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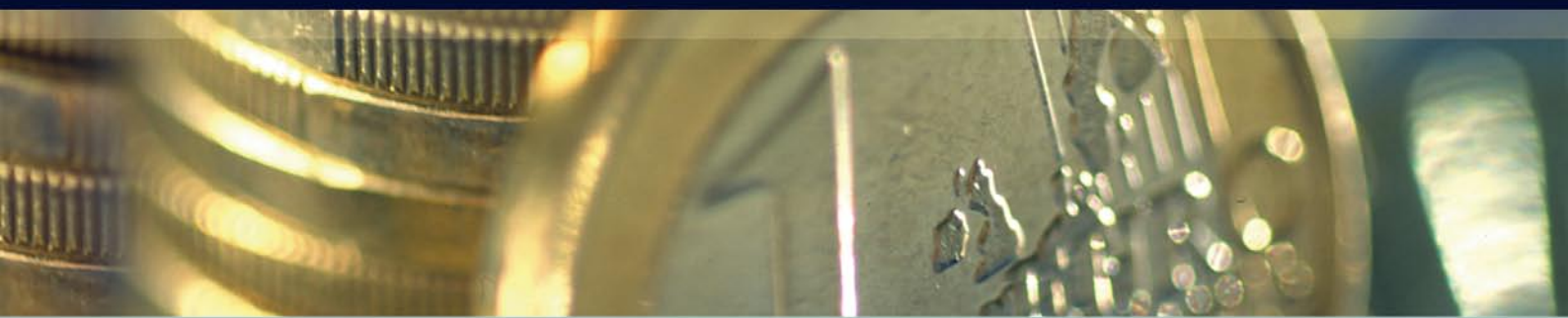
Gauging by numbers:

A first attempt to measure the quality of public finances in the EU

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Economic and Financial Affairs
DIRECTORATE-GENERAL

EUROPEAN COMMISSION

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Gauging by numbers:
A first attempt to measure the quality of public finances in the EU

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Abstract:

Ensuring high quality of public finances (QPF) with a view to supporting long-term economic growth has gained new urgency as the room for fiscal manoeuvre has shrunk in light of the current crisis. To more systematically analyse QPF and compare developments across countries and over time, a greater focus on identifying and developing comparable QPF indicators is needed. This paper provides a first attempt in this respect. Based on the view that QPF is a multi-dimensional concept, it creates composite indicators for twelve areas of public finances that are linked to long-term economic growth. While the proposed alternative calculation methods yield relatively robust results and findings are in line with conventional wisdom, due to data problems the composite indicators should be only seen as a useful starting point for identifying a country's main strengths and weaknesses in QPF. This would need to be complemented by qualitative analysis that also accounts for country and other specificities.

Key words: Quality of public finances, public finances, fiscal policy, long-term economic growth, public expenditure, public revenue, fiscal governance

JEL classification: E62, H11, H50, H52, H60

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EXECUTIVE SUMMARY

Ensuring high quality of public finances (QPF) with a view to supporting long-term economic growth has gained new urgency in light of the current crisis. It has drastically reduced the medium-term fiscal room for manoeuvre which in many countries was already under long-term pressure due to ageing populations. Improving QPF can play an important role in creating additional fiscal space by delivering public services efficiently and effectively and creating conditions conducive to economic growth and employment, including through the structure and efficiency of revenue systems. Strong fiscal governance frameworks are another key element of QPF as they impact not only the efficiency of sector performances but also overall budgetary outcomes thereby contributing to ensuring long-term sustainability.

Based on the view that QPF is a multi-dimensional concept, this paper attempts to capture the main facets of QPF through a set of quantitative indicators which are summarised into several composite indicators. The paper takes a macroeconomic viewpoint, thus trying to capture the links between public finances and long-term economic growth (and abstracting from other policy objectives) through variables that represent these links. Based on a number of economic and statistical selection criteria, this paper chooses a set of 66 indicators (from a set of more than 400 variables considered) and summarises them into twelve composite indicators to capture some main facets of QPF and growth. In constructing the composite indicators the paper follows the ten-step approach laid out by the OECD as guidelines for their construction. Four aggregation methods are compared (unweighted average, weighted average, random weights and a weighted average using factor analysis) and the robustness of the results tested. Exemplary for one method (weighted average) detailed data for all indicators and composite indicators are provided in the paper's annex.

The main findings can be summarised as follows. A sufficient number of QPF indicators fulfil the selection criteria. However, their time coverage is generally rather poor, which would make an assessment of QPF over time rather difficult. Thus, this paper presents results only for 2007 (with some data only available up to 2005). The composite indicator calculations, using the four calculation methods, produce remarkably robust results which are broadly in line with conventional wisdom. In particular, indicators show that, on the one hand, some countries, based on 2007 data, appear to have weaknesses in many QPF areas. On the other hand, there is no EU Member State that excels in all QPF areas, but there are some countries that appear to have chosen a growth-conducive policy mix, e.g. by outperforming in areas, such as education, R&D and operating strong fiscal frameworks, in order to avoid that above-average size government expenditure risks being used inefficiently. As regards public expenditure, the composite indicators used here focus on outcomes rather than expenditure efficiency or effectiveness for which more detailed analysis would be needed. A proposed simple method in the paper to link the composite outcome indicators with public expenditure shows that the composite indicators indeed contain useful information with findings that are broadly in line with efficiency studies.

Overall the paper finds merit in quantifying QPF through composite indicators but cautions about their usage. Composite indicators are a useful tool to capture and make operational complex issues, such as QPF, and compare them systematically across countries with a view to having a rough guide to identify potential strengths and weaknesses. However, composite indicators need to be treated cautiously given the inherent caveats such as potential oversimplification and lack of accounting for country-specificities. In particular, the indicators used here do not yet account for a time dimension and the measurement of expenditure efficiency. Given these limitations the use of composite indicators can be only one instrument in the analysis of QPF and need to be supplemented by qualitative assessments.

1. Introduction

As the financial and economic crisis is putting unprecedented strains on public finances, assuring high quality of public finances (QPF) with a view to supporting long-term economic growth has gained new urgency. Already before the crisis, policy makers had increasingly focused on how public finances could support long-term economic growth in response to the challenges of ageing populations and tougher competition from increased globalisation. But as the crisis has reduced the fiscal room for manoeuvre, the importance of delivering high quality of public finances has further moved to the fore. This relates particularly to the questions of how to best allocate scarce public resources and structure revenue systems with a view to closing not only short-term demand gaps but also backing the long-term growth potential. For Europe's economies better quality of public finances is a key aspect for eventually putting the fiscal houses back in order to ensure long-run sustainability and over the long run making the economies more resilient to shocks.

Against this background, efforts were undertaken in developing a conceptual framework and identifying indicators that could contribute to more systematically analysing the quality of public finances in EU Member States with a view to identifying strengths and weaknesses and progress made over time. Quality of public finances is defined as a multi-dimensional concept, in particular all fiscal policy arrangements and operations that support achieving macroeconomic goals of fiscal policy, in particular long-term economic growth. While the conceptual framework was presented in the *Public Finances in EMU – 2008* report (Part III) and in Barrios and Schaechter (2008), the current paper should be seen as a next step. It presents a range of QPF indicators and lays out the key steps to summarising them into a set of QPF composite indicators.[2] Since our angle of analysis is a macroeconomic one (to assess the links to long-term growth), this calls for summarising the many individual indicators into composite indicators.[3] They are a useful tool to capturing and making operational complex issues, such as QPF. However, it needs to be stressed that summary indicators will never be able to fully reflect the complexities and country differences. Given these limitations the use of composite indicators can be only one instrument in the analysis of QPF and needs to be supplemented by qualitative assessments which can explicitly take country-specific factors into account.

This paper lists a range of potentially useful QPF indicators, describes a systematic way of selecting them and compares options on combining them to build composite indicators. It shows an illustration of QPF indicators for one point in time, namely pre-crisis (data available until September 2008), thus it does not yet incorporate the important time dimension. The paper discusses the strength and weaknesses of these methods and conducts robustness checks by comparing the outcomes of the weighting schemes and different options for treating data gaps. In choosing the indicators and combining them into composite indicators the paper follows closely the ten-step guidelines for constructing composite indicators suggested by the OECD.

This paper is structured as follows. Section 2 lays out the role that composite indicators can play in general and describes the ten guiding principles, proposed by the OECD, for building composite indicators. Sections 3 and 4 then follow this approach step by step. In Section 3 this process

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[2] The work was motivated by the rising importance of QPF as well as shortcomings in analytical tools to analyse QPF in Member States and was based on a mandate from EU Finance Ministers. In particular, in their conclusions from May 2008 the Ecofin Council "reconfirm(ed) the call for the EPC and the Commission to step up their efforts to improve the measurement and analysis of the quality of public finances and its impact on growth." This followed up on the October 2007 Ecofin Council conclusions. The indicator work documented here has also been presented to and discussed at the EPC and Working Group on QPF where some Member States took strong issues with it and the proposed five-dimensional approach. They suggested instead to follow a sector-by-sector approach with the objective to developing own indicators for those areas.

[3] The macroeconomic angle can be seen to be complementary to the work on government indicators currently underway by the OECD. In the "Government at glance" project, to be published for the first time in 2009, the OECD will provide a suite of key indicators of good government and efficient public services. For an overview of first set of core indicators see Lonti and Woods (2008).

includes a brief review of the theoretical framework for the QPF indicators, the selection process of variables based on a number of properties, the normalisation of data to make them comparable, the treatment of data gaps, options for aggregating variables into composite indicators and an application based on a set of 66 indicators. Composite indicators are calculated for the main five QPF dimensions and seven sub-composite indicators for expenditure. Section 4 conducts some robustness checks, takes a closer look at efficiency of spending and presents options on how to use the results. Section 5 concludes.

2.   The overall process for structuring and choosing indicators

Choosing QPF indicators that can also be summarised into composite indicators should follow a transparent and systematic approach without becoming overly mechanistic. Composite indicators have become a useful tool to compare and analyse complex issues across countries while at the same time facilitating the communication of key messages to policy makers and the public. But the use of composite indicators is not without pitfalls. Poor construction can lead to wrong policy messages and even well-constructed indicators may get 'hi-jacked' to deliver over-simplistic policy messages (see the pros and cons of composite indicators in Box 1). Therefore the OECD in its *Handbook on constructing composite indicators* (2005) proposes ten steps in support of building and using sound composite indicators (Box 2). In this note we closely follow these steps though in a slightly different order to better reflect our primary aims.

Box 1: Pros and cons of composite indicators 1/	
Pros	**Cons**
• Can summarise complex or multidimensional issues in view of supporting decision-makers	• May send misleading policy messages if they are poorly constructed or misinterpreted
• Easier to interpret than trying to find a trend in many separate indicators	• May invite simplistic policy conclusions
• Facilitate the task of ranking countries on complex benchmarking exercise	• May be misused, e.g., to support a desired policy, if the construction process is not transparent and lacks sound statistical or conceptual principles
• Can assess progress of countries over time on complex issues	• The selection of indicators and weights could be the target of political challenge
• Reduce the size of a set of indicators or include more information within the existing size limit	• May disguise serious failings in some dimensions and increase the difficulty of identifying proper remedial action.
• Place issues of country performance and progress at the centre of the policy arena	
• Facilitate communication with the general public (i.e. citizens, media, etc.) and promote accountability	• May lead to inappropriate policies if dimensions of performance that are difficult to measure are ignored

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1/ OECD (2005) *Handbook on constructing composite indicators: methodology and user guide*, OECD Statistics Working Papers 2005/3 (Paris).

Box 2: Ten steps to constructing composite indicators

The OECD (2005)[1] recommends ten steps for designing and disseminating composite indicators.

1. Theoretical framework – A theoretical framework should be developed to provide the basis for the selection and combination of single indicators into a meaningful composite indicator under a fitness-for-purpose principle.

2. Data selection – Indicators should be selected on the basis of their analytical soundness, measurability, country coverage, relevance to the phenomenon being measured and relationship to each other. The use of proxy variables should be considered when data are scarce.

3. Normalisation – Indicators should be normalised to render them comparable.

4. Imputation of missing data – Consideration should be given to different approaches for imputing missing values. Extreme values should be examined as they can become unintended benchmarks.

5. Multivariate analysis – An exploratory analysis should investigate the overall structure of the indicators, assess the suitability of the data set and explain the methodological choices, e.g., weighting, aggregation.

6. Weighting and aggregation – Indicators should be aggregated and weighted according to the underlying theoretical framework.

7. Robustness and sensitivity – Analysis should be undertaken to assess the robustness of the composite indicator in terms of e.g., the mechanism for including or excluding single indicators, the normalisation scheme, the imputation of missing data and the choice of weights.

8. Links to other variables – Attempts should be made to correlate the composite indicator with other published indicators as well as to identify linkages through regressions.

9. Visualisation – Composite indicators can be visualised or presented in a number of different ways, which can influence their interpretation.

10. Back to the real data - Composite indicators should be transparent and be able to be decomposed into their underlying indicators or values.

