JRC Scientific and Technical Reports

Towards a set of composite indicators on Flexicurity: the Indicator on Modern Social Security Systems

Matteo Governatori (DG EMPL), Anna Rita Manca , Massimiliano Mascherini

EUR 24091 EN - 2009

JRC EUROPEAN COMMISSION

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Contact information
Anna Rita Manca
Address: Via Enrico Fermi 2749
E-mail: Anna.Manca@jrc.ec.europa.eu
Tel.: +39(0)332789314
Fax: +39(0)332785733
http://ipsc.jrc.ec.europa.eu/
http://www.jrc.ec.europa.eu/

Matteo Governatori
Directorate General for Employment, Social Affairs and Equal Opportunities
Employment Analysis
Address: Rue Joseph II 27, 1049 Brussels, Belgium
E-Mail: Matteo.Governatori@ec.europa.eu
Tel.: +32(0)22993436
Fax: +32(0)22994233

JRC 55559 EN

EUR 24091 EN
ISBN 978-92-79-14244-4
ISSN 1018-5593
DOI 10.2788/46991

Luxembourg: Office for Official Publications of the European Communities

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1 Introduction

This paper presents an attempt to calculate a composite indicator measuring the extent to which Social Security Systems in the EU are compatible with high employment levels and inclusive labour markets. The index includes aspects such as generosity, extent of coverage and incentive effects of social security systems and is based on 25 indicators drawn from different sources.

Together with the composite indexes on Life Long Learning (LLL) and Active Labour Market Policies (AMLP) previously elaborated, this exercise is part of a joint project of DG Employment and the Joint Research Centre[1] aimed to measure the level of Flexicurity across the EU through a set of four composite indicators corresponding to the four main dimensions of flexicurity identified by the European Commission[2]. Such indicators are described in separate reports produced within the project. This exercise should be seen as complementary to the analysis of flexicurity in the EU carried out by Commission services within the *Employment in Europe* reports of 2006 and 2007 (see European Commission, 2006 and 2007)

In this paper social security systems are considered in a narrow sense, as the focus lies mainly on transfers to the unemployed, thereby disregarding other categories of welfare spending such as health care, pensions etc. This choice is justified, firstly, by the fact that the analysis aims at looking at the component of welfare states which directly concerns the risk of unemployment and the resulting incentives to take up jobs, and, secondly, by the need to avoid a too large number of basic indicators, which would prevent a meaningful interpretation of the composite indicator. The scope of the exercise also reflects the definition of modern social security systems adopted by the EU within the framework of flexicurity, i.e. "Modern social security systems that provide adequate income support, encourage employment and facilitate labour market mobility. […]"[3]. Finally, the index is computed following the methodology developed in the OECD/JRC handbook on composite indicators.

2. The list of Indicators

The list of basic indicators included in the index follows the theoretical framework jointly developed by DG EMPL/D1 (Employment Analysis unit) and JRC/G09.

[1] "*Statistical analysis in support of Flexicurity policy*", Administrative Arrangements 30566-2007-03 A1CO ISP BE.

[2] 1) flexible and reliable contractual arrangements; 2) comprehensive lifelong learning strategies; 3) effective active labour market policies; 4) modern, adequate and sustainable social protection systems. See COM(2007)359 of 27 June 2007 and Presidency conclusions, EPSCO Council 5/6 December 2007.

[3] European Commission Communication "Towards Common Principles of Flexicurity: more and better jobs through flexibility and security" adopted on 27 June 2007.

25 indicators have been selected from different sources including, mainly, the Compendium of indicators developed by the Employment Committee (EMCO) to monitor Member States' progress towards the objectives set in the Employment Guidelines (hereinafter the Compendium), the Labour Market Policies Database of Eurostat and the joint Commission-OECD project on tax and benefits (see below for further details on sources).

Those indicators were chosen in order to cover different aspects of social security mainly related to the amount and coverage of transfers to the unemployed, both at the country-level (e.g. overall spending) and for the individual benefit's recipient, as well as the employment incentives implied by such systems, both financial (in combination with taxation) and non-financial. The availability of child-care services is also captured, given its role to facilitate the combination of work with private and family responsibilities. Specific aspects, such as the unemployment benefits' coverage of non-standard forms of employment (e.g. temporary work) and the extent of financial incentives to take up jobs for inactive people, are also covered.

Therefore, the Modern Social Security (MSS) index covers five dimensions, each including a number of indicators varying from 3 to 7:

1. *Overall spending and coverage of unemployment benefits.* This dimension includes three indicators, i.e. the amount of resources devoted by Member States to income support for unemployed expressed both as a share of GDP and as average spending per person wanting to work and the number of unemployment benefits' recipients as a percentage of all people wanting to work. The source of these indicators is the LMP database (Eurostat).

2. *Financial incentive to take up work for people out of employment.* This dimension includes five indicators which measure the percentage of gross extra-income which is "taxed away" when an individual moves from non-employment to employment as a combined effect of the withdrawal of welfare benefits and the increase of income taxation (including social security contributions). Two indicators concern people moving from unemployment to employment (and they are therefore called unemployment traps) whereas the remaining three look at employment incentives for inactive people, which are not entitled to unemployment benefits but often receive other forms of social assistance (i.e. inactivity traps). Unemployment and inactivity traps are normally calculated for different family types and wage levels. As financial incentives to move out of non-employment tend to be particularly weak in case of low-pay jobs, only indicators for a wage level of 67% of Average Wage (AW) are included. Finally, two family types are covered for both the unemployment and the inactivity trap, i.e. single person without children and 1-earner couple with two children, as benefit's levels and tax burden can vary substantially according to family situation (due e.g. to tax allowances for children). In the case of inactivity trap, the indicator for a two-earner couple with two children is also included to specifically account for employment incentives for the second family earner. Trap indicators

have been calculated within the joint Commission-OECD project on Tax and Benefit systems.

3. *Amount and duration of individual unemployment benefits.* As opposed to the first dimension, which looks at the extent and coverage of income support for unemployed at the macro-level, this dimension looks at the main features of individual unemployment transfers and includes seven indicators. Essentially, three aspects are covered: the size of the transfer after-tax, relative to the wage previously received (i.e. the net replacement rate, NRR) after 6 and 12 months of unemployment; the length of the eligibility period, measured indirectly by the NRR after 5 years of unemployment; the stringency of non-financial incentives to move back to employment for benefits' recipients (e.g. job-search obligations, availability for work, sanctions etc.). Figures for the NRR are drawn from the Commission-OECD Tax and Benefits project, whereas the degree of strictness indicator has been constructed by the Danish Ministry of Finance.

4. *Childcare services.* This dimension is included in order to capture the extent to which national welfare systems facilitate the combination of work with private and family responsibilities by providing comprehensive childcare services. Six indicators are included, all of them measuring the share of children in three different age groups (from 0 to 2 years, from 3 to compulsory school age and from school age to 12 years) which are taken care of by public childcare services for either less than or at least 30 hours per week on average. All childcare indicators considered are drawn from the Compendium

5. *Unemployment benefits' coverage of flexible workers*. This dimension covers one aspect which is often quoted as one of the main obstacles to the full achievement of flexicurity in several Member States. It concerns the risk that workers with contracts different from full-time open-ended ones may be less covered (if not at all) by unemployment benefits. Harmonized figures on this aspect are in general lacking at EU level. However, a recent study carried out on behalf of DG Employment[4] proposes a methodology to fill this gap and presents preliminary figures for the year 2007 only. Four indicators produced within the study are included to cover this dimension. Essentially, they provide a measure of the share of workers under non-standard contracts which are not covered or less covered than regular workers by the unemployment insurance. They concern, respectively, part-time workers, temporary workers, self-employed and the total for the three categories.

The quality of data and the geographical coverage of the selected indicators are very satisfactory, overall, as the number of missing values is quite small. The different aspects of data quality have been assessed through commonly used statistical criteria. Each aspect has been evaluated from a maximum (++) to a minimum (--), following

[4] "Flexicurity: indicators on the coverage of certain social protection benefits for persons in flexible employment", VC/2007/0870.

standards adopted in the LIME project[5]. Table 1 reports the full list of indicators used for the calculation of the Composite Index by dimension.

Time coverage: the main index covers the period from 2005 to 2007. Using the LIME statistical standards, such time coverage can be rated with a "++". Two additional indexes for the years 2004 and 2007, respectively, have also been built. This set of indexes reflects the varying time coverage of indicators used, and particularly the fact that the degree of strictness of rules for benefits' recipients is available only for 2004 whereas coverage of flexible workers by unemployment benefits has been calculated only for 2007.

Hence, the main indicator is computed by excluding the above mentioned variables, thereby not covering the fifth dimension in the list above, in order to maximize time coverage. On the other hand, the two additional indicators for 2004 and 2007 include, respectively, the strictness of benefits' rules and the four indicators on coverage of flexible workers, which are only available in those years. This implies that the main indicator and the additional one for 2004 have only four dimensions whereas the one of 2007 has five. The different set of variables included implies that the three indicators are not fully comparable.

Geographical coverage: the main index covers 25 member states over the whole period considered (from 2005 to 2007), leading to a "++" rating following the LIME standards. The two additional indicators for 2004 and 2007 cover, respectively 19 and 25 member states (see below).

[5] Lisbon Assessment Methodology.

Table 1 - List of indicators part of Modern Social Security System Composite Indicator

Indicators and dimensions	*Short name*	*Source*
Overall spending and coverage of unemployment benefits		
% of persons wanting to work receiving out-of-work income support	19m2	Eurostat
Expenditure on out-of-work income maintenance (% of GDP)	19a5	Eurostat
Expenditure on out-of-work income maintenance per person wanting to work.	19a6	Eurostat
Financial incentives to take up a job		
Unemployment trap: Marginal effective tax rate for an unemployed person (67% AW, single person)	19m7_1	Eurostat
Unemployment trap: Marginal effective tax rate for an unemployed person (67% AW, one-earner couple with 2 children)	19m7_2	Eurostat
Inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, single person)	inactivity trap_1	Eurostat
inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, one-earner couple with 2 children)	inactivity trap_2	Eurostat
inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, two-earner couple with 2 children)	inactivity trap_3	Eurostat
Amount and duration of individual unemployment benefits		
Net replacement rate after 6 months - Single 67% AW	Net_replacement_rate_1	Eurostat
Net replacement rate after 12 months - Single 67% AW	Net_replacement_rate_2	Eurostat
Net replacement rate after 60 months - Single 67% AW	Net_replacement_rate_3	Eurostat
Net replacement rate after 6 months - 1 earner 2 children, 67% AW	Net_replacement_rate_4	Eurostat
Net replacement rate after 12 months - 1 earner 2 children, 67% AW	Net_replacement_rate_5	Eurostat
Net replacement rate after 60 months - 1 earner 2 children, 67% AW	Net_replacement_rate_6	Eurostat
Strictness of rules for benefits' recipients		Danish Ministry of Finance
Childcare services		
childcare 0-2 (1-29 hours)	18m3_1	Eurostat
childcare 0-2 (30 hours or more)	18m3_2	Eurostat
3 years to compulsory school age(1-29 hours)	18m3_3	Eurostat
3 years to compulsory school age (30 hours or more)	18m3_4	Eurostat
Compulsory school age - 12 years (1-29 hours)	18m3_5	Eurostat
Compulsory school age - 12 years (30 hours or more)	18m3_6	Eurostat
Unemployment benefits' coverage of flexible workers		
Flexible Workers: Part-time	IND2PT	Eurostat
Flexible Workers:Temporary	IND2TE	Eurostat
Flexible Workers: Self-employed	IND2SE	Eurostat
Total flexible workers	IND2	Eurostat

Note : AW=Average wage

Missing data: the main MSS index (covering the period from 2005 to 2007) is based on 20 indicators. This does not necessarily mean that data for all of them are actually available for all EU Member States and all years considered. Table 2 below presents the number of indicators with available data by country and year. The situation is good, overall as only a few member states present data limitations. Major exceptions are

Bulgaria and Romania which have been completely excluded from the dataset. On the other hand, the presence of missing data in the remaining countries has been dealt with imputation techniques (see below).

Table 2 - Available data over the total number of basic indicators, by country

	2005	2006	2007
AT	(20/20)	(20/20)	(20/20)
BE	(20/20)	(20/20)	(20/20)
BG	(3/20)	(3/20)	(3/20)
CY	(17/20)	(20/20)	(20/20)
CZ	(20/20)	(20/20)	(20/20)
DE	(20/20)	(20/20)	(18/20)
DK	(18/20)	(18/20)	(20/20)
EE	(20/20)	(20/20)	(20/20)
ES	(20/20)	(20/20)	(20/20)
FI	(20/20)	(20/20)	(20/20)
FR	(20/20)	(20/20)	(20/20)
GR	(19/20)	(17/20)	(17/20)
HU	(20/20)	(20/20)	(20/20)
IE	(20/20)	(20/20)	(20/20)
IT	(20/20)	(20/20)	(20/20)
LT	(20/20)	(20/20)	(14/20)
LU	(20/20)	(20/20)	(20/20)
LV	(20/20)	(20/20)	(20/20)
MT	(17/20)	(20/20)	(20/20)
NL	(20/20)	(20/20)	(20/20)
PL	(20/20)	(20/20)	(20/20)
PT	(20/20)	(20/20)	(20/20)
RO	(3/20)	(3/20)	(9/20)
SE	(20/20)	(20/20)	(20/20)
SI	(20/20)	(20/20)	(20/20)
SK	(20/20)	(20/20)	(20/20)
UK	(20/20)	(20/20)	(20/20)

Table 3 provides the same information as in table 2 for the additional indicators of 2004 and 2007, respectively. As for the main index, Bulgaria and Romania have been excluded due to the large number of missing data.

Concerning the index for 2004, major problems arise for data on childcare: four indicators[6] are either completely missing or only cover a few countries and were then excluded. Given the inclusion of the indicator on strictness of rules for benefits' recipients, this brings the total number of indicators to 17. Despite the above mentioned exclusions, table 3 shows that a few countries still present a large number of missing data, i.e. Cyprus, Estonia, Lithuania, Latvia, Malta and Slovenia, and have henceforth been excluded from the dataset, bringing the total number of countries considered to 19.

[6] i.e. all those concerning care availability for 30 hours or more and, for children between compulsory school age and 12 years, also the one for less than 30 hours

On the other hand, the additional indicator for 2007 also includes the dimension of unemployment benefit's coverage for flexible workers, bringing the total number of basic indicators included to 24. 25 Member states are included and, as shown in table 3, missing data are very rare.

Table 3 - Available data over the total number of basic indicators for 2004 and for 2007

	2004		2007
AT	(17/17)	AT	(23/24)
BE	(17/17)	BE	(24/24)
BG	(3/17)	BG	(7/24)
CY	(0/17)	CY	(24/24)
CZ	(15/17)	CZ	(24/24)
DE	(15/17)	DE	(22/24)
DK	(17/17)	DK	(24/24)
EE	(6/17)	EE	(24/24)
ES	(17/17)	ES	(24/24)
FI	(17/17)	FI	(24/24)
FR	(17/17)	FR	(24/24)
GR	(16/17)	GR	(21/24)
HU	(14/17)	HU	(24/24)
IE	(15/17)	IE	(24/24)
IT	(17/17)	IT	(24/24)
LT	(4/17)	LT	(18/24)
LU	(15/17)	LU	(24/24)
LV	(3/17)	LV	(24/24)
MT	(1/17)	MT	(24/24)
NL	(17/17)	NL	(24/24)
PL	(13/17)	PL	(24/24)
PT	(17/17)	PT	(24/24)
RO	(4/17)	RO	(14/24)
SE	(15/17)	SE	(24/24)
SI	(1/17)	SI	(24/24)
SK	(15/17)	SK	(24/24)
UK	(16/17)	UK	(24/24)

The contribution of individual indicators to a composite index can have either a positive or a negative sign, according to the interpretation given to the variable that the indicator represents. In other words, for every indicator 'more' can be considered to be either 'good' or 'bad'. Contrary to the CI calculated for Active Labour Market Policies and for Life Long Learning, where all components entered with a positive sign, different indicators enter with opposite sign within the MSS index.

More in detail, the **direction** has been assumed to be positive (i.e. the higher the score, the better the performance of the country) for the dimensions of “childcare services”, “overall spending and coverage of unemployment benefits” and “unemployment benefit's coverage for flexible workers”. The rationale is that more resources for and larger coverage of income support for unemployed, larger availability of care services for children and better access of non-standard workers to unemployment benefits all contribute positively to the achievement of flexicurity.

On the other hand, all indicators within the dimension of financial incentives are given a negative sign as flexicurity policies should ensure that the combined effect of tax and benefits systems does not lead to overly weak incentives to move from unemployment or inactivity to employment (especially in the case of low paid jobs).

Finally, indicators included in the third dimension, i.e. "Amount and duration of unemployment benefit", enter with opposite sign. Net Replacement Rates after 6 and 12 months of unemployment contribute positively to the composite index, the rationale being that sufficient income support should be provided to workers entering unemployment according to the flexicurity approach. On the other hand, NRR after 60 months enters with a negative sign, as a long duration of the eligibility period to unemployment insurance tends to lead to longer unemployment spells via reduced incentives to job search. Finally, the degree of strictness of rules for recipients of unemployment benefits enters with a positive sign, as flexicurity policies call for an appropriate balance of rights and obligations in the design of unemployment insurance, implying that non-financial incentives to active job search should be incorporated in such systems, such as reporting to Public Employment Services, availability to job offers, partial or total benefit withdrawal in case of lack of job search efforts.

Correlations among indicators are also an important issue within the construction of a composite indicator. Although the identification and removal of redundant indicators is still a controversial topic among researchers, correlation analysis remains a useful tool to that purpose. However, as highlighted in the literature, the mechanical application of correlation analysis is not sufficient to identify redundant indicators. Within a pair of indicators, one of them can be considered redundant when it is both highly correlated *and* with a similar meaning to the other.

Table 4 presents the correlation matrix for 2005. Two examples of pair correlations are discussed below in order to illustrate the reasoning applied. A high positive correlation is recorded, for instance, between *19a5* and *19m2* (see table 1 above for labels of all indicators). This implies that large expenditure on out-of-work income support as a share of GDP tends to be associated to large expenditure on the same item per person wanting to work. However, both indicators have been kept in the analysis as they concern two different aspects of the same policy[7].

Indicators *net_replacement_rate_4* and *19m7_2* are also highly and negatively correlated, implying that the higher is the net replacement rate of unemployment benefits after 6 months of unemployment for a 1-earner couple with 2 children, the higher[8] is the unemployment trap for the same family type. This correlation is clearly meaningful as it is reasonable to expect that more generous unemployment benefits are associated to lower financial incentives to move from unemployment to work. However, both variables have been kept in the analysis as they capture partially different aspects: firstly, the

[7] the former capturing the overall amount of resources devoted to the policy at national level and the latter the ratio of such resources relative to the pool of people which, in principle, should be covered.
[8] The sign of Unemployment Trap indicators has been reversed, see below.

unemployment trap also considers the impact of taxation and, secondly, the NRR, contrary to the unemployment trap, is calculated for a specific duration of unemployment. In all other cases of high correlations the corresponding indicators have been kept in the analysis due to their different meaning.

The same reasoning is applied in the correlation analysis for subsequent years. Table 5, and 6 present the correlation matrices for 2006 and 2007, respectively. Applying the same reasoning as for 2005, all pairs of variables registering high correlations in 2006 and/or 2007 were kept in the analysis.

	m_19m2	i_19a5	i_19a6	m7_1	m7_2	inactivity trap 1	inactivity trap 2	inactivity trap 3	net_replacement 1	net_replacement 2	net_replacement 3	net_replacement 4	net_replacement 5	net_replacement 6	i_18m3_1	i_18m3_2	i_18m3_3	i_18m3_4	i_18m3_5	i_18m3_6
m_19m2	1																			
i_19a5	0.78	1																		
i_19a6	0.16	0.16	1																	
m7_1	-0.40	-0.41	-0.21	1																
m7_2	-0.36	-0.28	-0.14	0.73	1															
inactivity trap 1	-0.57	-0.44	-0.35	0.51	0.63	1														
inactivity trap 2	-0.38	-0.21	-0.25	0.43	0.71	0.80	1													
inactivity trap 3	-0.19	-0.26	-0.32	0.38	0.14	0.50	0.11	1												
net_replacement 1	0.66	0.56	0.26	-0.55	-0.59	-0.60	-0.35	-0.34	1											
net_replacement 2	0.72	0.62	0.32	-0.50	-0.60	-0.75	-0.66	-0.19	0.79	1										
net_replacement 3	-0.61	-0.41	-0.37	0.43	0.57	0.98	0.78	0.42	-0.62	-0.78	1									
net_replacement 4	0.36	0.19	0.24	-0.49	-0.90	-0.66	-0.81	-0.08	0.56	0.60	-0.65	1								
net_replacement 5	0.36	0.19	0.21	-0.44	-0.77	-0.75	-0.96	-0.09	0.44	0.70	-0.74	0.86	1							
net_replacement 6	-0.50	-0.28	-0.27	0.31	0.51	0.82	0.88	0.19	-0.47	-0.70	0.84	-0.66	-0.81	1						
i_18m3_1	0.58	0.57	0.04	-0.39	-0.26	-0.47	-0.17	-0.10	0.53	0.58	-0.51	0.17	0.15	-0.26	1					
i_18m3_2	0.27	0.35	0.72	-0.60	-0.34	-0.31	-0.23	-0.35	0.48	0.46	-0.31	0.28	0.20	-0.22	0.18	1				
i_18m3_3	0.61	0.52	-0.15	0.02	-0.15	-0.42	-0.20	0.04	0.34	0.43	-0.45	0.16	0.17	-0.32	0.76	-0.27	1			
i_18m3_4	-0.33	-0.17	0.36	-0.11	0.26	0.27	0.18	-0.15	-0.18	-0.23	0.28	-0.24	-0.26	0.23	-0.32	0.63	-0.70	1		
i_18m3_5	0.28	0.30	-0.11	-0.08	-0.22	-0.20	-0.21	0.06	0.05	0.11	-0.18	0.17	0.24	-0.24	0.05	-0.31	0.28	-0.48	1	
i_18m3_6	-0.23	-0.25	0.13	0.07	0.18	0.18	0.20	-0.06	0.02	-0.07	0.15	-0.13	-0.23	0.23	0.00	0.33	-0.23	0.46	-0.99	1

Table 4 -Correlation matrix of basic indicators for 2005

	m_19m2	i_19a5	i_19a6	m7_1	m7_2	inactivity trap 1	inactivity trap 2	inactivity trap 3	net_replacement 1	net_replacement 2	net_replacement 3	net_replacement 4	net_replacement 5	net_replacement 6	i_18m3_1	i_18m3_2	i_18m3_3	i_18m3_4	i_18m3_5	i_18m3_6
m_19m2	1																			
i_19a5	0.82	1																		
i_19a6	0.26	0.26	1																	
m7_1	-0.41	-0.38	-0.32	1																
m7_2	-0.34	-0.32	-0.15	0.70	1															
inactivity trap 1	-0.61	-0.44	-0.36	0.48	0.61	1														
inactivity trap 2	-0.38	-0.22	-0.16	0.42	0.73	0.77	1													
inactivity trap 3	-0.29	-0.26	-0.45	0.34	0.10	0.48	0.06	1												
net_replacement 1	0.64	0.58	0.29	-0.54	-0.57	-0.6	-0.3	-0.3	1											
net_replacement 2	0.73	0.64	0.32	-0.45	-0.57	-0.8	-0.6	-0.2	0.80	1										
net_replacement 3	-0.64	-0.41	-0.34	0.40	0.54	0.98	0.75	0.38	-0.63	-0.79	1									
net_replacement 4	0.32	0.23	0.13	-0.47	-0.91	-0.6	-0.8	-0	0.51	0.57	-0.61	1								
net_replacement 5	0.36	0.22	0.12	-0.41	-0.78	-0.7	-1	-0	0.40	0.67	-0.71	0.86	1							
net_replacement 6	-0.51	-0.30	-0.18	0.31	0.53	0.81	0.88	0.14	-0.45	-0.68	0.822	-0.66	-0.81	1						
i_18m3_1	0.48	0.42	-0.04	-0.28	-0.18	-0.5	-0.1	-0.1	0.47	0.48	-0.48	0.11	0.09	-0.22	1					
i_18m3_2	0.35	0.39	0.77	-0.51	-0.31	-0.3	-0.2	-0.3	0.52	0.46	-0.28	0.27	0.19	-0.21	-0.01	1				
i_18m3_3	0.53	0.47	-0.16	0.09	-0.17	-0.4	-0.2	0.02	0.35	0.45	-0.45	0.22	0.18	-0.30	0.72	-0.27	1			
i_18m3_4	-0.13	-0.05	0.35	-0.20	0.24	0.23	0.14	-0.1	-0.14	-0.17	0.228	-0.28	-0.22	0.14	-0.35	0.61	-0.72	1		
i_18m3_5	0.13	0.16	-0.11	0.04	-0.19	-0.2	-0.2	0.14	0.01	0.05	-0.16	0.18	0.22	-0.25	0.09	-0.26	0.30	-0.43	1	
i_18m3_6	-0.10	-0.12	0.13	-0.11	0.18	0.14	0.2	-0.1	0.04	-0.01	0.119	-0.17	-0.21	0.20	-0.10	0.33	-0.34	0.50	-0.98	1

Table 5- Correlation matrix of basic indicators for 2006

	m_19m2	i_19a5	i_19a6	m7_1	m7_2	inactivity trap 1	inactivity trap 2	inactivity trap 3	net_replacement 1	net_replacement 2	net_replacement 3	net_replacement 4	net_replacement 5	net_replacement 6	i_18m3_1	i_18m3_2	i_18m3_3	i_18m3_4	i_18m3_5	i_18m3_6
m_19m2	1																			
i_19a5	0.78	1																		
i_19a6	0.79	0.67	1																	
m7_1	-0.31	-0.30	-0.51	1																
m7_2	-0.41	-0.34	-0.64	0.59	1															
inactivity trap 1	-0.51	-0.36	-0.55	0.39	0.66	1														
inactivity trap 2	-0.38	-0.18	-0.36	0.34	0.69	0.80	1													
inactivity trap 3	-0.19	-0.22	-0.14	0.33	0.12	0.49	0.07	1												
net_replacement 1	0.56	0.55	0.69	-0.43	-0.60	-0.60	-0.33	-0.36	1											
net_replacement 2	0.64	0.61	0.62	-0.35	-0.58	-0.74	-0.65	-0.18	0.79	1										
net_replacement 3	-0.54	-0.35	-0.56	0.32	0.61	0.98	0.79	0.39	-0.63	-0.79	1									
net_replacement 4	0.38	0.21	0.50	-0.37	-0.88	-0.72	-0.79	-0.08	0.56	0.59	-0.71	1								
net_replacement 5	0.38	0.19	0.36	-0.32	-0.75	-0.77	-0.95	-0.04	0.43	0.70	-0.77	0.85	1							
net_replacement 6	-0.47	-0.23	-0.44	0.28	0.63	0.83	0.93	0.17	-0.45	-0.68	0.84	-0.76	-0.88	1						
i_18m3_1	0.46	0.47	0.50	-0.14	-0.24	-0.43	-0.13	-0.15	0.45	0.49	-0.46	0.16	0.13	-0.20	1					
i_18m3_2	0.13	0.28	0.24	-0.53	-0.28	-0.29	-0.18	-0.40	0.49	0.41	-0.30	0.22	0.16	-0.20	-0.02	1				
i_18m3_3	0.63	0.56	0.59	0.11	-0.35	-0.44	-0.26	-0.04	0.41	0.50	-0.46	0.36	0.28	-0.32	0.73	-0.27	1			
i_18m3_4	-0.25	-0.13	-0.30	-0.17	0.38	0.24	0.21	-0.15	-0.15	-0.23	0.24	-0.38	-0.32	0.16	-0.38	0.61	-0.72	1		
i_18m3_5	0.21	0.17	0.36	0.12	-0.32	-0.21	-0.30	0.14	-0.01	0.08	-0.19	0.33	0.33	-0.29	-0.06	-0.32	0.30	-0.43	1	
i_18m3_6	-0.14	-0.08	-0.29	-0.12	0.33	0.22	0.33	-0.14	0.08	-0.05	0.19	-0.33	-0.35	0.30	0.03	0.39	-0.31	0.48	-0.98	1

Table 6- Correlation matrix of basic indicators for 2007

3. Methodological Assumptions

Nardo et al. (2005) define a composite indicator as "a mathematical combination of individual indicators that represent different dimensions of a concept whose description is the objective of the analysis" (p.7). Following this logic, we summarize the concept of Modern Social Security Systems into one number; encompassing all dimensions which are relevant for flexicurity and for which data are currently available. To create this composite indicator the methodological guidelines of Nardo et al. (2005) were thoroughly followed.

