic. However, the use of standards is essential to creating and developing networks. It also increases the inventory and facilitates the transfer of codified and decodified knowledge through experts and the consultants that they employ, intensifies competition among companies entering new markets and accelerates the dissemination of innovation via all these channels. For political decision makers and institutional actors such as Chamber organizations, federations and unions, it is important to better understand and evaluate the role of standards in producing innovation so as to set out an effective promotion strategy if needed.

This analysis proposes a very preliminary and partial stage for assessing the impact of certification of companies' capacity to innovate. The International Organization for Standardization (ISO) is the major producer and publisher in the world of international standards. This organization has three benchmark standards in the area of Management: ISO 9000 which deals with quality, ISO 14000 dealing with the environment and ISO 27000 for safety. The latest CIS2006 survey on innovation was enriched with information concerning the ISO 9000 certification process in order to study the relationship between standards and innovation. This standard is comprised of general directives applicable in all economic sectors that represent an international consensus on good practices in the area of quality management. The (CIS) 2006 survey assembles fairly accurate information on the characteristics of companies, their behavior and their performance in the area of innovation as well as the competitive context within which they operate.

The principal results derived from similar studies show that in general, SME, companies involved in services and companies that operate on the local market that are not part of international groups, are relatively less prone to obtain ISO 9000 certification :

Figure 55 : The number of certified companies in Luxembourg continues to increase

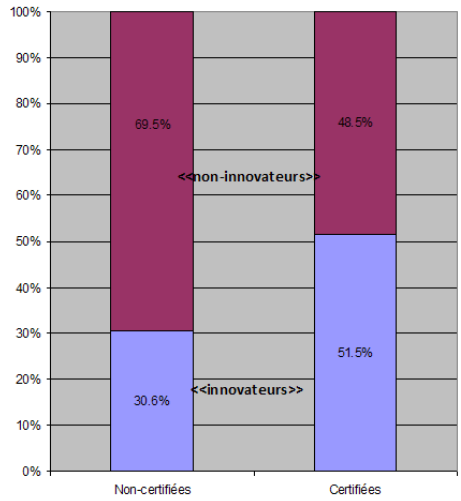


(*Top: Number of certifications obtained in Luxembourg*
RH side: ISO 9000 certifications in 2000; ISO 9000 certifications in 1994; ISO 14000 certifications)
Source: ISO survey 2007

In addition, the proportion of companies using ISO 9000 between 2004 and 2006 varies significantly depending on the characteristics under consideration. In particular, companies that operate in non-European markets are more often certified than others, as do those belonging to an international group. Also, those that work in the manufacturing sector or with more than 250 employees are also likely to get certification. Furthermore, there is a non-linear relationship between competitive intensity and the propensity to obtain certification. When the competitive intensity classifications increase from “weak” to “average”, the proportion of companies with certification increases, yet when it moves to “strong” the ratio drops sharply, to a point even lower than weak competition levels.

Lastly, the proportion of innovative companies among certified companies is significantly higher.

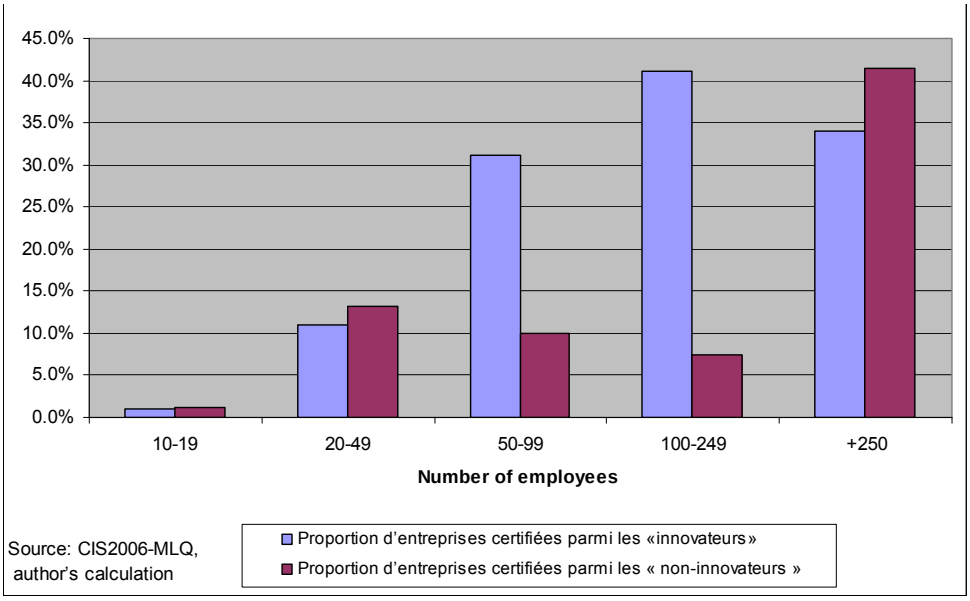
Figure 56 : Certification and innovation



(Non-innovative companies – innovative companies
Non-certified companies – Certified companies)
Source: CIS 2005-MLQ, calculations by the author of this segment

It appears that certified companies have a significantly higher propensity to innovate than those that do not. This involves companies that have marketed one or several new products or services between 2004 and 2006. According to the results found for other countries, small companies with fewer than 50 employees and large corporations with more than 250 employees are more likely to be certified than medium-sized companies.

Figure 57 : Certification and innovation by company size



(Proportion of certified companies among innovative companies Proportion of certified companies among non-innovative companies)

Work on this subject must be continued. In particular, it would be appropriate to determine whether the correlation between certification and the propensity to innovate corresponds to a causal relationship that should be made explicit.

5.3.2.1 Importance of standards

Standards have key economic functions although their importance is sometimes misunderstood. Standards permit the existence of network (compatibility standard), decrease transactional cost (minimum assurance), provide well recognized and codified knowledge (information) and finally, standards reduce excessive diversity (variety reduction).

Standards are crucial to the economic development. For example, the lack of a common standard delayed the success of mobile phone market and internet would be not possible without standards because standards permit computers to communicate. Moreover, the lack of a common standard may have enormous consequences. A NASA mission of 125 millions crashed because one group of engineers made calculation in metrical system and the other in US customary unit (de Vries, 2003), to give just one anecdote.

Firms strongly compete to impose their standard to the market. The owner of the dominant standard has a clear competitive advantage. Very famous “standards war” was on video format of cassette Betamax versus VHS and HDDVD versus Blu-ray in the support for data storage market.

Standards are of great interest to policy-makers as well. The European Union, in order to promote the internal common market, supported the GSM standard in mobile phone market. In this case, European mobile producers benefited of compatibility and economies of scale gaining international competitive advantage.

5.3.2.2 Management Standard

This research will focus on Management standards as a special type of standard. Management standards are guidelines published by International Standards Organization (ISO) to support the permanent improvement of quality, environmental and information security. These standards are intended not to interfere with

competition, to be generic and applicable to all organizations, regardless of nationality, size and product category. Certification is voluntary, but companies can be certified by third parts to demonstrate their compliance to the standards.

As shown in the table below, management standards evolved over time and ISO9000, ISO14000 and ISO27000 refers to different aspect of management.

This study will focus on ISO9000 since ISO9000 is the oldest standard and it is as well the most common in Luxembourg.

Table 51 : ISO management standards

Object	Standards	Year of first publication	Year of updates	Certifications in Luxembourg
Quality management system (QMS)	ISO 9000	1987	1994, 2000, 2008	197
Environmental Management System (EMS)	ISO 14000	1996	2004	40
Information Security Management System (ISMS)	ISO 27000	2005[179]	-	2

Source: ISO survey, 2007

5.3.2.3 ISO9000

The ISO 9000 is the evolution of the BS5750 British Standard (a mandatory standard for the supplier of military sector) and was updated in 1994, 2000 and in 2008.

As shown in the table below, the background of ISO9000 is the Plan-Do-Check-Act (PDCA) methodology that can be a useful tool to define, implement and control corrective actions and improvements.

Table 52 : PDCA Plan-Do-Check-Act

"Plan"	*Establish the objectives and processes necessary to deliver results in accordance with customer, statutory and regulatory requirements and the organization's policies;*
"Do"	*Implement the processes;*
"Check"	*Monitor and measure processes and product against policies, objectives and requirements and report the results;*
"Act"	*Take actions to continually improve process performance;"*

Source: ISO 9000

ISO9000 is voluntary, a company has not legal obligation to respect the ISO9000 requirements. But if the firm complies with the ISO9000 requirements, it can choose

[179] In 2007 the ISO 17799:2005 changed name in ISO 27000.

to be certified. Certification has the advantage to signal to the market the commitment to quality.

The certification is issued by recognized auditors after a deep assessment. The certification is valid for one year.

The important of the ISO9000 for the companies is debated in literature. (see Rahman and Sohal, 2000 for a review).

ISO9000 can raise efficiency and effectiveness of the operations, increase customer satisfaction and facilitate penetration in new market. Listed manufacturing companies in US increased the firm performance measured as the return on asset, before and after the year of certification (Corbett et al, 2003).

However, ISO9000 has some disadvantages. First of all, the certification can be too expensive for small-medium enterprises[180]. Other critical points are the excess of bureaucracy and the focus on optimization of existing process and product instead of exploring new opportunities (Benner and Tushman, 2002).