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1/ OECD (2005) *Handbook on constructing composite indicators: methodology and user guide*, OECD Statistics Working Papers 2005/3 (Paris).

3. The first six steps to developing QPF composite indicators

3.1. Step 1: Theoretical framework and structure of indicators

A multi-dimensional conceptual framework provides the theoretical backing for structuring and selecting QPF indicators. The framework, which was laid out in detail in the *Public Finances in EMU – 2008* report (Part III) and Barrios and Schaechter (2008), defines QPF as all fiscal policy arrangements and operations that support achieving macroeconomic goals of fiscal policy, in particular long-term economic growth. It identifies five main transmission channels, or dimensions, through which public finances impact long-term growth (see Box 3) based on a review of the theoretical and empirical literature and own empirical analysis. The five QPF dimensions include: (i) the size of government (*dimension QPF 1*), (ii) the fiscal position and sustainability (*dimension QPF 2*), (iii) the composition, efficiency and effectiveness of expenditure (*dimension QPF 3*), (iv) the structure and efficiency of revenue systems (*dimension QPF 4*) and (v) fiscal governance (*dimension QPF 5*). This paper identifies a set of QPF indicators for each of the key five QPF dimensions which, however, have been summarised into more than five composite indicators given

the complexity of some dimensions. This includes, particularly, the composition, efficiency and effectiveness of expenditure (dimension QPF 3).

Box 3: The conceptual framework of QPF

QPF has been defined as a multi-dimensional concept. It comprises all fiscal policy arrangements and operations that support achieving macroeconomic goals of fiscal policy, in particular long-term economic growth. Thus, QPF goes beyond maintaining sound fiscal positions and sustainable debt levels, which can be viewed as the outcome of fiscal policy making. QPF also comprises the size of governments, the composition, efficiency and effectiveness of expenditure, and the structure and efficiency of revenue systems. The theoretical and empirical literature shows that all of them are linked to growth. At the same time, the set-up of fiscal rules, institutions and procedures (fiscal governance) can affect all of the above four dimensions. Moreover, there are many ways in which public finances, through non-budgetary items, can impact the functioning of markets and the overall business environment, which can therefore viewed to be a sixth, though indirect, dimension of QPF (see chart below) ,which will not be explicitly considered here.

The quality of public finances: a multi-dimensional framework
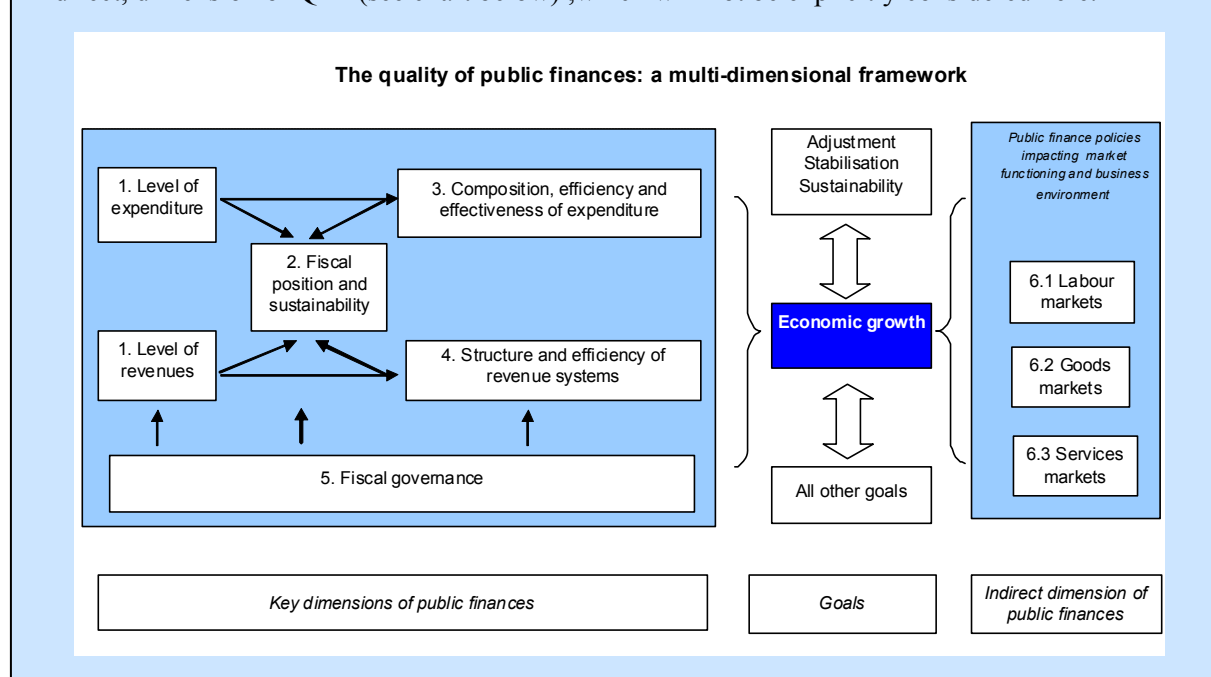
For each indicator either a positive or negative sign has been attributed to the link with long-term economic growth based on a review of the theoretical and empirical literature (see European Commission, 2008). However, for many variables the sign of the link may neither be clear-cut nor very direct and therefore leaves room for debate. This includes, among others, the size of government, where, as the current financial and economic crisis has demonstrated, a larger public sector can be instrumental in stabilising the economy. However in general, econometric studies have demonstrated that very large public sectors can be detrimental for long-run growth (i.e., going beyond the cycle) if financed through deficits and accumulation of excessive debt or distortionary taxation. Moreover, they risk but do not necessarily have to be accompanied by an inefficient use of public resources. As this example indicates, the signs of QPF indicators may be debatable and thus need to be cross-checked with country-specificities or other specific circumstances.

Policy and performance indicators are needed for analysing QPF. *Policy indicators* are directly controlled by policy makers reflecting choices in each public finance dimension (e.g., the level of

education and health spending or tax rates on labour and capital).[4] *Performance indicators* link the policy choices with outcomes. Thus, they measure policy effectiveness (e.g., linking education spending with education attainment or the labour income tax rate with labour market participation).

But defining appropriate performance indicators is problematic. Outcomes are often hard to measure and therefore have to be proxied by output indicators. For example, education attainment can be measured by the OECD PISA indicators (standardised test of competence of secondary-school students) but the score may not adequately reflect the employability of human capital. Or the number of roads financed by public spending can be used to reflect the public infrastructure outcome needed to encourage investment but they may not capture whether those roads are built in areas where they are needed most. Moreover, how policy choices impact outcomes depends on a number of other factors. Some of these other factors are also policy variables. For instance the effectiveness of education spending may be linked to institutional choices such as the freedom of schools to decide on the use of funds; or the impact of lower labour income tax rates on labour participation rates may also depend on the availability of child care facilities. Furthermore, some factors that shape outcomes are not under the control of fiscal policy (e.g., the effectiveness of health spending also depends on eating habits and life-style choices). Given these issues, simplification is inevitable and one needs to be transparent to avoid a misinterpretation of the results.

3.2. Step 2: Data selection

QPF indicators should fulfil some minimum economic and statistical standards. These include relevance (economic rationale), statistical reliability, country and time coverage as well as timeliness. These criteria have been suggested by the OECD and were, for example, used by the Working Group on Methodology to Assess Lisbon-related Structural Reforms (LIME group) for selecting a set of relevant indicators.[5] Statistical properties, summarised in Table 1, were assigned a "rating" of "++" to " -" in line with those used by the LIME group.

When choosing indicators, one needs to weigh the various selection criteria. In principle, all selection criteria should be met. However in practice, there may be trade-offs between the economic relevance of a variable and its statistical properties, which requires making choices in the data selection process. The principle that we follow here is to give greater weight to the economic relevance than some statistical properties, such as country coverage, if the availability of the indicator for a sub-set of EU Member States (possibly combined with data for non-EU OECD countries) enriches the analysis for the countries in the sample and possibly outside the sample. One should rather aim to fill these data gaps than exclude the usage of the indicators from the start.

- **Economic rationale:** The economic rationale of the indicator should be straightforward so as to promote public understanding and debate on policy issues. Therefore, the choice of variables presented in this paper is based on a broad literature review.[6] Nevertheless, due to the complexity of the issue, the links between QPF and growth can never be unambiguously clear and the indicator set should therefore be understood as an on-going process that can be revised as new empirical findings emerge and new indicators are developed and become operational.

- **Statistical reliability:** Indicators need to be statically reliable. That means they should rely on a sound and comparable methodology with few revisions over time. Preferably, each individual indicator should come from the same data source for all countries, but in some

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[4] It should be noted however, that these policy decisions reflect many more policy objectives than merely economic growth, which is the benchmark against which QPF is assessed here.

[5] See European Commission and Economic Policy Committee (2008) and the LIME assessment framework database (LAF) (http://ec.europa.eu/economy_finance/db_indicators/db_indicators14998_en.htm).

[6] See Part III of the *Public finances in EMU – 2008* report.

cases one may need to combine several data sources to achieve a broad country coverage. For structural and macroeconomic indicators sourced from Eurostat, we use Eurostat's assessment; as regards other indicators (e.g., those from the IMF, World Bank or Transparency International) we judge the statistical reliability mainly based on the level of standardisation across time and countries and methodologies used. It should be noted that particularly survey indicators need to be treated with caution. On the other hand, they can provide useful information on perceptions about the quality of public services that cannot be captured in output figures alone. Thus, they have been included were considered useful but cross-checked with "hard" numbers.

- **Country coverage:** Indicators should be available and comparable across most EU Member States. A wide geographical coverage is also necessary to ensure sufficient variability in the indicators. Moreover, having indicators for non-EU OECD countries could be useful as comparators for different QPF policy choices.[7] The assessment of country coverage is therefore split into two parts: EU Member States and non-EU OECD countries. For the first, we assign a "++" when data are available for at least 20 of the EU27 countries (corresponding to a coverage rate of 75%) and give a "+" when data are available for at least 14 of the EU27 countries (corresponding to a coverage rate of 50%). In all other cases, the indicator is rated with a "-". For non-EU OECD Member States (AU, CA, CH, IS, JP, KR, MX, NO, NZ, TR, US), we assign a "++" if 7 of the 11 countries are covered and a "+" if 5 of the countries are covered, including the US. Otherwise we assign a "-".

Table 1: **Ratings for the statistical properties of QPF indicators**

Statistical properties	Rating		
	+ +	**+**	**-**
1. Statistical reliability	• If "A" or "B" by Eurostat. • For other data sources, high level of standardisation across time and countries.	• If "C" by Eurostat • For other data sources, good level of standardisation across time and countries.	Otherwise
2. Country coverage			
EU coverage	• 20 of the EU27 countries covered	• 14 of the EU27 countries covered	Otherwise
Non-EU OECD coverage	• 7 of the 11 countries covered	• 5 of the countries covered, including the US	Otherwise
3. Timeliness	• Latest year available is 2005-2007 for 20 of the EU27 countries covered	• Latest year available is 2003-2004 for 20 of the EU27 countries covered	Otherwise
4. Time coverage	• At least 5 data points are available going back to at least to 1980 for 12 old Member States and • at least 3 data points going back to at least 1998 are available for 9 new Member States	• At least 3 data points are available going back to at least to 1990 for 12 old Member States and • at least 2 data points going back to at least 2001 are available for 9 new Member States	Otherwise

- **Timeliness:** Indicators should be regularly updated without too great a time lag. However, one should bear in mind that significant changes for some indicators are only expected in the medium run given the usual policy lags. We thus give a "++" when the latest year available is 2005-2007 for 20 of the EU27 countries covered. We assign a "+" when the latest year is

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[7] Thus, the data catalogue also includes data for 11 non-EU OECD countries but in our exemplary application to calculate composite indicators here, we have focused entirely on the EU Member States.

2003-2004 for 20 of the EU27 countries covered. In all other cases the indicator is receiving a "-".

- **Time coverage:** A long coverage is not needed to compare the status quo of QPF across countries, which was the starting point for our work. However, to assess developments over time, in particular new policy initiatives under the European Economic Recovery Programme and subsequent fiscal consolidation strategies as well as to deepen the empirical analysis on the links between QPF and growth and, a longer time coverage is desirable and therefore included here as a statistical property. The rating should also help identify and fill data gaps in this respect. We give a "++" when at least 5 data points are available going back to at least to 1980 for 12 of old Member States (e.g. five-year averages), we give a "+" if at least 3 data points are available going back to at least to 1990 for 12 of old Member States. In all other cases the indicator is receiving a "-". The rating of time coverage obeys different criteria for the recently acceded Member States given the non-comparable initial situation. We assign a "++" if in addition to the above, at least 3 data points going back to at least 1998 are available for 9 new Member States and a "+" if in addition to the above, at least 2 data points going back to at least 2001 are available for 9 new Member States.