A composite indicator is ultimately the sum of all its parts; hence the methodological assumptions made for its calculation need to be clear and well justified. In general, different methodological decisions can be taken, provided that they are supported by the relevant theoretical framework and their effects on the indicators' final values are carefully evaluated. In the present exercise, methodological choices need to be made with respect to the following elements:

a) the structure of the composite indicator
b) the imputation of missing data.
c) the aggregation rule
d) the standardization formula
e) the weighting system

Based on the theoretical framework developed in cooperation with Unit D1 in DG Employment, the composite indicator has been constructed following the methodological assumptions specified below and already adopted for the construction of the LLL and AMLP composite indicator (Mascherini; 2008: Mascherini and Manca, 2009, see above).

3.1 The structure of composite indicator

The three composite indicators for Modern Social Security Systems share a simple structure.
As explained above (see section 2 and table 1) the main indicator for 2005-2007 consists of four different dimensions:

1. *Overall expenditure and coverage of unemployment benefits,* including three indicators.
2. *Financial Incentives to take up a job,* including 5 indicators.
3. *Amount and duration of individual unemployment benefits;* including 6 indicators, as the strictness of rules for unemployment benefits' recipients is excluded.
4. *Childcare services,* including 6 indicators.

The first additional indicator is calculated only for 2004 and includes the same four dimensions albeit with two differences concerning the set of indicators included within them:

- The dimension of Childcare includes only 2 indicators instead of 6 (see above).
- The dimension of *Amount and duration of individual unemployment benefits* includes 7 indicators as the degree of strictness of rules for unemployment benefits' recipients is added.

The second additional indicator is calculated only for 2007 and differs from the main one for the inclusion of the fifth dimension:

5. *Unemployment benefit for flexible workers*, with 4 indicators.

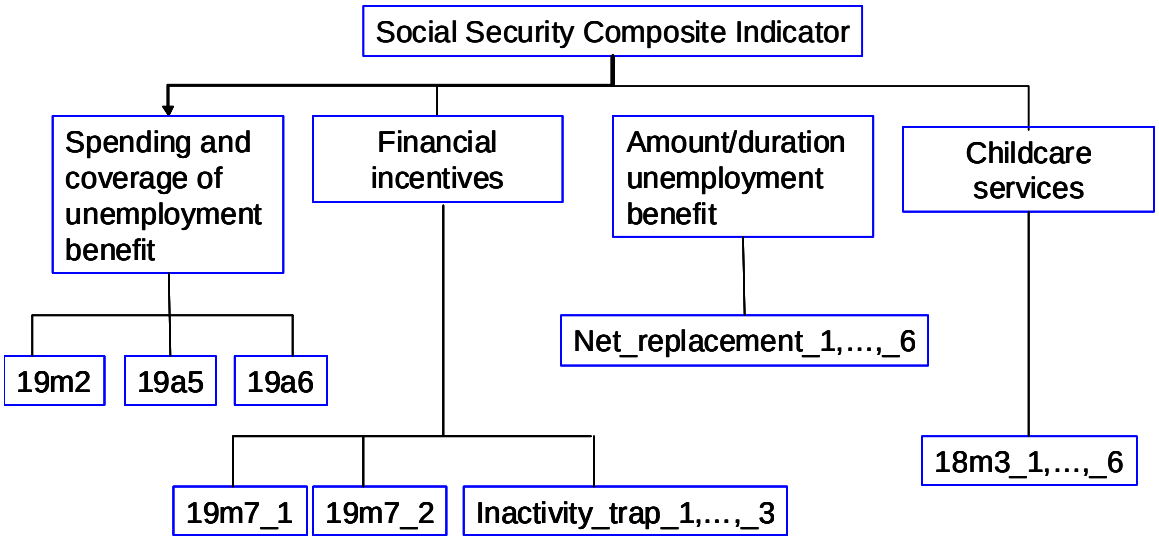

Figure 1: The structure of the Modern Social Security System Composite Indicator 2005-2007

The effect of alternative structures of the composite indicator on the final ranking of countries is discussed in the section on uncertainty analysis below.

3.2 The imputation of data

The construction of a composite indicator requires, ideally, a complete dataset. However, statistical methodologies have been developed to enable the calculation of composite indicators even in presence of missing data.

As discussed above, in this exercise missing data were mainly tackled by excluding from the dataset those Member States which were more seriously affected by this problem. The exclusion was either partial (i.e. 6 Member States for 2004: CY, EE, LT, LV, MT and SI) or total (RO and BG). Then, indicators presenting a too large number of missing data were also excluded[9].

After these corrections, the number of remaining missing data was rather limited (see table 7) and could be tackled through specific statistical techniques.

Number of missing by indicator: all countries

Year	19m2	19m7_1	19m7_2	19a5	19a6	18m3_1	18m3_2	18m3_3	18m3_4	18m3_5	18m3_6	dofs	Intrap_1	Intrap_2	Intrap_3	net_repl 1	net_repl 2	net_repl 3	net_repl 4	net_repl 5	net_repl 6
2004	19%	26%	26%	15%	19%	52%	74%	52%	74%	96%	100%	26%	30%	30%	30%	30%	30%	30%	30%	30%	30%
2005	11%	7%	7%	11%	11%	7%	7%	7%	7%	7%	7%	100%	7%	7%	7%	7%	7%	7%	7%	7%	7%
2006	4%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	100%	7%	7%	7%	7%	7%	7%	7%	7%	7%
2007	4%	7%	7%	4%	4%	11%	11%	7%	7%	7%	7%	100%	7%	7%	7%	7%	7%	7%	7%	7%	7%

Number of missing by indicator: selected countries

Year	19m2	19m7_1	19m7_2	19a5	19a6	18m3_1	18m3_2	18m3_3	18m3_4	18m3_5	18m3_6	dofs	Intrap_1	Intrap_2	Intrap_3	net_repl 1	net_repl 2	net_repl 3	net_repl 4	net_repl 5	net_repl 6
2004	10%	0%	0%	5%	10%	30%	60%	30%	60%	90%	95%	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2005	8%	0%	0%	8%	8%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2006	4%	0%	0%	8%	8%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2007	4%	0%	0%	4%	4%	8%	8%	4%	4%	4%	4%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table 7: Number of missing data by indicators in two different scenarios

Three such methods exist: 1) case deletion, 2) single imputation and 3) multiple imputations. The first one omits missing records from the analysis. It has the advantage of maintaining the original data-set and the disadvantage of reducing the overall number of observations. The two remaining approaches consider missing data as part of the analysis and aim at imputing values through different techniques[10].

In order to use a simple approach and to avoid "black box" techniques such as, for instance, multiple imputations a three steps strategy has been applied:

1. For each member state, whenever possible, the value of the previous/following year (or the average of values over all available years) was imputed to the missing indicator. This is a hot-deck type of approach, based on proximity criteria. This technique has been used in 39 cases.
2. For each member state, whenever an indicator was missing throughout the entire period considered, missing values were imputed through the regression imputation method. The number of missing data imputed through this technique was 5 for each year.
3. The effect of imputed values on the final ranking of countries was tested through an extensive MCMC simulation (see section on uncertainty analysis below).

[9] This was the case for four childcare variables in 2004 having no data for any Member State, or for more than half of them

[10] Single imputation methods include hot deck or mean/median/mode substitution and regression imputation (Little and Schenker, 1994; Little, 1997; Little and Rubin, 2002) whereas multiple imputations include Markov Chain Monte Carlo (MCMC) algorithm (Gilks, Richardson and Spiegelhalter, 1996; Schafer, 1999; Rubin and Schenker,1986).

3.3 The standardization scheme

Being the 25 basic indicators expressed with different scales, they need to be standardized as a pre-condition for their aggregation. Different standardization techniques are available (Nardo et al., 2005). In this exercise the Min-Max approach adapted for a 3 years time-coverage has been applied. Each original indicator q has then been standardized based on the following rule (where t indicates the year and c the country)

$$I^{t}{}_{qc} = \frac{x^{t}{}_{qc} - \min_{c}(x_{q}^{2005-2007})}{\max_{c}(x_{q}^{2005-2007}) - \min_{c}(x_{q}^{2005-2007})} \cdot 1000 .$$

Using this method, all indicators have been rescaled in such a way as to lie between 0 (laggard $x_{qc}=\min_c(x^{2005\text{-}2007}{}_q)$) and 1000 (leader, $x_{qc}=\max_c(x^{2005\text{-}2007}{}_q)$). Where $\max_c(x^{2005\text{-}2007}{}_q)$ and $\min_c(x^{2005\text{-}2007}{}_q)$ are respectively the maximum and the minimum value of the indicator over all countries and years considered. In order to assess the robustness of the composite indicator, alternative standardization methods have been applied in the context of the uncertainty and sensitivity analysis (see below).

3.4 The weighting scheme

Following on the standardization process, it is important to ensure that for every indicator a higher score corresponds to a better performance of the country, so that the different indicators can be meaningfully aggregated. As discussed above, in the present case some of the indicators contribute negatively to the overall score of the MSS index, according to specific theoretical arguments. Therefore, those indicators had to be transformed by multiplying them by -1 to make sure the above condition was fulfilled. No transformation was needed for the other indicators.

The weighting scheme adopted for the construction of the MSS index consists of attributing equal weights to all indicators *within the same dimension*. This strategy avoids rewarding those dimensions which include more indicators (e.g. financial incentives) relative to those with fewer ones (e.g. overall spending and coverage of unemployment benefits). The only exceptions concern the dimension of *childcare services*, where a double weight was attributed to indicators of care availability for 30 hours or more, relative to those for less than 30 hours, and, for the 2004 index, the indicator on strictness of benefits' rules, which was given double weight relative to the other indicators within the dimension of amount and duration of benefits. As a result, all dimensions included in the index are equally important, although individual variables do not necessarily have the same weight across different dimensions. Table 8 below presents the numerical values of the weights.

Table 8 - Weighting scheme for the MSS composite indicator

Dimension	Dimension weight			Indicator	Indicator weight within the dimension			Normalised weight*
	I(05-07)	I(04)	I_2(07)		I(05-07)	I(04)	I_2(07)	
spending and coverage of benefits	1/4	1/4	1/5	% person covered	1/3	1/3	1/3	0.083
				Spending % GDP	1/3	1/3	1/3	0.083
				Spending per person	1/3	1/3	1/3	0.083
Financial incentive	1/4	1/4	1/5	UT single	1/5	1/5	1/5	0.05
				UT 1e-2c	1/5	1/5	1/5	0.05
				IT single	1/5	1/5	1/5	0.05
				IT 1e-2c	1/5	1/5	1/5	0.05
				IT 2e-2c	1/5	1/5	1/5	0.05
Amount and duration of benefits	1/4	1/4	1/5	NRR 6-s	1/6	1/8	1/6	0.042
				NRR 12-s	1/6	1/8	1/6	0.042
				NRR 60-s	1/6	1/8	1/6	0.042
				NRR6-1e2c	1/6	1/8	1/6	0.042
				NRR12-1e2c	1/6	1/8	1/6	0.042
				NRR60-1e2c	1/6	1/8	1/6	0.042
				strictness	NA	1/4	NA	NA
Childcare	1/4	1/4	1/5	0-2 (0-29h)	1/9	1/2	1/9	0.037
				0-2 (>30h)	2/9	NA	2/9	0.047
				3-sa (0-29h)	1/9	1/2	1/9	0.037
				3-sa (>30h)	2/9	NA	2/9	0.047
				Sa-12 (0-29h)	1/9	NA	1/9	0.037
				Sa-12 (>30h)	2/9	NA	2/9	0.047
Coverage flexible workers	NA	NA	1/5	TE	NA	NA	1/4	NA
				PTE	NA	NA	1/4	NA
				SE	NA	NA	1/4	NA
				Tot FE	NA	NA	1/4	NA

Notes:
* Normalised weights are shown only for the main indicator covering the period from 2005 to 2007.
UT = Unemployment Trap; IT = Inactivity Trap; NRR = Net Replacement Rate, TE = Temporary Employment; PTE = Part Time Employment; FE = Flexible Employment.
S = Single; 1e2c = 1-earner couple with 2 children; 2e2c = 2-earners couple with 2 children; NA = Not Available

3.3 The aggregation rule

The issue of aggregation of the information conveyed by the different dimensions into a composite index comes together with the weighting. Different aggregation rules are possible. Sub-indicators could be summed up (e.g. linear aggregation), multiplied (geometric aggregation) or aggregated using non linear techniques (e.g. multi-criteria analysis). Each technique implies different assumptions and has specific consequences.

In this paper, for each year considered, a simple linear aggregation rule was adopted, implying that basic indicators are aggregated according to the structure of the indicator (see above 3.1) and the following formula:

$$Y_c^t = \sum_{i=1}^{4} w_i \sum_{j=1}^{k_i} w_j^* I_{ijc}^t$$

Where t is the year of reference, w are the weights of the 4 dimensions (5 in the case of the additional indicator for 2007), w^* are the weights of basic indicators within each dimension, k_i is the number of indicators included in dimension i, I the basic indicator and c the country index. Different aggregation rules have been tested within the sensitivity analysis.

4. Results

After having defined the structure, the weighting scheme and the standardization procedure, the computation of the MSS composite indicator can be performed. This section presents and discusses the results of the indicator in terms of Member States' ranking over the four-years period considered.

Table 9 presents the score of the main composite indicator by country for 2005, 2006 and 2007. A higher score should be interpreted as a sign that the corresponding Member State has a Social Security System which is relatively more in line with the flexicurity approach, by providing adequate income support to the unemployed while maintaining sufficient financial and non-financial (i.e. childcare) incentives to take up a job for unemployed and inactive people.

Denmark, Sweden, The Netherlands, Belgium and Finland rank in the top five positions. Continental Member States and Ireland rank in intermediate-to-upper positions. Slovenia (in 10th position) has the highest ranking among New Member States while a number of Southern Member States (Spain, Portugal, Cyprus and Malta) as well as UK and Latvia rank in intermediate-to-lower positions. New Member States tend to rank at the lower end of the scale together with Italy and Greece.

Like for every composite indicator, the overall score may mask divergent situations across individual dimensions or basic variables.

Table 9 - 2005 Modern Social Security System composite indicators

Rank	Country	Score 2005	Rank	Country	Score 2006	Rank	Country	2007
1	DK	736.25	1	DK	746.38	1	DK	706.68
2	SE	632.68	2	SE	617.26	2	NL	671.30
3	NL	606.77	3	NL	605.70	3	BE	639.24
4	BE	585.83	4	BE	587.12	4	IE	624.63
5	FI	560.42	5	DE	574.50	5	LU	619.17
6	DE	558.94	6	FI	549.66	6	DE	596.03
7	FR	557.50	7	IE	549.48	7	SE	582.50
8	IE	530.86	8	FR	543.04	8	FR	558.34
9	LU	529.45	9	LU	527.67	9	FI	558.34
10	SI	495.55	10	PT	504.65	10	SI	495.82
11	PT	492.40	11	SI	503.84	11	PT	493.58
12	CY	453.08	12	CY	450.73	12	ES	475.15
13	LV	442.36	13	ES	435.89	13	AT	450.81
14	UK	434.66	14	LV	429.60	14	CY	449.72
15	ES	429.08	15	UK	420.07	15	UK	418.97
16	AT	414.79	16	AT	413.35	16	MT	390.68
17	PL	400.52	17	MT	390.07	17	CZ	386.43
18	MT	374.90	18	PL	385.20	18	HU	379.40
19	CZ	362.02	19	HU	368.76	19	LV	363.41
20	HU	300.16	20	CZ	342.95	20	PL	360.95
21	EE	298.91	21	LT	272.84	21	LT	294.06
22	LT	278.86	22	EE	263.17	22	EE	271.55
23	IT	229.54	23	SK	248.50	23	SK	249.95
24	SK	218.59	24	IT	234.69	24	IT	242.75
25	GR	176.42	25	GR	169.08	25	GR	186.52

Differences in ranking between 2005 and 2006 are quite limited overall with the greatest change concerning Spain, which gains two positions. Apart from that, only shifts by one position are observed.

As regards 2007, larger deviations can be observed relative to the previous two years. A few Member States (i.e. Finland, Cyprus, Latvia, Poland and Sweden) have worsened their positions compared to 2005 and 2006. Changes tend to concentrate on the upper end of the scale. Sweden significantly deteriorates its ranking (from the 2nd in 2005and 2006 to the 7th in 2007), whereas Spain, Austria, Malta, Czech Republic and Hungary improve it. New Member States still predominantly cluster in the lower end of the scale, followed by Italy and Greece in the last positions.

Table 10 and figure 2 below track the evolution of member states' ranking over the three years considered. Overall, the ranking varies moderately over the period considered, and Member States tend to be systematically distributed across geographical clusters. Denmark, Sweden, the Netherlands, Belgium systematically rank on the top end of the scale; Continental Member States tend to rank in intermediate positions and, finally, New Member States, together with Italy and Greece, systematically cluster on the lower end. The largest changes concern Latvia, Sweden, Finland and Poland, which significantly worsen their ranking, and Ireland, Luxemburg, Spain and Austria, which improve it.

Table 10 - Comparison of the rankings 2005-2007

Country	Rank 2005	Rank 2006	Rank 2007
AT	16	16	13
BE	4	4	3
CY	12	12	14
CZ	19	20	17
DE	6	5	6
DK	1	1	1
EE	21	22	22
ES	15	13	12
FI	5	6	9
FR	7	8	8
GR	25	25	25
HU	20	19	18
IE	8	7	4
IT	23	24	24
LT	22	21	21
LU	9	9	5
LV	13	14	19
MT	18	17	16
NL	3	3	2
PL	17	18	20
PT	11	10	11
SE	2	2	7
SI	10	11	10
SK	24	23	23
UK	14	15	15

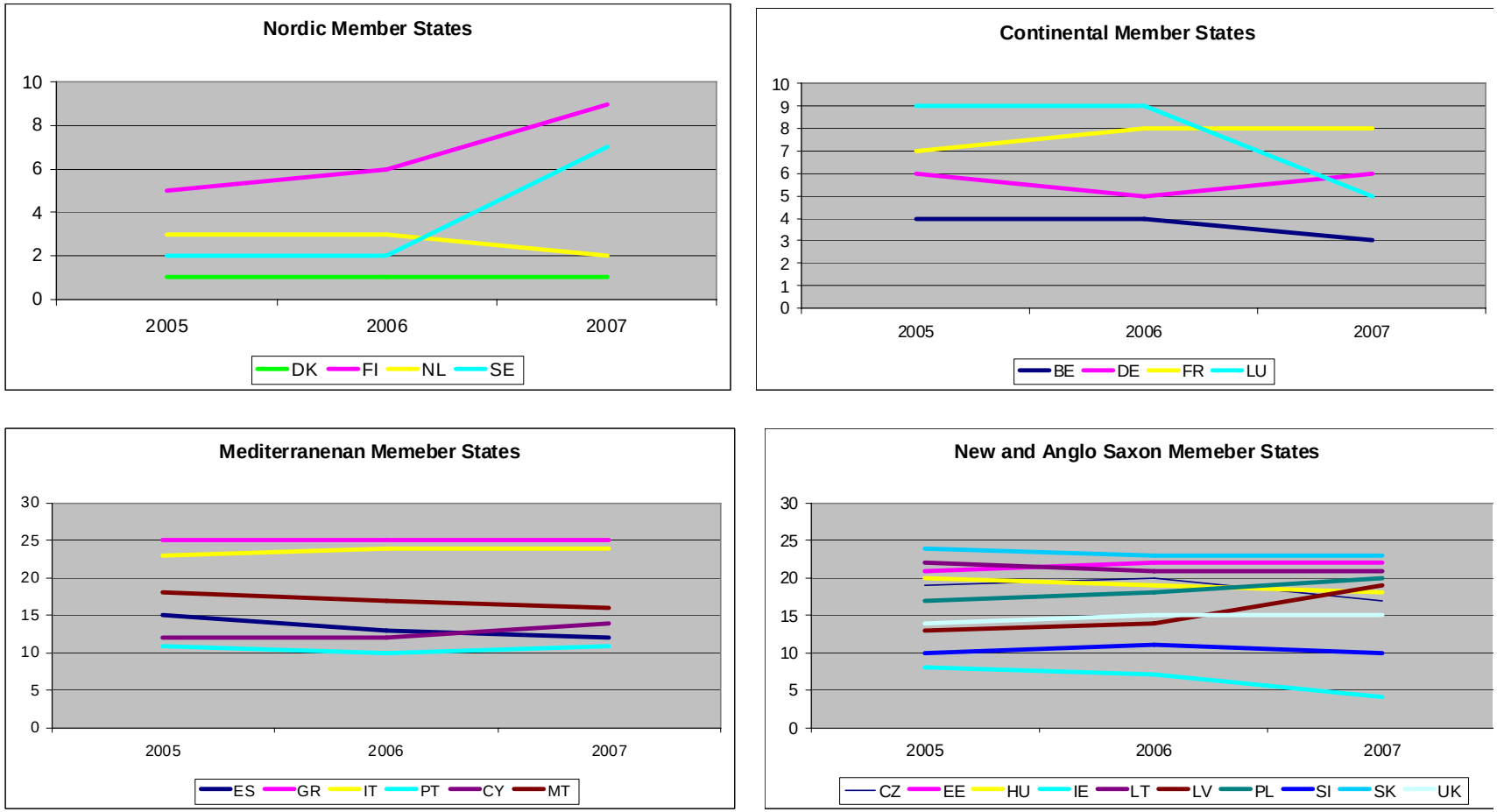

Figure 2 - Ranking Comparison 2005-2007 for each cluster

Table 11 below shows the scores for the additional index calculated for 2004 by country and in decreasing order. Country ranking is only slightly different relative to the one resulting from the main index (in particular for 2005). This is unsurprising given that the set of indicators included is only marginally different (see above). The major deviation concerns Poland which sharply improves its position. The EU map in Figure 3 below provides a graphical illustration of country ranking in the 2004 index. Countries filled with bright blue are those with relatively worse performance, whereas top performers are filled with dark blue.

Table 11 - MSS composite index for 2004

Rank	Country	CI 2004
1	SE	829.85
2	NL	561.24
3	DK	554.85
4	FR	518.89
5	BE	515.02
6	FI	464.88
7	DE	451.80
8	PL	442.02
9	IE	431.89
10	LU	401.38
11	PT	387.12
12	UK	373.34
13	AT	367.34
14	CZ	332.73
15	ES	322.25
16	HU	212.97
17	SK	160.78
18	GR	159.78
19	IT	67.51

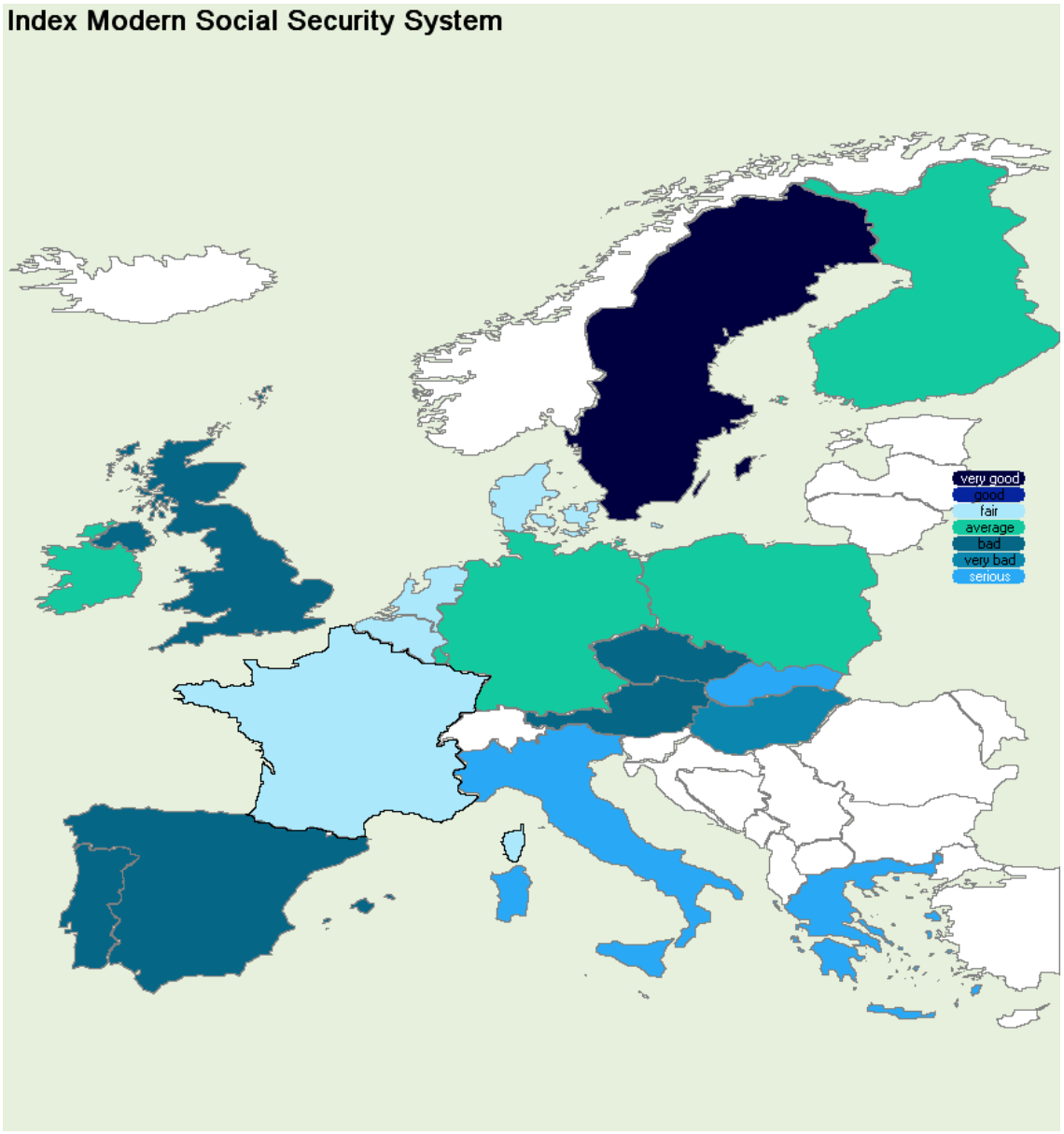

Figure 3 – Map of the Modern Social Security System Composite Indicator for 2004

Figure 4 – Score distribution of the Modern Social Security System Composite Indicator for 2004

Table 12 below presents country scores for the additional index built for 2007 in descending order. Compared to country ranking for the main MSS index in the same year, several differences can be observed. A number of Member States significantly improve their ranking, i.e. Luxemburg (which moves to top position), France and Spain; whereas others register sharp deteriorations, i.e. UK, Denmark, Poland and Germany. This highlights that the addition of indicators on the share of non standard workers covered by unemployment benefits makes a non negligible difference in the assessment of social security systems' consistency with flexicurity. Similarly to figure 3, the map in figure 5 illustrates graphically the country ranking on the 2007 additional index by means of different shades of colour.