5.3.2.4 ISO9000 diffusion

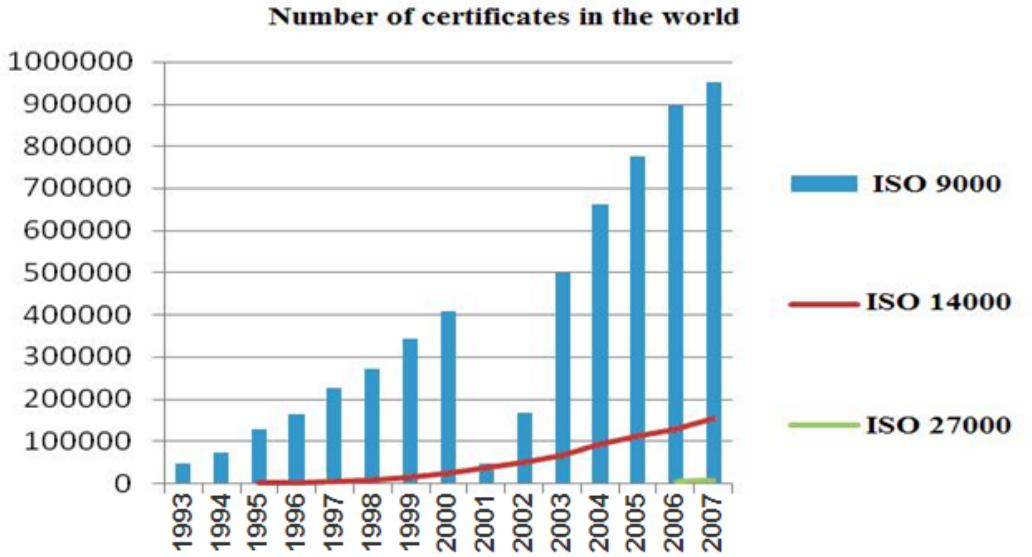
In the literature, there is general consensus that small and medium enterprises, service sector and companies whose market is local and are not part of a international group are less likely to adopt ISO 9000. In all the studies, the financial companies certified ISO9000 are really few.

ISO9000 is adopted worldwide and at the end of 2007 almost 1 000 000 company were certified. Half of the certifications were issued in Europe (ISO survey 2007). As shown in the figure below, even if the number of certification is still increasing, the rate of growth of certification is decreasing. Most of the new certifications are issued in developing countries. This trend suggests that the certification market is saturating in developed economies.

Figure 58 : Number of world certification[181,182]

180 Resetarits (1997) reports that ISO9000 could cost in the range of $50,000- $250,000, from the first training to final certification.

[181] In 2001 there was the shift from ISO 9000:1994 and ISO 9000:2000 and survey reported only ISO 9000:2000 certification. 3Japan account about 65% of total ISO 27000 certifications.



Source: ISO survey 2007, author's calculation

5.3.2.5 ISO9000 and innovation

Little literature exists on the link between standards and innovation. Standards, in broad sense, are the necessary baseline for any innovation. Innovation is by definition a dynamic process while standards require stability, at least for a certain period, in order to display their benefits (Riillo, 2009).

ISO9000 facilitates innovation mainly by increasing the stock of valuable knowledge for innovation process and raising the trust of the customers for new product. In addition, ISO9000 emphasizes the optimization of the process needed to improve the quality facilitating process innovation.

On the other end, ISO9000 can hinder innovation. ISO9000 is costly and it requires formalities, and "bureaucratic" paper work. ISO9000 could increase rigidity in the procedures and reduce the innovative attitude (Benner and Tushman, 2002).

Regulations and standards on environmental and health appear to have a positive influence to innovation propensity (NSSF, 2001).

Standards can foster and hinder innovation at the same time. If companies judge standard a source of valuable knowledge, then they perceive standards as barrier for

innovation. In the same way, if companies consider standard useless for innovation, then they do not consider standards a constraint for innovation (Swann, 2005).

The relation between innovation input and ISO9000 propensity was investigated in German innovative service companies. The study reports that financial companies are not certified and that the use of technology in more dynamic sectors has an important impact for the propensity to be ISO9000 certified (Blind and Hipp, 2003).

5.3.2.6 Data

This investigation is based on data coming from two Luxembourgish databases. One source of data is Community Innovation Survey (CIS2006) and the other source is the list of ISO9000.

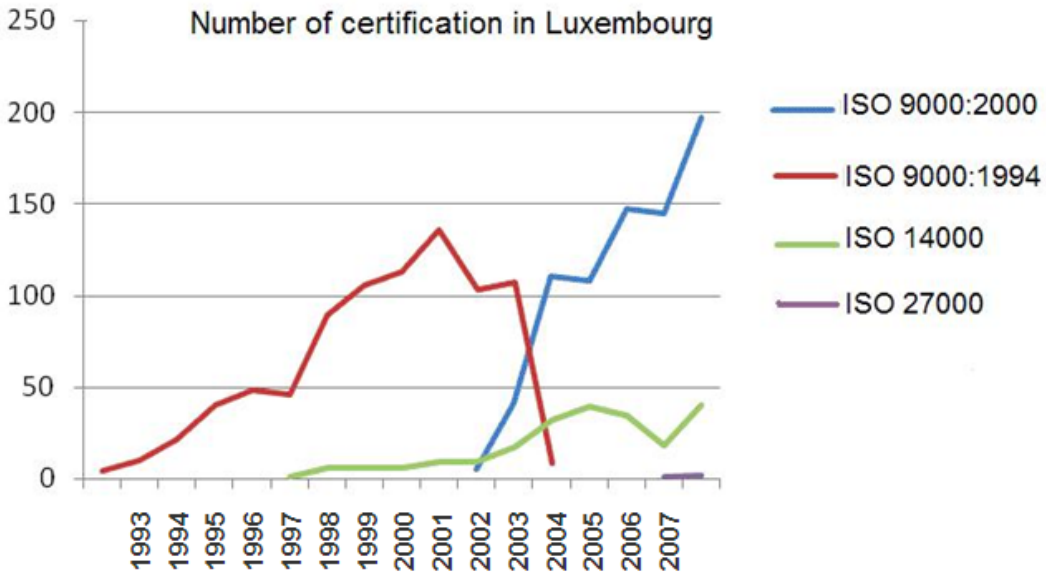
As there is not an official and centralized data base of the certificate companies, data on certification were kindly provided by Mouvement luxembourgeois pour la Qualité (MLQ). MLQ is a public and private association to promote quality in Luxembourg that regularly updated the data on ISO certified companies. MLQ is the source of Luxembourgish data for international studies such as ISO world survey.

The Community Innovation Surveys (CIS) are a series of surveys executed by national statistical offices throughout the European Union since 1992 according the definitions of Oslo manual. The survey collects data at firm level to investigate the innovation input, output and process. The survey in Luxembourg is monitored by Statec. CIS2006 refers to the period 2004-2006, and includes companies with more than 10 employees. Detailed straits can be found in Ferreira (2009).

The main results are provided in the following charts[183].

[183] The data set was constructed under the following hypotheses: 1 a company is considered certified, in a given year, if at least a "part" of a company is certified; 2 If a company is certified for at least one year between 2004 and 2006, then it is considered certified over the period. Results require cautious interpretation due to the time discrepancies between two dataset and the difficulty to follow the evolution of companies.

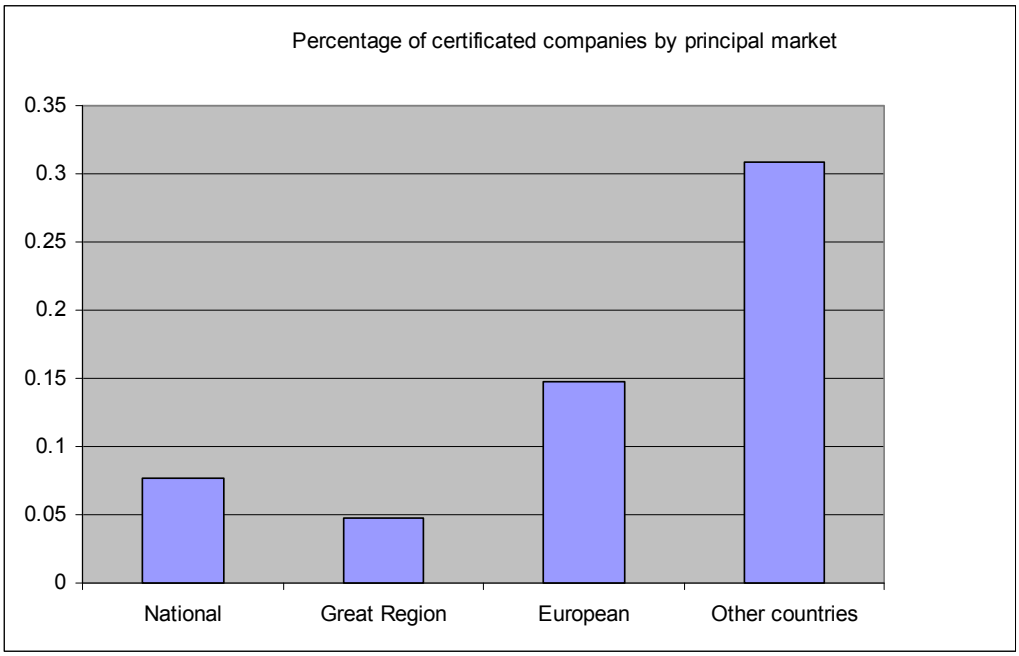
Figure 59 : Diffusion of standards in Luxembourg at December 2007