Based on a review of over 400 potentially relevant QPF indicators, we have chosen 66 that meet the selection criteria (see Table 2 and Annex 1 and 2). While overall there are sufficient indicators with good statistical properties for each QPF dimension to undertake a comparison of the status of QPF in Member States, two key weaknesses need to be acknowledged. First, the time coverage of data is rather poor. Consequently, an assessment of QPF over time would currently be very difficult. This is further complicated by the fact that the most recent data are in many cases only available for 2005 or 2006. The poor time coverage also poses problems for a more thorough macroeconomic analysis of the links between QPF dimensions and long-term economic growth, since data for at least two business cycles would be needed. The second weakness is the country coverage of non-EU OECD countries, which is poor in specific areas such as expenditure composition and fiscal governance. Thus, a desirable benchmarking also against countries outside the EU, which could be useful to better compare different policy approaches, would only be possible in selected areas.

Table 2: **Number of indicators used for composite indicator calculations**

QPF dimensions		Number of variables
QPF1	Size of government	1
QPF2	Fiscal position and sustainability	5
QPF3	Composition, efficiency and effectiveness of expenditure	44
QPF3.1	Composition expenditure	4
QPF3.2	Education	5
QPF3.3	Health	5
QPF3.4	R&D	7
QPF3.5	Public infrastructure	7
QPF3.6	Public order and safety	9
QPF3.7	General public services	7
QPF4	Structure and efficiency of revenue systems	13
QPF5	Fiscal governance	3
Total		66

3.3. Step 3: Normalisation of data

Before combining any indicators into composite indicators, the various variables need to be transferred into comparable units.[8] Specifically, indicators have been standardised by the following formulas:

(1) Score x = (Indicator – average of indicator) / Standard deviation of indicator * 10

(2a) Average of indicator = average of EU-15

(2b) Standard deviation of indicator = standard deviation of EU-15

Multiplying the score by the factor ten (simply serving as a magnifying glass), assuming that observations are normally distributed and assigning a maximum and minimum score to outliers would deliver scores ranging from -30 to +30. The corresponding ratings and probability ranges are presented in Table 3.

Table 3: **Distribution and classification of scores**

Continuous score	Summary score	Classification of score	Distribution	Probability under normal distribution
10 < x < = 30	+ +	"very good"	$\sigma<x-E(x)$	16%
4 < x < = 10	+	"good"	$0.4\sigma<x-E(x)<\sigma$	19%
- 4 < x < = 4	0	"average"	$-0.4\sigma<x-E(x)<0.4\sigma$	31%
- 10 < x < = - 4	-	"poor"	$-\sigma<x-E(x)<-0.4\sigma$	19%
- 30 < = x < = -10	- -	"very poor"	$x-E(x)<-\sigma$	16%

As benchmarks we have used the unweighted EU-15 average. This is meant to abstract from the on-going catching-up process in the new Member States and gives equal weights to EU-15 Member States' different policy choices and outcomes allowing, for example, to review how a Member State compares to its peers as regards the efficiency of education spending independent of the size of its economy. Other benchmarks than the EU-15 could be easily calculated to address specific research or policy interests.

3.4. Step 4: Dealing with data gaps

For indicators with great economic relevance but which are available only for a subset of countries and/or time points one needs to decide on how to fill the data gaps.

- One option would be to attach a zero weight to the missing data when aggregating the data into a composite indicator. However, this has the disadvantage of over-representing the other factors in the composite indicator for which data are available for the country. For example, if a composite indicator is made up of five variables of which only two are available for country A, these two indicators would feature with a 50% weight each in an unweighted average. Overall, the country may receive a high score even though it may have performed poorly in the three areas for which no data are available.

- If the indicator is not entirely missing for a country but only for certain years, information could be drawn from the available data to fill the gaps. This could either be by using the latest

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[8] This normalisation procedure follows the one of the LIME group and would therefore also allow to interchanging variables between the two work streams (see European Commission and Economic Policy Committee, 2008).

available data point or through some interpolation (e.g. with assumptions about growth rates or ratios to other variables). The downside of this method is that the use of remote lags could potentially distort the overall message provided by the indicators.

- A third option would be to assign the country a 'representative' value for the missing indicator by using other indicators or other countries as benchmarks. A range of possibilities exists on how to determine such values. One could use the average value of countries with similar features (e.g., new Member States average, EU-15 average, average of countries with similar per capita income). Another possibility is to derive the missing indicator from the relative performance of other indicators, which are highly correlated with the missing one. More sophisticated methods include regression imputation.

For our calculations presented in Section 3.6, gaps for EU Member States have been filled by using the most representative values for related variables using simple methods. We have either used the most recent observation, as long as it was not older than 10 years.[9] In practice, most lagged variables were taken from the years 2006 to 2004. Or, in the absence of any recent data, we have filled the gap by using the score for the available indicators, which were highly correlated with the missing one. For instance if the mortality rate was missing for a given country, the score on life expectancy which belongs to the same QPF sub-category, namely QPF3.3, was used to fill in the missing value. The following formula was applied in order to derive the corresponding value for a given country:

$$(3) \qquad X_i^k = \left(\frac{X_i^z - X_{EU-15}^z}{\sigma_{EU-15}^z} \right) \cdot 10$$

where X_i^k is the missing score of the indicator for country i, X_i^z is the available indicator belonging to the same sub-category for country i and X_{EU-15}^z and σ_{EU-15}^z are the EU-15 average and standard deviation of these indicators. The indicators imputed using this option are listed in Annex 3. Countries most heavily affected were Bulgaria, Cyprus, Malta, Latvia and Romania.[10] When no comparable indicator was available, the EU-15, EU-27 or new Member States average was applied. Despite devising to a transparent concept of filling data gaps, one should note that the data imputation remains ultimately subjective and using representative values tends to underestimate the variance of the variable.

3.5. Steps 5-6: Weighting and aggregating individual into composite indicators

This section combines the individual indicators into composite indicators and conducts robustness checks.[11] The weighting scheme is closely linked to the data selection process since the exclusion of certain variables corresponds to the assignment of a weight of zero. Thus, checking the robustness of the weighting scheme and selecting the indicators may become an iterative process. Ideally, weights should reflect the contribution of each indicator to the overall performance of a country in a given QPF category. The weighting scheme should therefore reflect the complementarity between the different dimensions of QPF. This could either be based on economic theory and empirical studies or on statistical models that group sub-indicators by using, for example, factor analysis. These and other statistical methods attempt to avoid double-counting, i.e. including highly correlated indicators which may lead to artificially over-emphasising certain dimensions. One possibility would be to include only those indicators that contain the highest level

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[9] We did not fill all the missing interim years since, in our example, we calculate the composite indicator only for one data point (the latest available observations).
[10] Data gaps were also large for non-EU OECD countries but we do not present calculations of composite indicators for them here.
[11] Step 5 (multivariate analysis), i.e. exploring the overall structure of indicators, is conducted through the factor analysis which is one of the weighting and aggregation methods chosen here.

of information as measured through simple correlation coefficients. However, this may overlook the potential changing impact over time and samples. Furthermore, a high correlation between two variables does not necessarily mean that both are highly correlated to a third variable. In other words, bilateral correlation coefficients may provide little information regarding the joint-correlation of several variables taken together and should be treated with caution in their use as a data selection, and thereby implicitly as a weighting device.

Of the various methods that can be used to combine scores into composite indicators, we have explored four methods.[12] They differ mostly in their weighting schemes, which is potentially important for the final score of the composite indicator if, for instance, the scores of two indicators belonging to the same QPF category point in two different directions. However, this risk is minor, if all indicators provide similar information concerning the relative performance of countries within a given QPF category.

3.5.1. Linear unweighted average

The first option is to simply calculate the averages of all indicators in each QPF dimension (and sub-dimension). A drawback with this method is that it assigns an equal weight, thus equal importance, to each indicator and thus assumes that all indicators provide the same level of information. The danger is that the most critical variable gets overshadowed by less-relevant indicators. This could for example be the case, when the indicator already reflects a number of policy decisions and outcomes. For instance, the public debt-to-GDP ratio reflects a history of past fiscal positions, interest payments and risk premiums and in many cases the size of government. Thus, when the debt ratio is included in dimension QPF2 together with other variables, such as the current fiscal position, one would need to consider whether an equal weighting is misleading. A similar issue arises, when too many variables with similar information are used for a composite indicator. For example, for dimension QPF3.7 (quality of general public services) many measures on corruption in public administration exist, but far less on other measures that mirror the quality of general public services.

3.5.2. Linear weighted average

Given the downsides of unweighted averages, weights could be assigned to better reflect the differences in importance of the selected indicators. The weighting scheme could be based on economic priors or more formally economic modelling. In our example (presented in Annex 4), we use a very simple weighting scheme. Instead of giving equal weight to all indicators in all dimensions, we calculate, where appropriate, averages for indicators with similar information content. For example, for dimension QPF4 (structure and efficiency of revenue systems) we have 13 indicators. We sort them into six groups and calculate the unweighted average scores for each group. The averages of these five groups then enter into the overall composite indicator for dimension QPF4. More complex weighting schemes would be possible but since the number of choices is ultimately infinite, instead of focusing on some specific weights, we prefer to use the random weights method, described below, as an alternative.

3.5.3. Random weights method

A third option is to calculate composite indicators as linear averages and allocate the weights randomly.[13] Using a random number generation process a large number of alternative weights can be calculated. Results presented below are obtained using a pseudo-random numbers distribution following the approach developed by Marsaglia (1997). Each indicator entering a given QPF dimension is randomly given a weight on the interval [0,1], and each randomly generated number

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[12] More methods are described in OECD (2005).
[13] This method has, for example, been used when constructing the Commission services' index on the quality of medium-term budgetary frameworks and fiscal rules presented in the 2007 and 2006 issues of the *Public finances in EMU* report.

is then scaled-down in order for the sum of weights to be equal to one. This process is repeated 100 times in the results presented below. The advantage of using random weights is that it completely abstracts from any prior regarding the relative importance of each variable. Moreover, it allows an assessment of the potential bias related to the choice of alternative weightings. In particular, the average value of the weights obtained from the random generation process can be compared with the range of possible outcomes (maximum and minimum scores). The drawback related to the use of random weights is that the weighting process is a black box.

3.5.4. *Weights based on factor analysis*

Factor analysis, which is a special case of principal component analysis, can be used to construct weights based on the construction of summary indicators. This method is usually considered for the construction of composite indicators when, as in the current case, the number of the underlying indicators is large.[14] When using factor analysis, preference is given to indicators that have low correlation to alternative indicators and a high degree of cross-country differences across all dimensions in order to obtain weights that are the most representative of a countries' specificities.

In a nutshell, factor analysis explains the variability among observed variables through fewer unobserved variables, the so-called factors.[15] In using this methodology, a coefficient (or factor loading) can be calculated for each variable denoting its relative weight in the factor according to the proportion of the cross-country variance which is explained by the factor. All the indicators entering a given QPF dimension (or sub-dimension for QPF3) can thus be summarised by a number of factors which are in turn a function of the coefficients corresponding to the individual indicators. Each factor is thus defined using a set of coefficients measuring the correlation between the individual indicators and the factor. In the current approach, only one factor has been retained for each QPF dimension (and sub-dimension for QPF3) and the individual weights of each indicator are calculated as the square values of each factor loading divided by the sum of the squared values of the factor loadings of all the indicators.

The advantage of the factor analysis, or more generally, principal component analysis, is that it allows keeping all variables entering a given composite indicator while avoiding redundancy of information. The drawback of the factor analysis is that it is potentially sensitive to the existence of missing values in a given year which may make the temporal analysis more difficult.

3.6.   An application for calculating composite indicators

The four alternative options described above are tested here in building composite indicators for QPF using pre-crisis data (available as of September 2008). Since each method has its merits and drawbacks, the final choice of a method should be an empirical one, where the robustness of the results can be contrasted by comparing results obtained with different methods. If no single method appears to have a clear advantage over the others, the preference should be given to the simplest and clearest method since it will most likely be best understood.[16]

The composite indicators calculated on the basis of three weighting methods (linear unweighted average, random weights and factor analysis) are shown in Table 4. The indicators entering each QPF dimension are those listed in Annex 2 for the latest available data; the actual data for each indicator and the respective "scores" are shown in Annex 4. The overall value of the composite indicator for dimension QPF 3 (*composition, efficiency and effectiveness of expenditure*) is shown in Table 4 for illustrative purposes only as a simple average of the seven sub-dimensions. Given the

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[14]   This is the case also of the Product Market Regulation index developed by the OECD (see Nicoletti, Scarpetta and Boylaud, 2000

[15]   Given that factor analysis is a widely used technique, this sub-section omits technical details. For example OECD (2005) provides more technical details on this method.

[16]   The economic rationale for choosing specific indicators and attributing the direction of their links to growth is not explored. It is based on the detailed review of the literature and own analysis on public finances and growth in Barrios and Schaechter (2008) and European Commission (2008).

complexity of this dimension, an economic interpretation should be based on the seven sub-categories presented in Table 5.