Rank	Country	CI 2007
1	LU	561.97
2	FR	540.98
3	NL	540.55
4	ES	539.23
5	BE	534.37
6	IE	525.14
7	SE	524.20
8	DK	518.77
9	FI	506.61
10	DE	504.70
11	MT	473.71
12	CY	470.37
13	AT	469.76
14	CZ	460.97
15	PT	451.54
16	GR	440.32
17	IT	427.15
18	SI	423.22
19	HU	417.64
20	LV	417.45
21	EE	417.02
22	UK	399.42
23	SK	387.27
24	PL	334.51
25	LT	266.02

Table 12 - Additional MSS composite index for 2007

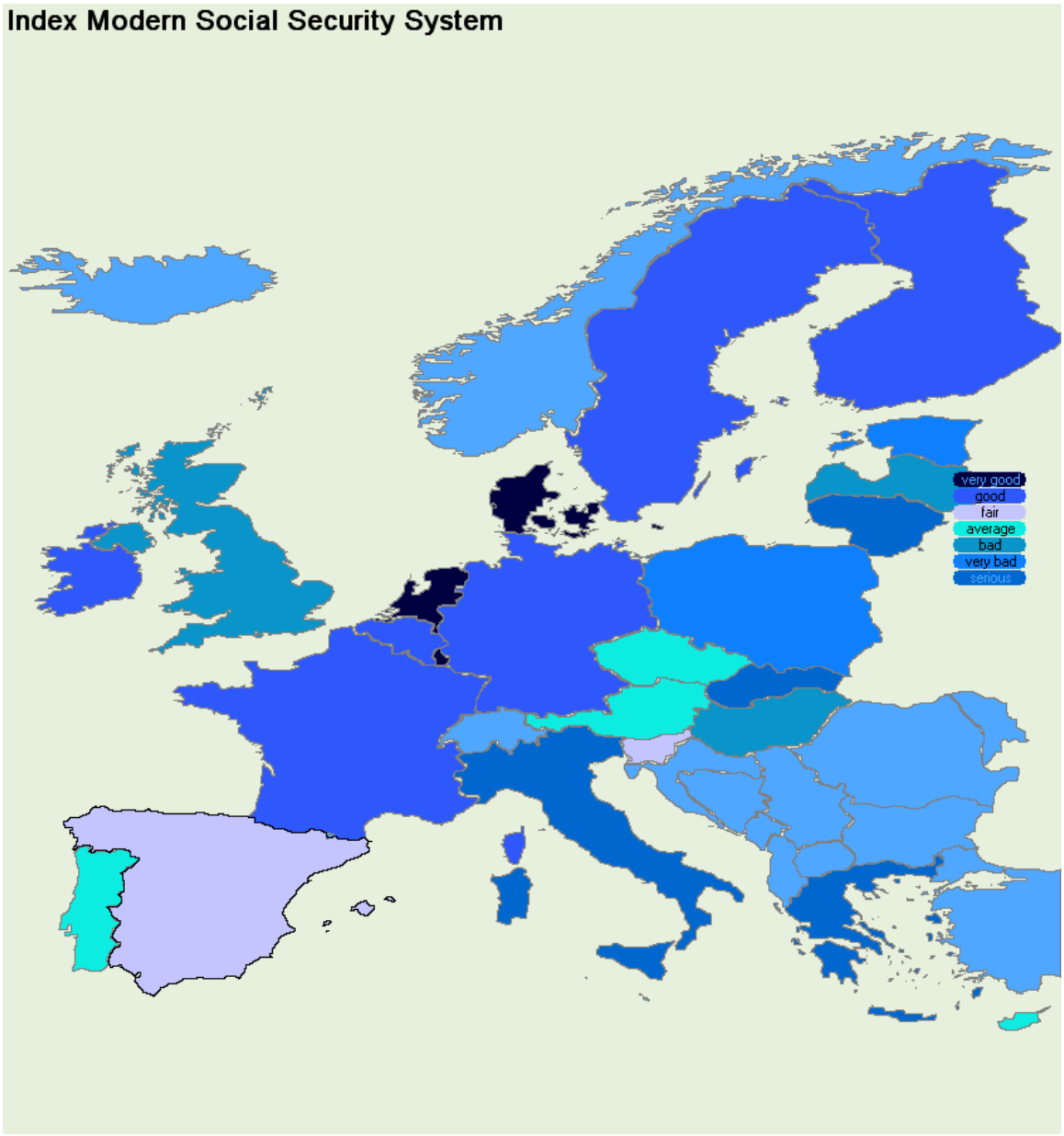

Figure 5 – Map of the Modern Social Security System Composite Indicator for 2007

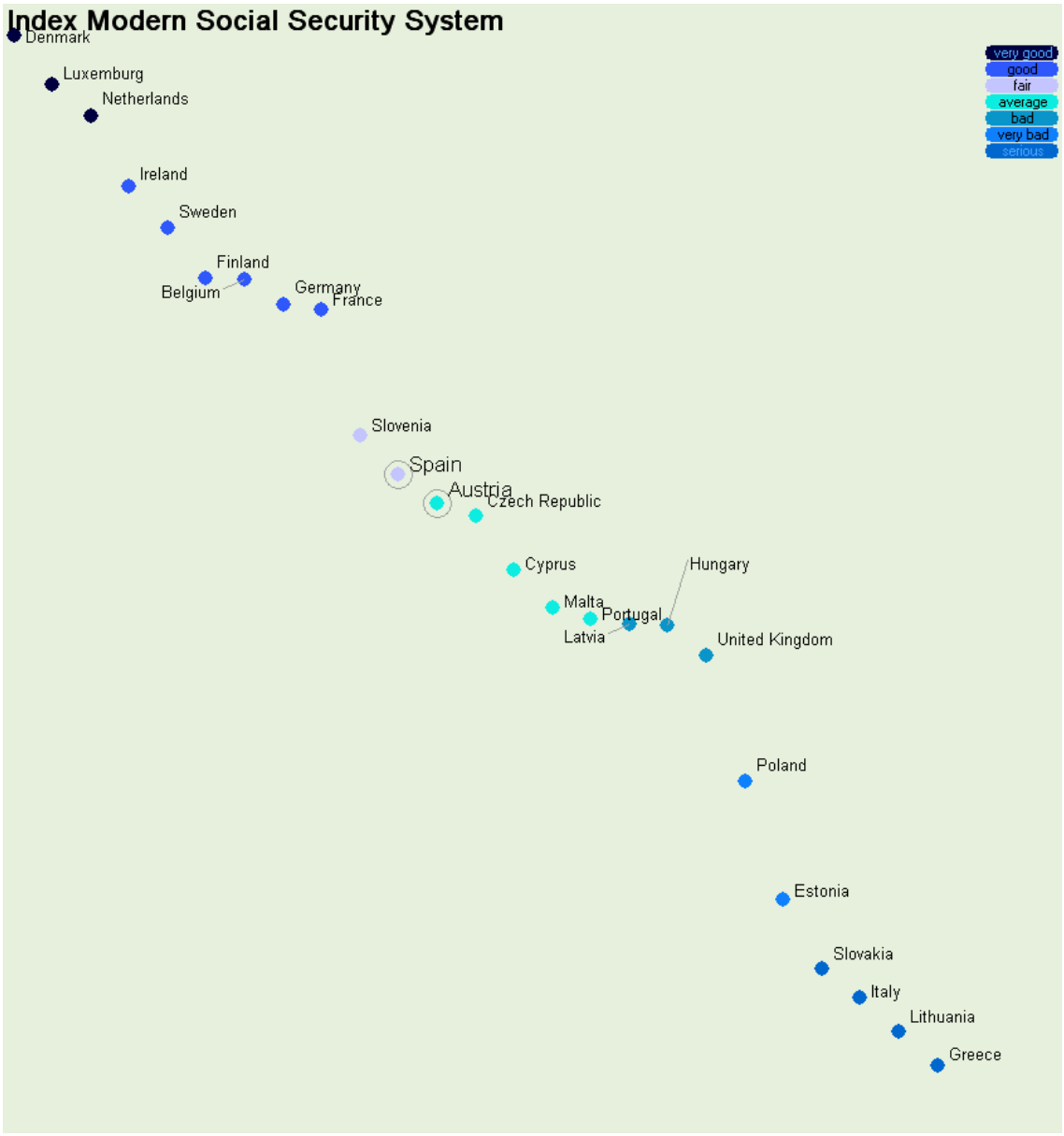

Figure 6 – Score distribution of the Modern Social Security System Composite Indicator for 2007

5. Uncertainty and Sensitivity Analysis.

In order to assess the robustness of the MSS composite indicator the main sources of uncertainties underlying its calculation as well as the sensitivity of country scores/rankings to the methodological approach adopted are assessed. This section presents the main conclusions of this uncertainty and sensitivity analysis. Further details are available in the Annex.

Every composite index, including this one, involves subjective judgments in several steps of the calculation procedure, such as the selection of indicators, the choice of aggregation model, the imputation of missing data and the weights applied to the indicators. This implies that the quality and reliability of an index as well as the uncertainties associated with the methodology followed for its construction need to be evaluated. Moreover, to ensure the validity of the policy conclusions based on the index, it is important to analyze its sensitivity to alternative methodological assumptions. A combination of uncertainty and sensitivity analyses can help to gauge the robustness of the indicator's results, to increase its transparency and to help frame the debate about its use.

Five main sources of uncertainty can be highlighted and their combined effect on country rankings needs to be tested:

1) Data Normalization
2) Weighting Scheme
3) Composite Indicator Formula (Aggregation Rule)
4) Inclusion/Exclusion of Basic Indicators
5) Imputation of Missing Data via MCMC.

Essentially, uncertainty analysis is carried out through computer simulations. First, the five above mentioned sources of uncertainty are turned into 5 input factors with uniform probabilities across the different alternatives they can take, i.e. the different approaches and methods (see table 13). Then, all possible combinations of input factors are simulated. This would result, in principle, in 48800 combinations with corresponding sets of indicators' values and country rankings related to the main indicator 2005-2007. However only 29400 of them produce a valid scenario and are, therefore, retained in the analysis.

Table 13 - Uncertainty factors for the MSS composite indicator

X_1	Standardization
1	Z-Score
2	Min-Max
3	Ranking across countries

X_2	Weighting Scheme
1	Equal Weight
2	Predetermined set of Weights
3	PCA weights
4	DEA weights

X_3	Aggregation Rule
1	Linear
2	Geometric
3	No further Aggregation (for DEA)

X_4	Excluded Sub-Indicator
1	Indicator 1 omitted
2	Indicator 2 omitted
3	Indicator 3 omitted
...	...
19	Indicator 19 omitted
20	Indicator 20 omitted

X_5	Imputation of Missing Data via MCMC
1	Sample 1 of the set of missing data randomly simulated.
2	Sample 2 of the set of missing data randomly simulated.
3	Sample 3 of the set of missing data randomly simulated.
…	…
100	Sample 100 of the set of missing data randomly simulated..

Following on this, for every country the distribution of possible rankings across the 29400 simulations is assessed. The variability of these distributions can be considered as the result of the uncertainty underlying the construction process of the composite indicator. It is more appropriate to discuss ranks and not scores because of the non-normal nature of data. The results of the simulations can then be organized in a frequency matrix and the overall MSS indicator is calculated across the 29400 scenarios. Besides the frequency matrix, the median rank per country was selected as benchmark to be compared with the rank recorded in the MSS composite indicator as presented in section

3 above. Frequency distribution matrices are presented below, for each of the four years considered and for the two added composite indicators (I_04 and I_07)

On table 15 an example of frequency distribution of a country rank over the 29400 scenarios is presented. A colour code is used to distinguish different frequencies as illustrated in table 14:

Table 14 - Colour Codes

	Frequency lower than 10%
	Frequency between 10% and 20%
	Frequency between 20% and 35%
	Frequency between 35% and 50%
	Frequency higher than 50%
bold	Position in the MSS composite indicator
Italic	median
Red	mode of the distribution

Moreover, **Bold**, *Italic* and Red represent the country rank in the MSS composite indicator, the median and the mode of the 29400 simulations, respectively. For example Sweden in 2005 has a distribution encoded as follows, Table 15:

Table 15 – Frequencies of Sweden performance in the 29400 scenarios in 2005.

2005	1	2	3	4	5
SE	22.00%	***63.53%***	13.65%	0.79%	0.03%

This means that the country is ranked in positions 1st to 5th among the 29400 simulations performed. In particular, Sweden is ranked in position 5th and 4th with a frequency lower than 10%, in position 3rd with a frequency between 10% and 20%, in position 2nd with a frequency higher than 50% and in position 1st with a frequency between 20% and 35%. Position 2nd is the mode, the median as well as the position of the country in the composite indicator.

In the following tables, the frequency matrices for the period 2005-2007 and the matrices for the indicator of 2004 and the second indicator for 2007 are presented. Due to the huge number of simulations performed, only frequencies higher than 10% are shown. A first consideration is that the overall ranking is quite stable; in fact, considering the main indicator, over the whole set of 29400 simulations all countries clustered unambiguously. This is true in particular for the first and the last positions which show a very low degree of variability across the three years. The imputation of missing data affects the results of the uncertainty analysis only to a minor extent. In this section a general overview of the results of uncertainty analysis is given, whereas the specific situation of each country is commented in the country profile section.

The frequency matrix for 2005 is shown in Figure 3. Although the results of uncertainty analysis for this year show some variability in the ranking of countries, the overall

situation does not contradict the ranking of the composite indicator presented in table 2. In particular, Denmark is the leader of the ranking in the 76% of the 29400 different scenarios performed and in almost 22% of the cases is ranked in 2nd positions. The same holds for Sweden which is ranked in the top 2 positions in 85% of the cases. The ranking of the Netherlands is more variable, although the country is ranked in the 3rd position in more than 50% of the cases. Luxemburg presents a high variability in the ranking which goes from the 4th to the 10th position, the mode falls in the 4th position in 21% of the cases, whereas the position of the composite indicator falls in the 9th. Cyprus and Latvia respectively in 12th and 13th position show a bi-modal distribution of frequencies, with the median of the distribution respectively in 13th and 14th position. Also Spain and Estonia have a bi-modal distribution but in both cases the median of the distribution corresponds to the position recorded in the composite indicator. For most countries ranking is robust as, for instance, for Malta, Czech Republic, Lithuania, Italy and Greece it is concentrated in their position in the index in more than 85% of scenarios considered. Similar results are found for the remaining countries.

Results for 2006 highlight some increase in the variability of countries' ranking although the overall situation does not contradict the composite indicator presented above. Despite the increase in variability, for most countries record a rank which varies across a maximum of +/- 2 positions compared with that identified in the composite indicator. This trend is confirmed in more than 90% of the 29800 different scenarios considered. Moreover, results are still robust in some countries, such as Ireland, Latvia, or Austria where the rank varies within 3 positions in more than 75% of the different scenarios. The situation is even better for different countries such as Czech Republic, Hungary or Slovakia which show a very robust situation with a ranking varying across just two positions in more than 85% of the cases. On the other hand, some bi-modal patterns appear for Luxemburg implying that some assumptions in the possible sources of uncertainty can affect the country ranking in some cases. Other countries present a bi-modal distribution, such as Slovenia or Latvia, but in both cases the median of the distribution corresponds to the position recorded in the composite indicator.

Finally the uncertainty analysis results for 2007, despite presenting a slight increase in the variability of countries' ranking, confirms for most of them the positions of the composite indicator. This is not the case only for Denmark, which ranks from the 2nd to the 4th position in 50% of the cases or Belgium which ranks from the 4th to the 8th position in 40% of the cases. Three other countries present a similar situation: Sweden, Finland and Portugal which respectively rank between the 6th and 8th position in 70% of cases, between the 5th and 9th in 85% of cases and between the 10th and 15th in 80% of cases. This ranking variability is mainly due to the imputation of missing data. However, most countries record a ranking which does not deviate more than +/- 2 positions relative to the one in the composite indicator. In particular, the Netherland moves across the first two positions in more than 85% of cases. Austria, Hungary, Czech Republic and Latvia have their ranking varying by two positions in more than 70% of cases. The situation is even better for Lithuania, Estonia Slovakia, Italy and Greece which show a very robust situation with a ranking varying between only two positions in more than 90% of the cases.

Figure 6 shows the results of the uncertainty analysis for the 2004 Modern Social Security composite indicator. Although the results of uncertainty analysis for this year show some variability in the ranking of countries, for most of them the country positions of the composite indicator shown in table 3 are confirmed. For few countries the ranking position does not confirm the position of the composite indicator such as for the Netherlands which ranks from the2nd to the 3rd position in 80% of the cases out of 25200 different scenarios simulated or as for France which ranks between the 4th and the 7th position with 70% of the observations. Similar situation is recorded for Finland, Poland Ireland and Germany where the variability in the ranking involved 5 different positions. This ranking variability in countries distributions is due mainly as a result of imputation of missing data. Moreover, results are still robust in some countries, such as Sweden, which ranks the 1st position in 100% of the cases out of 25200 different scenarios simulated, Portugal, United Kingdom and Austria where the rank varies within 2 positions in more than 70% of the different scenarios. The situation is even better for different countries such as Hungary, Slovakia and Italy which show a very robust situation with a ranking which does not vary at all in more than 85% of the cases.

In figure 7 are presented frequencies matrices for the second Modern Social Security composite indicator for 2007. The two indicators for 2007 are not comparable because they include different dimensions. The uncertainty analysis shows for some countries a high variability in the ranking positions such as for United Kingdom, Cyprus and Spain where the ranks varies respectively from the 14th to the 19th position for 90% of the cases out of 35000 different scenarios simulated, from the 10th to the 14th position for 76% of the cases and finally from 10th to the 15th for the 88% of the cases. Despite the increase in variability, for the most part countries record a rank which varies across a maximum of +/- 2 positions compared with that identified in the composite indicator. This trend is confirmed in more than 90% of the % of the 35000 different scenarios considered.

Figure 3 - Uncertainty Analysis frequency matrix for 2005

2005	DK	SE	NL	BE	FI	DE	FR	IE	LU	SI	PT	CY	LV	UK	ES	AT	PL	MT	CZ	HU	EE	LT	IT	SK	GR
Rank 1	76.54%	22.00%	0.54%																						
Rank 2	22.03%	63.53%	8.40%	4.99%			0.45%																		
Rank 3	1.00%	13.65%	50.60%	15.39%	10.16%		6.88%	0.22%	2.10%																
Rank 4	0.05%	0.79%	10.20%	20.23%	22.97%		17.20%	7.10%	21.46%																
Rank 5	0.13%	0.03%	3.73%	*13.21%*	45.62%	5.00%	10.63%	7.95%	13.68%																
Rank 6			0.88%	4.54%	14.22%	***15.44%***	*26.98%*	30.29%	5.01%	2.05%	0.16%														
Rank 7			*11.03%*	6.24%	5.71%	16.58%	30.31%	16.57%	7.86%	2.45%	1.51%	1.74%													
Rank 8			0.68%	19.18%	0.38%	5.93%	7.18%	***28.58%***	19.51%	10.19%	3.44%	4.91%													
Rank 9			1.18%	3.20%		38.20%	0.37%	8.54%	***17.19%***	17.38%	5.66%	7.17%		0.33%	0.77%										
Rank 10			5.97%	7.26%		13.86%		0.59%	11.81%	35.15%	9.73%	11.24%		2.74%	1.65%										
Rank 11				5.18%		4.98%		0.17%	0.86%	*20.80%*	30.88%	18.03%	0.37%	6.50%	11.59%	0.63%									
Rank 12									0.41%	9.71%	10.54%	18.59%	15.57%	38.59%	3.26%	2.99%									
Rank 13									0.09%	1.88%	*15.52%*	*11.07%*	24.19%	*27.26%*	4.16%	15.17%									
Rank 14										0.39%	16.99%	8.23%	*21.05%*	**18.31%**	15.32%	17.94%	0.05%	0.04%							
Rank 15											5.58%	6.35%	23.38%	4.46%	***16.88%***	32.38%	6.02%	0.06%	1.11%						
Rank 16												10.11%	13.31%	1.82%	20.26%	***22.58%***	25.45%	0.37%	5.78%						
Rank 17												1.61%	2.05%		21.98%	7.90%	36.62%	4.86%	24.97%						
Rank 18												0.72%	0.06%		3.98%	0.28%	*26.31%*	**16.07%**	52.32%	0.09%	0.17%				
Rank 19												0.03%				0.13%	5.05%	69.87%	**13.78%**	7.63%	1.00%		2.38%		
Rank 20																	0.50%	6.01%	2.04%	***39.71%***	45.04%	1.92%	4.78%		
Rank 21																		2.68%		43.69%	***42.41%***	8.93%	2.30%		
Rank 22																		0.04%		8.89%	11.34%	73.48%	6.24%		
Rank 23																					0.03%	14.99%	***18.87%***	59.86%	6.24%
Rank 24																						0.68%	18.22%	***16.53%***	64.57%
Rank 25																							47.20%	23.61%	***29.18%***

Figure 4 - Uncertainty Analysis frequency matrix for 2006

2006	DK	SE	NL	BE	DE	FI	IE	FR	LU	PT	SI	CY	ES	LV	UK	AT	MT	PL	HU	CZ	LT	EE	SK	IT	GR
Rank 1	***88.10%***	10.54%	0.34%	0.68%																					
Rank 2	10.88%	***57.46%***	*20.41%*	10.23%		0.68%																			
Rank 3	0.68%	29.61%	**42.53%**	*10.85%*	0.68%	5.10%	9.18%	1.03%	0.34%																
Rank 4		1.70%	8.86%	**20.08%**	4.43%	13.57%	34.02%	13.95%	3.06%																
Rank 5			0.66%	7.17%	***22.11%***	*25.84%*	10.20%	7.13%	26.89%																
Rank 6			7.14%	3.70%	8.83%	**40.14%**	8.85%	7.84%	*17.11%*		5.70%														
Rank 7			3.42%	4.09%	31.61%	8.86%	**15.64%**	*14.94%*	10.87%	1.00%	1.40%	7.82%													
Rank 8			2.37%	6.47%	25.81%	5.46%	*13.95%*	**26.95%**	11.12%	0.35%	3.44%	4.09%													
Rank 9			2.38%	13.61%	5.19%	0.34%	5.12%	25.45%	**21.46%**	6.45%	12.20%	6.80%	1.01%												
Rank 10			5.10%	9.86%	1.35%	0.00%	1.44%	2.38%	7.85%	***13.19%***	39.07%	18.71%	0.70%		0.33%										
Rank 11				13.27%			0.93%		1.29%	30.02%	***36.81%***	11.21%	6.12%		0.35%										
Rank 12							0.34%			23.81%	1.03%	**29.60%**	*13.26%*	3.05%	27.21%	1.36%									
Rank 13										10.89%		*13.93%*	**18.05%**	*17.32%*	24.82%	12.59%			2.34%						
Rank 14										11.22%		3.42%	14.96%	**16.32%**	17.36%	31.65%	0.34%		3.04%						
Rank 15										3.07%		3.38%	14.61%	21.78%	***21.08%***	*30.61%*	3.74%		0.72%						
Rank 16												0.68%	12.92%	24.17%	8.85%	**15.65%**	17.70%	13.56%	3.42%						
Rank 17												0.01%	7.14%	10.20%		1.38%	**49.97%**	*21.14%*	9.19%	0.34%					
Rank 18												0.34%	10.88%	6.48%		6.43%	*26.88%*	**24.83%**	*23.81%*	0.34%					
Rank 19													0.34%	0.68%		0.34%	1.36%	12.59%	**46.60%**	37.41%				0.68%	
Rank 20																		27.89%	10.88%	***56.46%***				4.76%	
Rank 21																				5.44%	***66.67%***	13.95%	1.36%	12.59%	
Rank 22																					25.85%	***57.49%***	12.24%	3.40%	1.02%
Rank 23																					5.10%	13.94%	***74.84%***	3.74%	2.38%
Rank 24																					1.36%	10.20%	10.20%	***37.63%***	*40.60%*
Rank 25																					1.02%	4.42%	1.36%	*37.20%*	***56.00%***

Figure 5 - Uncertainty Analysis frequency matrix for 2007

2007	DK	NL	BE	IE	LU	DE	SE	FR	FI	SI	PT	ES	AT	CY	UK	MT	CZ	HU	LV	PL	LT	EE	SK	IT	GR
Rank 1	**9.11%**	67.04%	6.59%	15.90%	0.68%																				
Rank 2	*18.23%*	**15.89%**	9.91%	46.33%	7.13%																				
Rank 3	29.65%	4.96%	**7.31%**	*18.14%*	29.78%	6.10%	3.96%																		
Rank 4	23.84%		13.04%	**13.51%**	29.61%	5.46%	7.14%		6.80%																
Rank 5	2.91%		12.15%		***17.82%***	8.32%	5.45%	2.83%	40.71%																
Rank 6	2.02%		9.18%			***24.82%***	29.44%	12.13%	16.65%																
Rank 7	2.02%		*9.18%*			35.61%	**8.31%**	4.76%	*32.65%*																
Rank 8	11.12%		14.64%			17.30%	*15.65%*	***26.87%***	2.38%					6.15%											
Rank 9							22.11%	47.07%	**0.34%**	2.72%				6.00%											
Rank 10								6.33%		41.50%	2.04%	9.86%	6.80%	25.31%											
Rank 11										*31.93%*	**23.13%**	*11.22%*	11.95%	12.59%											
Rank 12										15.43%	15.65%	16.05%	41.11%	8.70%	2.72%										
Rank 13										6.26%	7.17%	15.24%	***21.10%***	*16.21%*	*34.03%*										
Rank 14										2.16%	*17.66%*	10.54%	18.70%	22.37%	12.23%		*16.33%*								
Rank 15											28.45%	7.83%			43.53%	5.23%	9.18%	5.11%							
Rank 16											5.23%	13.94%			6.81%	**18.24%**	45.59%	6.46%	3.06%						
Rank 17												5.78%				42.86%	**13.61%**	18.71%	5.79%	11.90%					
Rank 18																*21.09%*	9.87%	***25.91%***	14.24%	27.93%					
Rank 19																	5.43%	35.65%	***32.38%***	16.61%					
Rank 20																		8.16%	44.54%	**39.14%**				3.74%	
Rank 21																				3.74%	63.34%	17.97%		14.96%	
Rank 22																					20.28%	74.71%	2.28%	2.73%	
Rank 23																					10.63%	6.98%	74.23%	8.16%	
Rank 24																					5.75%		23.49%	***28.58%***	*41.84%*
Rank 25																								41.84%	58.16%

Figure 6 - Uncertainty Analysis frequency matrix for 2004

		SE	NL	DK	FR	BE	FI	DE	PL	IE	LU	PT	UK	AT	CZ	ES	HU	SK	GR	IT
Rank	1	***100.00%***																		
Rank	2		***29.57%***	56.82%	12.46%															
Rank	3		46.61%	***17.82%***	*12.67%*	*13.20%*	1.59%				7.63%									
Rank	4		19.79%	6.61%	**24.90%**	11.38%	26.76%				*8.99%*									
Rank	5			13.33%	8.85%	**24.04%**	22.38%	0.29%	5.76%	3.99%	17.33%									
Rank	6			5.15%	5.86%	8.81%	***17.79%***	7.43%	10.55%	38.90%	5.54%									
Rank	7				34.70%	2.90%	9.53%	**21.51%**	6.94%	18.67%	5.09%		0.37%							
Rank	8					23.12%	6.70%	14.56%	**24.94%**	16.26%	13.67%		0.11%							
Rank	9					10.48%	10.09%	*17.81%*	28.48%	***21.96%***	8.40%	2.44%	0.31%							
Rank	10					4.85%	5.03%	29.56%	18.49%		**21.10%**	10.48%	4.09%	6.26%						
Rank	11							8.85%	*1.72%*		3.55%	**56.71%**	14.45%	14.14%						
Rank	12										5.08%	*16.53%*	**42.72%**	*34.94%*						
Rank	13										3.63%	13.69%	*35.98%*	**41.02%**		5.39%				
Rank	14												1.97%	3.62%	***62.30%***	31.90%				
Rank	15														37.70%	***62.30%***				
Rank	16																**93.46%**		6.46%	
Rank	17																2.59%	**72.38%**	20.62%	4.41%
Rank	18																*3.95%*	13.34%	**72.92%**	9.79%
Rank	19																	14.29%	0.00%	***85.71%***

Figure 7 - Uncertainty Analysis frequency matrix for 2007 second indicator

		DK	LU	NL	IE	SE	FI	BE	DE	FR	SI	ES	AT	CZ	CY	MT	PT	LV	HU	UK	PL	EE	SK	IT	LT	GR
Rank	1	**12.59%**	42.57%	34.31%	10.25%	0.29%																				
Rank	2	9.68%	**37.26%**	*26.28%*	*24.51%*	0.87%	1.40%																			
Rank	3	*25.68%*	13.93%	**11.22%**	38.65%	2.39%	8.13%																			
Rank	4	49.79%	5.66%	4.97%	**21.02%**	6.17%	11.53%																			
Rank	5	1.69%		8.20%	4.62%	**7.01%**	66.20%			9.57%																
Rank	6					62.46%	**10.96%**	3.14%	10.70%	5.11%																
Rank	7					13.77%		**9.57%**	35.37%	*30.02%*																
Rank	8							*29.39%*	***23.05%***	30.60%																
Rank	9							39.22%	20.29%	**23.27%**	6.44%				6.67%											
Rank	10										50.12%	10.71%			19.96%											
Rank	11										*34.58%*	**27.87%**	8.84%		*16.62%*											
Rank	12										6.00%	12.48%	56.07%	5.47%	13.93%											
Rank	13											*14.28%*	16.94%	48.53%	8.61%					9.23%						
Rank	14											6.65%	3.69%	*24.33%*	**16.91%**	4.85%	3.34%		9.44%	29.92%						
Rank	15											16.66%	0.43%	13.45%	4.28%	**20.25%**	15.35%	5.30%	9.11%	*15.17%*						
Rank	16											7.11%	0.57%	5.32%		*30.00%*	23.32%	9.70%	*18.48%*	4.67%						
Rank	17															30.45%	*20.25%*	**15.86%**	20.32%	4.34%						
Rank	18															12.69%	20.69%	*30.58%*	**19.29%**	10.00%	4.44%					
Rank	19																14.77%	31.31%	17.01%	26.09%	9.94%					
Rank	20																	7.26%	5.97%		81.41%			3.14%		
Rank	21																				3.65%	**5.29%**		7.63%	83.43%	
Rank	22																					80.09%		8.35%	10.94%	
Rank	23																					14.61%	72.29%	**6.74%**	5.13%	
Rank	24																						12.37%	24.15%		63.47%
Rank	25																						14.72%	49.98%		**35.30%**

6. Conclusions

As a third step in the process of construction of a set of composite indicators on flexicurity within a joint DG EMPL-JRC project, this paper presents an attempt to calculate a Composite Indicator on Modern Social Security System, which is one of the main four dimensions of flexicurity according to relevant Commission policy documents (see COM(2007) 359). The dimension of Modern Social Security System is captured through three different indicators:

1. the main indicator, which is based on 20 basic indicators and covers the three year period from 2005 to 2007,
2. a first additional indicator, based on 17 basic indicators and covering only 2004,
3. a second additional indicator built on 24 basic indicators and covering only 2007.