Source: ISO survey 2007; author's calculation

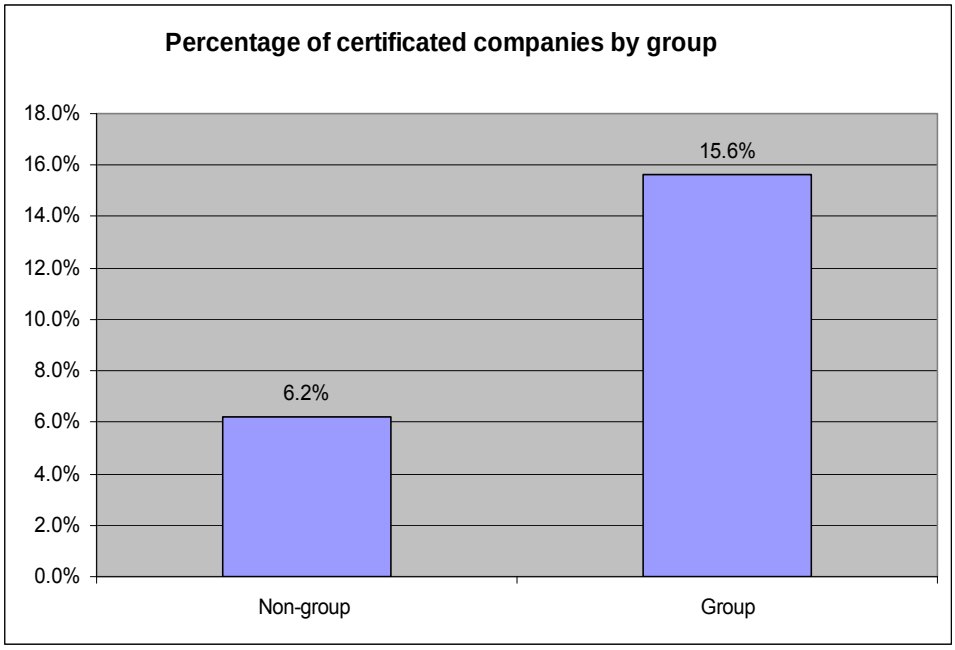
As show in the figure above, the number of ISO9000 certified companies in Luxembourg increased steadily from 1993 achieving a number of 197 in 2007. The ISO14000 appears to follow roughly the same trend. The ISO27000 is almost absent in 2007 probably because it was published only recently.

Figure 60 : Percentage of certified company by market



Source data: CIS2006-MLQ, author's calculation

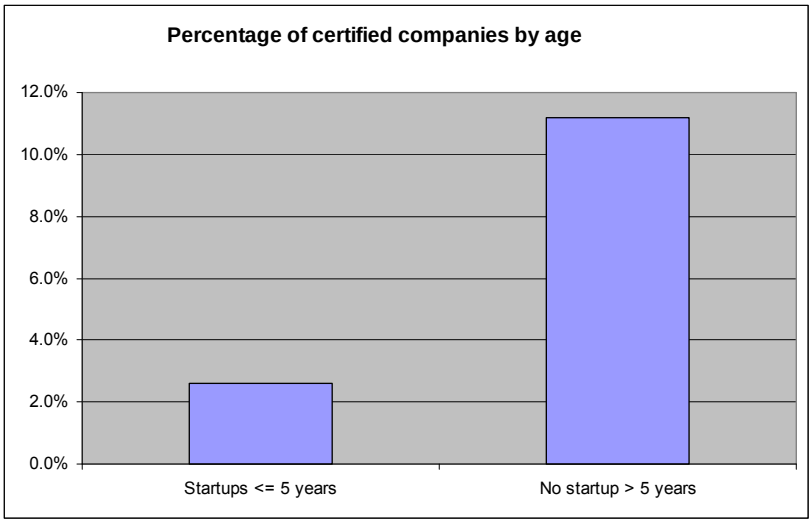
Figure 61 : Percentage of certificated companies by group



Source data CIS2006-MLQ, author's calculation

The ISO 9000 certification appears to be linked with the principal market of enterprises, as shown in above. The percentage of certified companies increases from 7% for national companies to 34% for international companies. The certification is an important factor for the competition in international markets. ISO9000 is more likely if the company belong to a group. The percentage of certified companies doubles if the company is part of a group, as shown in the figure above. This fact suggests that certification is an effective tool for the management for complex structures.

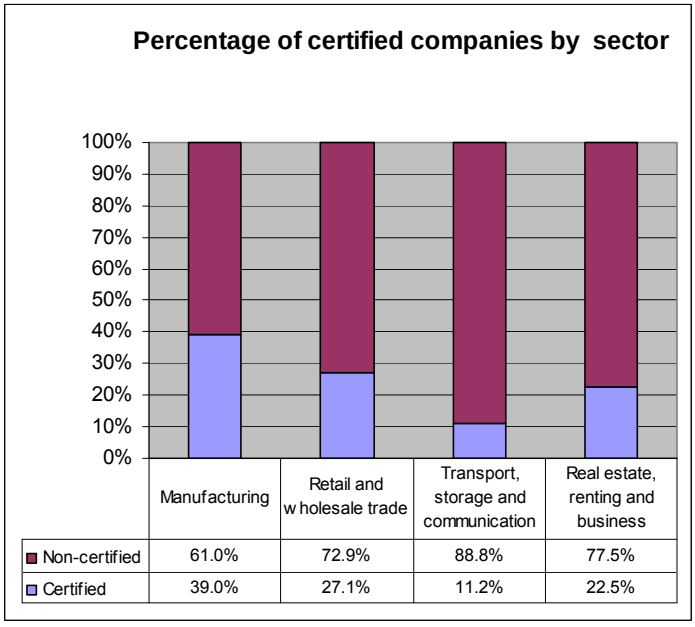
Figure 62 : Percentage of certified companies by age



Source data CIS2006-MLQ, author's calculation

As shown in the figure above, the propensity to certification increases with the age of the company. Startups have a low propensity to use ISO9000. Assuming that all other relevant variables have the same impact on startup and mature companies, this relation suggests that ISO9000 is more commonly used to optimize existing business activities than to signal commitment to quality for new entrants.

Figure 63 : Percentage of certified companies by sector[184]



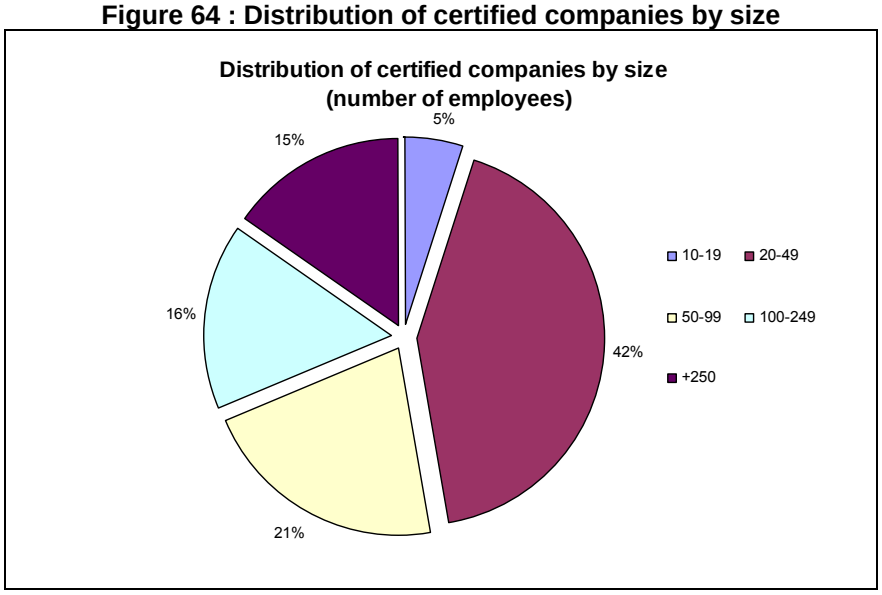
Source data CIS2006-MLQ, author's calculation

The average number of certified companies in the whole Luxembourg economy is around 8% but as shown in the figure above, the propensity to certification varies

[184] Financial and energy sector are excluded because there are no ISO9000 certified company and the next results are calculated excluding these sectors.

among the different sectors of the economy. The certification is more likely in manufacturing sector, probably because ISO9000 was originally published to meet its specific requirement. None of financial and energy companies are ISO9000 certified, probably due to the fact that these sectors are highly regulated and a minimum quality assurance standard offers no advantage. This fact is consistent with the results of Blind and Hipp (2003). Therefore, the rest of the analysis is conducted excluding financial and energy sectors. But as financial sector represents an important part of Luxembourg GDP, a specific study should address this sector.

Figure 64 : Distribution of certified companies by size

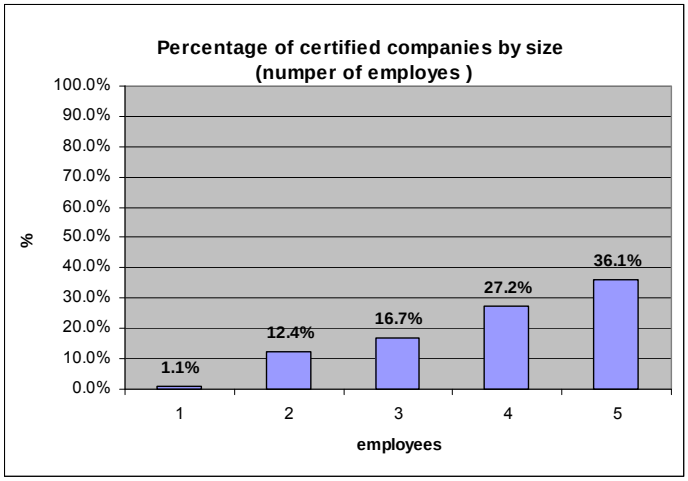


Source data CIS2006-MLQ, author's calculation

The average number of certified companies in the whole Luxembourg economy is around 8% but as shown in the figure above, the propensity to certification varies among the different sectors of the economy. The certification is more likely in manufacturing sector, probably because ISO9000 was originally published to meet its specific requirement. None of financial and energy companies are ISO9000 certified, probably due to the fact that these sectors are highly regulated and a minimum quality assurance standard offers no advantage. This fact is consistent with the results of Blind and Hipp (2003). Therefore, the rest of the analysis is conducted excluding financial and energy sectors. But as financial sector represents an important part of Luxembourg GDP, a specific study should address this sector.