The composite indicators calculated on the basis of simple linear weighted averages can be found in Annex 4. As mentioned above, the approach differs only slightly from the linear unweighted average by grouping some sub-indicators, thus giving them a combined, rather than an individual weight. Consequently, also the outcomes are very similar. Thus, we have chosen not to present the calculations here but include them in an Annex as a part of a detailed example of constructing composite indicators. This allows to see the individual indicators that enter each QPF dimension and get an idea of the variations within each dimension. Thus, it is also an example of step 10 of the OECD guidelines from Box 2 ("back to the real data", i.e. decomposing the composite indicators into their underlying values).

Table 4: **Composite indicators on QPF: scores for EU Member States**

Country	QPF1. Size of government	QPF2. Fiscal position and sustainability			QPF3. Composition, efficiency and effectiveness of expenditure			QPF4. Structure and efficiency of revenue systems			QPF5. Fiscal governance		
		Average	Factor	Random	Average	Factor	Random	Average	Factor	Random	Average	Factor	Random
BE	-6.5	-3.5	-2.8	-3.3	-0.1	-1.2	-0.8	-4.6	-10.6	-5.3	-1.0	-0.4	-0.8
BG	15.4	13.7	11.5	13.7	-16.3	-12.0	-15.0	11.2	14.8	11.7	-8.1	-4.5	-15.0
CZ	6.3	-12.0	-8.8	-12.4	-5.1	-6.1	-5.7	2.2	1.3	2.7	1.7	2.3	1.2
DK	-9.8	14.5	13.2	14.7	4.3	3.1	3.2	-2.0	1.3	-2.3	5.9	7.1	7.3
DE	3.4	-0.8	-1.3	-0.8	1.4	1.8	1.8	-6.5	-10.6	-7.1	-0.8	0.8	0.6
EE	23.5	9.7	4.8	9.6	-4.7	-4.1	-4.8	7.8	4.3	8.3	6.8	4.4	4.3
IE	18.1	-1.6	-0.3	-1.8	0.8	1.2	1.0	11.8	21.5	12.1	-4.1	-6.1	-6.8
EL	4.6	-7.8	-13.0	-7.5	-7.3	-7.4	-7.2	7.1	4.3	6.6	-2.2	-8.8	-7.3
ES	13.4	3.7	7.7	3.5	-4.2	-3.6	-4.1	-1.0	-0.6	0.2	8.0	8.3	7.4
FR	-13.8	-7.9	-11.1	-7.9	1.9	2.7	1.3	-5.0	-7.1	-4.1	-1.8	-2.1	-3.9
IT	-5.7	-4.6	-6.2	-4.4	-6.2	-7.6	-6.5	-0.9	-4.3	-0.4	-1.8	-2.0	-2.4
CY	3.4	7.9	13.6	8.1	-4.0	-3.8	-3.2	13.1	25.7	13.2	-7.7	-12.0	-12.3
LV	15.0	-0.9	-4.1	-1.1	-8.6	-8.5	-8.5	0.9	0.3	0.1	2.7	-3.1	-3.9
LT	19.7	-1.7	-4.3	-1.9	-7.8	-7.4	-8.1	2.8	1.9	2.6	-1.4	-3.2	-3.7
LU	16.0	1.9	10.2	1.5	1.7	2.1	2.0	-0.9	3.5	-1.1	-5.8	-5.9	-6.0
HU	-8.8	-15.9	-17.2	-16.1	-8.6	-8.6	-8.8	1.5	1.6	-0.7	-5.4	-8.7	-12.2
MT	6.1	-3.3	-9.0	-3.2	-5.9	-8.2	-5.8	11.3	21.2	11.3	-9.0	-9.0	-5.6
NL	-0.6	-1.0	1.5	-1.2	3.8	4.5	3.8	-1.2	-0.5	-1.6	2.4	4.7	4.1
AT	-5.1	-1.1	-4.3	-1.0	1.5	1.2	2.3	-1.3	-3.5	-1.5	-2.2	-0.6	-1.0
PL	6.3	-0.7	-7.5	-0.7	-9.3	-11.5	-10.6	0.5	5.4	1.0	2.7	1.5	0.2
PT	-0.4	-7.1	-8.4	-7.1	-5.9	-8.6	-5.2	4.8	8.5	4.9	-12.6	-14.0	-13.7
RO	17.2	-3.5	-11.3	-3.6	-13.9	-9.8	-12.7	5.1	***	5.4	-13.3	-12.2	-15.0
SI	4.6	-5.5	-2.2	-5.8	-3.2	-3.2	-2.9	-4.8	-0.5	-5.5	1.2	0.7	0.5
SK	17.2	-7.7	-9.3	-8.0	-11.7	-12.5	-11.9	6.7	10.1	7.0	-6.7	-6.6	-7.3
FI	-3.7	13.7	14.8	13.8	4.4	6.7	4.8	-2.9	-2.4	-3.1	4.2	5.4	4.9
SE	-13.8	9.4	7.1	9.5	4.8	6.5	5.2	-2.3	-5.0	-2.8	3.9	5.3	6.3
UK	3.8	-9.9	-11.3	-10.2	-1.0	-1.7	-1.6	4.7	5.2	5.1	7.5	8.0	8.5
Average	4.7	-0.8	-1.8	-0.9	-3.7	-3.6	-3.6	2.1	3.3	2.1	-1.4	-1.9	-2.7
Std. dev.	10.8	8.0	9.2	8.1	5.8	5.8	5.7	5.6	9.2	5.8	5.9	6.5	7.1

Notes:
1/ Scores range from -30 to +30 with an EU-15 average of 0. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ The three calculation methods are linear unweighted average, factor analysis and random weights average.
3/ *** Insufficient number of observations.
Source: Authors' calculations.

The results obtained for the composite indicators are similar independent of the method used. For dimension QPF1, only one variable is used to measure the size of government (public expenditure to GDP-ratio). Thus, obviously there is no difference across methods. For the other dimensions, the results from the linear weights and random weights methods are relatively close. The results from the factor analysis method are also very much in line with the other two methods, but deviations are a bit larger except for QPF3. This may reflect that the number of variables for those dimensions is too low for a factor analysis. A formal comparison of the outcomes of the three methods is undertaken in Section 4.1.1 below.

The scores of the composite QPF indicators, based on pre-crisis data, are in line with conventional wisdom. No country outperforms in all dimensions, but some countries show weaknesses in a number of areas. For example, Hungary combines a relatively large *size of government* sector, with a weak *fiscal position and sustainability,* shortcomings in the *composition, efficiency and effectiveness of expenditure* and weak *fiscal governance.* Italy shows weaknesses in all the same areas. Countries with a number of strengths in QPF are, for example, Luxembourg with a relatively small government sector, low debt and strong fiscal position and relatively efficient expenditure and revenue systems. It has weaknesses, however, in its fiscal governance framework. Finland, on the other hand, has a relatively large government and exerts some inefficiencies in its revenue system, but it excels in the efficiency of certain expenditure categories and sustainability as well as operates under a strong fiscal governance framework.

Given the complex nature of dimension QPF3, the results of seven sub-indicators are reported in Table 5. As regards the composition of public spending (QPF3.1) theory and empirics generally do not give clear-cut answers which items to consider as "growth-enhancing" and how to measure them (e.g., in % of GDP or in % of total (primary) government spending). For public investment, which the literature finds to have a clear link to long-term economic growth, the measurement issue does not seem to matter much since it is a relatively small part of government expenditure and the relative "performance" of countries against the EU-15 average is hardly affected by the denominator of the ratio. However, for aggregate public spending on e.g. transportation, R&D, education and health,[17] which is about fivefold public investment, the relative performance changes more depending on how the ratio is calculated. This is particularly the case for countries with very small or very large public sectors. For example, Denmark has the second highest level of "productive spending" in terms of GDP, but it has an even higher share of other spending. Thus, when measured in percent of primary spending its score is significantly lower. The reverse holds, for example, for Ireland (based on 2005-07 data). The scores for QPF3.1 are thus a combination of the two calculation methods.

The indicators for dimension QPF3 show high score for most recently acceded Member States in the sub-dimension composition of expenditure (QPF 3.1) and rather low scores in the expenditure outcome categories (dimension QPF3.2-3.7). This reflects the countries' catching-up process in which they have, on the one hand, been using a higher share of public resources for growth-enhancing items than the old Member States. On the other hand, this is not yet fully reflected in outcomes, which take time to be accomplished, so that the scores for sub-dimensions QPF 3.2-3.7 are far below the EU-15 average. Abstracting from the catching up process there are some other Member States with above average spending and below average outcomes, which hints at efficiency problems. However, the scores do not include a direct relation between input and outputs and a closer look at the efficiency matter is therefore taken in Section 4.2.

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[17] Some studies also find spending on the environment, public order and safety and defence to be linked to long-term growth while others do not include public health spending in "growth-enhancing" spending. For an overview of the literature see European Commission (2004) and Gemmel et al. (2009) for recent econometric estimates.

Table 5: **Composite indicators of QPF dimension 3:**
composition, efficiency and effectiveness of public expenditure

Country	QPF 3.1 Composition of public spending Average	Rank	QPF 3.2 Education Average	Rank	QPF3.3 Health Average	Rank	QPF 3.4 R&D and innovation Average	Rank	QPF 3.5 Public infrastructures Average	Rank	QPF 3.6 Public order Average	Rank	QPF 3.7 Public administration Average	Rank
BE	-3.7	23	5.3	8	-0.9	8	2.2	8	4.1	5	-3.9	14	-3.9	12
BG	4.6	11	-6.5	22	-30.0	26	-17.6	27	-21.1	26	-20.2	27	-22.9	27
CZ	13.2	5	8.3	2	-14.5	19	-9.4	16	-3.6	11	-12.2	22	-17.3	22
DK	-1.2	20	3.2	14	-2.7	11	2.7	6	6.3	4	6.8	3	15.0	1
DE	-9.7	27	3.1	15	-7.2	16	10.1	1	7.4	3	5.6	4	0.7	7
EE	10.9	6	4.6	10	-25.5	24	-6.8	14	-4.5	13	-7.8	19	-3.8	11
IE	14.4	4	6.2	6	-1.1	9	-0.2	10	-10.4	20	-2.7	13	-0.4	8
EL	-7.0	24	-5.8	21	0.6	6	-12.9	23	-11.5	21	-1.8	12	-13.0	18
ES	5.1	10	-13.3	25	6.2	4	-12.7	22	-4.3	12	-4.2	16	-6.3	13
FR	3.3	13	1.7	16	7.0	2	2.6	7	1.3	7	0.3	10	-3.1	10
IT	-2.0	22	-8.5	24	7.6	1	-5.6	13	-6.2	17	-10.3	21	-18.1	24
CY	-1.1	19	4.2	13	-7.0	15	-15.1	26	-5.8	16	5.4	5	-8.4	15
LV	15.6	3	0.4	19	-27.1	25	-14.4	25	-14.6	25	-4.1	15	-16.3	20
LT	16.2	2	4.3	12	-24.9	23	-10.6	19	-8.4	19	-13.7	23	-17.3	23
LU	2.1	15	-3.6	20	0.9	5	-3.7	11	7.7	1	3.2	7	4.9	6
HU	1.4	16	1.3	18	-24.7	22	-9.8	18	-7.7	18	-5.1	17	-15.3	19
MT	5.8	9	-20.8	27	-3.3	13	-8.8	15	-14.5	24	8.5	1	-7.9	14
NL	-1.8	21	4.6	11	-0.3	7	7.2	3	7.7	2	1.0	9	8.2	4
AT	-7.9	26	5.8	7	-2.7	12	5.1	5	0.6	8	4.0	6	5.8	5
PL	4.5	12	6.8	5	-15.0	20	-10.8	20	-13.8	23	-16.2	25	-20.7	25
PT	6.6	8	-20.4	26	-1.9	10	-9.5	17	-5.5	14	-1.3	11	-9.7	17
RO	16.7	1	-8.1	23	-30.0	26	-14.2	24	-23.0	27	-16.9	26	-21.5	26
SI	8.4	7	7.1	3	-9.2	18	-4.3	12	-5.5	15	-10.2	20	-8.5	16
SK	-7.2	25	4.9	9	-22.7	21	-12.6	21	-12.5	22	-14.9	24	-16.6	21
FI	-1.1	18	13.2	1	-7.9	17	7.9	2	-0.7	10	8.2	2	11.5	2
SE	3.1	14	6.9	4	6.6	3	5.8	4	0.3	9	2.2	8	8.6	3
UK	-0.2	17	1.7	17	-4.0	14	0.9	9	1.5	6	-6.4	18	-0.8	9
Average	3.3		0.2		-8.7		-5.0		-5.1		-4.0		-6.6	
Std. dev.	7.6		8.5		12.1		8.2		8.4		8.3		10.8	

Notes:
1/ Scores range from -30 to +30 with an EU-15 average of 0. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ Scores were calculated using a linear unweighted average.
Source: Authors' calculations.