All indicators used are based on three different sources. Results point to a heterogeneous Europe, with an overall good performance of Continental countries, and less favourable scores for Mediterranean and Eastern Member States. The indicator's country ranking is quite stable over the period considered with a few changes from one year to another. Uncertainty and sensitivity analyses have been performed in order to test the robustness of the Composite Indicator. Those were based on 29400 different simulated scenarios for the main indicator, 25200 different scenarios for the 2004 indicator and 35000 simulated scenarios for the 2007 indicator, generated by considering different options with respect to standardization methods, weighting scheme, aggregation rules and the inclusion/exclusion of basic indicators. Results show that the composite indicator's scores and rankings are overall robust over the period, although some variability is present in each year. This is mainly due to the imputation of missing data. On average, countries record a higher ranking variability with respect to the Life Long Learning Composite indicator, but a lower one compared to the index on Active Labour Market Policies. This is due to the varying presence of missing data. However, the MSS index is quite robust compared to similar indicators developed in the literature.

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ANNEX 1: COUNTRY PROFILES

Country Profiles

In this section we analyse the individual country profiles for the 20 basic indicators of the main MSS index and the robustness of each country's ranking in 2005, 2006 and 2007. In order to ensure comparability of performance, the normalized values of basic indicators are represented using a radar plot. For most indicators, a greater value corresponds to a better performance. Exceptions are indicators 19m7_1, 19m7_2 (i.e. unemployment traps), inactivitytrap_1, inactivitytrap_2, inactivitytrap_3, net_replacement_rate_3 and net_replacement_rate_6 (i.e. level of unemployment benefits after 5 years of unemployment) where a greater value indicates a worse performance. Those variables are reported in italic for the reader's convenience. The radar plot shows the performances in all three years and is supported by a table presenting the normalized values of each basic indicator. The basic indicators are listed using their short name, for the complete name please see table 1. In addition the robustness of the country ranking in the composite index in each year is presented with the results of the uncertainty and sensitivity analysis.

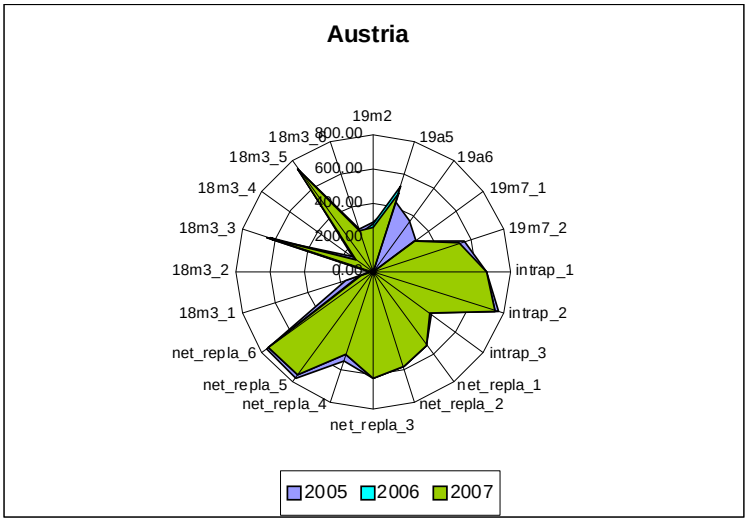
Austria

The performance of Austria across the three years varies between the 13th and the 16th position in the index. In particular, in 2005 the rank of Austria is quite robust, the median of the distribution of the 29400 simulations correspond to the position in the ranking of the MSS composite indicator, whereas the mode of the distribution falls in the 15th position. In 2006 Austria maintains its 16th position, whereas most of frequencies (76%) are concentrated between the 13th and the 16th position among the 29400 different scenarios. The performance of Austria is even better in 2007 where the 13th position is gained. Although Austria's rank varies between the 11th and the 14th position 72% of frequencies are concentrated between the 12th and the 13th position, the median falls in the position of the composite indicator whereas the mode is in the 12th position.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank
AT	10	11	12	13	14	15	16
2005		0.63%	2.99%	15.17%	17.94%	32.38%	***22.58%***
2006			1.36%	12.59%	31.65%	*30.61%*	**15.65%**
2007	6.80%	11.95%	41.11%	***21.10%***	18.70%		

Across the period considered the performance of Austria is quite good, mainly as a result of its score on the *Childcare services: compulsory school age-12 years 1-29 hours and 30 hours* (where Austria is 1st).A good performance is recorded also for *Net replacement rate after 12 months for 1 earner with 2 children at 67% of average wage* while a bad performance is recorded for *Net replacement rate after 60 months for 1 earner with 2 children at 67% of average wage* and for *Expenditure on out-of-work income maintenance per person wanting to work* in particular in 2006 and 2007.

	2005	2006	2007
19m2	286.91	276.86	261.47
19a5	424.45	521.19	480.61
19a6	365.94	0.33	0.32
19m7_1	*308.47*	*295.09*	*302.70*
19m7_2	*563.95*	*521.76*	*533.96*
intrap_1	*661.38*	*659.49*	*659.44*
intrap_2	*767.82*	*746.77*	*752.86*
intrap_3	*419.98*	*404.99*	*413.51*
net_repla_1	529.41	529.41	529.41
net_repla_2	586.21	586.21	586.21
net_repla_3	*621.95*	*621.95*	*621.95*
net_repla_4	547.17	509.43	509.43
net_repla_5	771.43	752.38	752.38
net_repla_6	*771.43*	*752.38*	*752.38*
18m3_1	170.73	97.56	73.17
18m3_2	15.15	0.00	15.15
18m3_3	615.38	628.21	653.85
18m3_4	146.67	120.00	120.00
18m3_5	730.34	741.57	741.57
18m3_6	258.43	235.96	247.19



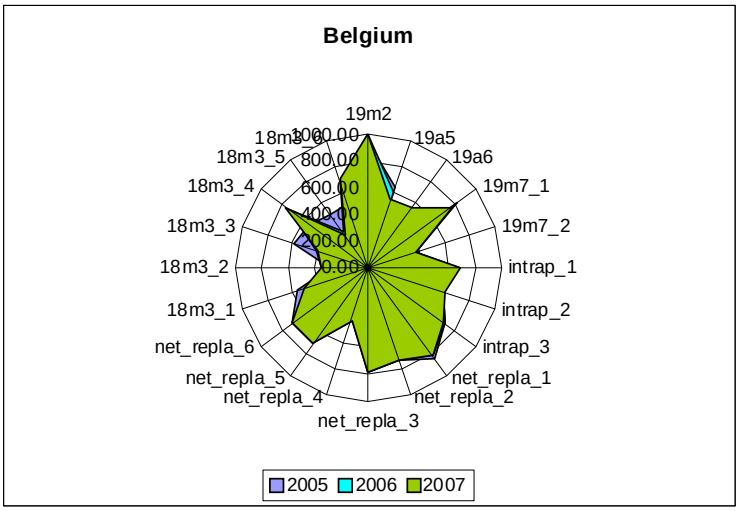
Belgium

Belgium performs well in the overall ranking across the three years keeping the first 8th positions. In particular in 2005 Belgium ranks the 4th position with a frequency of more than 20% of the cases out of the 29400 different scenarios simulated. The median falls in the 5th position while the mode in the same position of the composite indicator. In 2006 Belgium maintains the 4th position in the ranking as in 2005. The mode confirms the position of the composite indicator (4th) whereas the median falls in the 3rd position.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank
BE	2	3	4	5	6	7	8	9	10	11
2005	4.99%	15.39%	**20.23%**	*13.21%*	4.54%	6.24%	19.18%	3.20%	7.26%	5.18%
2006	10.23%	*10.85%*	**20.08%**	7.17%	3.70%	4.09%	6.47%	13.61%	9.86%	13.27%
2007	9.91%	**7.31%**	13.04%	12.15%	9.18%	*9.18%*	14.64%			

In 2007 Belgium loses four positions ranking in the 8th with more than 14% of the observations, the mode is in 3rd position while the median falls in 7th. The figure below shows the performance of Belgium across the three years for all basic indicators. As result the performance of 2006 is overlapped to 2007 with small differences, whereas in 2005 some basic indicators follow a different performance. In particular in all three years "*% of persons wanting to work receiving out-of-work income support*" records the best performances ranking the country in 1st position in 2007 and in 2nd position in 2006 and 2005.

	2005	2006	2007
19m2	947.65	997.15	1000.00
19a5	639.31	596.93	536.56
19a6	0.51	0.55	563.70
19m7_1	*821.98*	*762.08*	*766.34*
19m7_2	*375.37*	*371.41*	*377.45*
intrap_1	*674.01*	*671.82*	*684.65*
intrap_2	*594.93*	*592.09*	*604.21*
intrap_3	*706.83*	*701.87*	*699.41*
net_repla_1	852.94	808.82	808.82
net_repla_2	735.63	735.63	735.63
net_repla_3	*780.49*	*780.49*	*780.49*
net_repla_4	415.09	339.62	415.09
net_repla_5	704.76	704.76	704.76
net_repla_6	*704.76*	*704.76*	*704.76*
18m3_1	560.98	414.63	512.20
18m3_2	287.88	348.48	348.48
18m3_3	589.74	410.26	397.44
18m3_4	546.67	733.33	773.33
18m3_5	494.38	325.84	303.37
18m3_6	505.62	674.16	696.63



Performance is quite negative for variables related to inactivity trap in all three years whereas "*Expenditure on out-of-work income maintenance per person wanting to work*" records the worst performance in 2005 and 2006 which becomes better in 2007.

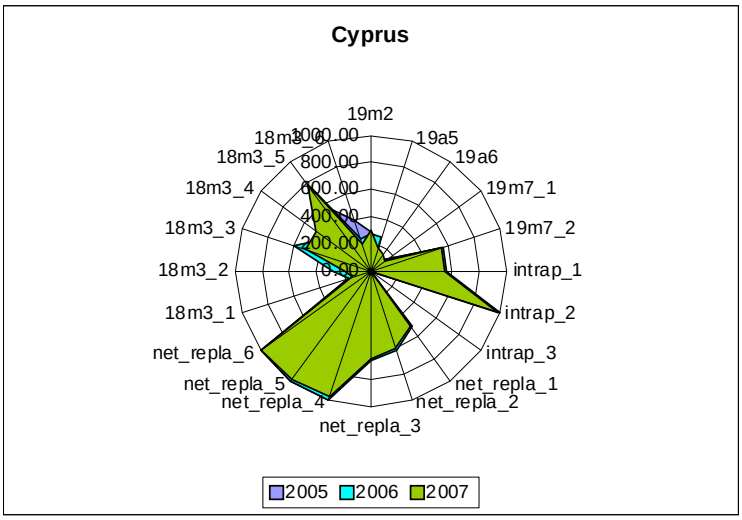
Cyprus

The performance of Cyprus ranks in the middle of the league, between the 12th and the 14th position. On overall the position of Cyprus is quite stable as confirmed by the uncertainty analysis. In 2005 and 2006 Cyprus maintain the 12th position with respectively 18 % and 29% of frequencies out of 29400 different simulations. On the other side the median falls in both cases in the 13th position, whereas the mode is in the position of the composite indicator. In 2007 the ranking of Cyprus lose two positions falling in 14th position.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank
CY	10	11	12	13	14	15	16
2005	11.24%	18.03%	**18.59%**	*11.07%*	8.23%	6.35%	10.11%
2006	18.71%	11.21%	**29.60%**	*13.93%*	3.42%	3.38%	0.68%
2007	25.31%	12.59%	8.70%	*16.21%*	**22.37%**		

Across the three years the performance of Cyprus record very high scores for some variables as "*Net replacement rate after 6, 12 months for 1 earner and two children"* where the country ranks the 1st position both in 2005 and 2006 whereas in 2007 reach the 2nd position. The best performance reached is recorded for I*nactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, two-earner couple with 2 children)* where the country reaches the first position. The worse performances are recorded for "*inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, one-earner couple with 2 children)*" where Cyprus unfortunately reaches the worst performance. Bad performance of Cyprus is recorded in the dimension of "*Expenditure on out-of-work income maintenance per person wanting to work*" for 2006 and in the dimension of "*inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, one-earner couple with 2 children)"* in all three years.

	2005	2006	2007
19m2	288.91	278.69	299.14
19a5	223.94	263.30	184.58
19a6	76.98	0.28	153.68
19m7_1	*133.94*	*133.87*	*131.49*
19m7_2	*565.27*	*565.00*	*556.55*
intrap_1	*541.39*	*556.64*	*543.44*
intrap_2	*1000.00*	*997.53*	*985.73*
intrap_3	*0.00*	*0.00*	*0.00*
net_repla_1	500.00	514.71	500.00
net_repla_2	609.20	620.69	609.20
net_repla_3	*646.34*	*658.54*	*646.34*
net_repla_4	1000.00	1000.00	981.13
net_repla_5	1000.00	1000.00	990.48
net_repla_6	*1000.00*	*1000.00*	*990.48*
18m3_1	170.73	170.73	146.34
18m3_2	181.82	272.73	181.82
18m3_3	487.18	589.74	500.00
18m3_4	480.00	400.00	493.33
18m3_5	606.74	752.81	786.52
18m3_6	393.26	247.19	213.48



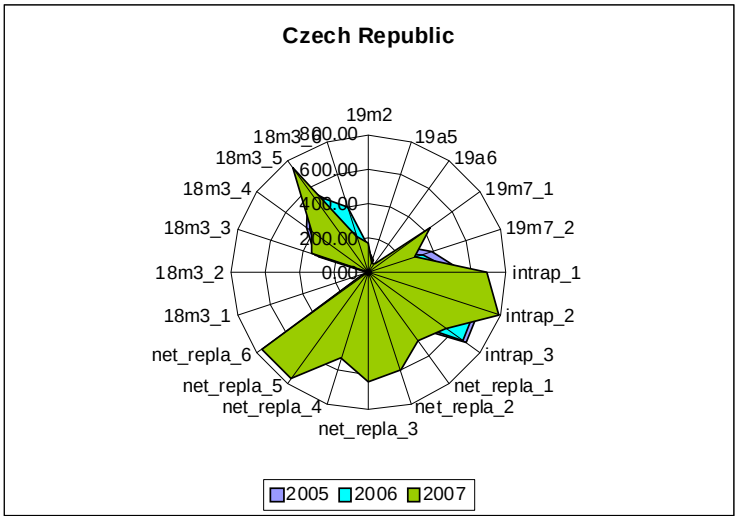
Czech Republic

The position of Czech Republic is quite stable as confirmed by the uncertainty analysis across the three years. The ranking position varies maximum of three positions as in 2005 where the Modern Social Security Composite Indicator ranks the 18th position with a frequency of more than 50% among the 29400 different scenarios simulated. The mode and the median falls both in the position of the composite indicator. The situation in 2006 is a little worse; Czech Republic loses two positions and falls in the 20th position with more than 50% of the total frequencies out of 29400 different simulations. In 2007 the country gains four positions and the composite indicator falls in the 16th position where 45% of observations out of 29400 simulations are concentrated.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank
CZ	14	15	16	17	18	19	20	21
2005		1.11%	5.78%	24.97%	*52.32%*	**13.78%**	2.04%	
2006				0.34%	0.34%	37.41%	*56.46%*	5.44%
2007	*16.33%*	9.18%	45.59%	**13.61%**	9.87%	5.43%		

Czech Republic is ranked between the 16th and the 20th position across 2005-2007 of the overall ranking of the Modern Social Security Composite Indicator. The best performance achieved by Czech Republic is in "*Net replacement rate after 12months - 1 earner 2 children, 67% AW*" across the three years where the country is ranked in 5th position. On the other hand the worse performance is recorded by "*Expenditure on out-of-work income maintenance (% of GDP)*" in all three years.

	2005	2006	2007
19m2	135.36	147.73	168.86
19a5	74.84	70.78	55.72
19a6	0.03	0.04	67.12
19m7_1	*252.34*	*189.28*	*435.60*
19m7_2	*390.75*	*337.30*	*284.94*
intrap_1	*557.21*	*503.94*	*689.75*
intrap_2	*681.44*	*654.78*	*790.57*
intrap_3	*697.95*	*671.63*	*553.86*
net_repla_1	382.35	338.24	485.29
net_repla_2	517.24	482.76	597.70
net_repla_3	*548.78*	*512.20*	*634.15*
net_repla_4	490.57	452.83	528.30
net_repla_5	742.86	723.81	761.90
net_repla_6	*742.86*	*723.81*	*761.90*
18m3_1	48.78	24.39	48.78
18m3_2	0.00	15.15	0.00
18m3_3	333.33	307.69	346.15
18m3_4	440.00	426.67	413.33
18m3_5	595.51	573.03	752.81
18m3_6	382.02	404.49	224.72



Overall the performance of all single basic indicators is similar across the three years but there are some significant differences. In particular "*Compulsory school age - 12 years*

(30 hours or more records a good position only in 2006 while it has a worse position in the other two years.

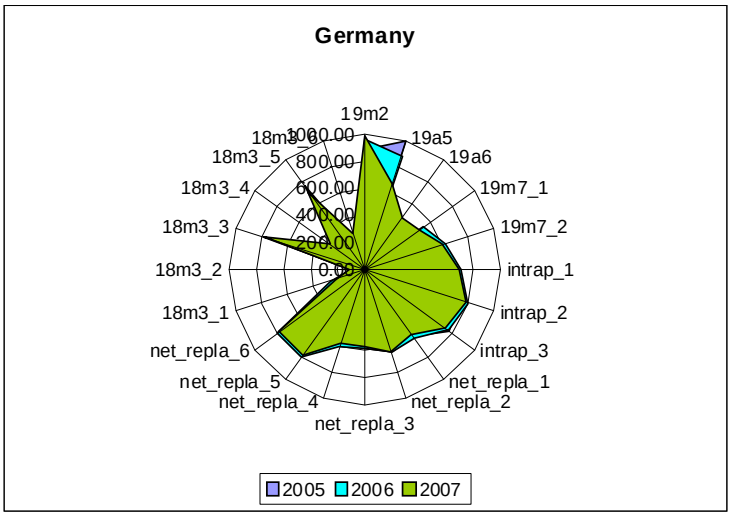
Germany

Germany shows a robust performance across the three years as confirmed by the uncertainty analysis. The position of the Modern Social Security Composite indicator varies between the 5th and the 6th position. In particular in 2005 the country falls in the 6th position with more than 15% of the observations simulated in the 29400 different scenarios, the median confirms the position of the composite indicators, whereas the mode falls in the 9th position. In 2006 Germany gains one position falling in the 5th position with a frequency of 22% out of 29400 different scenarios simulated. Finally in 2007 the country confirms the 6th position occupied in 2005, the median falls in the position of the composite indicator while the mode is the 7th position.

	Rank	Rank	Rank	Rank	Rank	Rank
DE	5	6	7	8	9	10
2005	5.00%	***15.44%***	16.58%	5.93%	38.20%	13.86%
2006	***22.11%***	8.83%	31.61%	25.81%	5.19%	1.35%
2007	8.32%	***24.82%***	35.61%	17.30%		

The performance of Germany across the three years present and excellent scores for "*% of persons wanting to work receiving out-of-work income support*" which leads the country in 3rd position in 2006 and 2007 and in 4th in 2005. Excellent performances are recorded also for "*Expenditure on out-of-work income maintenance (% of GDP)"* but only in 2005 when leads the country in first position. On the other side a worse performance is recorded for "*childcare services 0-2 (30 hours or more)"*. On average a good performance is recorded for "*Net replacement rate after 12 months - 1 earner 2 children*" which leads the country in 7th position across the three years.

	2005	2006	2007
19m2	885.41	962.46	996.91
19a5	1000.00	885.93	672.63
19a6	0.52	0.51	473.36
19m7_1	*515.54*	*539.61*	*504.99*
19m7_2	*528.56*	*626.59*	*605.16*
intrap_1	*704.10*	*709.31*	*693.39*
intrap_2	*750.17*	*799.05*	*788.37*
intrap_3	*764.76*	*760.78*	*738.94*
net_repla_1	602.94	617.65	588.24
net_repla_2	643.68	643.68	632.18
net_repla_3	*585.37*	*585.37*	*573.17*
net_repla_4	509.43	603.77	566.04
net_repla_5	752.38	800.00	780.95
net_repla_6	*752.38*	*800.00*	*780.95*
18m3_1	195.12	268.29	231.71
18m3_2	121.21	106.06	113.64
18m3_3	730.77	794.87	782.05
18m3_4	253.33	266.67	320.00
18m3_5	764.04	662.92	707.87
18m3_6	191.01	202.25	280.90



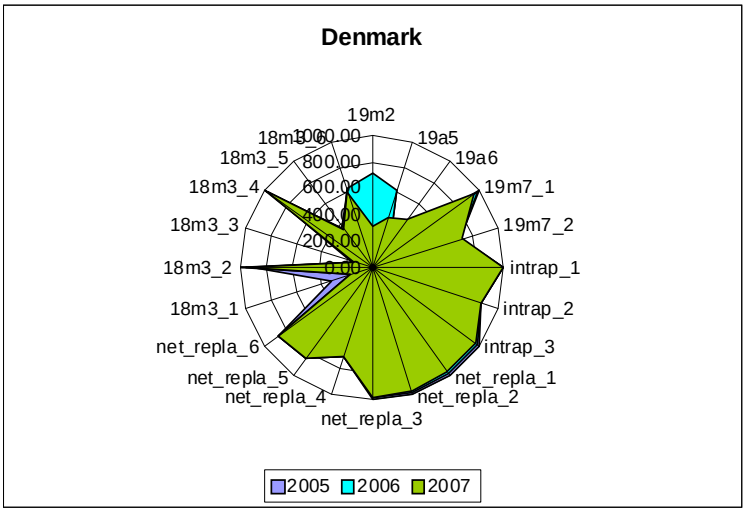
Denmark

Denmark is one of the top performers of the overall ranking of the Modern Social Security System composite indicator. The position of the country is stable in the 1st position across the three years. In 2005 the country leads the league in 1st position with more than 76% of the observation out of 29400 different scenarios simulated. The median and the mode of the distribution are recorded in the 1st position which corresponds to the position recorded in the Modern Social Security System composite indicator. The situation is not different in 2006 where the 1st position is recorded with a frequency of more than 88% of observation. The median and the mode correspond to the 1st position. In 2007 the country still leads the league but with a very low frequency (9%), whereas the median falls in the 2nd position and the mode in the 3rd.

	Rank	Rank	Rank	Rank
DK	1	2	3	4
2005	*76.54%*	22.03%	1.00%	0.05%
2006	*88.10%*	10.88%	0.68%	
2007	**9.11%**	*18.23%*	29.65%	23.84%

The performance of Denmark is mainly driven by net replacement variables in particular by top performances in the dimensions of "*Net replacement rate after 6, 12 months – Single"*. A bad performance is recorded for the dimension of "*Inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work"* and for "*Childcare services: 3 years to compulsory school age (1-29 hours)"* across the three years. The dimension of "*Percentage of persons wanting to work receiving out-of-work income support"* records a good performance only in 2006 while in the other two years this dimension does not have a good performance.

	2005	2006	2007
19m2	592.04	724.15	312.09
19a5	623.09	623.09	405.34
19a6	230.31	230.31	459.93
19m7_1	*1000.00*	*982.00*	*961.20*
19m7_2	*710.38*	*709.40*	*710.58*
intrap_1	*1000.00*	*996.20*	*992.11*
intrap_2	*869.57*	*868.81*	*868.77*
intrap_3	*1000.00*	*983.84*	*963.27*
net_repla_1	1000.00	985.29	970.59
net_repla_2	1000.00	988.51	977.01
net_repla_3	*1000.00*	*987.80*	*987.80*
net_repla_4	698.11	698.11	698.11
net_repla_5	847.62	847.62	847.62
net_repla_6	*876.19*	*876.19*	*866.67*
18m3_1	317.07	170.73	170.73
18m3_2	909.09	1000.00	954.55
18m3_3	141.03	153.85	141.03
18m3_4	960.00	973.33	1000.00
18m3_5	382.02	359.55	359.55
18m3_6	606.74	629.21	606.74



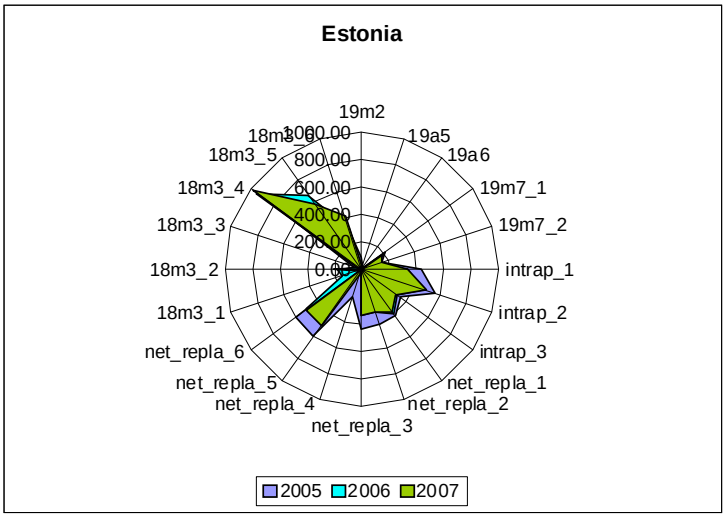
Estonia

The performance of Estonia is not very good and the ranking of the country is ranked between the 21st and the 22nd position of the Modern Social Security System composite indicator. On overall the ranking of Estonia is quite robust as confirmed by the uncertainty analysis. In 2005 the 21st position is held with more than 42 % of observations while the mode is in the 20th position and the median confirms the position of the composite indicator. In 2007 median and mode converge to the position of the composite indicator which falls in the 22nd position with more than 70 % of the observations out of 29400 different scenarios simulated.