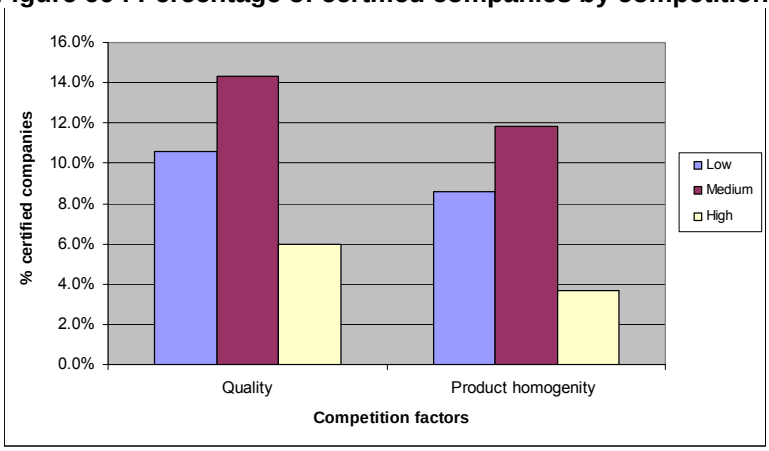
63% of all the certifications are issued to companies with 20-99 employees indicating that the typical ISO9000 certified company has medium size. This result is in line with previous studies and suggests that ISO9000 is too expensive or not sufficiently valuable for small companies. This impression is further confirmed by the figure below showing that only 1.1% of all the companies with 10-19 employees are certified. On other hand certification is more frequent in larger enterprises than in medium sized companies[185]. The relationship size and certification is increasing monotonically supporting the hypothesis that ISO9000 does not meet the needs of small companies.

Figure 65 : Percentage of certified companies by size (number of employees)



Source data: CIS2006-MLQ, author's calculation

Figure 66 : Percentage of certified companies by competition



Source data: CIS2006-MLQ, author's calculation

As the figure above shows, the impact of competition factors on ISO9000 propensity to is not linear. The percentage of ISO9000 increases if quality competition increases

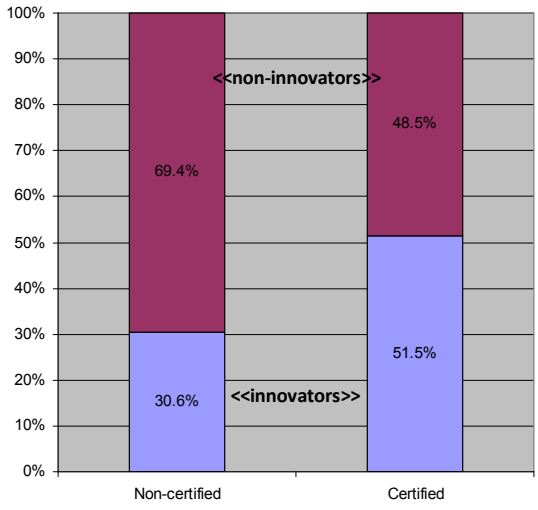
[185] The peculiarities of Luxembourgish economic structure oblige to cautiously appreciate any result concerning large companies.

from low to medium, but if the competition is high then this percentage drops. This irregular relation can easily be explained by the fact that ISO9000 only assures a minimum quality level. Hence, if the importance of quality is low, there are few incentives to conform to a quality standard. As the competition increases to a medium level, signaling the commitment to quality by a certification can be a competitive advantage. But if the competition is high, a minimum quality standard is not enough.

The figure shows that this mechanism is in place when the product is easy to reproduce. When goods and services on the market are relatively homogeneous, then ISO9000 certification is a valuable tool to differentiate the product. The easier a product can be copied, the more the propensity to certificate is bound to increase. But, as with low quality, if a product is very easy to reproduce, ISO9000 is not sufficient to differentiate from competitors and ISO9000 propensity decreases sharply.

Other characteristics of the competition, such as adaptation to customer wishes, price, advertising, and technological advance, are not statistically significant.

Figure 67 : Percentage of innovators by certification



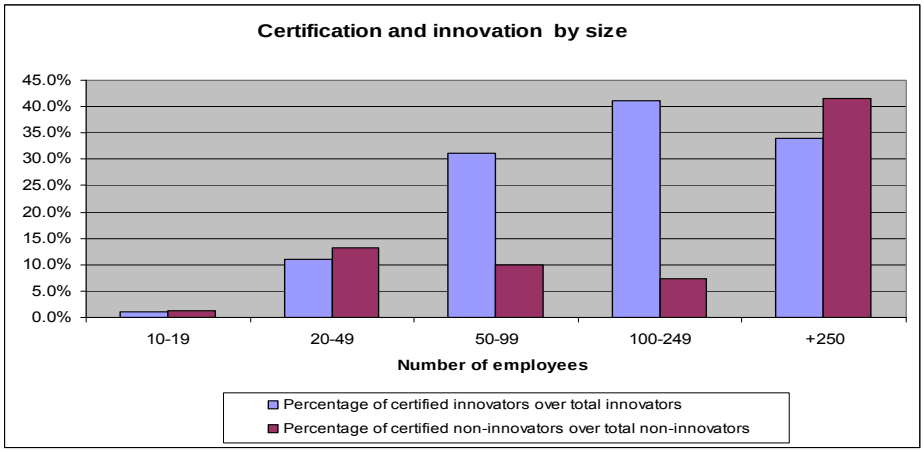
Source data: CIS2006-MLQ; calcul auteur

As shown in the figure above ISO9000 and innovation have a positive significant association[186]. Being certified increases the propensity to be an innovator: 52.9% of

[186] Innovators are the companies that have introduced a new product or service for the market or the firm, with a positive research and development expenditure.

certified companies are innovators, while only 30.3% of all not certified companies are innovators[187]. The intensity of this relationship varies by size and sector, as shown in the figure below.

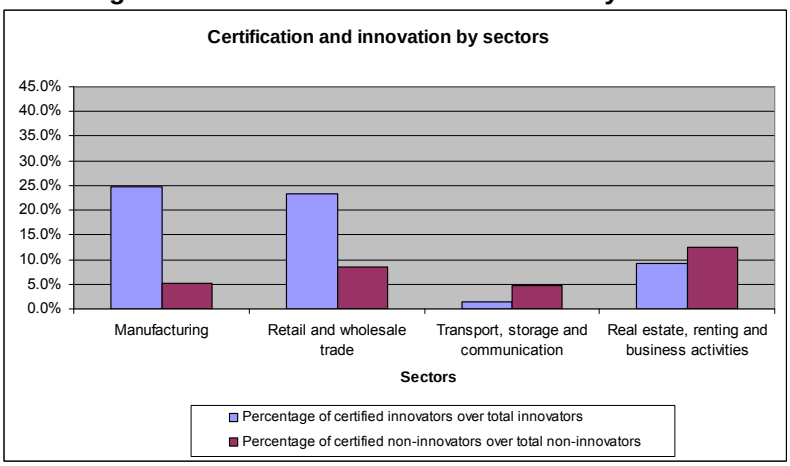
Figure 68 : Certification and innovation by size



Source data: CIS2006-MLQ, calcul auteur

The association of innovation and certification is stronger when the company has between 50 and 249 employees, as shown in the figure above, suggesting that the association is more robust for medium enterprises. For small companies, ISO9000 is probably too expensive to obtain, while large companies could easily access more effective sources of knowledge (such as internal and external R&D) to support innovation activities.

Figure 69 : Certification and innovation by sector



Source: data: CIS2006-MLQ, calcul auteur

[187] This result can be partially compared only with the report of NSSF on CIS3 data in United Kingdom. It states that 59% of adopters of environmental regulation or standards are innovators while 51% of the non adopters are innovators.

The relation of ISO9000 and innovation is contingent to the sector. The percentage of certified innovators is higher in manufacturing and trade sectors while the transport and real estate sectors do not present any evidence of certified innovation. In the real estate sector the certification appears to be of little significance. In the transport sector, few innovators are present among the certified companies. The results of the figure above offers proxy the relevance of ISO9000 for each sector and can better explain the propensity to certification by sector.

5.3.2.7 Conclusions

This analysis contributes to the general debate on the relationship between standardization and innovation. The results provide the first firm-level empirical evidence of a significant and positive association between ISO9000 and innovation propensity, confirming at the same time the determinants for certification identified in the literature.

These promising first results are currently being explored with more advanced econometric tools in order to control the effect of all relevant variables simultaneously.

Standards and standardization deserve more attention and further investigation because standards can be a tool for policy-makers aiming at the increase of innovation capabilities of companies with specific features in terms of size and sector.