4. The final four steps in developing QPF indicators

4.1. Step 7: Robustness checks

The robustness of the above results is checked in three ways. First, robustness is assessed regarding the choice of the weighting method. Second, the random weights method is used to assess the potential variability and bias depending on the values of the weights assigned to each variable. And third, robustness is gauged regarding the filling of missing values.

4.1.1.   Checking the *robustness* of the weighting methods

The alternative weighting methods for calculating the composite indicators give very similar country results. While Table 4 above showed the score of the three methods, Table 6 below compares the ranking of each country for the three alternative methods, which is very similar across the alternative weighting methods. A more systematic comparison in rankings can be done by computing the Spearman rank correlation coefficients and calculating their significance levels.[18]

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[18]   Assuming two variables X and Y are being ranked in two alternative ways x_i and y_i the Spearman correlation coefficient compares A and B's ranking results by calculating the Pearson correlation coefficient on ranks. Assuming that n is the number of comparable values of the two variables, the Spearman rank correlation coefficient formula is

$$\rho = \frac{n\left(\sum x_i y_i\right) - \left(\sum x_i\right)\left(\sum y_i\right)}{\sqrt{n\left(\sum x_i^2\right) - \left(\sum x_i^2\right)}\sqrt{n\left(\sum y_i^2\right) - \left(\sum y_i\right)^2}}$$

see Kendall, M.G. and J.D. Gibbons, 1990, *Rank correlation methods*, Oxford University Press).

The value of this correlation coefficient is bounded between 0 and 1 with a higher value depicting a higher correlation. The calculations in Table 7, indeed confirms that the rankings obtained using the three alternative weighting methods are very close.[19] In nearly all cases the Spearman rank correlation coefficients is above 0.85. Non-reported *p-values* also indicates that these correlation coefficients are highly significant. Simple correlation coefficients for the scores (also in Table 7) showing even higher values. Overall, one can summarise that in a few cases the absolute values of the scores differ somewhat depending on the weighting method used, but the relative countries' performance is very similar independently of the three weighting methods.

Table 6: **Composite indicators on QPF: rankings for EU Member States** 1/ 2/

	QPF1. Size of government	QPF2. Fiscal position and sustainability			QPF3. Composition, efficiency and effectiveness of expenditure			QPF4. Structure and efficiency of revenue systems			QPF5. Fiscal governance		
Average	Average	Average	Factor	Random	Average	Factor	Random	Average	Factor	Random	Average	Factor	Random
BE	23	17	13	17	10	10	10	24	26	25	13	12	12
BG	7	2	4	3	27	26	27	4	4	3	24	18	27
CZ	10	26	20	26	16	16	17	12	14	11	10	8	8
DK	25	1	3	1	3	4	4	21	15	21	4	3	3
DE	16	10	11	10	8	7	7	27	25	27	12	10	9
EE	1	4	8	4	15	15	15	5	9	5	3	7	6
IE	3	14	10	14	9	9	9	2	2	2	19	20	20
EL	13	23	26	22	20	17	20	6	10	7	17	23	22
ES	9	7	6	7	14	13	14	18	19	14	1	1	2
FR	26	24	23	23	5	5	8	26	24	24	16	15	17
IT	22	19	17	19	19	19	19	16	22	16	15	14	14
CY	16	6	2	6	13	14	13	1	1	1	23	25	24
LV	8	11	14	12	23	21	22	14	16	15	7	16	16
LT	2	15	16	15	21	18	21	11	12	12	14	17	15
LU	6	8	5	8	6	6	6	17	11	18	21	19	19
HU	24	27	27	27	22	23	23	13	13	17	20	22	23
MT	12	16	21	16	17	20	18	3	3	4	25	24	18
NL	19	12	9	13	4	3	3	19	17	20	9	6	7
AT	21	13	15	11	7	8	5	20	21	19	18	13	13
PL	10	9	18	9	24	25	24	15	7	13	8	9	11
PT	18	21	19	21	18	22	16	9	6	10	26	27	25
RO	4	18	24	18	26	24	26	8	***	8	27	26	26
SI	13	20	12	20	12	12	12	25	18	26	11	11	10
SK	4	22	22	24	25	27	25	7	5	6	22	21	21
FI	20	3	1	2	2	1	2	23	20	23	5	4	5
SE	26	5	7	5	1	2	1	22	23	22	6	5	4
UK	15	25	25	25	11	11	11	10	8	9	2	2	1

Notes:
1/ The three calculation methods are linear unweighted average, factor analysis and random weights average.
2/ *** Insufficient number of observations.
Source: Authors' calculations.

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[19] Correlation coefficients were also calculated for the scores and rankings received for the sub-dimensions QPF3.1-3.7 and yield similarly high values.

	Spearman ranking correlation coefficient (using country rankings)			Simple correlation coefficient (using country scores)		
QPF2. Fiscal position and sustainability	Average	Factor	Random	Average	Factor	Random
Average	1			1		
Factor	0.886	1		0.912	1	
Random	0.996	0.880	1	1.000	0.907	1
QPF3. Composition, efficiency and effectiveness of expenditure	Average	Factor	Random	Average	Factor	Random
Average	1			1		
Factor	0.970	1		0.960	1	
Random	0.993	0.9628	1	0.994	0.972	1
QPF4. Structure and efficiency of revenue systems	Average	Factor	Random	Average	Factor	Random
Average	1			1		
Factor	0.906	1		0.921	1	
Random	0.982	0.893	1	0.994	0.915	1
QPF5. Fiscal governance	Average	Factor	Random	Average	Factor	Random
Average	1			1		
Factor	0.926	1		0.929	1	
Random	0.923	0.956	1	0.923	0.946	1

Source: Authors' calculations.

4.1.2. Using the variance of the random weights results for a robustness check

The use of random weights provides information on the potential variability of the QPF composite indicators depending on the values of the weights assigned to each variable. Graph 1 illustrates this variability by plotting for each country the range (i.e. minimum and maximum values) of the scores obtained by using random weights together with the average value of the composite indicator for the dimensions QPF2-QPF5.[20] The variability of the composite indicators is relatively high though on average lowest for dimensions QPF3 and QPF4 which are based on a rather large number of variables. In principle, the larger the number of variables entering the computation of a given composite indicator, the less likely is the random allocation of weights to change the relative impact of each individual variable. Put differently, if very few variables enter a given composite indicator and if these variables provide very different scores, changing the weights for each variable can significantly influence the final value of the composite indicator. The case of the QPF5 (fiscal governance) composite indicator illustrates this point quite well. It shows that, for instance, for Greece and Latvia, the differences in scores can be very wide depending on the values given to each of the three variables entering this QPF dimension. Both countries receive below average score on their frameworks for fiscal rules and medium-term budgetary procedures but have a large share of tenders for public procurement, which was used as a measure of transparency.

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[20] As before, QPF1 is excluded from this comparison given that it makes use of only one variable.

Graph 1: **Range of composite indicators using the random weights method**

(A) Variability of QPF2
Fiscal position and sustainability

(B) Variability of QPF3
Composition efficiency and effectiveness of expenditure

(C) Variability of QPF4
Structure and efficiency of revenue systems

(D) Variability of QPF5
Fiscal governance
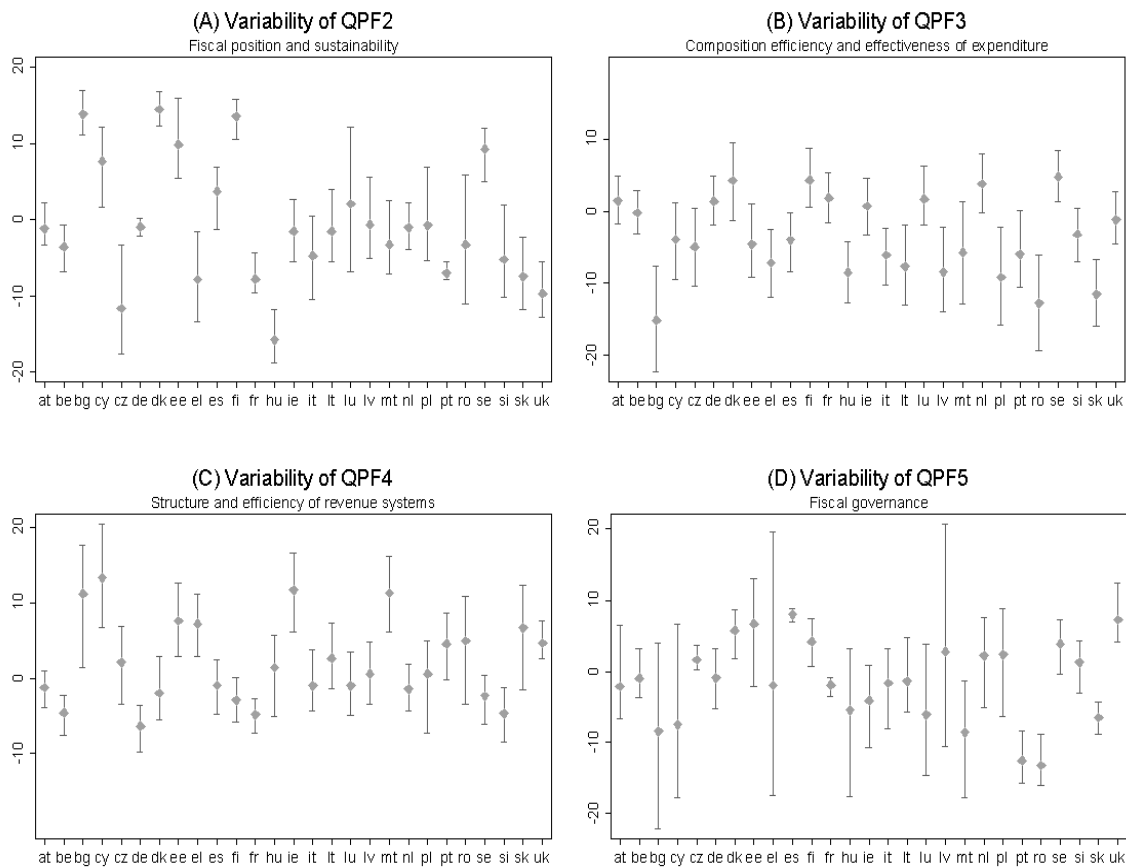
Notes: QPF2-5 are the composite indicators of the corresponding QPF dimension with a score ranging from -30 to +30.
Source: Authors' calculations.

Independently of the QPF dimension, the recently acceded Member States usually tend to display a higher variability in their QPF composite indicators than the EU-15. This is due to more sub-indicators pointing in different directions for recently acceded Member States. The finding would indicate that the QPF indicators are also less precise for these countries.

4.1.3. Checking the robustness of imputing missing data

And finally, as regards filling of missing values, the results of the composite indicators are relatively robust. The use of lagged observations or representative values (as described in Section 3.4) to fill missing values may potentially impact the results. In particular, we compared the scores and rankings for QPF composite indicators obtained when filling missing values versus the alternative of simply dropping the corresponding variable as long as this variable was missing for at least one of the 27 EU countries. We find that in most countries filling data gaps has a relatively small impact on the value of the composite indicator.

4.2. Back to public spending: a closer look at the efficiency and effectiveness of expenditure

To go beyond the mere use of outcome variables for QPF3 and get a better grasp of spending efficiency, we offer two illustrations. The above calculation of composite indicators for QPF3.2-3.7 focused entirely on outcome variables without putting them in relation to monetary or technical inputs. In the first simple exercise we assess a country's spending and performance relative to the best performing countries and recalculate the composite indicators for a selection of QPF dimensions. The selected dimensions are education (QPF3.2), health (QPF3.3), R&D and

innovation (QPF3.4) and public infrastructure (QPF3.5). We focus on these four categories since they are most directly linked to growth. There is a also likely to be a more direct link between public spending in these areas and policy outcome which is less clear-cut for the other dimensions public order (QPF 3.6) and public administration (QPF 3.7).

A country's relative performance is assessed against the benchmark of the five best performers. In particular, we calculate the average public spending-to-GDP ratios for those five countries that have achieved the highest composite indicator scores for the selected dimensions. We want to assess whether the other countries achieve their results with a more economic or greater use of public resources than those five countries. Thus, we put each individual country's spending-to-GDP ratio in relation to the five best performers' spending ratio. If the ratio is bigger than one, the country spends more; it is less than one, the country spends less. Thus, those countries that spend more but achieve far worse outcomes, can be considered inefficient. However, in addition, to the already mentioned problems in adequately capturing the effectiveness of public spending (see Section 3.1), one needs to be aware here that recent spending initiatives may only pay off in future years, so outliers should be carefully assessed.