	Rank	Rank	Rank	Rank	Rank
EE	20	21	22	23	24
2005	45.04%	***42.41%***	11.34%	0.03%	
2006		13.95%	***57.49%***	13.94%	10.20%
2007		17.97%	***74.71%***	6.98%	

Even if Estonia does not shows a very good performance there are some dimensions where the country reach a good score. In particular the dimension of "*Childcare services: 3 years to compulsory school age (30 hours or more)*" where the country is ranked among the fourth positions in the three years. On the other hand the worst performance of Estonia is recorded in the dimension of "*Expenditure on out-of-work income maintenance"* for all three years.

	2005	2006	2007
19m2	83.71	29.06	35.47
19a5	19.39	0.00	10.33
19a6	0.00	0.00	21.86
19m7_1	*213.75*	*191.16*	*177.39*
19m7_2	*155.75*	*110.71*	*152.68*
intrap_1	*435.36*	*337.19*	*334.72*
intrap_2	*564.24*	*461.96*	*491.03*
intrap_3	*346.40*	*324.24*	*307.36*
net_repla_1	411.76	397.06	382.35
net_repla_2	413.79	321.84	321.84
net_repla_3	*439.02*	*341.46*	*341.46*
net_repla_4	207.55	0.00	18.87
net_repla_5	600.00	495.24	504.76
net_repla_6	*600.00*	*495.24*	*504.76*
18m3_1	73.17	146.34	24.39
18m3_2	136.36	181.82	212.12
18m3_3	64.10	38.46	12.82
18m3_4	826.67	946.67	986.67
18m3_5	640.45	674.16	584.27
18m3_6	325.84	314.61	404.49



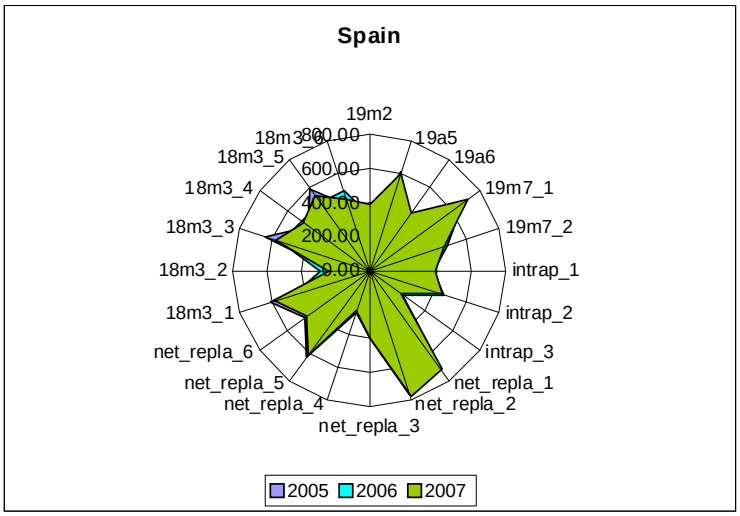
Spain

Across 2005 to 2007 the ranking of the Modern Social Security System composite indicator of Spain varies between the 12th to the 15th position. In 2005 the country is ranked in the 15th position with 16% of the observations, the median confirms the 15th position whereas the mode falls in the 17th. On overall the ranking of Spain in 2005 is not very stable and it is spread between the 11th and the 17th position. In 2006 Spain gains two positions ranking in 13th position. In 2007 Spain reaches the best performance across all the three years ranking the 12th position.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank
ES	11	12	13	14	15	16	17	18
2005	11.59%	3.26%	4.16%	15.32%	***16.88%***	20.26%	21.98%	3.98%
2006	6.12%	*13.26%*	**18.05%**	14.96%	14.61%	12.92%	7.14%	10.88%
2007	*11.22%*	**16.05%**	15.24%	10.54%	7.83%	13.94%	5.78%	

The best performance of the Spain is achieved in the dimension of "*Net replacement rate after 12 months – Single*" where the country is ranked at the 5th position across the three years. A relatively bad performance is recorded for the dimension of "*Unemployment trap: Marginal effective tax rate for an unemployed person*", whereas it is better for "*Inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, two-earner couple with 2 children)*"

	2005	2006	2007
19m2	280.16	313.37	386.65
19a5	605.95	595.13	600.18
19a6	0.28	0.32	415.00
19m7_1	*673.92*	*677.63*	*716.24*
19m7_2	*479.43*	*486.59*	*458.82*
intrap_1	*373.57*	*379.90*	*383.79*
intrap_2	*460.68*	*458.12*	*450.35*
intrap_3	*231.21*	*241.31*	*234.12*
net_repla_1	705.88	705.88	720.59
net_repla_2	770.11	770.11	781.61
net_repla_3	*402.44*	*402.44*	*402.44*
net_repla_4	264.15	264.15	245.28
net_repla_5	628.57	628.57	619.05
net_repla_6	*466.67*	*457.14*	*457.14*
18m3_1	609.76	487.80	585.37
18m3_2	212.12	287.88	242.42
18m3_3	641.03	551.28	576.92
18m3_4	440.00	493.33	480.00
18m3_5	595.51	494.38	539.33
18m3_6	393.26	494.38	438.20



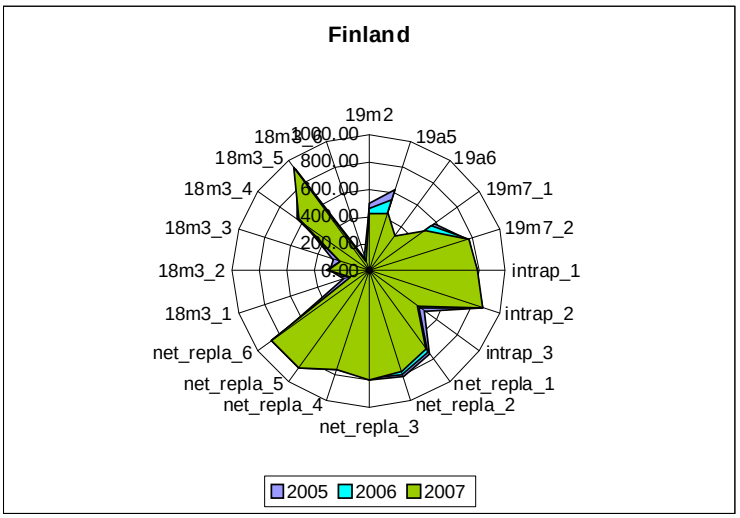
Finland

Finland shows a good performance in the overall ranking of Modern Social Security System where the country is ranked from the 5th to the 6th position across the three years. In particular in 2005 the country is ranked in the 5th position with more than 45% of the observations out of 29400 different scenarios simulated. The median falls in the 4th position while the mode confirms the position of the composite indicator. In 2006 the country loses one position falling in the 6th with 40% of the observations, whereas in 2007 the country returns in the original position of the composite indicator (5th). On overall the position of the composite indicator of Finland is quite robust and it is spreads in three positions in each year.

	Rank	Rank	Rank	Rank	Rank
FI	3	4	5	6	7
2005	10.16%	*22.97%*	**45.62%**	14.22%	5.71%
2006	5.10%	13.57%	*25.84%*	**40.14%**	8.86%
2007		6.80%	40.71%	16.65%	*32.65%*

The performance of Finland is mainly driven by top performances in the dimensions of "*Childcare service: Compulsory school age - 12 years (1-29 hours)"* where the country is 4th in 2005 and varies between the 4th and the 6th position respectively in 2006 and 2007.

	2005	2006	2007
19m2	492.59	460.29	420.48
19a5	626.24	545.99	441.40
19a6	0.32	0.32	313.50
19m7_1	*592.35*	*563.17*	*511.10*
19m7_2	*757.94*	*761.74*	*767.87*
intrap_1	*791.59*	*776.61*	*789.82*
intrap_2	*864.56*	*866.46*	*869.52*
intrap_3	*494.06*	*454.21*	*446.40*
net_repla_1	750.00	735.29	705.88
net_repla_2	804.60	793.10	770.11
net_repla_3	*792.68*	*780.49*	*792.68*
net_repla_4	735.85	754.72	754.72
net_repla_5	866.67	876.19	876.19
net_repla_6	*866.67*	*876.19*	*876.19*
18m3_1	195.12	121.95	146.34
18m3_2	287.88	318.18	303.03
18m3_3	269.23	217.95	217.95
18m3_4	586.67	653.33	640.00
18m3_5	921.35	898.88	932.58
18m3_6	78.65	101.12	67.42



A good performance is also recorded for the dimension of "*Net replacement rate after 12, months - 1 earner 2 children*" where the country is 6th across the three years. On the other hand Finland worst performance is achieved for the dimensions of "*Childcare service Compulsory school age - 12 years (30 hours or more)" and in "Net replacement rate after 60 months - 1 earner 2 children*".

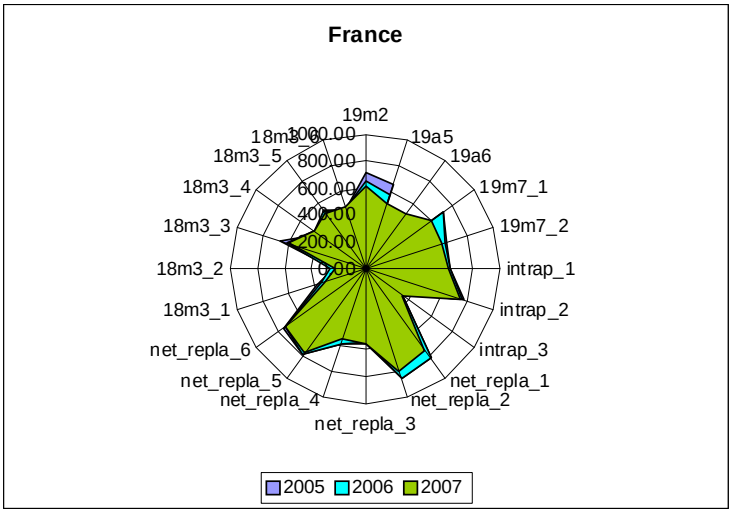
France

The position of France is ranked between the 7th and the 9th position of the Modern Social Security System composite indicator across the three years. The best performance of France is achieved in 2005 in 7th position with more than 30% of the observations out of 29400 different scenarios. In 2005 France spreads the ranking from the 4th to the 7th position, but concentrates more than 55% of the observation between the 6th and the 7th rank where the median (6th) and the mode (7th) fall. In 2006 the country loses one position ranking in the 8th position, whereas in 2007 France ranks the 9th with more than 47% of the observations.

	Rank	Rank	Rank	Rank	Rank	Rank
FR	4	5	6	7	8	9
2005	17.20%	10.63%	*26.98%*	**30.31%**	7.18%	0.37%
2006	13.95%	7.13%	7.84%	*14.94%*	**26.95%**	25.45%
2007		2.83%	12.13%	4.76%	***26.87%***	47.07%

This good performance of France is due to an excellent performance in the dimension of "*Net replacement rate after 6, 12 months"* where the country is 3rd across the three years. An excellent performance is recorded also in 2005 for the dimension of "*Percentage of persons wanting to work receiving out-of-work income support*" where the country is 5th. A good performance is achieved for the dimension of "*Inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, two-earner couple with 2 children)*" where the country is 22nd in each year.

	2005	2006	2007
19m2	708.96	650.95	605.42
19a5	658.25	573.94	513.67
19a6	0.55	0.49	499.24
19m7_1	*723.76*	*708.15*	*597.35*
19m7_2	*631.94*	*620.99*	*598.02*
intrap_1	*634.11*	*625.52*	*618.93*
intrap_2	*762.46*	*750.17*	*745.67*
intrap_3	*330.68*	*332.52*	*337.02*
net_repla_1	823.53	823.53	750.00
net_repla_2	862.07	862.07	804.60
net_repla_3	*560.98*	*548.78*	*560.98*
net_repla_4	584.91	584.91	547.17
net_repla_5	790.48	790.48	771.43
net_repla_6	*752.38*	*742.86*	*733.33*
18m3_1	390.24	341.46	317.07
18m3_2	242.42	257.58	227.27
18m3_3	666.67	615.38	602.56
18m3_4	426.67	466.67	466.67
18m3_5	539.33	528.09	505.62
18m3_6	460.67	471.91	483.15



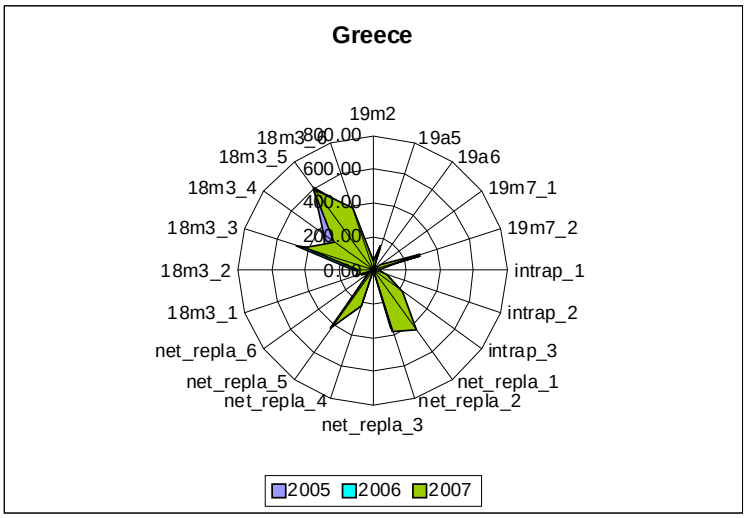
Greece

The performance of Greece is robust in the uncertainty analysis and the position of the countries falls in 25th in each year. In particular in 2005 Greece falls in 25th position with 29% of the frequencies among the 29400 different scenarios, whereas the mode falls in 24th position even if the median confirms the position of the composite indicator (25th)
In 2006 the ranking of Greece is spread between the 24th and the 25th position, where the Modern Social Security System composite indicator falls in 25th position with 56% of the observations out of 29400 different scenarios simulated. The ranking in 2007 does not change and falls in 25th position with more than 58% of the observations, whereas the median of the distribution falls in the 24th position.

	Rank	Rank	Rank
GR	23	24	25
2005	6.24%	64.57%	***29.18%***
2006	2.38%	*40.60%*	**56.00%**
2007		*41.84%*	**58.16%**

Greece is unfortunately the laggard of the overall ranking of the Modern Social Security System composite indicator across the three years. The bad performance of Greece is driven by a poor performance in all the basic indicators. Anyway, the best performance of Greece is achieved for the dimensions of "*Childcare service: Compulsory school age - 12 years (30 hours or more)"*, where the 15th position is achieved in 2005 and 2007 whereas in 2006 the country reaches the 16th position.

	2005	2006	2007
19m2	56.10	56.10	56.10
19a5	146.53	147.66	147.66
19a6	0.12	0.12	0.12
19m7_1	*5.03*	*0.00*	*51.98*
19m7_2	*292.44*	*277.96*	*293.17*
intrap_1	*0.00*	*16.96*	*32.92*
intrap_2	*85.30*	*85.30*	*85.30*
intrap_3	*168.17*	*200.70*	*212.56*
net_repla_1	426.47	426.47	441.18
net_repla_2	356.32	367.82	379.31
net_repla_3	*0.00*	*0.00*	*0.00*
net_repla_4	226.42	207.55	226.42
net_repla_5	409.52	419.05	428.57
net_repla_6	*28.57*	*19.05*	*19.05*
18m3_1	73.17	48.78	97.56
18m3_2	60.61	121.21	90.91
18m3_3	294.87	474.36	423.08
18m3_4	360.00	173.33	280.00
18m3_5	606.74	550.56	595.51
18m3_6	382.02	303.37	393.26



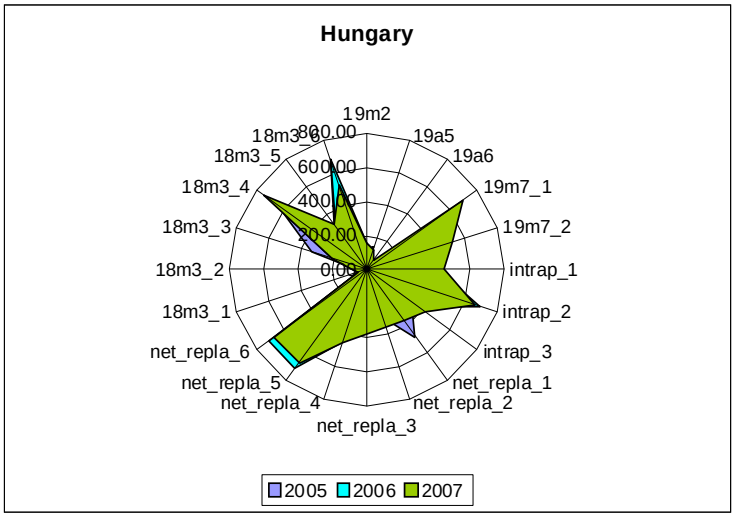
Hungary

Hungary is ranked between the 18th and the 20th position across the three years. The uncertainty analysis confirms the robustness of the Modern Social Security System composite indicator. In 2005 the country position is spread between the 20th and the 21st position with more than 85% of the observations out of 29400 different scenarios. In 2006 Greece gains one position respect the 2005 ranking in 19th position with more than 46% of the observations. In 2007 the country maintains the 19th position with more than 35% of the observations out of 29400 different scenarios simulated.

	Rank	Rank	Rank	Rank	Rank
HU	17	18	19	20	21
2005		0.09%	7.63%	***39.71%***	43.69%
2006	9.19%	*23.81%*	**46.60%**	10.88%	
2007	18.71%	***25.91%***	35.65%	8.16%	

The performance of Hungary is strongly driven by scores in the dimensions of "*Unemployment trap: Marginal effective tax rate for an unemployed person (67% AW, single person)")*" which are quite high in 2006 and 2007. Moreover, a bad performance is reached across the three years in the dimension of "*Expenditure on out-of-work income maintenance (% of GDP)"* and "*Inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, one-earner couple with 2 children"* .

	2005	2006	2007
19m2	127.59	154.65	156.10
19a5	138.86	123.99	119.22
19a6	0.05	0.05	70.85
19m7_1	*157.99*	*602.88*	*688.67*
19m7_2	*209.22*	*466.79*	*527.68*
intrap_1	*349.49*	*415.63*	*456.82*
intrap_2	*529.13*	*691.25*	*660.34*
intrap_3	*319.92*	*360.97*	*420.78*
net_repla_1	485.29	352.94	367.65
net_repla_2	287.36	344.83	356.32
net_repla_3	*304.88*	*365.85*	*378.05*
net_repla_4	264.15	433.96	452.83
net_repla_5	571.43	714.29	676.19
net_repla_6	*571.43*	*714.29*	*676.19*
18m3_1	48.78	48.78	48.78
18m3_2	75.76	90.91	90.91
18m3_3	333.33	217.95	217.95
18m3_4	626.67	680.00	746.67
18m3_5	325.84	303.37	325.84
18m3_6	674.16	685.39	516.85



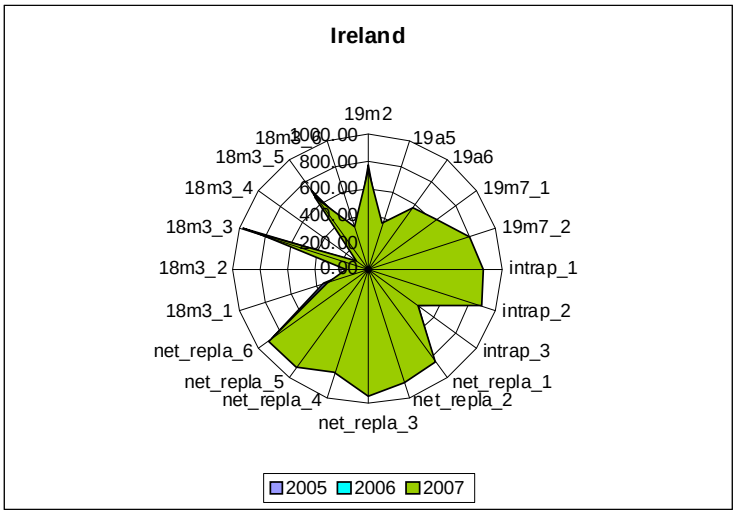
Ireland

The performance of Ireland is good and the country position across the three years varies between the 4th to the 8th positions. The results of the uncertainty analysis show a high variability in the country position. In particular in 2005 Ireland presents a bimodal distribution, the Modern Social Security System composite indicator ranks in 8th with more than 28% of observations. The median of the distribution confirms the position of the composite indicator. In 2006 Ireland improves its position ranking in 7th position, although the ranking variability is spread between the 4th and the 8th position. In 2007 the country falls in 4th position.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank
IE	1	2	3	4	5	6	7	8
2005			0.22%	7.10%	7.95%	30.29%	16.57%	***28.58%***
2006			9.18%	34.02%	10.20%	8.85%	**15.64%**	*13.95%*
2007	15.90%	46.33%	*18.14%*	**13.51%**				

The performance of Ireland is mainly driven by top performances in the dimensions of "*Net replacement rate after 6, 12 months – Single*" where the country held the 3rd position across the three years. A good performance is also recorded for the dimension of "*Childcare services: 3 years to compulsory school age (1-29 hours)"* where Ireland achieved the 4th position. On the other hands the worst performance is reached in the dimension of "*Childcare 0-2 years (30 hours or more)*".

	2005	2006	2007
19m2	770.17	718.63	740.25
19a5	312.44	325.97	356.71
19a6	0.44	0.47	559.64
19m7_1	*500.97*	*570.77*	*625.17*
19m7_2	*656.09*	*688.50*	*791.80*
intrap_1	*800.62*	*834.10*	*862.66*
intrap_2	*813.77*	*829.93*	*881.45*
intrap_3	*422.86*	*453.86*	*455.78*
net_repla_1	779.41	823.53	852.94
net_repla_2	827.59	862.07	885.06
net_repla_3	*878.05*	*914.63*	*939.02*
net_repla_4	716.98	754.72	811.32
net_repla_5	857.14	876.19	904.76
net_repla_6	*857.14*	*876.19*	*904.76*
18m3_1	341.46	317.07	317.07
18m3_2	90.91	75.76	166.67
18m3_3	769.23	974.36	858.97
18m3_4	93.33	80.00	106.67
18m3_5	719.10	696.63	662.92
18m3_6	269.66	303.37	337.08



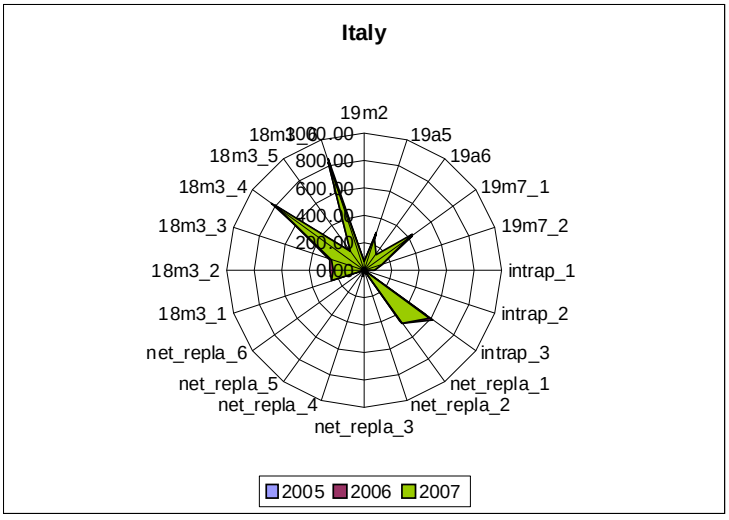
Italy

Italy is ranked between the 21st and the 24th position of the overall ranking across the three years and the frequencies of the simulations are spread among these values. In 2005 more than 90% of the observations are concentrated between the 23rd and the 25th position; the Modern Social Security System composite indicator falls in the 23rd as well the median of the distribution. In 2006 the country loses position ranking in the 24th position; the distribution across the 29400 different simulations is bimodal around the 24th and the 25th position. In 2007 Italy ranks in 24th position with more than 28% of the observations simulated among the 29400 different scenarios.

	Rank	Rank	Rank	Rank	Rank
IT	21	22	23	24	25
2005	2.30%	6.24%	***18.87%***	18.22%	47.20%
2006	12.59%	3.40%	3.74%	**37.63%**	*37.20%*
2007	14.96%	2.73%	8.16%	***28.58%***	41.84%

The best performance achieved by Italy is recorded for the dimensions of "*Childcare services: 3 years to compulsory school age (1-29 hours)*", where the country is ranked between the 2nd and 3rd position across 2005-2007, and for *Net replacement rate after 60 months - Single 67% AW"* and *Net replacement rate after 60 months 1 earner 2 children, 67% AW"*.
A bad performance is reached in the dimension of "*Inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, two-earner couple with 2 children)*" where the country is ranked between the 13th and the 15th position across the three years. On the other hand, the worst performance is achieved for the dimension of "*Net replacement rate after 6 months - Single 67% AW"*.

	2005	2006	2007
19m2	67.43	61.83	58.07
19a5	289.00	275.47	249.47
19a6	0.13	0.13	141.85
19m7_1	*356.51*	*431.68*	*436.72*
19m7_2	*134.45*	*132.95*	*126.85*
intrap_1	*34.88*	*70.94*	*73.36*
intrap_2	*5.52*	*0.00*	*4.07*
intrap_3	*562.36*	*617.59*	*596.07*
net_repla_1	455.88	470.59	470.59
net_repla_2	0.00	0.00	0.00
net_repla_3	*0.00*	*0.00*	*0.00*
net_repla_4	56.60	56.60	56.60
net_repla_5	0.00	0.00	0.00
net_repla_6	*0.00*	*0.00*	*0.00*
18m3_1	219.51	243.90	243.90
18m3_2	242.42	242.42	227.27
18m3_3	217.95	256.41	243.59
18m3_4	840.00	786.67	800.00
18m3_5	146.07	168.54	168.54
18m3_6	853.93	831.46	831.46



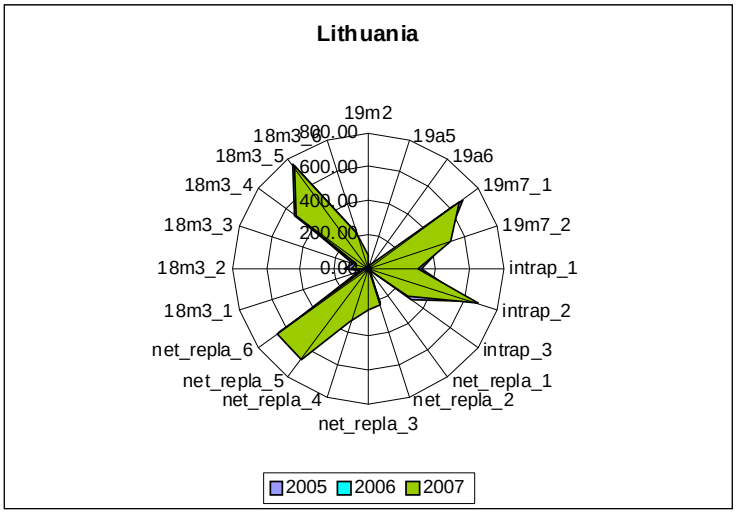
Lithuania

Lithuania is ranked between the 21st and the 22nd position of the overall ranking across the three years. The performance of Lithuania is robust in the uncertainty analysis and the position of the countries varies from position 21st to 23rd and the frequencies of the simulations are spread among these three values. In particular in 2005 the country ranks in 22nd position with more than 73% of the observations simulated across the 294000 different scenarios, the mode and the median falls both in the position of the composite indicator. In 2006 Lithuania gains one position ranking in 21st with more than 66% of the observations. The situation does not change in 2007 where the country confirms the ranking.