5.3.2.8 Bibliogaphy

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5.3.3 The impact of ICT on companies' capacity for innovation

5.3.3.1 A preliminary study

A significant number of studies attempting to illustrate the impact of ICT on growth have been conducted on both the macroeconomic and microeconomic levels. They tend to show that the extent to which ICT tools are used, combined with organizational modifications or increases in employee qualification levels, contribute to improving growth through improvements in companies' performance. In addition, information and communications technologies provide a platform for scientific and technological innovation as organizational changes. Knowledge transfer and sharing made possible through networks in real time increase scientific and technological innovation capacities and reinforce new organizational practices and arrangements such as e-management, e-business, e-commerce, etc. These practices are both organizational innovations in themselves and drivers for improving the performance of companies. An overall assessment of the results and of international comparisons is offered in the 2003 OECD report and for a review of more in-depth literature on the subject see Pilat (2004). With this type of phenomenon coming into the picture it will be necessary to engage in an analysis of microdata. In this spirit, OCDE put out a project entitled "Microdata Project on Innovation" in 2005. The work presented here is a part of of the Working Party on Indicators for the Information Society (WPIIS), which examines the impact of ICT on innovation so as to characterize the link between innovation and use of ICT within companies. The primary objective is to bring out and understand any link that may exist between the intensity of use of ITC and the propensity to innovate within companies and to compare the results obtained with those from other participating countries.

The most recent version of the Oslo manual sets out four innovation categories: a product or service innovation—when a company in the business or services sector is concerned—that results in putting out a new product or offering a new business service ; a process innovation, i.e. the implementation of new techniques for producing goods or for providing services; organizational innovation, such as quality control circles, and innovation in marketing, such as creating a franchise or promoting a product on the internet. Using this definition from the Oslo Manual, the

Community Survey CIS 2006 concentrates on the various types of innovation cited previously that occurred between 2004 and 2006.

Since 2002, Luxembourg has been conducting an “Annual Survey on Computer Use” (hereafter referred to as the ICT survey) that covers a sample of some 2,000 companies. More to the point, the ICT survey provides information concerning the types and number of connections installed, the types of internet technologies used and the various uses that are made of them as well as the information used to characterize the level of qualification of technical personnel. This survey has brought out a large amount of information on the access to IT equipment and the internet of companies, the use of e-commerce selling or purchasing online, about IT networks and about systems used to support orders and purchasing. However, it provides little information about company characteristics or economic performance or with regard to advances in innovation.

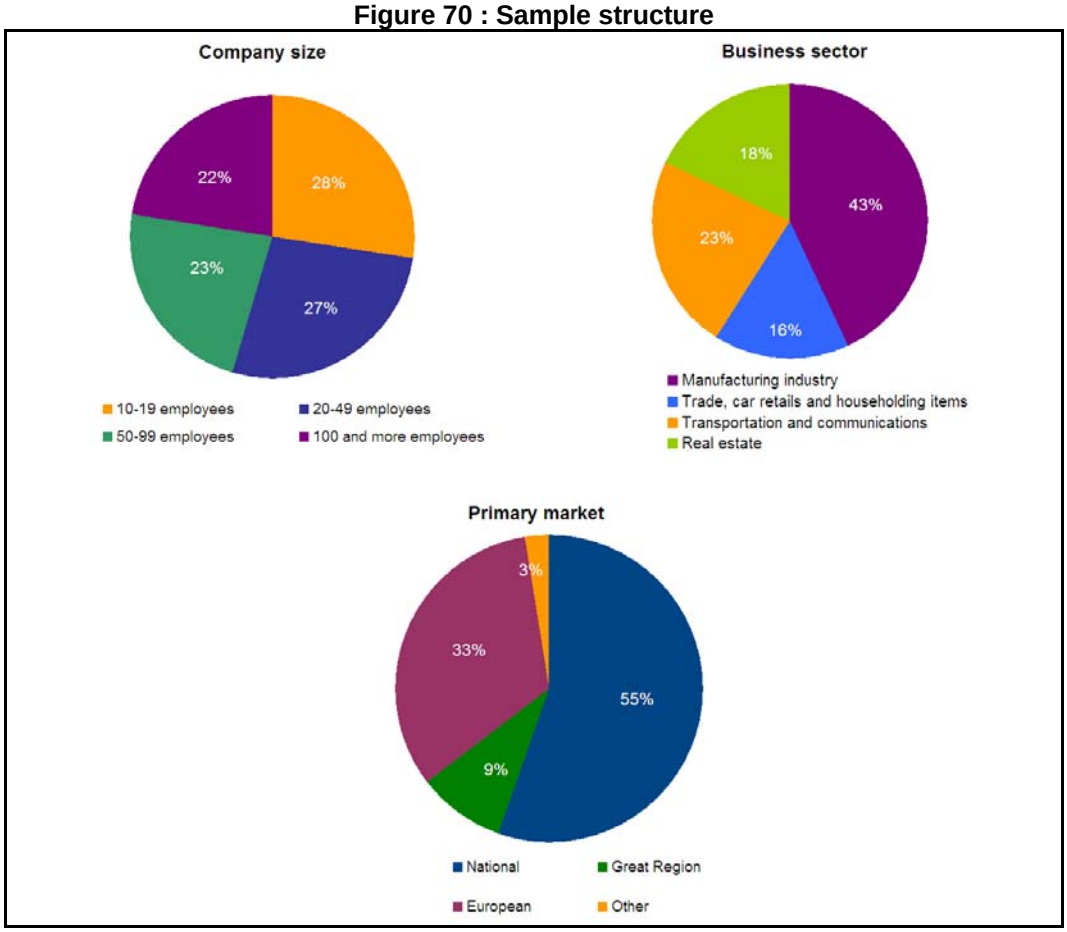
To measure the impact of the use and spread of ICT, other data sources are necessary that may be taken from the CIS survey. The 2007 ICT survey was merged with the 2006 CIS survey. The two surveys are coordinated by Eurostat and are providing harmonized statistics in European Union countries. The merger has made it possible to build a sampling of 349 observations representing about 60% of companies with at least ten employees in the 2006 CIS survey.

5.3.3.2 Characterization of the companies in the sample

As indicated previously, this single database includes information from both the ICT 2007 and CIS 2006 surveys. However, this sample has limitations. The way it has been set up allow us onlyto use companies belonging to one or another of the NACE sections common to both studies. Furthermore, the companies in the financial sector cannot fill out the e-commerce part, which represents a weakness for our study and ends up excluding 37 firms. There remain then only 312 findings. No weighting is used in the sample so that the method may be harmonized with the method used by the rest of the OECD working group. However, the impact of this choice should be analyzed in upcoming stages of the work.

The following graphs provide a succinct breakdown of companies according to size, sector of business operations and primary markets on which the companies of this particular sample are operating.

Figure 70 : Sample structure

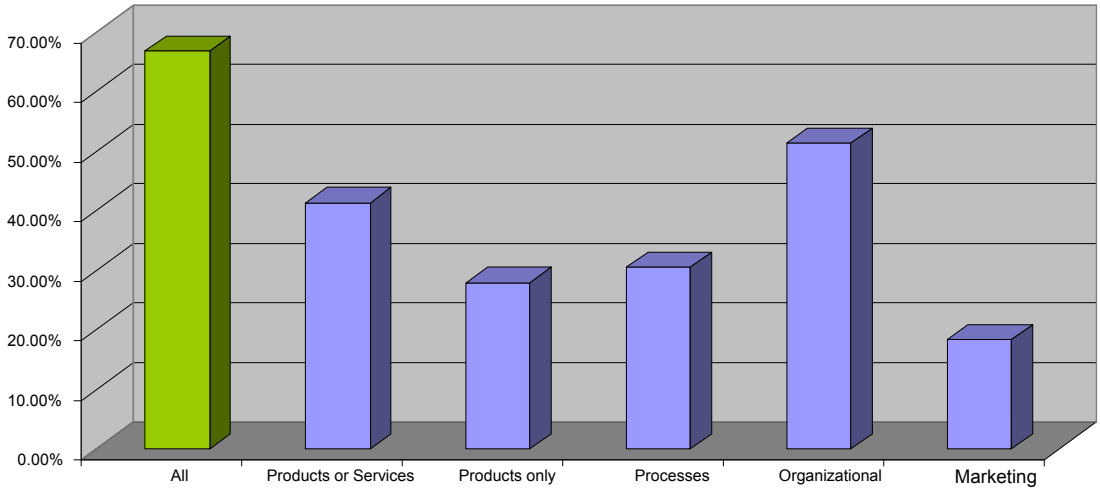


Source: STATEC CIS2006-ITC2007 surveys – calculations by the authors of this segment

There are some very innovative companies…

Nearly 7 companies out of 10 declared in 2006 that they had innovated between 2004 and 2006, although they did not do it the same way. Only 3 companies out of 10 introduced a new product during that period, while half of the sample introduced an organizational change.

Figure 71 : Propensity to innovate by innovation type



Source: STATEC CIS2006-ICT 2007 surveys – calculations by the authors of this segment

In this sample, it appears that small companies, with between 10 and 19 employees, have the lowest proportion of innovators regardless of innovation category observed. In contrast, companies with more than 100 employees innovate more than the average rate. Yet no clear linear relationship between the size of a company and the decision to innovate exists when considering mid-size companies. Furthermore, the table below illustrates that the propensity to innovate also varies depending on business sector and in particular, individual sectors do not innovate principally in the same manner. Companies in the manufacturing industry and real estate and business services innovate primarily by introducing new products and services and by implementing organizational changes. In contrast, companies working in transportation and communications that are on the average less innovative are present chiefly among companies that introduced organizational changes. Also, companies who operate primarily on the domestic market innovate less than the others. These results are all consistent with the results obtained overall throughout the CIS 2006 database.