The results for education are plotted in Graph 2. There appears to be only a slight positive relationship between the quality of education policies (measured by the composite indicator of QPF3.2) and public spending in education. However, some countries (in the upper right quadrant) pay a relatively high price to achieve their outcomes. For example, Denmark and Sweden have used relatively many resources (measured as expenditure per student and in % of GDP) but have achieved worse education outcomes than Finland who has spent less. Most problematic, however, are situations in the lower right quadrant where a country not only spends more than some of the best performers but has achieved below average education outcomes. This could signal an inefficiency problem.[21]

Graph 2: **Composite outcome indicator in education and public spending in education**

Total education spending

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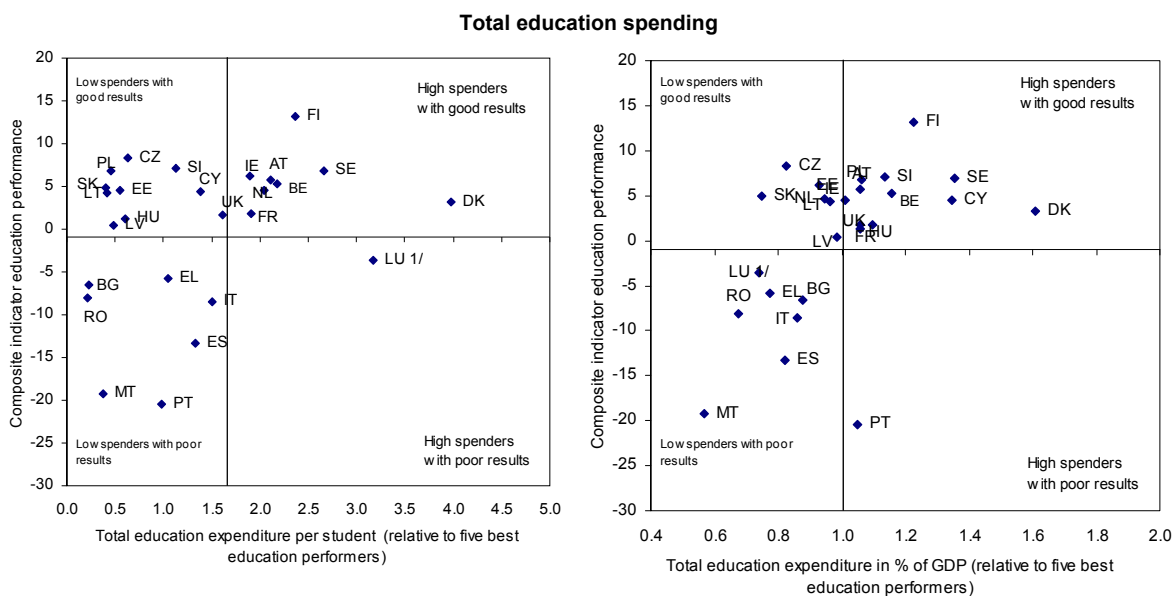
[21] For Portugal, this finding is generally not shared by studies conducting efficiency score estimates. See below for an explanation of these differences.

Primary and secondary education spending
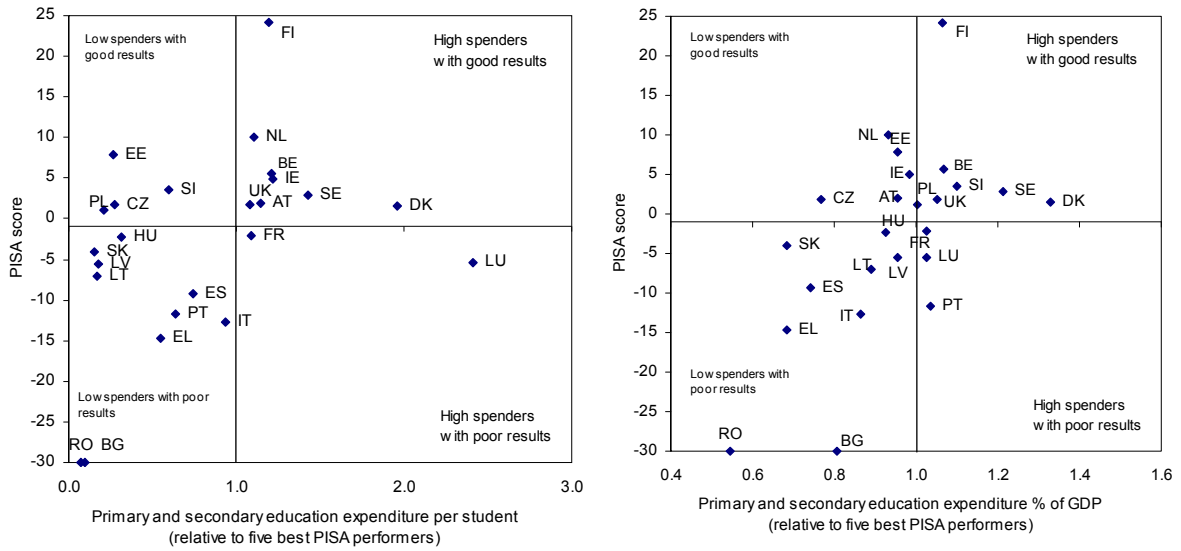
Notes: Spending in education is measured as the ratio of country x to the average of the five countries with the highest score in the QPF 3.2 education composite indicator.
Source: Commission services.

Graph 3 shows the results for health, R&D and public infrastructure. For health and R&D spending the relatively stronger positive relation between the level of spending and performance indicates that in particular for the countries in the lower left quadrant there is room to improve the health situation and knowledge build-up and innovation by allocating more resources to those two sectors. The results for public infrastructure, which seem to imply, at first sight, a negative relation between spending and outcome, need to be assessed with caution. The large number of recently acceded Member States in the lower right quadrant reflect their catching-up expenditure on infrastructure which requires time until it pays off in the relevant outcomes.

Composite outcome indicators in health, R&D and public infrastructure and respective public spending
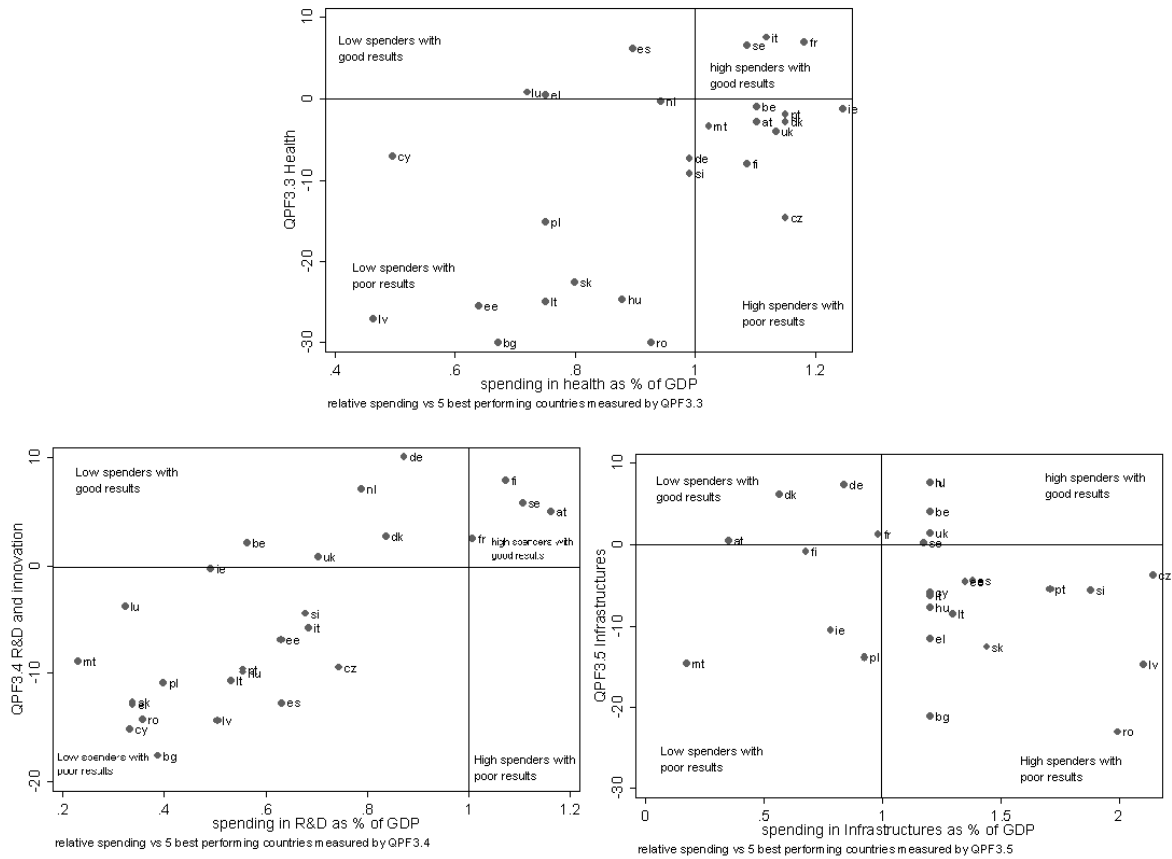
Notes: QPF3.3-3.5 are the composite indicators of the corresponding QPF dimension with a score ranging from -30 to +30. Spending is measured as the ratio of country x to the average of the five countries with the highest score in the composite indicator of the corresponding QPF dimension.
Source: Authors' calculations.

While the above charts can serve as a basis for indentifying potential spending inefficiencies, ideally one should calculate efficiency scores for each spending category using a range of parametric and non-parametric methods. The econometric and statistical estimation of efficiency gaps can account for environmental factors, such as the development stage of an economy or institutional factors. However, the results generally depend to a large degree on the estimation method, the country sample and the variables used. For some spending categories, in particular education and R&D, efficiency estimates are available in the literature and the main results are reported in Tables 8 and 9.[22] This should serve as a cross-check to our simpler method used above.

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[22]   Since the estimates include a range of OECD countries we show the results for the entire sample of EU and OECD countries. For a detailed analysis on efficiency and effectiveness on health care spending (however, with data only up to 2003) see Joumard et al. (2008).