	Rank		Rank		Rank
LT	21	22	23	24	25
2005	8.93%	***73.48%***	14.99%	0.68%	
2006	***66.67%***	25.85%	5.10%	1.36%	1.02%
2007	***63.34%***	20.28%	10.63%	5.75%	

Lithuania performs not well in many of the basic indicators of the Modern Social Security System composite indicator. Although the best result of Lithuania is achieved for the basic indicator of "*Childcare services: Compulsory school age - 12 years (1-29 hours)*" where the country is 6th in the overall ranking across the three years. A good performance is achieved by Lithuania in the dimension of "*Inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, two-earner couple with 2 children)*" and "*Net replacement rate after 60 months - 1 earner 2 children, 67% AW*". On the other hand the worst performance is achieved for the dimension of "*Percentage of persons wanting to work receiving out-of-work income support"*

	2005	2006	2007
19m2	6.23	31.05	76.46
19a5	13.53	20.29	18.38
19a6	0.00	0.01	36.38
19m7_1	*689.16*	*633.58*	*661.89*
19m7_2	*481.33*	*456.05*	*513.79*
intrap_1	*311.48*	*283.91*	*297.27*
intrap_2	*633.01*	*654.03*	*684.42*
intrap_3	*318.52*	*274.08*	*288.22*
net_repla_1	0.00	0.00	14.71
net_repla_2	218.39	218.39	229.89
net_repla_3	*231.71*	*231.71*	*243.90*
net_repla_4	264.15	301.89	339.62
net_repla_5	628.57	647.62	666.67
net_repla_6	*628.57*	*647.62*	*666.67*
18m3_1	48.78	0.00	24.39
18m3_2	136.36	60.61	98.48
18m3_3	89.74	64.10	76.92
18m3_4	520.00	533.33	526.67
18m3_5	741.57	752.81	747.19
18m3_6	224.72	224.72	224.72



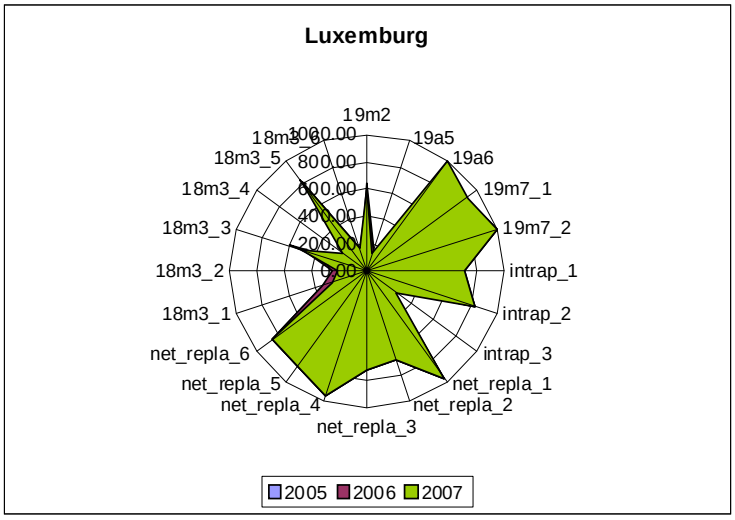
Luxemburg

Luxemburg shows a good performance of the overall ranking of the Modern Social Security System composite indicator across the three years. On overall the uncertainty analysis is not very stable and it is spread from the 4th to the 10th position, this is mainly due to the missing imputation. In particular in 2005 the country ranks the 9th position with more than 17% of the observations. The median falls in the position of the composite indicator, whereas the mode held the 4th position. In 2006 the country still maintains the 9th position while in 2007 the ranking is sensibly improved and the position of Luxemburg falls in the 5th with more than 17% of the observations out of 29400 different scenarios simulated.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank
LU	3	4	5	6	7	8	9	10
2005	2.10%	21.46%	13.68%	5.01%	7.86%	19.51%	***17.19%***	11.81%
2006	0.34%	3.06%	26.89%	*17.11%*	10.87%	11.12%	**21.46%**	7.85%
2007	29.78%	29.61%	***17.82%***					

The performance of Luxembourg is mainly driven by top performances in the dimensions of "*Expenditure on out-of-work income maintenance per person wanting to work*" which leads the country in 1st position in 2007 but in 2006 and 2005 falls dramatically in the last position. Good performances are recorded for "Net replacement rate after 6 months - Single 67% AW" and for "Net replacement rate after 6 months - 1 earner 2 children, 67% AW" where the country is respectively 2nd and 3rd across the three years. On the other hand the worst performance is achieved in the dimension of "*Expenditure on out-of-work income maintenance (% of GDP)*" and in the dimension of "*Unemployment trap: Marginal effective tax rate for an unemployed person (67% AW, one-earner couple with 2 children)*".

	2005	2006	2007
19m2	640.79	532.06	603.55
19a5	175.83	155.09	136.71
19a6	0.94	0.82	1000.00
19m7_1	*897.51*	*901.44*	*910.72*
19m7_2	*1000.00*	*1000.00*	*1000.00*
intrap_1	*710.71*	*707.59*	*716.02*
intrap_2	*833.34*	*835.54*	*835.45*
intrap_3	*235.85*	*235.28*	*267.99*
net_repla_1	970.59	970.59	970.59
net_repla_2	678.16	678.16	678.16
net_repla_3	*719.51*	*719.51*	*719.51*
net_repla_4	962.26	962.26	962.26
net_repla_5	857.14	857.14	857.14
net_repla_6	*857.14*	*857.14*	*857.14*
18m3_1	341.46	341.46	268.29
18m3_2	121.21	257.58	212.12
18m3_3	602.56	487.18	500.00
18m3_4	66.67	120.00	213.33
18m3_5	831.46	797.75	808.99
18m3_6	134.83	179.78	179.78



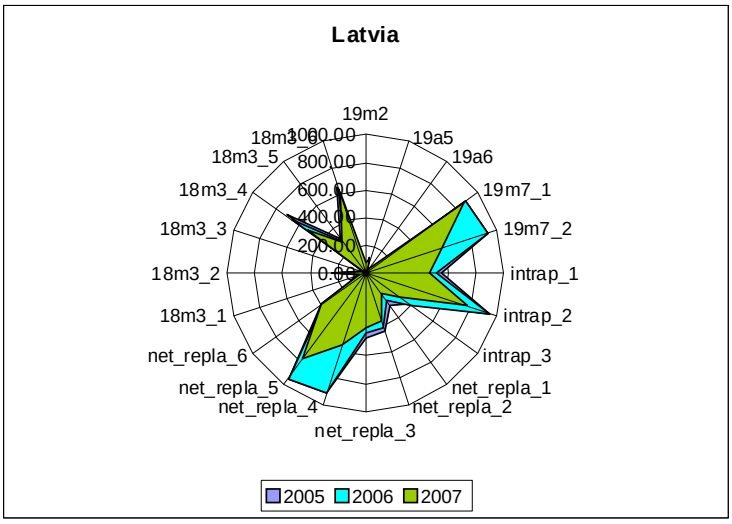
Latvia

The performance of Latvia is not good and the country is ranked between the 13th and the 19th position of the overall ranking, in line with the performances of the rest of the Eastern European Countries. In particular in 2005 the country ranks the 13th position with more than 24% of the observations out of the 29400 different scenarios simulated. In 2006 Latvia worsens its position falling in the 14th. The mode ranks the 16th position while the median falls in the 13th. In both years the ranking is spread between the 13th and the 17th position. In 2007 the country ranks the 19th position with more than 32% of the observations. On overall the ranking is not very stable as emerged from the uncertainty analysis; this is due mainly to the imputation of missing data.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank
LV	13	14	15	16	17	18	19	20
2005	**24.19%**	*21.05%*	23.38%	13.31%	2.05%	0.06%		
2006	*17.32%*	**16.32%**	21.78%	24.17%	10.20%	6.48%	0.68%	
2007				3.06%	5.79%	14.24%	***32.38%***	44.54%

Latvia best performance is achieved in 2006 for the dimensions of "*Net replacement rate after 6, 12 months - 1 earner 2 children*" where the country ranks the 2nd position and for the dimension of "*Inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, two-earner couple with 2 children)*". A bad performance is recorded for the dimension of "*Unemployment trap: Marginal effective tax rate for an unemployed person (67% AW, single person)*" and "*Unemployment trap: Marginal effective tax rate for an unemployed person (67% AW, one-earner couple with 2 children)*". On the Other hand a worst position is achieved in the dimension of "*Percentage of persons wanting to work receiving out-of-work income support*" and "*Expenditure on out-of-work income maintenance (% of GDP)*".

	2005	2006	2007
19m2	47.11	56.10	80.57
19a5	112.26	101.89	108.34
19a6	0.01	0.01	36.05
19m7_1	*897.07*	*896.75*	*872.64*
19m7_2	*926.83*	*926.83*	*577.84*
intrap_1	*547.07*	*516.70*	*467.31*
intrap_2	*948.79*	*948.79*	*774.74*
intrap_3	*384.49*	*404.52*	*300.36*
net_repla_1	294.12	250.00	191.18
net_repla_2	448.28	413.79	367.82
net_repla_3	*475.61*	*439.02*	*390.24*
net_repla_4	905.66	905.66	547.17
net_repla_5	952.38	952.38	771.43
net_repla_6	*390.48*	*380.95*	*390.48*
18m3_1	48.78	48.78	48.78
18m3_2	242.42	212.12	212.12
18m3_3	25.64	0.00	25.64
18m3_4	706.67	653.33	520.00
18m3_5	303.37	269.66	280.90
18m3_6	651.69	640.45	606.74



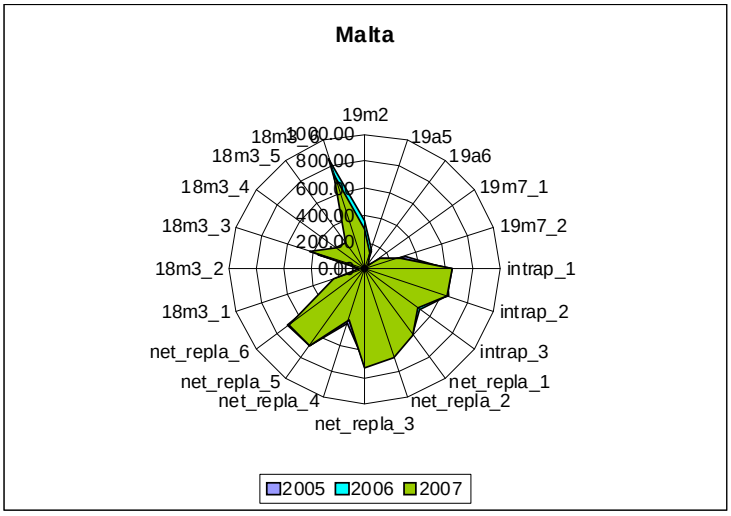
Malta

Malta shows a not very good performance of the overall ranking of the Modern Social Security System composite indicator across the three years. The uncertainty analysis confirms the stability of the ranking in the three years. In particular in 2005 the country ranks the 18th position with 16% of the observations simulated out of 29400 different scenarios; whereas the uncertainty analysis ranks the country in 19th position. In 2006 the country improve its position ranking the 17th position with more than 49% of the observations, whereas in 2007 Malta falls in 16th with 18% of the observations simulated. The median falls in the 18th position while the median in the 17th.

	Rank	Rank	Rank	Rank	Rank
MT	15	16	17	18	19
2005	0.06%	0.37%	4.86%	**16.07%**	*69.87%*
2006	3.74%	17.70%	**49.97%**	*26.88%*	1.36%
2007	5.23%	**18.24%**	42.86%	*21.09%*	

The performance of Malta is driven by the good performance in the dimension of "*Childcare services: compulsory school age - 12 years (30 hours or more)*" where the country is 4th across the three years. A good performance is achieved also in the dimension of "*Net replacement rate after 12 months - Single 67% AW*" where Malta falls in 8th positions of the overall ranking in the three years. On the other hands the worst performance is recorded in the dimensions of "*Expenditure on out-of-work income maintenance (% of GDP)*"and "*Expenditure on out-of-work income maintenance per person wanting to work*".

	2005	2006	2007
19m2	333.52	364.02	303.01
19a5	140.56	150.14	130.99
19a6	17.07	0.07	34.06
19m7_1	*69.14*	*144.29*	*144.80*
19m7_2	*318.96*	*282.20*	*281.18*
intrap_1	*602.09*	*637.83*	*637.88*
intrap_2	*651.98*	*633.42*	*632.77*
intrap_3	*454.13*	*500.85*	*481.43*
net_repla_1	558.82	588.24	602.94
net_repla_2	655.17	678.16	689.66
net_repla_3	*695.12*	*719.51*	*731.71*
net_repla_4	415.09	396.23	396.23
net_repla_5	704.76	695.24	695.24
net_repla_6	*704.76*	*695.24*	*695.24*
18m3_1	121.95	121.95	243.90
18m3_2	0.00	45.45	45.45
18m3_3	358.97	358.97	435.90
18m3_4	213.33	240.00	266.67
18m3_5	213.48	101.12	235.96
18m3_6	764.04	865.17	741.57



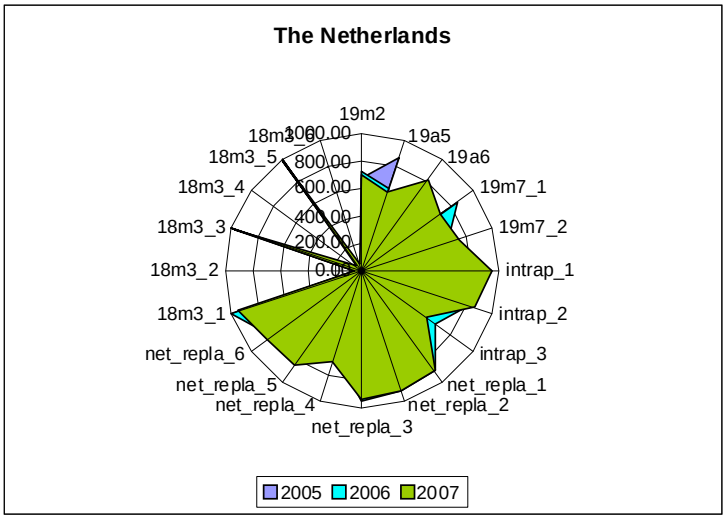
The Netherlands

The Netherlands is one of the top performers of the overall ranking of the Modern Social Security System composite indicator across the three years. On the overall ranking the country varies the ranks between the 1st to the 3rd position. In 2005 the Netherlands ranks the 3rd position with more than 50% of the observations simulated out of 29400 different scenarios. The ranking is not very stable; median falls in 7th position while the mode confirms the position of the composite indicator. In 2006 the ranking becomes very stable with more than 42% of the observation in the 3dr position which confirms the position of the composite indicator in the previous year. The performance in 2007 is even better; the country ranks between the 1st and the 2nd position with more than 80% of the observation simulated.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank
NL	1	2	3	4	5	6	7
2005	0.54%	8.40%	**50.60%**	10.20%	3.73%	0.88%	*11.03%*
2006	0.34%	*20.41%*	**42.53%**	8.86%	0.66%	7.14%	3.42%
2007	*67.04%*	**15.89%**	4.96%				

The best performance achieved by the Netherlands is recorded for the dimensions of *Childcare services: 3 years to compulsory school age(1-29 hours)*" and "*Childcare services: compulsory school age - 12 years (1-29 hours)*" where the country is 1st . A good performance is recorded in the dimension of "*Expenditure on out-of-work income maintenance (% of GDP)*" where the country reaches the 4th position in 2005. On the other hand, the Netherlands worst performance is achieved for the dimensions of "*Expenditure on out-of-work income maintenance per person wanting to work*" in 2005 and 2006.

	2005	2006	2007
19m2	672.99	722.54	693.87
19a5	870.60	626.69	603.07
19a6	0.83	0.82	812.34
19m7_1	*771.86*	*855.13*	*707.62*
19m7_2	*695.78*	*653.53*	*740.02*
intrap_1	*922.77*	*951.82*	*940.53*
intrap_2	*819.42*	*826.48*	*866.20*
intrap_3	*581.29*	*654.11*	*580.60*
net_repla_1	838.24	897.06	897.06
net_repla_2	873.56	919.54	919.54
net_repla_3	*914.63*	*951.22*	*939.02*
net_repla_4	660.38	622.64	698.11
net_repla_5	828.57	809.52	847.62
net_repla_6	*809.52*	*819.05*	*857.14*
18m3_1	878.05	1000.00	951.22
18m3_2	60.61	60.61	60.61
18m3_3	1000.00	1000.00	974.36
18m3_4	0.00	0.00	53.33
18m3_5	1000.00	988.76	955.06
18m3_6	0.00	11.24	44.94



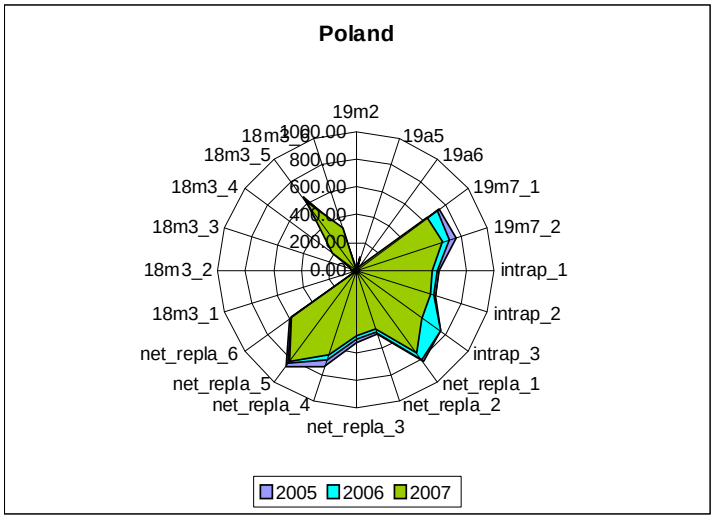
Poland

Across the three years the performance of Poland is not very good on the overall ranking of the Modern Social Security System composite indicator. In particular in 2005 Poland falls in the 17th position with more than 36% of the observations, the median falls in the 18th and the mode confirms the position of the composite indicator. In 2006 Poland loses one position ranking in 18th with almost 25% of the observations concentrated in this position. The worst performance is achieved in 2007 where the country ranks the 20th position.

	Rank	Rank	Rank	Rank	Rank	Rank
PL	16	17	18	19	20	21
2005	25.45%	**36.62%**	*26.31%*	5.05%	0.50%	
2006	13.56%	*21.14%*	**24.83%**	12.59%	27.89%	
2007		11.90%	*27.93%*	16.61%	**39.14%**	3.74%

The best performance achieved by Poland is recorded for the dimensions of" *Net replacement rate after 12 months - 1 earner 2 children, 67% AW*" where the country is 5th across the three years. A good performance is achieved in the dimension of "*Net replacement rate after 6 months - Single 67% AW*" where the country reaches the 3rd position. On the other hands the worst performance is achieved for the dimensions of "*Expenditure on out-of-work income maintenance (% of GDP)*".

	2005	2006	2007
19m2	10.55	0.00	0.41
19a5	103.70	83.41	49.17
19a6	0.01	0.01	20.40
19m7_1	*748.99*	*736.12*	*637.57*
19m7_2	*766.49*	*704.10*	*657.92*
intrap_1	*602.87*	*589.12*	*548.69*
intrap_2	*603.15*	*595.72*	*566.86*
intrap_3	*752.27*	*752.55*	*596.87*
net_repla_1	823.53	808.82	750.00
net_repla_2	494.25	471.26	448.28
net_repla_3	*524.39*	*500.00*	*475.61*
net_repla_4	735.85	679.25	641.51
net_repla_5	866.67	838.10	819.05
net_repla_6	*590.48*	*580.95*	*580.95*
18m3_1	0.00	0.00	0.00
18m3_2	30.30	30.30	30.30
18m3_3	51.28	38.46	51.28
18m3_4	200.00	186.67	213.33
18m3_5	651.69	617.98	606.74
18m3_6	303.37	314.61	325.84



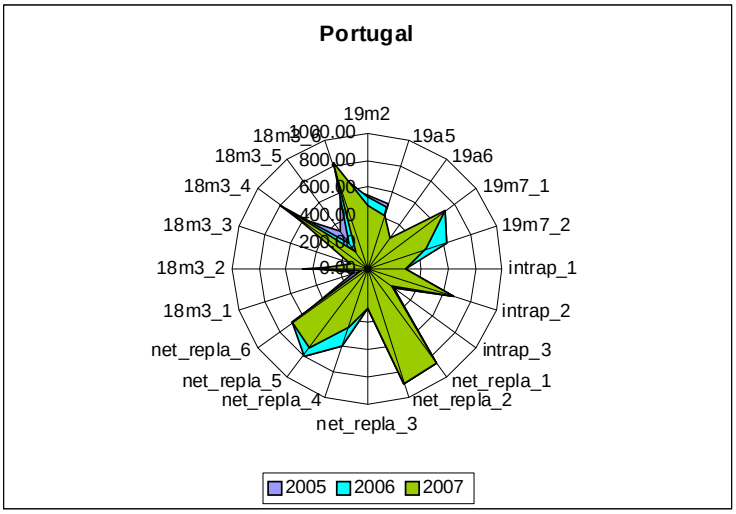
Portugal

Portugal is ranked between the 10th and the 11th position of the overall ranking of the Modern Social Security System composite indicator across the three years. In particular in 2005 the country ranks the 11th position with more than 30% of the observations out of the 29400 different scenarios simulated. The median falls in the 13th position, while the mode confirms the position of the composite indicator. In 2005 the country improves its position ranking in 10th. In 2007 Portugal confirms the position of 2005 ranking the 11th position. On overall the uncertainty analysis shows certain variability spreading the ranking of Portugal between the 10th and the 15th position across the three years.

	Rank	Rank	Rank	Rank	Rank	Rank
PT	10	11	12	13	14	15
2005	9.73%	**30.88%**	10.54%	*15.52%*	16.99%	5.58%
2006	***13.19%***	30.02%	23.81%	10.89%	11.22%	3.07%
2007	2.04%	**23.13%**	15.65%	7.17%	*17.66%*	28.45%

Across the three years the performance of Portugal is good enough and it ranks in the middle position of the overall league. The best performance achieved by Portugal is recorded for the dimensions of "*Net replacement rate after 6, 12 and 60 months - Single 67% AW*" and "*Childcare services: compulsory school age - 12 years (30 hours or more)*" where the country is respectively 3rd and 4th across the three years. Performance is relatively bad in the dimension of "*Unemployment trap: Marginal effective tax rate for an unemployed person (67% AW, single person)*" where the country has the 5th position and "*Unemployment trap: Marginal effective tax rate for an unemployed person (67% AW, two-earner couple with 2 children)*" where the country ranks the 8th position in 2006. On the other hand Portugal worst performance is achieved for the dimensions of "*Expenditure on out-of-work income maintenance per person wanting to work*"

	2005	2006	2007
19m2	540.14	533.77	464.93
19a5	504.06	470.69	410.88
19a6	0.31	0.30	278.61
19m7_1	*710.62*	*718.43*	*718.23*
19m7_2	*622.90*	*623.20*	*464.12*
intrap_1	*274.13*	*278.89*	*281.11*
intrap_2	*668.32*	*671.61*	*673.44*
intrap_3	*233.87*	*241.44*	*232.94*
net_repla_1	867.65	867.65	867.65
net_repla_2	896.55	896.55	896.55
net_repla_3	*292.68*	*292.68*	*292.68*
net_repla_4	603.77	603.77	452.83
net_repla_5	800.00	800.00	723.81
net_repla_6	*676.19*	*685.71*	*685.71*
18m3_1	97.56	24.39	48.78
18m3_2	393.94	484.85	378.79
18m3_3	64.10	64.10	128.21
18m3_4	640.00	786.67	720.00
18m3_5	337.08	235.96	146.07
18m3_6	651.69	752.81	820.22



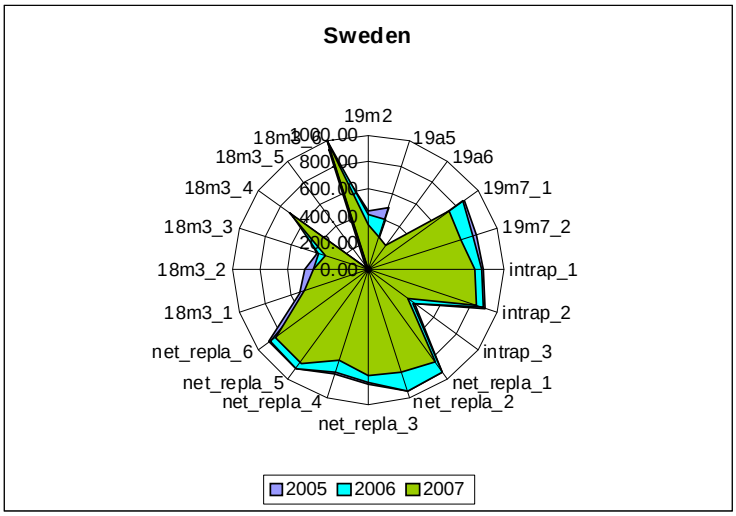
Sweden

The performance of Sweden is one of the top performances of the overall ranking of the Modern Social Security System composite indicator across the three years. As the uncertainty analysis shows the ranking of Sweden is spread between the 1st and the 3rd position in 2005-2006, whereas 2007 present higher variability. In particular in 2005 the country ranks in 2nd position with more than 63% of the observations simulated out of 29400 different scenarios, the median and the mode confirm both the position of the composite indicator. In 2006 the country confirms the 2nd position with more than 57% of the observations, mode and median still fall in the position of the composite indicator. In 2007 the country loses different position falling in the 7th. The ranking is not very stable as the uncertainty analysis shows, mainly due to missing data.

	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank	Rank
SE	1	2	3	4	5	6	7	8	9
2005	22.00%	***63.53%***	13.65%	0.79%	0.03%				
2006	10.54%	*57.46%*	29.61%	1.70%					
2007			3.96%	7.14%	5.45%	29.44%	**8.31%**	*15.65%*	22.11%

The good performance of Sweden is driven by the dimension of "*Childcare services: compulsory school age - 12 years (30 hours or more)*" where the country is 1st and the dimensions of "*Net replacement rate after 6, 12 months - 1 earner 2 children, 67% AW*" where the country is 2nd. A good performance is also achieved by the dimension of "*Childcare services: 3 years to compulsory school age (30 hours or more)*" where the country is 2nd. On the other hand the worst performance is achieved in the dimension of "*Expenditure on out-of-work income maintenance per person wanting to work*".

	2005	2006	2007
19m2	431.01	405.53	334.44
19a5	493.69	398.11	264.84
19a6	0.30	0.27	227.83
19m7_1	*875.85*	*872.32*	*733.46*
19m7_2	*841.61*	*815.94*	*719.23*
intrap_1	*856.09*	*843.37*	*787.53*
intrap_2	*906.29*	*893.49*	*845.26*
intrap_3	*427.04*	*413.94*	*359.85*
net_repla_1	926.47	926.47	838.24
net_repla_2	942.53	942.53	793.10
net_repla_3	*841.46*	*829.27*	*780.49*
net_repla_4	811.32	792.45	698.11
net_repla_5	904.76	895.24	847.62
net_repla_6	*904.76*	*895.24*	*847.62*
18m3_1	536.59	414.63	487.80
18m3_2	469.70	409.09	409.09
18m3_3	397.44	384.62	333.33
18m3_4	600.00	680.00	720.00
18m3_5	11.24	0.00	0.00
18m3_6	943.82	1000.00	1000.00



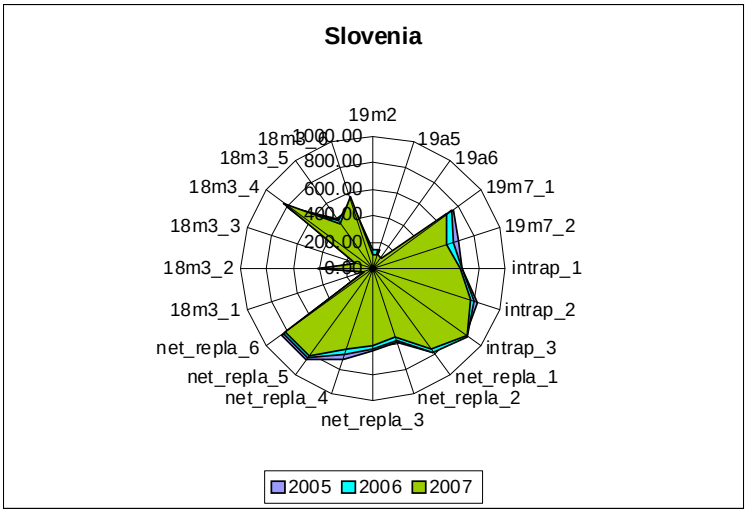
Slovenia

Slovenia performance is quite good especially compared with the other performances of the Eastern European Member States. In particular in 2005 the country ranks the 10th position with more than 35% of the observations, the median falls in the 11th position and the mode confirms the position of the composite indicator. In 2006Slovenia loses one position falling in the 11th with more than 36% of their observations simulated. In 2007 the country gains the position lost in 2006 ranking the 10th position. The median falls in the 11th position whereas the mode confirms the position of the Modern Social Security System composite indicator.