Table 53: Propensity to innovate by business sector, size and primary market

	INNOVATION (1)		Produit and/or Service		Product		Process		Organizational		Marketing	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Control variable												
SIZE												
Companies with 10 - 19 employees	57	43	31	69	17	83	22	78	43	57	12	88
Companies with 20 - 49 employees	62	38	33	67	19	81	27	73	48	52	14	86
Companies with 50 - 99 employees	67	33	39	61	26	74	26	74	44	56	21	79
Companies with more than 100 employees	84	16	66	34	53	47	49	51	73	27	29	71
NACE												
Manufacturing Industry	71	29	48	52	43	57	41	59	49	51	21	79
Trade, car retails and household items	66	34	40	60	32	68	14	86	52	48	36	64
Transports and communications	50	50	22	78	7	93	25	75	42	58	8	92
Real estate	79	21	52	48	14	86	27	73	68	32	9	91
Primary Market												
National	62	38	36	64	19	81	26	74	46	54	19	81
Great Region	75	25	43	57	29	71	21	79	64	36	18	82
European	70	30	47	53	40	60	39	61	58	42	17	83
Other	88	12	75	25	50	50	50	50	38	62	25	75

1) Innovation is defined here as a company innovating in products and/or services ,and/or a process , and/or has instituted an organizational change or marketing innovation
To read this table: 57% of small companies of 10-19 employees innovate and 43% do not;
21% of the companies having Great Region as primary market innovate in products and 79% do not

Source: CIS 2006 & ICT 2007

The most innovative companies are using advanced ITC tools

As with all companies in Luxembourg, those of our sample are rather well equipped with updated ICT tools. In particular, almost 9 out of 10 have broadband internet access and around 70% of the companies in the sample have their own web site. It also seems that less than one company out of ten stated having made purchases or selling goods via the internet while not having any web site. On the same time over 40% of the sample have both conducted e-commerce operations and had a web site between 2004 and 2006.

Finally, the initial appraisal of the structure and the behavior of the sample with regard to ICT, shows that some 40% of employees are connected to the internet and 35% of companies have at least 50% of their employees connected to internet, but only 25% of employees have a university education.

Table 54: Methods of internet connections

Internet connections:		
Via Modem	1.30%	312
Via ISDN	5.80%	312
Via xDSL	89.40%	312
No internet connection	3.50%	312
Number of reasons for using Internet (mean)	2.679	312
Number of automatic links (mean)	2.04	303
Own a Web site (mean)	67.60%	312
Number of services offered on the web site (mean)	1.34	205

Source ICT 2007

Table 55 : Use of ICT by companies

Use of the internet and e-commerce		
Makes purchases on the internet	41.70%	312
Sells products on the Internet	16.70%	312
Internet access and Web site	26.40%	303
Internet access and e-commerce	8.60%	303
Internet access and e-commerce + Web site	43.20%	303
Has no internet access or has access but no web site or does not engage in e-commerce	21.80%	303
Use of cooperative or integrated communications and management tools		
Use of an open source or 3rd party operating system	24.10%	301
Extranet	34.30%	303
Electronic forums	17.80%	303
Integrated software management package	25.70%	303
Intranet	57.40%	303
Video conferencing	14.50%	303
Reasons for using the internet		
To take advantage of banking and financial services	80.10%	301
For training	30.20%	301
To monitor the market	62.10%	301
To receive products that can be transmitted by internet	61.80%	301
For customer service	43.50%	305
Characteristics of companies		
Employees connected to the internet	41.70%	305
Having at least 50% of employees connected to the Internet	35.40%	310
Employees with at least a high school education	24.80%	312
Primary market is domestic	55.40%	312

Source: ICT 2007

A number of studies were conducted to obtain information from the database that appear or were described above. Although at this stage results have not been extremely satisfactory, they do make it possible to guide future stages of research in the area.

5.3.3.3 An exploratory analysis

ICT and innovation: a positive link

A simple test on the equality of the proportion Chi square test was performed to illustrate how numerous are the variables relative to the the use and the equipment in ICT which to distinguish the companies that innovate from those that do not, regardless of innovation type.[188]

[188] A chart containing results for all of the variables appears in Appendix 1 of this section.

It appears that some practices are common to all companies. Thus accessing internet, using an electronic messaging service or having a local LAN network does not help to distinguish two sub-populations in a group where 97.8%, 98.1% or 99.8% of the sample is concerned.

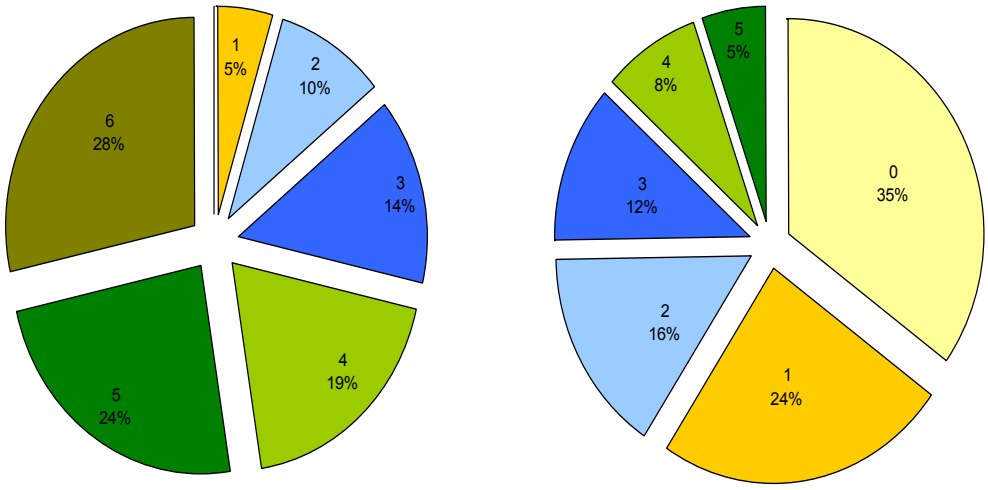
The majority of connection types to broadband networks and to tools and computer systems are significantly more frequent among innovative firms, although average penetration rates are very diverse. These connection types include the use of open source software, electronic calendars, project management tools, intranet and extranet. They also include more integrated systems for managing customer bases, orders, purchases, invoicing and production either ERP supported or not, or the existence of a web site. In contrast, less high performance tools, such as slow connections, are significantly more absent in innovative companies.

Depending on the type of innovation, there is a difference between variables which could be selected as significant. Nonetheless, it seems that the effects can be combined by the impact of different types of equipment or use of technological innovation(introducing of new goods and services, or implementing of new processes), and non-technical innovations (major organizational change or marketing innovations).

The link is probably a result of a more complex combination of uses

Taking in consideration a large large number of available and discriminatory variables in the initial analysis, it appeared useful to explore the combinations of variables having impact on the complexity of the link between innovation from one side and information and communications technologies from the other. Therefore a certain number of composite indicators was formed, in order to find out the the intensity of use and the degree of complexity of equipment used by companies in the sample. Two intensity scales were developed based on the 2007 ICT survey data .

Figure 72 : The number of reasons for using internet and the number of ICT equipment types



Source: STATEC CIS2006-ICT2007 surveys – calculations by the authors

The first scale is developed from a score involving the the following variables:

- Use of the internet for banking and financial services
- For education and training
- For monitoring the market
- For receiving digital products
- For customer service purposes

This scale provides information about the primary reasons business people use the internet. The preceding graph shows that the large majority of companies in the sampling use internet for more than one reason and that more than 80% use it for at least three different reasons.

The second value scale is built form a score involving the following variables:

- Extranet use
- Electronic forums
- ERP Enterprise Resource Planning
- Intranet
- Video-conferencing.

This score was built with the support of the Cronbach[189] Alpha statistic and it indicates whether the firm is a low or high level user of ICT equipment. According to this intensity of the internet use indicator, a third of companies in the sample are considered to be low-level users and do not use any of the above ICT items. In contrast, 13% of the companies in sample considered to be high-level users.

A single, one-stage estimate will not give the full explanation

Estimated models describe innovative behavior of a company through appraisal of the probability of innovation depending on a set of factors. The assumption derived from the previous analyses is that different types of ICT have different impacts on various types of innovation. As information is missing on performance measures and the type of impact exerted by process and other non-technological innovations, this initial study is restricted to indentifying any impact of ICT on the propensity of a company to innovate without being able to evaluate its effect on companies' performance.

Innovation types are represented by a dichromatic variable that assumes the value of 1 when a company introduces an innovation over the last two years thus giving it the qualification of "innovative company" and 0 if it does not and is therefore a "non-innovating company"[190]. In addition, the endogenous nature of ICT variables that explain the propensity to innovate but are themselves explained by variables that directly influence the propensity to innovate must be corrected. To accomplish this, an initial step in the estimation process is to regress the ICT variables on "common" variables and a variable called an instrumental variable, meaning that it has no correlation with the propensity to innovate (here the e-government web sites were

[189] The Cronbach Alpha is a statistical indicator with a variable value between 0 and 1 that is used to evaluate internal consistency of a measuring or evaluating instrument made up of a group of elements that all contribute to understanding a single underlying entity or dimension. This comprises the level of knowledge or skill concerning a given theme, the level of aptitude, attitude, motivation or interest in an area or with relation to an object, etc. This index reflects a level of internal consistency that grows higher as its value approaches 1. In practice, it is deemed that homogeneity in the instrument is satisfactory when the coefficient value is equal to at least 0.80.

[190] (see Wooldridge 2002) – The probability to innovate is modeled by a probit as follows:

$$Pr(Y = 1) = \int_{-\infty}^{\beta' X} \phi(t)dt = \Phi(\beta X)$$

Where Φ is the cumulative distribution for a normal distribution function and the error term follows a normal distribution with mean 0 and variance of 1.

chosen for use). Residuals from this initial estimation phase were added to explanatory variables to the second estimation phase. Business sector and company size are used as control variables. Therefore the results presented below concur, all other things being equal, from the perspective of business sector and size.