Table 8: Overview of estimated education efficiency scores

Country		2 inputs (teachers-student ratio, hours in school), and 1 output (PISA 2003 indicator)						Sutherland et al. (2007) - Stochastic frontier approach 4/	2 inputs (teachers per 100 students and socio-economic background) and 2 outputs (average PISA score and homogeneity of PISA score)				2 inputs (cumulative expenditure per student and socio-economic score and homogeneity of PISA score)				Percentile efficiency ranking, bias-corrected input oriented scores.		Average 8/ 9/	
		Alfonso and St. Aubyn (2006) - DEA output efficiency 1/		Alfonso and St. Aubyn (2006) - DEA output efficiency (bias corrected) 2/		Alfonso and St. Aubyn (2006) - DEA output efficiency (fully corrected) 3/		Sutherland et al. (2007) - Stochastic frontier approach 4/	Sutherland et al. (2007) - DEA technical input efficiency 5/		Sutherland et al. (2007) - DEA technical output efficiency 5/		Sutherland et al. (2007) - DEA cost input efficiency 6/ using PPP		Sutherland et al. (2007) - DEA cost output efficiency 6/ using PPP		Verhoeven et al. (2007) - Overall efficiency (spending vs. outcomes), total spending in education		Score 8/ 9/	Rank
		Estimated efficiency	Rank	Estimated efficiency	Rank	Estimated efficiency	Rank	Estimated efficiency	Estimated efficiency	Rank	Estimated efficiency	Rank	Estimated efficiency	Rank	Estimated efficiency	Rank	Percentile education 7/	Rank		
1	Belgium BE	1.06	8	1.06	5	1.10	22	0.97	0.83	8.0	0.94	5	0.84	16	0.94	18	57.4	18	1.8	9
2	Bulgaria BG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3	Czech Republic CZ	1.07	9	1.08	10	1.09	6	0.96	0.84	7	0.94	5	0.85	13	0.96	5	17.6	5	7.6	6
4	Denmark DK	1.09	13	1.11	14	1.18	23	0.95	0.79	10	0.95	4	0.80	22	0.95	12	61.2	19	-7.0	16
5	Germany DE	1.08	12	1.10	12	1.17	21	0.96	0.81	9	0.91	8	0.83	18	0.91	27	56.4	16	-10.5	17
6	Estonia EE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7	Ireland IE	1.08	11	1.09	11	1.16	19	0.96	0.90	3	0.98	1	0.90	5	0.97	4	41.8	10	10.4	4
8	Greece EL	1.18	21	1.19	21	1.17	20	0.93	0.79	10	0.93	6	0.80	22	0.92	25	46.3	11	-11.3	18
9	Spain ES	1.13	18	1.14	18	1.11	9	0.94	0.89	4	0.97	2	0.90	5	0.96	5	55.4	15	6.9	8
10	France FR	1.07	10	1.08	9	1.12	14	--	0.90	3	0.95	4	0.91	4	0.94	18	66.4	20	-6.3	13
11	Italy IT	1.15	19	1.16	19	1.16	18	0.96	0.82	8	0.93	6	0.82	20	0.93	22	74.7	22	-3.3	12
12	Cyprus CY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	Latvia LV	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
14	Lithuania LT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
15	Luxembourg LU	--	--	--	--	--	--	0.95	0.78	11	0.93	6	0.78	24	0.93	22	100.0	28	-13.1	19
16	Hungary HU	1.11	15	1.12	15	1.08	4	0.95	0.86	6	0.95	4	0.84	16	0.96	5	31.8	6	7.2	7
17	Malta MT	--	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--
18	Netherlands NL	1.04	6	1.07	6	1.11	13	0.96	0.87	5	0.95	4	0.88	12	0.95	12	57.2	17	-0.4	10
19	Austria AT	1.10	14	1.10	13	1.17	22	0.95	0.84	7	0.94	5	0.85	13	0.94	18	80.0	25	-6.3	14
20	Poland PL	--	--	--	--	--	--	0.96	0.89	4	0.96	3	0.93	3	0.98	1	17.5	4	15.5	3
21	Portugal PT	1.16	20	1.17	20	1.07	1	0.97	0.95	1	0.98	1	0.94	1	0.98	1	54.4	13	19.6	1
22	Romania RO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
23	Slovenia SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24	Slovakia SK	1.12	17	1.13	16	1.11	10	0.95	0.84	6	0.95	4	0.90	5	0.96	5	5.2	1	8.3	5
25	Finland FI	1.00	1	1.04	1	1.10	8	0.97	0.89	4	0.98	1	0.90	5	0.98	1	35.3	7	16.1	2
26	Sweden SE	1.00	1	1.05	4	1.12	15	0.95	0.81	9	0.94	5	0.82	20	0.94	18	75.4	23	-6.6	15
27	United Kingdom UK	--	--	--	--	--	--	0.96	0.82	8	0.94	5	0.85	13	0.94	18	73.9	21	-2.5	11
	EU-27	1.09	--	1.11	--	1.13	--	--	0.85	--	0.95	--	0.86	--	0.95	--	--	--	1.4	
	EU-25	1.09	--	1.11	--	1.13	--	--	0.85	--	0.95	--	0.86	--	0.95	--	--	--	1.4	
	EU-15	1.09	--	1.11	--	1.13	--	--	0.85	--	0.95	--	0.85	--	0.95	--	--	--	-0.8	
	EUR-15	1.09	--	1.11	--	1.13	--	--	0.86	--	0.95	--	0.86	--	0.95	--	--	--	0.3	
	EUR-12	1.09	--	1.11	--	1.13	--	--	0.86	--	0.95	--	0.86	--	0.95	--	--	--	0.3	
28	Australia AU	1.04	7	1.05	3	1.08	3	0.96	0.84	7	0.95	4	0.84	16	0.95	12	52.4	12	5.7	--
29	Canada CA	--	--	--	--	--	--	0.95	0.77	12	0.97	2	--	--	--	--	14.8	3	5.2	--
30	Iceland IS	--	--	--	--	--	--	0.93	0.70	15	0.95	4	0.70	27	0.95	12	41.1	9	-9.6	--
31	Japan JP	1.02	4	1.04	2	1.13	17	0.97	0.92	2	0.96	3	0.94	1	0.96	5	55.0	14	10.1	--
32	Korea KR	1.00	1	1.08	8	1.07	2	0.97	0.89	4	0.96	3	0.90	5	0.96	5	14.6	2	15.5	--
33	Mexico MX	--	--	--	--	--	--	--	0.90	3	0.96	3	0.90	5	0.96	5	--	--	--	--
34	New Zealand NZ	1.04	5	1.07	7	1.09	5	0.96	0.84	7	0.95	4	0.83	18	0.95	12	37.0	8	5.4	--
35	Norway NO	1.11	16	1.13	17	1.25	25	0.91	0.71	14	0.93	6	0.72	26	0.93	22	76.0	24	-20.1	--
36	Switzerland CH	--	--	--	--	--	--	0.96	0.90	3	0.95	3	0.89	11	0.95	12	86.4	26	2.7	--
37	Turkey TR	1.26	22	1.34	23	1.11	12	0.96	0.92	2	0.97	2	--	--	--	--	--	--	--	--
38	United States US	--	--	--	--	--	--	0.93	0.74	13	0.92	7	0.77	25	0.92	25	94.3	27	-17.5	--
	OECD	1.09	--	1.11	--	1.12	--	--	0.84	--	0.95	--	0.85	--	0.95	--	52.8	--	0.8	

1/ The difference between the score and 1 indicates by how much (in %) output could be increased while using the same inputs.
2/ Corrected by taking into account the correlation between the scores and environmental variables (here log of per capita GDP and parental education attainment).
3/ Corrected by environmental variables (here log of per capita GDP and parental education attainment). Corrections were computed as the changes in scores by artificially considering that per capita GDP and parental education attainment varied to the samp
4/ Exponential distribution of inefficiency (see Sutherland, 2007, Table 2, p. 24). Dependent variable are the PISA scores, explanatory variables are
5/ Bootstrap estimates with 2 inputs (teachers per 100 students and socio-economic background) and 2 outputs (average PISA score and homogeneity of PISA score).
6/ Bootstrap estimates with 2 inputs (cumulative expenditure per student and socio-economic background) and 2 outputs (average PISA score and homogeneity of PISA score).
7/ Indicates percentile of ranking.
8/ The average has been calculated as the average rank of a country in seven estimations reported in the table above. From the Afonso and St. Aubyn (2006) study only the fully corrected efficiency estimates (third column in table above) were used. The rank of a country was first standardised to range from 0 to 1 to account for the different numbers of countries covered in each study.
9/ Data gaps have not been filled.

Sources: Afonso, A. and M. St. Aubyn, 2006a, "Cross-country Efficiency of Secondary Education Provision: A Semi-Parametric Analysis with Nondiscretionary Inputs," in Economic Modelling, 23 (3), pp. 476-491.
Sutherland, D., R. Price, I. Joumard, and C. Nicq, 2007, "Performance Indicators for Public Spending Efficiency in Primary and Secondary Education," OECD Economics Department Working Paper No. 546 (Paris: OECD).
Verhoeven, M., V. Gunnarsson, and S. Carcillo, 2007, "Education and Health in G7 Countries: Achieving Better Outcomes with Less Spending," IMF Working paper 07/263 (Washington: International Monetary Fund).

Score 1/		Efficiency scores [One output (patents by millions of inhabitants) and one input (gross expenditure in R&D in % of GDP)] 2/			Efficiency scores [One output (publications by millions of inhabitants) and three inputs (higher education R&D expenditure; business R&D expenditure and government R&D expenditure in % of GDP)] 2/		
		Level (Efficiency score)	Score 1/	Rank	Level (Efficiency score)	Score 1/	Rank
1 Belgium	BE	0.83	2.4	9	0.71	5.7	6
2 Bulgaria	BG	0.57	-18.1	18	0.24	-22.3	22
3 Czech Republic	CZ	0.46	-26.8	21	0.43	-11.0	14
4 Denmark	DK	0.85	3.9	7	0.86	14.6	1
5 Germany	DE	0.81	0.8	10	0.56	-3.2	10
6 Estonia	EE	0.90	7.9	4	0.36	-15.2	17
7 Ireland	IE	0.66	-11.0	16	0.62	0.3	8
8 Greece	EL	0.68	-9.4	15	--	--	--
9 Spain	ES	0.66	-11.0	16	0.49	-7.4	12
10 France	FR	0.88	6.3	6	0.55	-3.8	11
11 Italy	IT	0.80	0.0	12	0.46	-9.2	13
12 Cyprus	CY	0.50	-23.6	20	0.31	-18.1	20
13 Latvia	LV	0.28	-30.0	25	0.18	-25.9	24
14 Lithuania	LT	0.43	-29.1	23	0.19	-25.3	23
15 Luxembourg	LU	0.90	7.9	4	0.35	-15.7	18
16 Hungary	HU	0.70	-7.9	14	0.38	-14.0	15
17 Malta	MT	0.81	0.8	10	0.18	-25.9	24
18 Netherlands	NL	0.73	-5.5	13	0.75	8.1	5
19 Austria	AT	0.92	9.4	2	0.57	-2.6	9
20 Poland	PL	0.29	-30.0	25	0.30	-18.7	21
21 Portugal	PT	0.52	-22.0	19	0.34	-16.3	19
22 Romania	RO	0.20	-30.0	25	0.15	-27.7	26
23 Slovenia	SI	0.46	-26.8	21	0.69	4.5	7
24 Slovakia	SK	0.42	-29.9	24	0.38	-14.0	15
25 Finland	FI	0.91	8.7	3	0.76	8.7	3
26 Sweden	SE	1.00	15.7	1	0.76	8.7	3
27 United Kingdom	UK	0.85	3.9	7	0.82	12.3	2
EU-27		0.67	-10.4	--	0.48	-8.2	--
EU-15		0.80	0.0	--	0.61	0.0	--
EUR-15		0.74	-4.9	--	0.52	-5.4	--
EUR-12		0.78	-2.0	--	0.56	-3.2	--
28 Australia	AU	--	--	--	--	--	--
29 Canada	CA	--	--	--	--	--	--
30 Iceland	IS	--	--	--	--	--	--
31 Japan	JP	0.89	7.1	--	0.89	16.4	--
32 Korea	KR	--	--	--	--	--	--
33 Mexico	MX	--	--	--	--	--	--
34 New Zealand	NZ	--	--	--	--	--	--
35 Norway	NO	0.77	-2.4	--	0.77	9.3	--
36 Switzerland	CH	0.94	11.0	--	0.94	19.4	--
37 Turkey	TR	0.27	-30.0	--	0.27	-20.5	--
38 United States	US	0.90	7.9	--	0.90	17.0	--
OECD-8		0.88	5.9	--	0.88	15.5	--
OECD-11		0.75	-3.6	--	0.75	8.3	--
OECD-30		0.74	-5.1	--	0.60	-0.7	--

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30, is deemed as very poor ('--'), between -4 and -10 as poor ('-'),
between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ Estimates using a stochastic frontier approach.

Source: European Commission (2009) "Measuring the efficiency of public spending on R&D", (forthcoming).

Comparing the results for efficiency scores with Graph 2-3, some broad patterns emerge. As regards education, Finland, Ireland, Poland and Slovakia are systematically considered among the most efficient countries while Italy and Greece are among the less efficient ones (Bulgaria and Romania also appear in that group from Graphs 2-3 but were not included in the efficiency studies). On the other hand, for Portugal the findings point in the graphs and the efficiency studies point (Table 8) in different directions. While the graphs seem to show room for a more efficient use of public resources on education, the efficiency score put Portugal at the top. This difference may be explained by the fact that the efficiency studies have used technical inputs (e.g. student-teacher ratios) rather than monetary inputs and correct for external factors (such as per capita income and parental education attainment). Moreover, we use a greater range of education output indicators to reflect the quality of education policies. As regards, R&D those countries identified in the efficiency estimates as the most efficient one (in particular the Nordic countries and Austria) also scored high in our more comprehensive output R&D indicator. However, in Graph 3 most of them were found to achieve these results also with above average public spending which does not seem to be the case in the efficiency study that uses total (public and private) R&D spending.

Overall, the illustrations show that while simplifying the composite indicator calculations for dimensions QPF3.2-3.7 by focusing on output/outcome indicators is possible to obtain some core indications it definitely needs to be complemented by more detailed analysis. While the broad positive link between outcome and input variables justifies some simplification, deviations for individual countries may be large. Therefore, a more detailed look at efficiency is needed, for

example through the proposed benchmarking to the best performers (in terms of output) and or the use of efficiency scores. But even this broad-based indicator approach can only give an indication of a country's weaknesses and strengths relative to its peers and an analysis needs to be complemented by country-specific and qualitative information.

4.3.   Steps 9 and 10: How to use the QPF indicators

Composite indicators on QPF can be a powerful communication tool but can also easily be misinterpreted. Therefore, one should be careful on how to present and disseminate QPF composite indicators, for what policy issues to apply them and with what information to supplement them. In particular, one needs to be transparent about their construction and be able to decompose them into their underlying values as attempted in this paper. Moreover, while for analytical purposes it may be useful to show the actual "scores" and "ranks" of each country, for the purposes of identifying broad trends and against the background of the broad uncertainty bands and caveats of the indicators it may be sufficient to show only the range into which the indicators fall as demonstrated in Table 10.

The work on QPF composite indicators presented in this paper serves three purposes: (i) contributing to the discussion on how to conceptually capture and "measure" QPF, (ii) providing a first step in developing a compass for identifying a country's strengths and weaknesses in QPF compared to its peers, and (iii) identifying variables that could be used for a more-detailed analysis on the links between public finances and long-term economic growth, including growth regressions, as well as pointing out data gaps that would need to be filled over time. In that sense, the QPF indicators presented here should be seen as a first attempt (as indicated in the title of the paper) to systematise and make more operational analysis and discussions on QPF. Since the proposed (and more generally all) composite indicators have inherently many caveats, they should never be the only tool on which an analysis or discussion should be based, but clearly need to be linked up with a more thorough (country-specific) review of any identified priority policy areas and possibly their interrelations with other policy aspects.