	Rank	Rank	Rank	Rank	Rank
SI	8	9	10	11	12
2005	10.19%	17.38%	**35.15%**	*20.80%*	9.71%
2006	3.44%	12.20%	39.07%	***36.81%***	1.03%
2007		2.72%	**41.50%**	*31.93%*	15.43%

The best performance achieved by Slovenia is recorded for the dimensions of "*Net replacement rate after 6 months - Single 67% AW*" where the country is 5th and in the dimension of "*Net replacement rate after 6 months - 1 earner 2 children, 67% AW*" where the country is 4th. A good performance is achieved in the dimension of "*Childcare service: 3 years to compulsory school age (30 hours or more)*" where the country is 8th across the three years. On the other hands the worst performance of the country is reached in the dimension of "*Expenditure on out-of-work income maintenance (% of GDP)*".

	2005	2006	2007
19m2	36.85	142.12	104.24
19a5	145.18	142.02	105.24
19a6	0.07	0.07	101.42
19m7_1	*746.05*	*736.21*	*690.26*
19m7_2	*680.16*	*640.13*	*586.11*
intrap_1	*678.73*	*672.31*	*651.91*
intrap_2	*825.77*	*805.81*	*778.87*
intrap_3	*860.01*	*875.65*	*871.58*
net_repla_1	779.41	779.41	750.00
net_repla_2	586.21	574.71	551.72
net_repla_3	*621.95*	*609.76*	*585.37*
net_repla_4	716.98	679.25	641.51
net_repla_5	857.14	838.10	819.05
net_repla_6	*857.14*	*838.10*	*819.05*
18m3_1	48.78	73.17	73.17
18m3_2	333.33	393.94	409.09
18m3_3	76.92	141.03	141.03
18m3_4	800.00	786.67	826.67
18m3_5	460.67	438.20	415.73
18m3_6	494.38	539.33	561.80



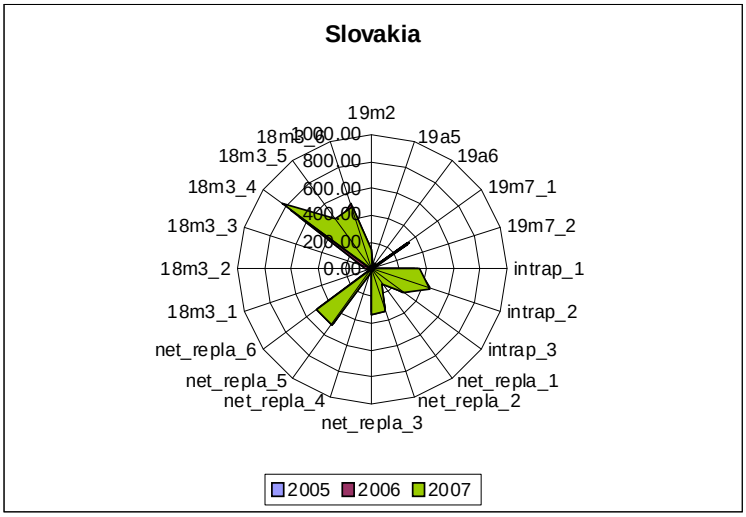
Slovakia

Across the three years Slovakia ranks between the 23rd and the 24th position. The ranking of Slovakia is quite robust in each year as shown from the uncertainty analysis. In particular in 2005 Slovakia ranks the 24th position with 16% of the observations. In 2006 the country ranks in 23rd position of the overall ranking of the Modern Social Security System composite indicator with more than 74% of the observations observed. The mode and the median fall both in the position of the composite indicator. In 2007 the country confirms the 23rd position as in 2006.

	Rank	Rank	Rank	Rank
SK	22	23	24	25
2005		59.86%	***16.53%***	23.61%
2006	12.24%	***74.84%***	10.20%	1.36%
2007	2.28%	***74.23%***	23.49%	

The best performance achieved by Slovakia is recorded for the dimensions of "*Childcare services: 3 years to compulsory school age (30 hours or more)*" where the country is 18th. A bad performance is achieved in the dimension of "*Inactivity trap (low wage-earner): Marginal effective tax rate when moving from social assistance to work (67% AW, one-earner couple with 2 children)*" whereas the worst performance is recorded in the dimension of "*Expenditure on out-of-work income maintenance (% of GDP)*"

	2005	2006	2007
19m2	10.43	148.45	143.46
19a5	43.73	20.74	7.42
19a6	0.00	0.00	18.36
19m7_1	*320.05*	*325.45*	*333.80*
19m7_2	*9.52*	*0.00*	*9.14*
intrap_1	*312.82*	*340.44*	*345.84*
intrap_2	*441.48*	*450.35*	*455.21*
intrap_3	*283.84*	*287.00*	*296.97*
net_repla_1	102.94	132.35	132.35
net_repla_2	298.85	321.84	321.84
net_repla_3	*317.07*	*341.46*	*341.46*
net_repla_4	0.00	18.87	18.87
net_repla_5	495.24	504.76	504.76
net_repla_6	*495.24*	*504.76*	*504.76*
18m3_1	0.00	24.39	24.39
18m3_2	45.45	60.61	15.15
18m3_3	76.92	76.92	25.64
18m3_4	666.67	746.67	826.67
18m3_5	438.20	426.97	460.67
18m3_6	370.79	516.85	483.15



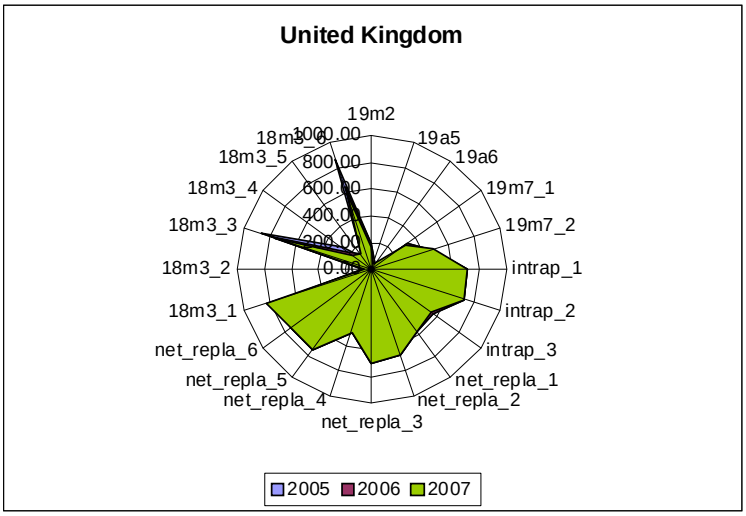
United Kingdom

The performance of United Kingdom is good enough on the overall ranking of the Modern Social Security System composite indicator across the three years. In particular in 2005 the country ranks the 14th position with 18%of the observations. The ranking is not very stable as the uncertainty analysis shows where the median falls in the 13th position and the mode in the 12th. In 2006 the country ranks the 15th position with more than 21%of the observations simulated. The median confirms the position of the composite indicator. In 2007 the country maintains the 15th position with more than 43% of the observations simulated out of 29400 different scenarios simulated.

	Rank	Rank	Rank	Rank
UK	12	13	14	15
2005	38.59%	*27.26%*	**18.31%**	4.46%
2006	27.21%	24.82%	17.36%	***21.08%***
2007	2.72%	*34.03%*	12.23%	**43.53%**

The best performance achieved by United Kingdom is recorded for the dimensions of "*Childcare services: 3 years to compulsory school age (1-29 hours)*" where the country is 5th. A good performance is also achieved in the dimension of "*Childcare services: Compulsory school age - 12 years (30 hours or more)"* where the country is 4th. On the other hands the worst performance of United Kingdom is recorded in the dimension n of "*Expenditure on out-of-work income maintenance (% of GDP)*".

	2005	2006	2007
19m2	193.17	191.76	161.35
19a5	50.05	50.50	37.95
19a6	0.05	0.05	58.93
19m7_1	*321.88*	*317.94*	*314.26*
19m7_2	*471.45*	*475.51*	*481.05*
intrap_1	*714.72*	*712.82*	*711.06*
intrap_2	*721.69*	*723.71*	*726.47*
intrap_3	*559.65*	*555.11*	*547.83*
net_repla_1	573.53	573.53	573.53
net_repla_2	666.67	666.67	666.67
net_repla_3	*707.32*	*707.32*	*707.32*
net_repla_4	490.57	490.57	490.57
net_repla_5	742.86	742.86	742.86
net_repla_6	*742.86*	*742.86*	*742.86*
18m3_1	585.37	682.93	829.27
18m3_2	75.76	75.76	60.61
18m3_3	871.79	782.05	756.41
18m3_4	280.00	226.67	186.67
18m3_5	112.36	146.07	146.07
18m3_6	865.17	640.45	595.51



ANNEX 2: UNCERTAINTY AND SENSITIVITY ANALYSIS

Composite indicators may send misleading, non-robust policy messages if they are poorly constructed or misinterpreted. In fact, the construction of composite indicators involves stages where judgment has to be made: the selection of sub-indicators, the choice of a conceptual model, the weighting of indicators, the treatment of missing values etc. All these sources of subjective judgment will affect the message brought by the CI's in a way that deserve analysis and corroboration. A combination of uncertainty and sensitivity analysis can help to gauge the robustness of the composite indicator, to increase its transparency and to help framing a debate around it.

General procedures to assess uncertainty in the MSS composite indicators building are in this section applied and analyzed. In particular, five main sources of uncertainty can be highlighted and their combined effect on country rankings needs to be tested:

1) Data Normalization
2) Weighting Scheme
3) Composite Indicator Formula (Aggregation Rule)
4) Inclusion/Exclusion of Basic Indicators
5) Imputation of Missing Data via MCMC.

Two combined tools are suggested to assess the uncertainty in the MSS Composite Indicator: Uncertainty Analysis (UA) and Sensitivity Analysis (SA). UA focuses on how uncertainty in the input factors propagates through the structure of the composite indicator and affects the composite indicator values. SA studies how much each individual source of uncertainty contributes to the output variance.

In the field of building composite indicators, UA is more often adopted than SA (Jamison and Sandbu, 2001; Freudenberg, 2003) and the two types of analysis are almost always treated separately. A synergistic use of UA and SA is proposed and presented here, considerably extending earlier attempts in this direction (Tarantola et al., 2000).

With reference to the uncertainty sources (1 to 5 above), the approach taken to propagate uncertainties could include in theory all of the steps below:

1) Inclusion-Exclusion of basic indicators
2) Using alternative data normalization schemes, such as rescaling, standardization, use of raw data.
3) Using several weighting schemes, i.e. Equal Weights, predetermined set of weights, Principal Components weights, Data envelopment analysis weights.
4) Using several aggregation systems, i.e. linear, another based on geometric mean of un-scaled variable.
5) Testing different set of missing data randomly simulated

General Framework of the Analysis

As described above, we shall frame the analysis as a single Monte Carlo experiment, e.g. by plugging all uncertainty sources simultaneously, as to capture all possible synergistic effects among uncertain input factors. This will involve the use of triggers, e.g. the use of uncertain input factors used to decide e.g. which aggregation system and weighting scheme to adopt. To stay with the example, a discrete uncertain factor which can take integer values between 1 and 3 will be used to decide upon the aggregation system and another also varying in the same range for the weighting scheme. Other trigger factors will be generated to select which indicators to omit, the aggregation rule, the normalization scheme and so on. Below, the sources of uncertainty affecting the MSS composite indicator are analyzed.

Inclusion – exclusion of individual sub- indicators

No more than one indicator at a time is excluded for simplicity. A single random variable is used to decide if any indicator will be omitted and which one. Note that an indicator can also be practically neglected as a result of the weight assignment procedure. Although this is not the case of the MSS composite indicator, for instance imagine a very low weight is assigned by an expert to a sub-indicator q . Every time we select that expert in a run of the Monte Carlo simulation, the relative sub-indicator q will be almost neglected for that run.

Normalization

As described in (Nardo et al. 2005) several methods are available to normalise sub-indicators. The methods that are most frequently met in the literature are based on the re-scaled values or on the standardized values or on the raw indicator values. In the robustness assessment of the MSS composite indicator the Z-score standardization, the Min-Max standardization and the Ranking-based standardization are applied. These three methods are shortly described below.

The Min-Max Standardization

The basic standardization technique that has been applied is the Min-Max approach. Each indicator, q, was standardized based on the following rule:

$$I^{t}_{qc} = \frac{x^{t}_{qc} - \min_c(x_q^{2005-2007})}{\max_c(x_q^{2005-2007}) - \min_c(x_q^{2005-2007})} \cdot 1000 \quad .$$

Using this method, all indicators have been rescaled in such a way as to lie between 0 (laggard $x_{qc}=\min_c(x^{2005\text{-}2007}_q)$) and 1000 (leader, $x_{qc}=\max_c(x^{2005\text{-}2007}_q)$).

Where $\max_c(x^{2005\text{-}2007}{}_q)$ and $\min_c(x^{2005\text{-}2007}{}_q)$ are respectively the maximum and the minimum value of the indicator over all countries and years considered.

Standardisation (or Z-scores)

For each sub-indicator $x_{qc}^{2005-2007}$, the average across countries $\bar{x}_{qc}^{2005-2007}$ and the standard deviation across countries $\sigma_{x_{qc}}^{2005-2007}$ are calculated. The normalization formula is:

$$I_{qc}^{2005-2007} = \frac{x_{qc}^{2005-2007} - \bar{x}_{qc}^{2005-2007}}{\sigma_{x_{qc}}^{2005-2007}},$$

So that all the y_{mn} have similar dispersion across countries. This approach converts all indicators to a common scale with an average of zero and standard deviation of one, yet the actual minima and maxima of the standardized values across countries vary among the sub-indicators.

Ranking of indicators across countries

The simplest normalization method consists in ranking each indicator across countries. The main advantages of this approach are its simplicity and the independence to outliers. Disadvantages are the loss of information on absolute levels and the impossibility to draw any conclusion about difference in performance.

$$I_{qc}^{2005-2007} = Rank(x_{qc}^{2005-2007})$$

Weighting Scheme

Central to the construction of a composite index is the need to combine in a meaningful way different dimensions measured on different scales. This implies a decision on which weighting model will be used and which procedure will be applied to aggregate the information.

Addressing the reader to (Nardo et al. 2005) for an exhaustive list of weighting schemes, in the robustness analysis of MSS composite indicator, three different weighting schemes are adopted and described below.

Equal Weights

In many composite indicators all variables are given the same weight when there are no statistical or empirical grounds for choosing a different scheme. Equal weighting (EW) could imply the recognition of an equal status for all sub-indicators (e.g. when policy assessments are involved).

Alternatively, it could be the result of insufficient knowledge of causal relationships, or ignorance about the correct model to apply (like in the case of Environmental Sustainability Index – World economic forum, 2002), or even

stem from the lack of consensus on alternative solutions (as happened with the Summary Innovation Index - European Commission, 2001a). In any case, EW does not mean any weighting, because EW anyway implies an implicit judgment on the weights being equal. The effect of EW also depends on how component indicators are divided into categories or groups: weighting equally categories regrouping a different number of sub-indicator could disguise different weights applied to each single sub-indicator.

Factor Analysis Weights

Principal component analysis (PCA) and more specifically factor analysis (FA) group together sub-indicators that are collinear to form a composite indicator capable of capturing as much of common information of those sub-indicators as possible. The information must be comparable for this approach to be used: sub-indicators must have the same unit of measurement. Each factor (usually estimated using principal components analysis) reveals the set of indicators having the highest association with it. The idea under PCA/FA is to account for the highest possible variation in the indicators set using the smallest possible number of factors. Therefore, the composite no longer depends upon the dimensionality of the dataset but it is rather based on the "statistical" dimensions of the data. According to PCA/FA, weighting only intervenes to correct for the overlapping information of two or more correlated indicators, and it is not a measure of importance of the associated indicator. If no correlation between indicators is found, then weights can not be obtained estimated with this method. For methodological details we address the reader to (Nardo et al. 2005).

Data Envelopment Analysis, (DEA), Weights

Data envelopment analysis (DEA) employs linear programming tools (popular in Operative Research) to retrieve an efficiency frontier and uses this as benchmark to measure the performance of a given set of countries.17 The set of weighs stems from this comparison. Two main issues are involved in this methodology: the construction of a benchmark (the frontier) and the measurement of the distance between countries in a multi-dimensional framework.

The construction of the benchmark is done by some simple assumptions as: positive weights (the higher the value of one sub-indicator, the better for the corresponding country); non discrimination of countries that are best in any single dimension (i.e. sub indicator) thus ranking them equally; a linear combination of the best performers is feasible (convexity of the frontier). The distance of each country with respect to the benchmark is determined by the location of the country and its position relative to the frontier. The countries supporting the frontier are classified as the best performing, other countries are then ordered according to the distance with respect to the benchmark. For methodological details we address the reader to (Nardo et al. 2005).

The benchmark could also be determined by a hypothetical decision maker (Korhonen et al. 2001, for an indicator of performance of academic research) who is asked to locate the target in the efficiency frontier having the most preferred combination of sub-indicators. In this case the DEA approach could merge with the budget allocation method (see below) since experts are asked to assign weights (i.e. priorities) to sub-indicators.

Aggregation Rules

The literature of composite indicators offers several examples of aggregation techniques. The most used are additive techniques that range from summing up country ranking in each sub indicator to aggregating weighted transformations of the original sub-indicators. However, additive aggregations imply requirements and properties, both of component sub-indicators and of the associated weights, which are often not desirable, at times difficult to meet or burdensome to verify. To overcome these difficulties the literature proposes other and less widespread, aggregation methods like multiplicative (or geometric) aggregations or non linear aggregations like the multi-criteria or the cluster analysis. For the MSS composite indicator we focus our attention on additive methods and geometric aggregation.

Additive methods

The simplest additive aggregation method entails the calculation of the ranking of each country according to each sub-indicator and the summation of resulting ranking (e.g. Information and Communication Technologies Index - Fagerberg J. 2001). By far the most widespread linear aggregation is the summation of weighted and normalized sub-indicators:

$$Y_c^t = \sum_{i=1}^{3} w_i \sum_{j=1}^{k_i} w_j^* I_{ijc}^t$$

Where t is the year of reference, w are the weights of the 3 dimensions, w^* are the weights of basic indicators within each dimension, I the basic indicators and c the country index.

Geometric aggregation

An undesirable feature of additive aggregations is the full compensability they imply: poor performance in some indicators can be compensated by sufficiently high values of other indicators. For example if a hypothetical composite were formed by inequality, environmental degradation, GDP per capita and unemployment, two countries, one with values 21, 1, 1, 1; and the other with 6,6,6,6 would have equal composite if the aggregation is additive. Obviously the two countries would represent very different social conditions that would not be reflected in the composite.

If multicriteria analysis entails full non-compensability, the use of a geometric aggregation (also called deprivational index) is an in-between solution.

$$Y_c^t = \prod_{i=1}^{3} \prod_{j=1}^{k} I_{ijc}^{t\ w_i w_j^*}$$

Where *t* is the year of reference, *w* are the weights of the 3 dimensions, w^* are the weights of basic indicators within each dimension, *I* the basic indicators and *c* the country index.

Uncertainty Analysis

All points showed above chain of composite indicator building can introduce uncertainty in the output variables Rank(I^t_c). Thus we shall translate all these uncertainties into a set of scalar input factors, to be sampled from their distributions. As a result, all outputs Rank(I^t_c) are non-linear functions of the uncertain input factors, and the estimation of the probability distribution functions (pdf) of Rank(I^t_c) is the purpose of the uncertainty analysis. The UA procedure is essentially based on simulations that are carried on the various equations that constitute our model. As the model is in fact a computer programme that implements different scenarios, the uncertainty analysis acts on a computational model. Various methods are available for evaluating output uncertainty.

In the following, the Monte Carlo approach is applied, which is based on performing multiple evaluations of the model with k randomly selected model input factors. The procedure involves different steps and we address the reader to (Nardo et al, 2005, Saltelli et al. 2000a, Saltelli et al. 2000b, Saltelli, A. 2002, Saltelli et al. 2008).

The selected random factors for which the uncertainty is assessed to the MSS composite indicator are four and are listed below in table 16:

Table 16 - Uncertainty factors for the MSS composite indicator

X_1	Standardization
1	Z-Score
2	Min-Max
3	Ranking across countries

X_2	Weighting Scheme
1	Equal Weight
2	Predetermined set of Weights
3	PCA weights
4	DEA weights

X_3	Aggregation Rule
1	Linear
2	Geometric
3	No further Aggregation (for DEA)

X_4	Excluded Sub-Indicator
1	Indicator 1 omitted
2	Indicator 2 omitted
3	Indicator 3 omitted
...	...
19	Indicator 19 omitted
20	Indicator 20 omitted

X_5	Imputation of Missing Data via MCMC
1	Sample 1 of the set of missing data randomly simulated.
2	Sample 2 of the set of missing data randomly simulated.
3	Sample 3 of the set of missing data randomly simulated.
…	...
100	Sample 100 of the set of missing data randomly simulated..

Where, trigger X_1 is used to select the standardization methods (Z-score, Min-Max, Ranking of Indicators across countries), trigger X_2 is used to select the weighting scheme (Equal weights, Predetermined set of weights, PCA weights, DEA weights).Then trigger X_3 is used to select the aggregation rule (linear/additive, geometric, no further aggregation (just in case of DEA). Trigger X_4 is generated to select which sub-indicator – if any, should be omitted. Finally, trigger X_5 is used to sample 100 set of missing data randomly simulated. Each input factor can be characterized by a probability density function; here we assume uniform distribution for the entire five input factors in order to do not penalize/reward any possible trigger modality.

After having generated the input factors distributions in step 1, we can now generate randomly N combinations of independent input factors X^i, i= l, 2 ,…,N where X^i is a set of outcomes of input factors, called a sample. For each trial sample $X^{l\backslash i}$ the computational model can be evaluated, generating values for the scalar output variable Y_l, where Y_l is the Rank(I^t_c) , the value of the rank assigned by the composite indicator to each country.

In the case of the uncertainty analysis of the MSS main composite indicator the total number of simulations performed is set equal to 29400, which correspond to the total exploration of all the possible combinations of the input factors.

The results of the uncertainty analysis are presented below. For every country the results of the distribution of the scores of the 29400 simulations are presented. The results of the simulations are organized in a frequency matrix and the overall MSS is calculated across the 29400 scenarios. Besides the frequency matrix, the median rank per country was selected in order to compare with the rank recorded in the MSS composite indicator.

On figures 3-7 the frequency distribution in all three years for all countries rank is presented and also the frequency distribution of the indicator for 2004 and for the second indicator for 2007. The frequencies of the main indicator 2005-2007 are estimated over the 29400 different scenarios, on the other hands the frequencies of the indicator for 2004 are based on 25200 different scenarios simulated, whereas the frequencies of the second indicator for 2007 are estimated on 35000 different scenarios. On table 18 an example of frequency distribution of a country rank over the 29400 scenarios is presented. A colour code is used to distinguish different frequencies as illustrated in table 17:

Table 17 - Colour Codes

	Frequency lower than 10%
	Frequency between 10% and 20%
	Frequency between 20% and 35%
	Frequency between 35% and 50%
	Frequency higher than 50%
bold	Position in the MSS composite indicator
Italic	median
Red	mode of the distribution

Moreover, **Bold**, *Italic* and Red represent the country rank in the MSS composite indicator, the median and the mode of the 29400 simulations, respectively. For example Sweden in 2005 has a distribution encoded as follows in table 18:

Table 18 – Frequencies of Sweden performance in the 29400 scenarios in 2005.

2005	1	2	3	4	5
SE	22.00%	***63.53%***	13.65%	0.79%	0.03%

This means that the country is ranked in positions 1st to 5th among the 29400 simulations performed. In particular, Sweden is ranked in position 5th and 4th with a frequency lower

than 10%, in position 3rd with a frequency between 10% and 20% , in position 2nd with a frequency higher than 50% and in position 1st with a between 20% and 35%. Position 2nd is the mode and also the position of the country in the composite indicator and the median.

In the following tables, the frequency matrices for the period 2005-2007 and for the single indicator for 2004 and for the second indicator for 2007 are presented. Due to the huge number of simulations performed, just frequencies higher than 5% are shown. Most countries show a slight degree of variability in their ranking, mainly as a result of imputation of missing data. The extent of such variability varies to some extent across countries.