Coefficients estimated from this type of model measure the marginal effect on the explained variable, i.e. the propensity to innovate, of the transition from 0 to 1 of dummy variables.

As may be inferred from these results, ICT tools and use patterns that have significant impact on the propensity to innovate differ depending on the type of innovation involved.

So the impact of ICT tools on the probability that a company will innovate in products and/or services is weak and only having available at least three of the five benchmarked tools augments the innovative urge. In addition, a company that has internet access and practices e-commerce, but does not have its own internet site will experience a diminishing of the probability that it will innovate in its product and/or services offering. It appears that having one's own internet site and combining this with the use of other web tools is a factor that promotes companies' propensity to innovate.

The level of ICT equipment does have an impact however on the probability of having implemented a process innovation.

The reasons for the internet use have an impact on the propensity to incorporate organizational change. More precisely, the impact of the number of reasons for using the internet is negative when only one reason is cited or when all the reasons possible are cited. Consequently it appears that the factor for innovation is more the degree of maturity of a company rather than the intensity of equipment use. When use rates are weak, companies make few organizational innovations. The same applies for companies that use internet intensively and appear to be fully mature. As soon as organizational systems achieve stability, fewer innovations in organization occur.

Preliminary descriptive data show that innovation in the domain of marketing appears to follow its own logic and probably entertains few links with other types of innovation. In the model selected for this study, no ICT variable had an impact on the probability of introducing marketing innovations.

Finally, it seems that there is an impact of staff's education on the probability of innovation. The more a company has personnel with at least a secondary school education, the stronger are the chances that it will innovate, more particularly by introducing new products and/or services. This result does not extend to other innovation types. The fact, that a companies' primary market is the domestic market, diminishes companies's propensity to innovate, especially it concerns product innovation and organizational change.

Table 56: Impact of the level of ICT equipment on innovation type

All innovation types	IMPACT
ICT equipment level =1	-
• % of employees with a secondary education	+
• Primary market = domestic market	-
NACE	
Size	

Innovation in products and/or services	
• ICT equipment level =3	+
• Connected to the Internet + e-commerce	-
• % of employees with a secondary education	+
NACE	
Size	

Innovation in Processes	
• ICT equipment level =3	+
• ICT equipment level =4	+
NACE	
Size	

Innovation in Organization	
• Reasons for using Internet=1	-
• Reasons for using Internet =6	-
• Primary market = domestic market	-
NACE	
Size	

Innovations in Marketing	
NACE	
Size	

Source: Calculations by the author

These initial results corroborate those found by Abello and Prichard in 2008 in which each innovation type has its own drivers, yet they do bring on a simple and direct categorization among ICT and innovation types.

5.3.3.4 Limitations and conclusion

Surprisingly, combinations of equipment types that had a significant impact taken separately contribute little or not at all to the explanatory model. As no equipment level type has a massive and direct impact other than that of maintaining an internet site, it appears that the propensity to innovate depends more on companies' maturity

levels, for which composite variables make up a sort of proxy that is not fully satisfactory. The optimal combination of a group of equipment and usage types that may be occasionally interchangeable is not easily illustrated by means of scored variables that account for usage and equipment levels rather than simple procedures.

In order to ensure that analyses carried out by the OECD working group were comparable on a temporal basis, it was decided that weightings would not be applied to these preliminary results. Using an approach based on solely Luxembourg data, it is appropriate to verify the impact of this choice on results and to analyze their robustness to the sample structuring. There exists no immediately operational weighting for this type of basis derived from the merger of two surveys that have somewhat different sampling and stratification methods. The results should be interpreted with prudence.

Additional analyses should be carried out by calculating new estimates that illustrate the complexity attached to each type of innovation. In particular, distinctive models should be estimated to account for underlying logic applicable to each innovation type, while supplementing the estimate with data such as elements restricting ICT use, availability of qualified IT personnel, etc. Also, the principal limitation of the approach selected for this study is that it cannot be used to measure the impact of ICT and innovation on the performance of companies. To compensate for this shortcoming, estimating this type of impact through the modeling of a production function is under consideration. However, global investments and especially those in ICT are not directly available at the firm level in Luxembourg. Therefore, prior to adopting this approach, it would be useful to develop series for measuring stocks of capital and particularly ICT investment levels beforehand.

5.3.3.5 Appendix 1: Discriminating ICT Variables of the Probability of Innovation

						64,79	59,18
					Marketing		
Companies using extranet	340	39,67	40,29	42,74	45,46	41,99	33,47
Companies using wireless LAN	340	35,59	34,22	43,75	42,22	40,31	29,43
Companies using other LAN	341	99,66	100,00	100,00	100,00	99,57	99,77
Companies using email services	341	97,20	97,86	98,39	97,75	97,21	98,10
Companies implementing videoconferences	340	18,81	22,91	15,07	31,44	19,56	14,37
Companies practicing eforums	340	17,74	20,43	12,35	14,68	17,45	16,50
Companies using eCalendar for group access	340	50,24	58,08	54,03	70,32	52,70	42,58
Companies implementing group project manager	340	35,70	36,75	37,74	39,97	39,88	27,50
Companies using LAN	341	99,66	100,00	100,00	100,00	99,57	99,77
Number of ICT used by the company	340	4,60	4,75	4,76	5,15	4,73	4,21
Companies using open source software	340	27,90	28,75	21,27	34,72	29,44	24,77
Usage of database management systems automatically connected to :							
Customers' database	340	31,11	31,18	32,31	34,65	29,43	27,17
Invoicing and payments database	340	64,69	63,88	77,22	63,58	63,67	60,18
Equipment supply database	340	26,29	29,21	24,29	32,36	25,99	21,98
Production management, logistics, operational services	340	42,65	40,80	52,25	49,88	42,36	36,52
Internal system of supplies restocking	340	31,14	33,72	46,97	33,86	33,59	25,49
Number of database management systems implemented	340	1,96	1,99	2,33	2,14	1,95	1,71
Usage of database management systems	340	70,18	72,05	79,08	67,87	69,34	64,79
Use of Enterprise resource planning							
Use of integrated Enterprise resource planning system	337	38,50	39,80	38,49	41,66	40,61	36,54
Use of ERP for information storage	337	36,38	38,44	36,29	39,98	37,92	34,87
Use of ERP for marketing purposes	337	26,35	26,20	26,13	23,41	27,14	21,68
Use of e-Invoicing							
Sending e-invoices	341	13,98	12,03	7,72	14,22	15,58	10,51
Receiving e-invoices	341	29,96	28,98	24,11	29,18	28,55	30,40
Sending and receiving e-invoices	349	12,34	10,03	4,52	11,85	14,20	9,08
Sending OR receiving e-invoices	341	31,37	30,97	27,30	31,45	29,63	31,58
Use of a digital e-signature	341	20,73	20,00	28,50	26,25	23,66	17,62
Connexion method							
Connection method : xdsl (adsl, sdsl,etc...)	349	76,18	73,95	85,39	60,75	74,85	75,26
Other broadband connections	349	36,05	45,84	47,52	59,33	39,10	27,49
Connection method: isdn	349	27,85	20,58	29,62	31,06	23,72	30,14
Connection method : mobile phone	349	32,97	40,24	40,36	34,25	33,29	27,66
Connection method : analogical modem	349	18,22	13,60	21,95	21,29	19,81	19,30
Low speed connection	338	4,70	2,11	0,71	9,33	3,62	8,13
High speed connection	341	94,68	97,41	99,29	89,93	95,96	91,27
Reasons for the internet use							
To benefit from financial and bank services	349	77,65	77,53	80,89	74,15	77,71	79,42
To attend training courses	349	26,41	32,26	24,48	29,64	25,76	25,67
For market observations	349	72,68	75,42	75,93	73,78	71,92	67,80
To receive products distributed via the internet	349	70,22	73,85	70,07	66,64	72,26	64,08
For after-sale assistance	349	50,90	55,00	64,31	56,39	49,10	44,62
Number of reasons to use the internet for company	349	2,98	3,14	3,16	3,01	2,97	2,82
To get in contact with public authorities to get information	348	85,63	87,13	82,52	84,53	84,05	82,19
To get in contact with public authorities to get application forms	348	87,90	86,99	88,83	85,43	86,12	85,43
To get in contact with public authorities to send the dully filled forms	348	44,60	47,92	45,06	54,14	44,99	43,31
Use of a web site							
Possession of a web site	349	82,30	85,56	90,31	87,29	84,96	75,52
To sell the products	242	64,01	74,06	63,97	67,29	63,46	65,47
To facilitate the access to the product catalogues and price lists	256	42,59	45,80	49,06	44,28	41,22	45,19
E-commerce							
To provide after-sale services	254	26,27	31,47	29,47	33,83	25,34	21,37
Ordered products or services via the internet	312	47,69	41,47	36,35	50,94	53,61	43,36
Received orders for products or services via the internet	312	15,40	17,87	31,69	18,61	14,68	16,06
Ordered products or services via other nets different from the internet	303	5,74	5,48	5,10	11,56	4,30	5,97
Received orders for products or services via other nets different from the internet	303	7,07	6,86	5,54	17,95	7,98	5,79
Company buys goods via the internet of other external nets	303	51,26	44,63	41,61	52,98	55,56	47,83
Company sells goods via internet of any other external nets	303	20,23	21,70	33,99	31,60	20,60	20,60
Company practices e-commerce	303	57,30	53,86	60,56	58,29	60,34	54,39
- *obstacles connected to the online sell*							
Your products or services could not be sold online	272	63,26	69,03	46,15	53,50	58,93	64,36
You have diminished your offer of the online sold products	267	3,45	1,55	0,00	2,33	3,90	4,40
You are having logistics problems	268	12,64	6,64	21,32	7,32	15,78	14,41
You are not sure about the legal context of online selling (contrats, conditions)	266	20,43	16,71	33,02	6,67	21,22	21,80
Some clients do not want to use e-commerce	268	45,84	41,36	64,02	35,46	50,69	42,60
Some clients made purchase via the internet but have stopped doing it	267	4,53	3,41	7,21	4,49	4,92	7,00
Payments security is not guaranteed	258	18,11	11,66	17,89	14,10	20,42	24,10
Other problems connected to online sell	249	3,80	5,02	2,79	8,48	4,07	5,17
Number of the problems connected to the online sell	270	99,14	85,00	129,18	68,02	110,17	92,92
- *obstacles connected to the online purchase*							
The supply of the goods and services offered online is quite poor	259	28,11	31,05	31,37	26,02	30,97	26,52
Some sellers stopped selling via the internet	260	14,26	10,39	9,77	15,57	14,72	12,97
Payment security is not guaranteed	251	22,37	13,39	15,11	17,22	24,67	23,55
You are not sure about the legal context of e-commerce (contrats, conditions)	249	27,32	25,86	34,47	16,78	28,72	27,55
Other problems	241	2,36	2,75	0,96	5,19	2,21	3,42
Number of the problems connected to online purchase	285	51,53	36,03	42,36	45,09	62,50	43,86
ICT specialized staff							
Presence of the staff specialized in ICT	341	38,13	44,04	37,55	51,37	41,70	30,90
The company did or tried to recruit the ICT specialists	340	20,28	21,44	11,22	31,83	22,34	16,64
The company had problems to recruit the ICT specialist	59	63,20	54,84	86,02	45,60	62,97	55,37
- *Difficulties to recruit because :*							
Absence of shortage of the candidates having the necessary competencies	38	85,27	85,62	100,00	78,23	86,52	86,14
Absence of competencies in ICT due to the education	38	36,39	38,51	28,82	53,14	37,45	37,87
Absence of the professional experience in ICT	38	45,06	39,57	32,67	32,07	48,57	46,02
Too high salary expectations	38	48,57	49,16	29,33	47,57	42,34	47,98
Other problems	38	3,10	5,48	3,69	3,30	3,58	2,91
The company recruited for the post connected with ICT	340	26,16	31,72	25,92	33,21	29,03	21,45
The company had problems to recruit because of the low concurrence	73	32,07	28,04	21,35	35,29	28,26	30,66
The ICT services are provided by a third party	338	64,51	67,13	67,40	58,79	63,05	60,41
Company recruited a foreign provider for the following ICT services	339	32,39	37,98	46,62	50,17	34,23	28,19
ICT management by a foreign provider	93	45,94	40,47	47,13	40,76	40,39	49,22
Development and implantation of ICT by a foreign provider	93	82,43	79,81	88,89	83,29	81,50	81,96
ICT operations by a foreign provider	93	76,14	78,63	66,56	75,84	73,75	77,97
Other ICT functions made by a foreign provider	93	35,24	42,80	42,48	34,54	35,82	28,14
Number of the ICT services is rendered by a foreign provider	93	2,40	2,42	2,45	2,34	2,31	2,37
Service provider is a foreigner from a country EU member	93	96,58	95,72	95,46	98,09	95,88	93,60
Service provider is a foreigner from a country which is not a EU member	93	12,00	16,11	19,99	9,83	14,43	13,05