Figure 3 - Uncertainty Analysis frequency matrix for 2005

2005	DK	SE	NL	BE	FI	DE	FR	IE	LU	SI	PT	CY	LV	UK	ES	AT	PL	MT	CZ	HU	EE	LT	IT	SK	GR
Rank 1	76.54%	22.00%	0.54%																						
Rank 2	22.03%	63.53%	8.40%	4.99%			0.45%																		
Rank 3	1.00%	13.65%	50.60%	15.39%	10.16%		6.88%	0.22%	2.10%																
Rank 4	0.05%	0.79%	10.20%	20.23%	22.97%		17.20%	7.10%	21.46%																
Rank 5	0.13%	0.03%	3.73%	13.21%	45.62%	5.00%	10.63%	7.95%	13.68%																
Rank 6			0.88%	4.54%	14.22%	15.44%	26.98%	30.29%	5.01%	2.05%	0.16%														
Rank 7			11.03%	6.24%	5.71%	16.58%	30.31%	16.57%	7.86%	2.45%	1.51%	1.74%													
Rank 8			0.68%	19.18%	0.38%	5.93%	7.18%	28.58%	19.51%	10.19%	3.44%	4.91%													
Rank 9			1.18%	3.20%		38.20%	0.37%	8.54%	17.19%	17.38%	5.66%	7.17%		0.33%	0.77%										
Rank 10			5.97%	7.26%		13.86%		0.59%	11.81%	35.15%	9.73%	11.24%		2.74%	1.65%										
Rank 11				5.18%		4.98%		0.17%	0.86%	20.80%	30.88%	18.03%	0.37%	6.50%	11.59%	0.63%									
Rank 12									0.41%	9.71%	10.54%	18.59%	15.57%	38.59%	3.26%	2.99%									
Rank 13									0.09%	1.88%	15.52%	11.07%	24.19%	27.26%	4.16%	15.17%									
Rank 14										0.39%	16.99%	8.23%	21.05%	18.31%	15.32%	17.94%	0.05%	0.04%							
Rank 15											5.58%	6.35%	23.38%	4.46%	16.88%	32.38%	6.02%	0.06%	1.11%						
Rank 16												10.11%	13.31%	1.82%	20.26%	22.58%	25.45%	0.37%	5.78%						
Rank 17												1.61%	2.05%		21.98%	7.90%	36.62%	4.86%	24.97%						
Rank 18												0.72%	0.06%		3.98%	0.28%	26.31%	16.07%	52.32%	0.09%	0.17%				
Rank 19												0.03%				0.13%	5.05%	69.87%	13.78%	7.63%	1.00%		2.38%		
Rank 20																	0.50%	6.01%	2.04%	39.71%	45.04%	1.92%	4.78%		
Rank 21																		2.68%		43.69%	42.41%	8.93%	2.30%		
Rank 22																		0.04%		8.89%	11.34%	73.49%	6.24%		
Rank 23																					0.03%	14.99%	18.87%	59.86%	6.24%
Rank 24																						0.68%	18.22%	16.53%	64.57%
Rank 25																							47.20%	23.61%	29.18%

Figure 4 - Uncertainty Analysis frequency matrix for 2006

2006	DK	SE	NL	BE	DE	FI	IE	FR	LU	PT	SI	CY	ES	LV	UK	AT	MT	PL	HU	CZ	LT	EE	SK	IT	GR
Rank 1	88.10%	10.54%	0.34%	0.68%																					
Rank 2	10.88%	57.46%	20.41%	10.23%		0.68%																			
Rank 3	0.68%	29.61%	42.53%	10.85%	0.68%	5.10%	9.18%	1.03%	0.34%																
Rank 4		1.70%	8.86%	20.08%	4.43%	13.57%	34.02%	13.95%	3.06%																
Rank 5			0.66%	7.17%	22.11%	25.84%	10.20%	7.13%	26.89%																
Rank 6			7.14%	3.70%	8.83%	40.14%	8.85%	7.84%	17.11%		5.70%														
Rank 7			3.42%	4.09%	31.61%	8.86%	15.64%	14.94%	10.87%	1.00%	1.40%	7.82%													
Rank 8			2.37%	6.47%	25.81%	5.46%	13.95%	26.95%	11.12%	0.35%	3.44%	4.09%													
Rank 9			2.38%	13.61%	5.19%	0.34%	5.12%	25.45%	21.46%	6.45%	12.20%	6.80%	1.01%												
Rank 10			5.10%	9.86%	1.35%	0.00%	1.44%	2.38%	7.85%	13.19%	39.07%	18.71%	0.70%		0.33%										
Rank 11				13.27%			0.93%		1.29%	30.02%	36.81%	11.21%	6.12%		0.35%										
Rank 12							0.34%			23.81%	1.03%	29.60%	13.26%	3.05%	27.21%	1.36%									
Rank 13										10.89%		13.93%	18.05%	17.32%	24.82%	12.59%			2.34%						
Rank 14										11.22%		3.42%	14.96%	16.32%	17.36%	31.65%	0.34%		3.04%						
Rank 15										3.07%		3.38%	14.61%	21.78%	21.08%	30.61%	3.74%		0.72%						
Rank 16												0.68%	12.92%	24.17%	8.85%	15.65%	17.70%	13.56%	3.42%						
Rank 17												0.01%	7.14%	10.20%		1.38%	49.97%	21.14%	9.19%	0.34%					
Rank 18												0.34%	10.88%	6.48%		6.43%	26.88%	24.83%	23.81%	0.34%					
Rank 19													0.34%	0.68%		0.34%	1.36%	12.59%	46.60%	37.41%				0.68%	
Rank 20																		27.89%	10.88%	56.46%				4.76%	
Rank 21																				5.44%	86.67%	13.95%	1.36%	12.59%	
Rank 22																					25.85%	57.49%	12.24%	3.40%	1.02%
Rank 23																					5.10%	13.94%	74.84%	3.74%	2.38%
Rank 24																					1.36%	10.20%	10.20%	37.63%	40.60%
Rank 25																					1.02%	4.42%	1.36%	37.20%	56.00%

Figure 5 - Uncertainty Analysis frequency matrix for 2007

2007	DK	NL	BE	IE	LU	DE	SE	FR	FI	SI	PT	ES	AT	CY	UK	MT	CZ	HU	LV	PL	LT	EE	SK	IT	GR
Rank 1	**9.11%**	67.04%	6.59%	15.90%	0.68%																				
Rank 2	*18.23%*	**15.89%**	9.91%	46.33%	7.13%																				
Rank 3	29.65%	4.96%	**7.31%**	*18.14%*	29.78%	6.10%	3.96%																		
Rank 4	23.84%		13.04%	**13.51%**	29.61%	5.46%	7.14%		6.80%																
Rank 5	2.91%		12.15%		***17.82%***	8.32%	5.45%	2.83%	40.71%																
Rank 6	2.02%		9.18%			***24.82%***	29.44%	12.13%	16.65%																
Rank 7	2.02%		*9.18%*			35.61%	**8.31%**	4.76%	*32.65%*																
Rank 8	11.12%		14.64%			17.30%	*15.65%*	***26.87%***	2.38%					6.15%											
Rank 9							22.11%	47.07%	**0.34%**	2.72%				6.00%											
Rank 10								6.33%		41.50%	2.04%	9.86%	6.80%	25.31%											
Rank 11										*31.93%*	**23.13%**	*11.22%*	11.95%	12.59%											
Rank 12										15.43%	15.65%	16.05%	41.11%	8.70%	2.72%										
Rank 13										6.26%	7.17%	15.24%	***21.10%***	*16.21%*	*34.03%*										
Rank 14										2.16%	*17.66%*	10.54%	18.70%	22.37%	12.23%		*16.33%*								
Rank 15											28.45%	7.83%			43.53%	5.23%	9.18%	5.11%							
Rank 16											5.23%	13.94%			6.81%	**18.24%**	45.59%	6.46%	3.06%						
Rank 17												5.78%				42.86%	**13.61%**	18.71%	5.79%	11.90%					
Rank 18																*21.09%*	9.87%	***25.91%***	14.24%	27.93%					
Rank 19																	5.43%	35.65%	***32.38%***	16.61%					
Rank 20																		8.16%	44.54%	**39.14%**				3.74%	
Rank 21																				3.74%	61.34%	17.97%		14.96%	
Rank 22																					20.28%	74.71%	2.28%	2.73%	
Rank 23																					10.63%	6.98%	74.23%	8.16%	
Rank 24																					5.75%		23.49%	***28.58%***	*41.84%*
Rank 25																								41.84%	58.16%

Figure 6 - Uncertainty Analysis frequency matrix for 2004

		SE	NL	DK	FR	BE	FI	DE	PL	IE	LU	PT	UK	AT	CZ	ES	HU	SK	GR	IT
Rank	1	***100.00%***																		
Rank	2		***29.57%***	56.82%	12.46%															
Rank	3		46.61%	***17.82%***	*12.67%*	*13.20%*	1.59%				7.63%									
Rank	4		19.79%	6.61%	**24.90%**	11.38%	26.76%				*8.99%*									
Rank	5			13.33%	8.85%	**24.04%**	22.38%	0.29%	5.76%	3.99%	17.33%									
Rank	6			5.15%	5.86%	8.81%	***17.79%***	7.43%	10.55%	38.90%	5.54%									
Rank	7				34.70%	2.90%	9.53%	**21.51%**	6.94%	18.67%	5.09%		0.37%							
Rank	8					23.12%	6.70%	14.56%	**24.94%**	16.26%	13.67%		0.11%							
Rank	9					10.48%	10.09%	*17.81%*	28.48%	***21.96%***	8.40%	2.44%	0.31%							
Rank	10					4.85%	5.03%	29.56%	18.49%		**21.10%**	10.48%	4.09%	6.26%						
Rank	11							8.85%	*1.72%*		3.55%	**56.71%**	14.45%	14.14%						
Rank	12										5.08%	*16.53%*	**42.72%**	*34.94%*						
Rank	13										3.63%	13.69%	*35.98%*	**41.02%**		5.39%				
Rank	14												1.97%	3.62%	***62.30%***	31.90%				
Rank	15														37.70%	***62.30%***				
Rank	16																**93.46%**		6.46%	
Rank	17																2.59%	**72.38%**	20.62%	4.41%
Rank	18																*3.95%*	13.34%	**72.92%**	9.79%
Rank	19																	14.29%	0.00%	***85.71%***

Figure 7 - Uncertainty Analysis frequency matrix for 2007 second indicator

		DK	LU	NL	IE	SE	FI	BE	DE	FR	SI	ES	AT	CZ	CY	MT	PT	LV	HU	UK	PL	EE	SK	IT	LT	GR
Rank	1	**12.59%**	42.57%	34.31%	10.25%	0.29%																				
Rank	2	9.68%	**37.26%**	*26.28%*	*24.51%*	0.87%	1.40%																			
Rank	3	*25.68%*	13.93%	**11.22%**	38.65%	2.39%	8.13%																			
Rank	4	49.79%	5.66%	4.97%	**21.02%**	6.17%	11.53%																			
Rank	5	1.69%		8.20%	4.62%	**7.01%**	66.20%			9.57%																
Rank	6					62.46%	**10.96%**	3.14%	10.70%	5.11%																
Rank	7					13.77%		**9.57%**	35.37%	*30.02%*																
Rank	8							*29.39%*	***23.05%***	30.60%																
Rank	9							39.22%	20.29%	**23.27%**	6.44%				6.67%											
Rank	10										50.12%	10.71%			19.96%											
Rank	11										*34.58%*	**27.87%**	8.84%		*16.62%*											
Rank	12										6.00%	12.48%	56.07%	5.47%	13.93%											
Rank	13											*14.28%*	16.94%	48.53%	8.61%					9.23%						
Rank	14											6.65%	3.69%	*24.33%*	**16.91%**	4.85%	3.34%		9.44%	29.92%						
Rank	15											16.66%	0.43%	13.45%	4.28%	**20.25%**	15.35%	5.30%	9.11%	*15.17%*						
Rank	16											7.11%	0.57%	5.32%		*30.00%*	23.32%	9.70%	*18.48%*	4.67%						
Rank	17															30.45%	*20.25%*	**15.86%**	20.32%	4.34%						
Rank	18															12.69%	20.69%	*30.58%*	**19.29%**	10.00%	4.44%					
Rank	19																14.77%	31.31%	17.01%	26.09%	9.94%					
Rank	20																	7.26%	5.97%		*81.41%*			3.14%		
Rank	21																				3.65%	**5.29%**		7.63%	*83.43%*	
Rank	22																					*80.09%*		8.35%	10.94%	
Rank	23																					14.61%	*72.29%*	**6.74%**	5.13%	
Rank	24																						12.37%	*24.15%*		*63.47%*
Rank	25																						14.72%	49.98%		**35.30%**

The overall variation in the position is synthesized for each year (figures 6-10). The width of the 5%-95% percentile bounds across the 29400 simulations represent the different rankings achieved by each country for the main indicator, 25200 simulation for the indicator of 2004 and finally 35000 simulations for the second indicator for 2007. Black marks correspond to the median MSS composite indicator rank and whiskers show best and worst rank occupied by a country considering the 29400 simulations. The confidence bound proved the stability and robustness of the ranking. In fact for instance in 2005 over the 29400 simulations only 1 country shift more than 3 positions while most countries present only 1 shift position in the ranking. In 2005 only 10 countries, (approximately the 40% of the total number of countries) shift of 1 positions, in 2006 just one country present a variability of 3 positions, while in 2007 less than 20% of countries present a variability of more than 3 positions.

In the relevant literature, the median rank is proposed as a summary measure of a rank distribution. The median rank of all combinations of assumptions indicates that for instance in 2005 for 15 out of 25 countries the MSS rank corresponds with the most likely (median) rank. Thus, for the remaining countries the differences between the MSS rank and the most likely (median) rank is less than 3 positions. So that, for all the countries studied in all the three years, the very modest sensitivity of the MSS ranking to the five input factors (standardization, weighting scheme, aggregation rule, inclusion/exclusion of a single indicator and missing imputation) implies a considerably high degree of robustness of the index for all the countries. The comparison in all three years is shown from table 19 to table 23.

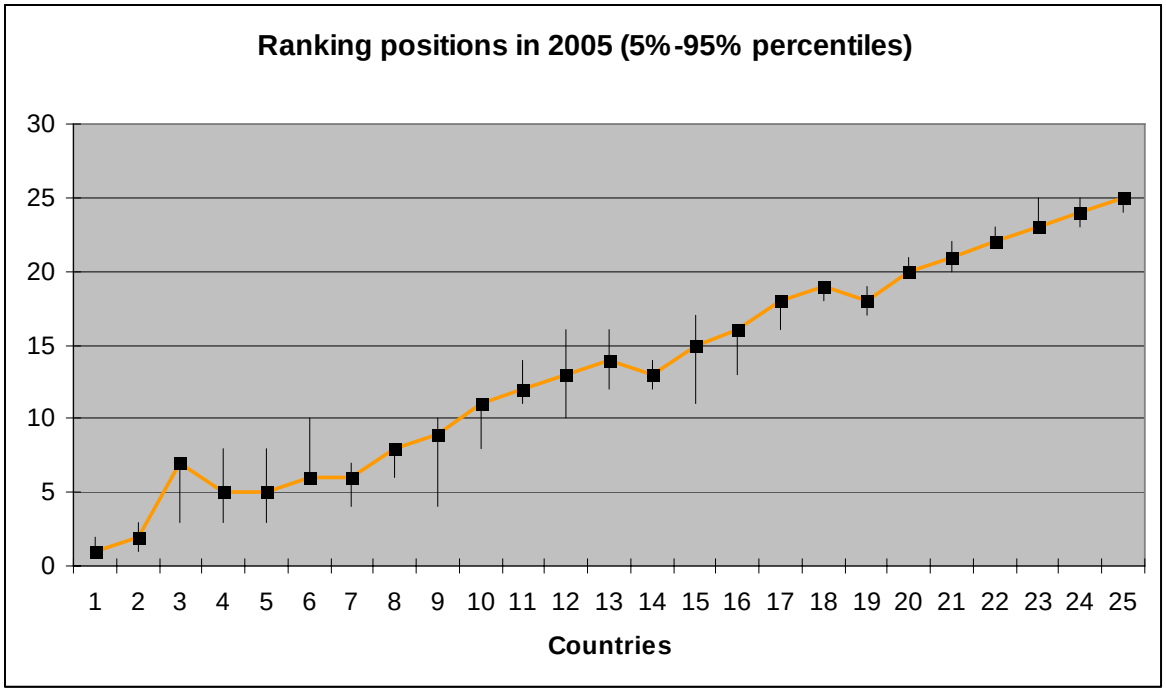


Figure 6 – Results of the Uncertainty Analysis: Ranking Position in 2005 (5%-95% percentiles)

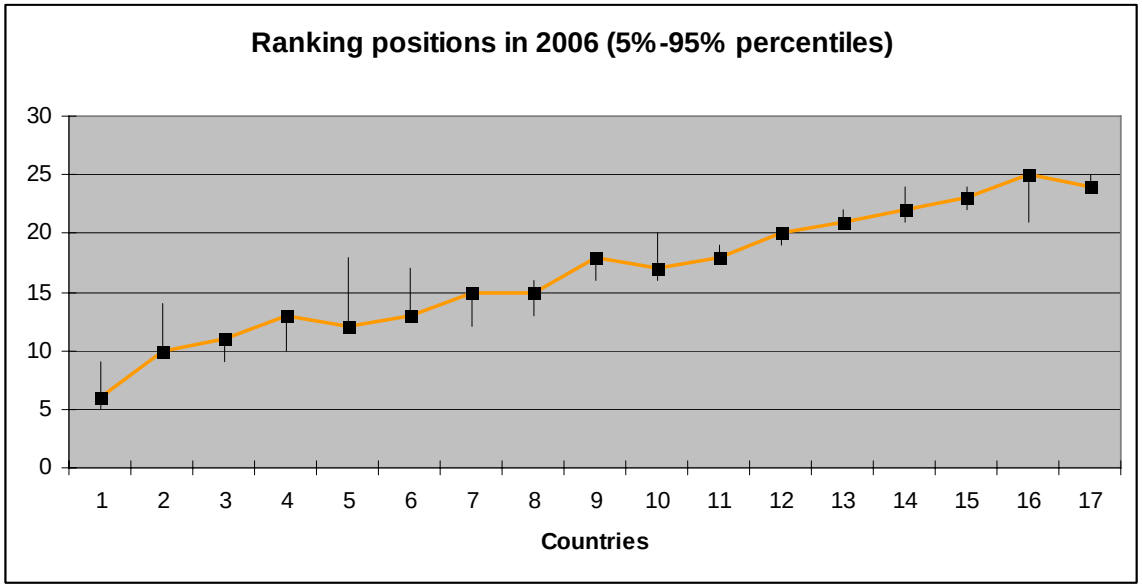


Figure 7 – Results of the Uncertainty Analysis: Ranking Position in 2006 (5%-95% percentiles)

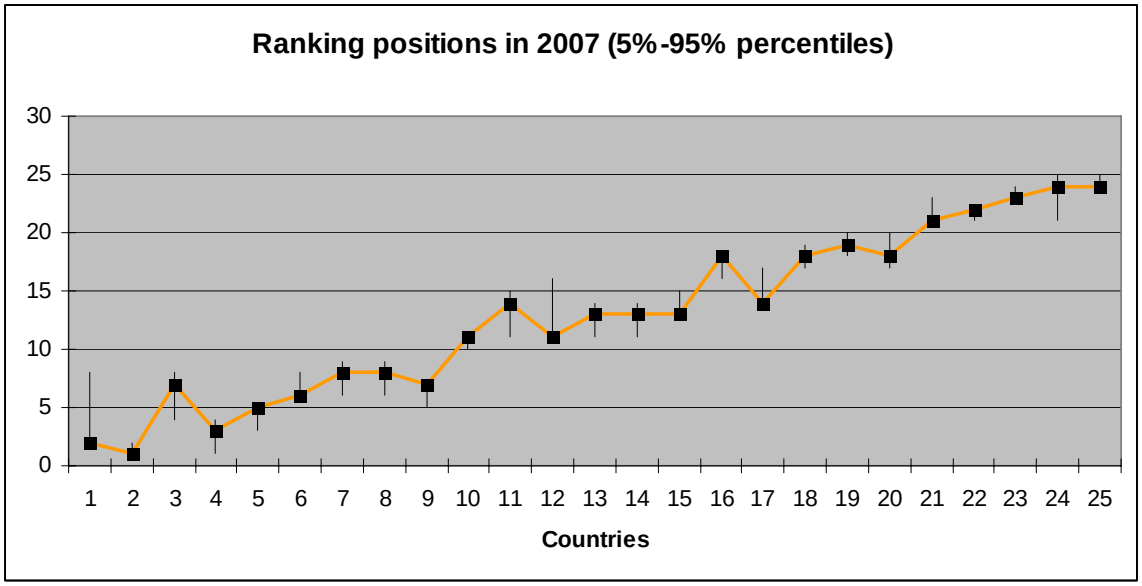


Figure 8 – Results of the Uncertainty Analysis: Ranking Position in 2007 (5%-95% percentiles)

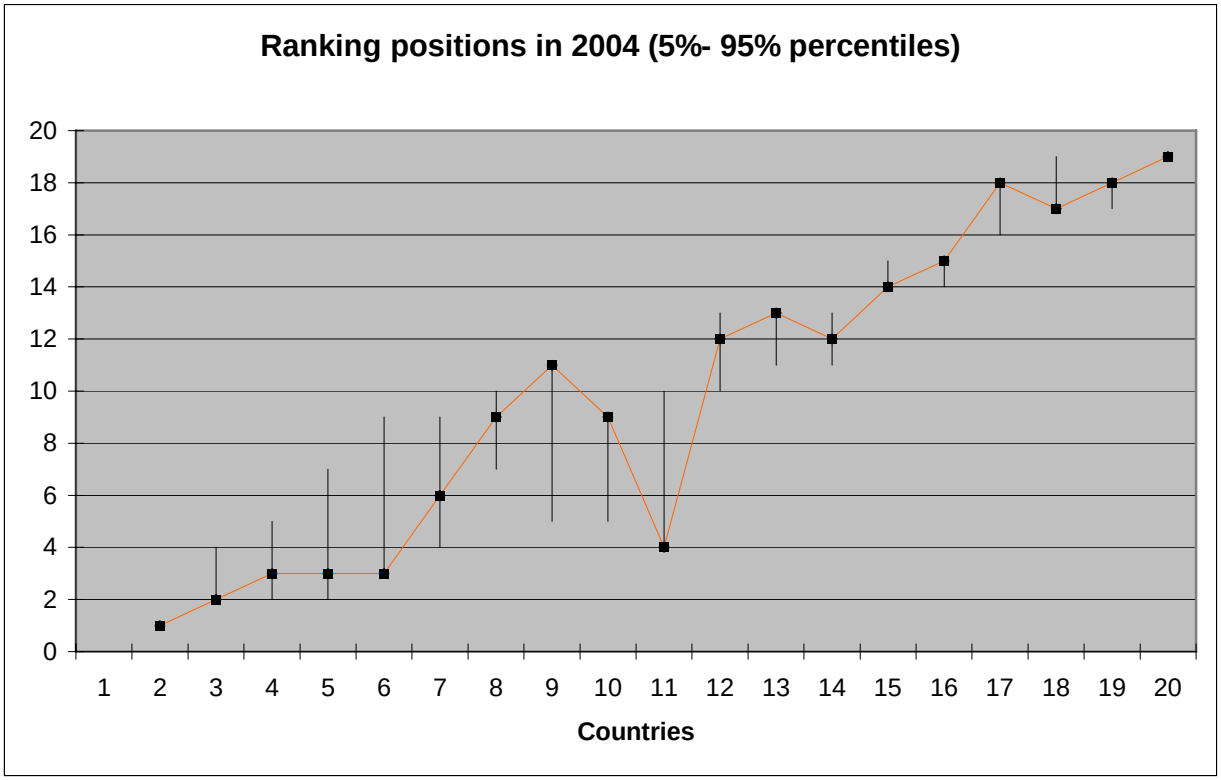


Figure 9 – Results of the Uncertainty Analysis: Ranking Position in 2004 (5%-95% percentiles)

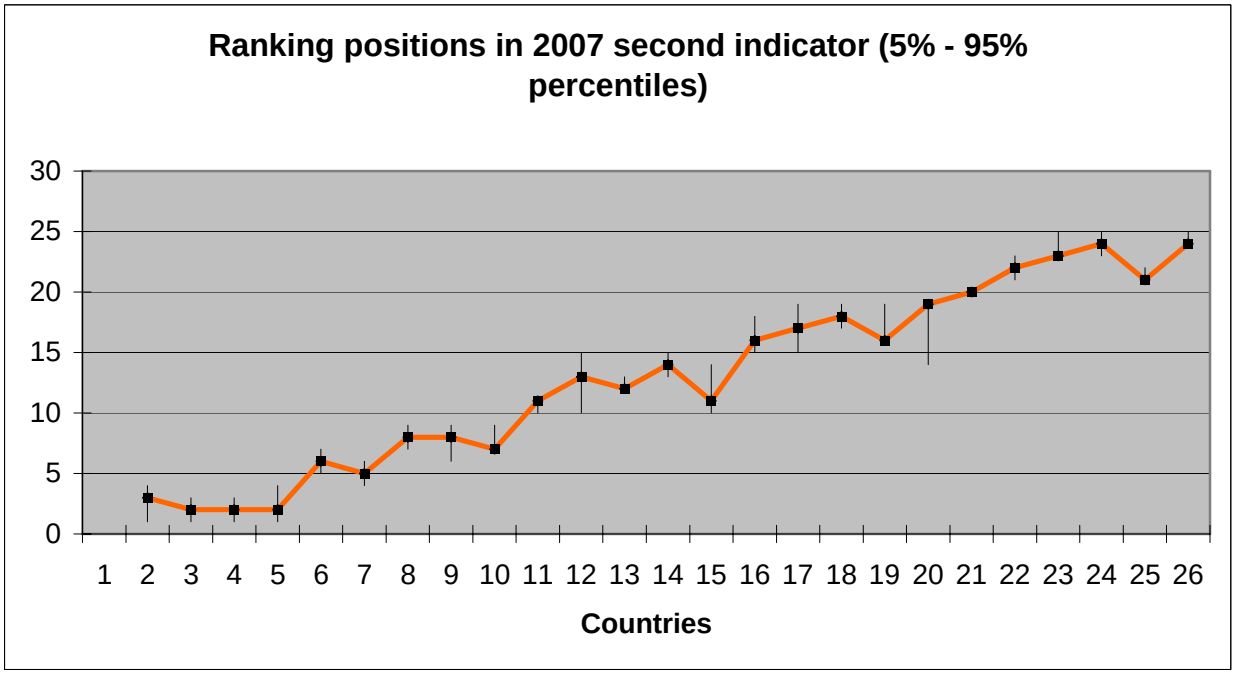


Figure 10 – Results of the Uncertainty Analysis: Ranking Position in 2007 second indicator (5%-95% percentiles)

2005	DK	SE	NL	BE	FI	DE	FR	IE	LU	SI	PT	CY	LV	UK	ES	AT	PL	MT	CZ	HU	EE	LT	IT	SK	GR
median	1	2	7	5	5	6	6	8	9	11	12	13	14	13	15	16	18	19	18	20	21	22	23	24	25
rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Table 19 – Comparison of median values and MSS composite indicator ranking in 2005

2006	DK	SE	NL	BE	DE	FI	IE	FR	LU	PT	SI	CY	ES	LV	UK	AT	MT	PL	HU	CZ	LT	EE	SK	IT	GR
median	1	2	2	3	5	5	8	7	6	10	11	13	12	13	15	15	18	17	18	20	21	22	23	25	24
rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Table 20 – Comparison of median values and MSS composite indicator ranking in 2006

2007	DK	NL	BE	IE	LU	DE	SE	FR	FI	SI	PT	ES	AT	CY	UK	MT	CZ	HU	LV	PL	LT	EE	SK	IT	GR
median	2	1	7	3	5	6	8	8	7	11	14	11	13	13	13	18	14	18	19	18	21	22	23	24	24
rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Table 21 – Comparison of median values and MSS composite indicator ranking in 2007

	SE	NL	DK	FR	BE	FI	DE	PL	IE	LU	PT	UK	AT	CZ	ES	HU	SK	GR	IT
median	1	2	3	3	3	6	9	11	9	4	12	13	12	14	15	18	17	18	19
rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Table 22 – Comparison of median values and MSS composite indicator ranking in 2004

	DK	LU	NL	IE	SE	FI	BE	DE	FR	SI	ES	AT	CZ	CY	MT	PT	LV	HU	UK	PL	EE	SK	IT	LT	GR
median	3	2	2	2	6	5	8	8	7	11	13	12	14	11	16	17	18	16	19	20	22	23	24	21	24
rank	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Table 23 – Comparison of median values and MSS composite indicator ranking in 2007 second indicator

European Commission

EUR 24091 EN – Joint Research Centre – Institute for the Protection and Security of the Citizen
Title: **Towards a set of composite indicators on Flexicurity: the Indicator on Modern Social Security Systems**
Author(s): Matteo Governatori (DG Employment), Anna Rita Manca, Massimiliano Mascherini
Luxembourg: Office for Official Publications of the European Communities
2009 – 93 pp. – 21 x 29.70 cm
EUR – Scientific and Technical Research series – ISSN 1018-5593
ISBN 978-9279-14244-4
DOI 10.2788/46991

Abstract As a third step in the process of construction of a set of composite indicators on flexicurity within a joint DG EMPL-JRC project, this paper presents an attempt to calculate a Composite Indicator on Modern Social Security System, which is one of the main four dimensions of flexicurity according to relevant Commission policy documents (see COM(2007) 359). The dimension of Modern Social Security System is captured through three different indicators:

4. the main indicator, which is based on 20 basic indicators and covers the three year period from 2005 to 2007,
5. a first additional indicator, based on 17 basic indicators and covering only 2004,
6. a second additional indicator built on 24 basic indicators and covering only 2007.

All indicators used are based on three different sources. Results point to a heterogeneous Europe, with an overall good performance of Continental countries, and less favourable scores for Mediterranean and Eastern Member States. The indicator's country ranking is quite stable over the period considered with a few changes from one year to another. Uncertainty and sensitivity analyses have been performed in order to test the robustness of the Composite Indicator. Those were based on 29400 different simulated scenarios for the main indicator, 25200 different scenarios for the 2004 indicator and 35000 simulated scenarios for the 2007 indicator, generated by considering different options with respect to standardization methods, weighting scheme, aggregation rules and the inclusion/exclusion of basic indicators. Results show that the composite indicator's scores and rankings are overall robust over the period, although some variability is present in each year. This is mainly due to the imputation of missing data. On average, countries record a higher ranking variability with respect to the Life Long Learning Composite indicator, but a lower one compared to the index on Active Labour Market Policies. This is due to the varying presence of missing data. However, the MSS index is quite robust compared to similar indicators developed in the literature.

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LB-NA-24091-EN-C

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ISBN 978-92-79-14244-4

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