Legend:

Significant at 5%level Significant at 10%level Non Significant

5.3.3.6 Appendix 2: Probit model estimate results

Estimation results are presented in the following table. The first column denotes the probability of innovation, regardless of type. All of these regressions are based on the same scale, N = 289. Results take into account a correction for the endogenous nature of ICT variables even if not present.

	Innov.	Product and/ or service	Processus	Organization	Marketing
Proportion of the employees connect. to internet	0,001	0,001	0,001	0,001	0,001
Equipment scale = 0	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Equipment scale = 1	0,01	-0,001	0,019	-0,065	0,007
Equipment scale = 2	0,134	0,1	0,043	0,115	0,111
Equipment scale = 3	0,083	**0.247***	**0.278***	0,099	0,137
Equipment scale = 4	0,096	0,085	**0.310***	0,053	0,054
Equipment scale = 5	-0,033	0,209	0,19	0,236	0,14
Reasons for using internet = 0	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Reasons for using internet = 1	**-0.420****	-0,013	-0,061	**-0.285***	0,029
Reasons for using internet = 2	-0,307	0,062	-0,008	-0,262	0,102
Reasons for using internet = 3	-0,164	0,165	0,133	-0,223	0,094
Reasons for using internet = 4	-0,221	0,134	-0,131	-0,275	0,095
Reasons for using internet = 5	-0,134	0,269	0,114	-0,211	0,068
Reasons for using internet = 6	-0,304	-0,016	-0,074	**-0.479*****	-0,104
Internet access and web site	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Internet access + e-commerce	-0,132	**-0.307*****	-0,14	-0,116	0,041
Internet access + e-commerce + web site	0,001	-0,087	0,073	0,065	0,082
% of the employees with secondary education	**0.512****	**0.424****	0,079	0,199	0,196
Domestic market	**-0.174****	-0,106	-0,077	**-0.231****	0,038
Number of employees	0,001	0,001	0,001	0.001**	0,001
Number of employees (squarred)	0,001	0,001	0,001	-0.000*	0,001
Manufacturing industry	*ref.*	*ref.*	*ref.*	*ref.*	*ref.*
Trade and car retails	-0,063	-0,096	**-0.277*****	0,102	0,043
Transportations and communications	**-0.250****	**-0.320*****	**-0.135***	-0,057	**-0.148*****
Real estate	-0,265	**-0.249***	**-0.237****	0,165	**-0.182*****

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6 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 labor 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[LISBON]

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 labor 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 labor. 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 labor force. The labor 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 labor 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 labor market functions. While the first type of unemployment may reduced by recovery in the economy, the second is due to structural factors, such as inadequate skills in the labor force or the cost of labor. The unemployment rate is an important measure of the efficiency of the labor 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 labor 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 maneuver.

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 maneuver 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-6 classification system as follows: Agriculture, Forestry and Fishing; Industry, including energy; Construction; Trade, Auto Repair, HORECA, Transportation and Communication; Financial activities, Business services, Real estate rentals and Other activities and services. 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 subsidy 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. EUROSTAT 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 unfavorable 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 labor market, such as inadequate qualifications for jobs or long periods of inactivity.

B1 B2 B3 – Employment rate (T, H, F) LISBONNE

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 labor market. Furthermore, the employment rate is an important factor in maintaining social protection systems in the long term. For these reasons, the EU has set the objective of achieving 70% employment by 2010 as part of its Lisbon Strategy. The objective for female employment in 2010 is 60%.

B4 B5 B6 – Employment rate of persons aged 55-64 (T, H, F) LISBONNE

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 labor 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 labor market permanently, thus depriving the country of human resources.

B8 – Long-term unemployment rate LISBON

EUROSTAT deems that a long-term unemployed person is one who has been without work for more that 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 labor potential of a country. Long-term unemployment depends above all on structural factors, such as inadequate skills in the labor force or the cost of labor. In addition, long-term inactivity not only gives rise to unfavorable 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 labor, 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 labor costs. Changes in labor productivity provide a standard of measurement for evaluating possible changes in the cost of labor. 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 labor 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 labor costs

The unit labor cost (ULC) represents the cost of labor per unit of added value produced. It is determined by the relationship between payroll coasts and added value at market prices. It should be noted that the indicator for unit labor 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 labor 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 labor costs rise, causing competitiveness to fall.

C5 - Costs/Revenue ratio in the banking sector

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

The minimum wage in effect is the social minimum monthly wage for labor 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 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 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 150 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 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

This indicator lists the lowest price DSL subscription available in September 2002 and compares it to the lowest cost subscription available in November 2004, in USD with tax included. Many applications in the information society depend on high speed data transfer systems. A market that is receptive to the offer of broad band connections promotes the spread of information and simultaneously allows consumers and companies, especially PME, to take advantage of increased online services.

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 Stat 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 favoritism 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 (not included in the TBCO)

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 labor. 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 favorable 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 favorable 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 labor 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 labor 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 unfavorable 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, enrollment 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 (not included in TBCO)

This indicator represents wage 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 labor 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 les 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. How efficiently resources are used must be evaluated in terms of academic results and levels of education attained.

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

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 labor market. The requirement for higher levels of qualification on the labor 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 labor market.

G4 – Percentage of human resources in scientific and technological fields (HRST) in the labor 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 (not included in the TBCO)

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 labor has come under the increasing attention of public policy makers and the media. Foreign skills are suitable for filling vacant positions. This labor 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 labor market and the presence of numerous European institutions.

G8 – Percentage of highly qualified workers (ICT) in total employment figures (not included in the TBCO)

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 labor 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 [LISBON]

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 Lisbon Strategy, the objective to be met in internal R & D expenditures is 3% by 2010.

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

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

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 center 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 have no motivation 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 labor, 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 LISBON

The 'At risk of poverty rate after social transfers' measures the proportion of persons whose equivalized disposable income is below the 'at risk of poverty line,' which is set at 60% of the median equivalized 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 equivalized 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.

I4 - 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.

I5 - 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 labor 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.

I6 - Serious work accidents

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 and the 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) LISBON

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 CO2 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 labor 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 LISBON

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 travelers is defined as the ratio between domestic passenger traffic and GDP at like prices of 1995. The unit used is passenger kilometer to represent the transport of one passenger over the distance of one kilometer. 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 in 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 CO2 released into the air through road traffic.

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