Table 10: **Summary indicators on quality of public finances 1/**

	QPF1. Size of government	QPF2. Fiscal position and sustainability	QPF3. Composition, efficiency and effectiveness of expenditure							QPF4. Structure and efficiency of revenue systems	QPF5. Fiscal governance	Number of "poor" and "very poor" scores
			QPF3.1 Composition	QPF3.2 Education	QPF3.3 Health	QPF3.4 R&D	QPF3.5 Public infrastructure	QPF3.6 Public order &safety	QPF3.7 General services			Across all 12 QPF composite indicators
BE	poor	poor	average	good	average	average	good	average	average	poor	average	3
BG	very good	very good	good	poor	poor	poor	poor	poor	poor	very good	average	6
CZ	good	poor	very good	good	poor	poor	average	poor	poor	average	average	5
DK	poor	very good	average	average	average	average	good	good	very good	average	good	1
DE	average	average	poor	average	poor	good	good	good	average	poor	average	3
EE	very good	very good	very good	good	poor	poor	poor	poor	average	very good	good	4
IE	very good	average	very good	good	average	average	poor	average	average	very good	poor	2
EL	good	poor	poor	poor	average	poor	poor	average	poor	good	average	6
ES	very good	good	good	poor	good	poor	poor	poor	poor	average	good	5
FR	poor	poor	average	average	good	average	average	average	average	poor	average	3
IT	poor	poor	average	poor	good	average	poor	poor	poor	average	average	6
CY	average	average	average	good	poor	poor	poor	average	average	very good	poor	4
LV	very good	average	very good	average	poor	poor	poor	poor	poor	average	average	5
LT	very good	average	very good	good	poor	poor	poor	poor	poor	good	average	5
LU	very good	average	average	average	average	average	good	average	average	average	poor	1
HU	poor	poor	average	average	poor	poor	poor	average	poor	average	poor	7
MT	good	average	good	poor	average	poor	poor	average	poor	very good	poor	5
NL	average	average	average	good	average	good	good	average	good	average	average	0
AT	poor	average	poor	good	average	good	average	average	good	average	average	2
PL	good	average	good	good	poor	poor	poor	poor	poor	average	average	5
PT	average	poor	good	poor	average	poor	poor	average	poor	good	poor	6
RO	very good	average	very good	poor	poor	poor	poor	poor	poor	good	poor	7
SI	good	average	good	good	poor	average	poor	poor	poor	average	average	4
SK	very good	average	poor	good	poor	poor	poor	poor	poor	good	poor	8
FI	average	very good	average	very good	poor	good	average	very good	very good	average	good	1
SE	poor	good	average	good	good	good	average	average	good	average	average	1
UK	average	poor	average	average	poor	average	average	poor	average	good	good	3

Notes: 1/ Weighted average (by groups of indicators as shown in Annex 4). Based on data available until September 2008.
Source: Authors' calculations.

5. Conclusions

To more systematically analyse the quality of public finance and compare developments across countries and over time, a greater focus on identifying and developing comparable indicators is needed. This paper provides a first attempt in this respect by creating composite indicators for twelve areas of public finances that are linked to long-term economic growth.

While the proposed alternative methods provide relatively robust results and findings are in line with conventional wisdom, the paper has identified also a number of problems and areas for future work. These relate to data gaps (in particular over time) and data methodologies, the need to account for time lags between the implementation of policy measures and outcomes and the danger that composite indicators oversimplify complex issues which cannot be captured in a few variables. This includes the focus here on the growth objective, which at times may not be in line with other policy objectives such as equity. Moreover, in this paper composite indicators did neither fully account for the efficiency of public spending, but the focus was rather more on expenditure outcomes, nor for the complementarity of indicators.

Nevertheless, this "first attempt" at measuring QPF shows that composite indicators can serve as a useful starting point for identifying a country's' main strengths and weaknesses in QPF. To improve the guidance function of those indicators, some of the data problems could be tackled over time (such as filling data gaps and drawing on public spending efficiency estimates). However, ultimately composite indicators can be only one instrument in the analysis of QPF and need to be supplemented by qualitative assessments that account for country and other specificities.

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Annex 1: Statistical properties of potential QPF indicators

QPF1: Government size	Statistical reliability	Country coverage		Timeliness	Time coverage
		EU-27	Non-EU OECD MS		
Total general government expenditure (AMECO)	++	++	+	++	++
Total general government expenditure (Eurostat)	++	++	-	++	+
Total general government expenditure (IMF)	++	++	++	++	++

QPF2: Fiscal position and sustainability			Statistical reliability	Country coverage		Timeliness	Time coverage
				EU-27	Non-EU OECD MS		
2.1	Fiscal position	Cyclically adjusted primary balance	+	++	-	++	-
		Fiscal position (AMECO)	++	++	+	++	+
		Fiscal position (Eurostat)	++	++	+	++	-
		Fiscal position (IMF)	++	++	++	++	++
		Primary fiscal deficit (AMECO)	++	++	+	++	+
		Structural balance and MTO	+	++	-	++	-
2.2	Public debt	Public gross debt (AMECO)	++	++	-	++	++
		Public gross debt (Eurostat)	++	++	+	++	-
		Public gross debt (IMF)	++	++	++	++	++
2.3	Sustainability	Sustainability (S1)	+	++	-	++	-
		Sustainability (S2)	+	++	-	++	-

QPF3: Composition, efficiency & effectiveness of expenditure					Statistical reliability	Country coverage		Timeliness	Time coverage
						EU-27	Non-EU OECD MS		
3.1	Composition of expenditure			COFOG - % GDP	++	++	-	++	-
				COFOG - % of public spending	++	++	-	++	-
				Productive expenditure					
				Def 1:Public spending on transportation, R&D and education	+	++	-	++	-
				Def 2:Public spending on transportation, R&D, education and health	+	++	-	++	-
				Def 3: Public spending on transportation, R&D, education, health, public order & safety and environmental protection - % GDP	+	++	-	++	-
				Public consumption (AMECO)	++	++	+	++	++
				Public consumption (IMF)	++	++	++	++	++
				Public investment (AMECO)	+	++	+	++	++
				R&D expenditure (Eurostat)					
				Gross domestic expenditure on R&D (GERD) by source of funds - government - % of GERD	++	++	-	++	-
				Gross domestic expenditure on R&D (GERD)	++	++	-	++	-
				Total GBAORD (Government budget appropriations or outlays on R&D)	++	++	-	++	-
				Spending on public infrastructure (airports, road, etc) (International Transport Forum)	-	+	-	-	-
3.2	Education	3.2.1	Education expenditure	Total public expenditure - all education levels (Eurostat)	++	++	+	+	-
				Public expenditure on primary education	++	++	+	+	-
				Public expenditure on secondary education	++	++	+	+	-
				Public expenditure on primary & secondary education	++	++	+	+	-
				Public expenditure on tertiary education	++	++	+	+	-
				Total public expenditure on education & exp on primary & sec ed. (OECD)	++	+	++	-	-
				Public expenditure on education (total & per level) - COFOG					
				Total general government expenditure on education	++	++	-	++	-
				Total general government expenditure on tertiary education	++	-	-	-	-
				Total general government expenditure on post-secondary non-tertiary education	++	-	-	-	-
				Total general government expenditure on secondary education	++	-	-	-	-
				Total general government expenditure on pre-primary and primary education	++	-	-	-	-
				Public expenditure on education (all countries covered, total & per level) (UIS-UNESCO)					
				Public expenditure on education as % of GDP	++	++	++	+	-
				Total expenditure on educ. institutions and administration. Public sources. Tertiary	++	++	++	+	-
				Total expenditure on educ. institutions and administration. Public sources. Secondary and post-secondary non-tertiary	++	++	++	++	-
				Total expenditure on educational institutions and administration as a % of GDP. Public sources. Primary	++	++	++	++	-
		3.2.2	Other education inputs	Institutional education indicators (OECD)	+	+	++	-	-
				Student teacher ratio (primary & secondary) (Eurostat)	++	++	-	++	-
				Student teacher ratio (primary or secondary, all countries covered) (UNESCO)	++	++	++	++	-
		3.2.3	Education outputs and outcomes	Educational attainment (% pop wih sec education) (Eurostat)	++	++	-	++	-
				Educational attainment (% pop wih tert. education) (OECD)	++	+	+	-	-
				Attainment (average years - Barro/ Lee)	++	+	++	-	-
				Early school leavers (Eurostat)	++	++	-	++	-
				Higher education and training & Quality of educational system & Local availability of specialized research and training services (WEF)	+	++	++	++	-
				PISA scores (2000, 2003 & 2006)	+	++	++	++	-
				Youth educational attainment (Eurostat)	++	++	-	++	-
				Knowledge transfer (IMD)	+	++	++	++	-
				Educational system (IMD)	+	++	++	++	-
		3.2.4	Education efficiency	Education efficiency (based on Alfonso/ St. Aubyn, 2006 and Verhoeven et al., 2007)	na	+	+	-	-

QPF3: Composition, efficiency & effectiveness of expenditure			Statistical reliability	Country coverage		Timeliness	Time coverage
				EU-27	Non-EU OECD MS		
3.3.1	Health expenditure	Public health expenditure (COFOG)	++	++	-	++	-
		Public health expenditure (UN)	++	++	++	++	-
		Sickness and health care expenditure (ESSPROS)	++	++	-	++	+
		Public health expenditure and composition (OECD System of Health Accounts)	++	+	++	-	-
3.3.2	Other health inputs	Doctor consultations (OECD)	++	+	++	-	-
		Hospital beds (Eurostat and OECD)	+	++	++	++	++
		Nurses (WHO, all countries covered)	++	++	+	-	-
		Nurses (OECD)	++	+	++	-	-
		Health personnel (practising) (Eurostat and OECD)	+	++	++	+	-
		Surgical procedures (WHO)	++	+	-	-	-
		Health infrastructure (IMD)	+	++	++	++	-
3.3.3	Health outputs and outcomes	Hospital discharges (WHO)	++	++	-	+	-
		Lenght of stay (WHO)	++	++	-	+	++
		Healthy life years expectancy	++	++	-	++	-
		Infant mortality rate (Eurostat)	++	++	-	++	++
		Life expectancy at birth (Eurostat and OECD)	+	++	++	++	+
		Life expectancy at 65 (Eurostat and OECD)	+	++	-	++	+
		Mortality rates (Eurostat, by gender & age)	+	++	-	++	-
		Mortality rates (OECD)	++	+	++	-	++
		Potential years of life lost (OECD)	++	+	++	-	-
3.3.4	Health efficiency	Health efficiency (Alfonso, St Aubyn, Verhoeven)	na	+	+	-	-
3.3.5	Other	Health and primary education (4th pillar, WEF)	+	++	++	++	-
		Quality of life (IMD)	+	++	++	++	-
3.4 R&D							
3.4.1	R&D expenditure	R&D expenditure (Eurostat)					
		Gross domestic expenditure on R&D (GERD) by source of funds - government - % of GERD	++	++	-	++	-
		Gross domestic expenditure on R&D (GERD)	++	++	-	++	-
		Total GBAORD (Government budget appropriations or outlays on R&D)	++	++	-	++	-
		BERD (Business entreprise R&D expenditure)	++	++	-	++	-
		Higher education R&D expenditure (Eurostat)	++	++	+	++	-
3.4.2	Other R&D inputs	Human resources in science and technology (Eurostat)	+	++	-	++	-
		Total R&D personnel in business enterprise sector, full time equivalent (Eurostat)	+	++	-	++	-
		Funding for technological development (IMD)	+	++	++	++	-
		Technological regulation (IMD)	+	++	++	++	-
		Scientific research (IMD)	+	++	++	++	-
3.4.3	R & D output and outcomes	WEF index R&D (technological readiness, innovation, innovation & sophistication factors subindex, local availability of specialised research and training)	+	++	++	++	-
		Science and technology graduates (Eurostat)	++	++	+	++	-
		Patent applications by milliard EUR of total R&D expenditure (GERD) (Eurostat)	++	++	+	+	+
		Patent applications to the European Patent Office (per million inhabitants) (Eurostat)	++	++	++	++	-
		Patents granted to residents (World International Property Organization)	+	++	++	++	++
		Triadic patents (Eurostat)	++	+	+	-	-
		Basic research (IMD)	+	++	++	++	-
		Science in schools (IMD)	+	++	++	++	-
		Youth interest in science (IMD)	+	++	++	++	-
3.4.4	R & D efficiency	European Commission (2009)	na	++	+	-	-
3.5 Public infrastructure							
3.5.1	Public infrastructure expenditure	Expenditure on public infrastructure (rail, roads, etc) (International Transport Forum)	-	+	-	-	-
3.5.2	Other input	---					
3.5.3	Public infrastructure output and outcomes	WEF index infrastructure	+	++	++	++	-
		Fixed line and mobile phone subscribers (World Bank)	+	++	++	++	++
		Internet users (World Bank)	+	++	++	++	+
		Length of motorways (Eurostat)	+	+	-	-	++
		Railway (Eurostat)	+	++	-	-	-
		Broad band access (World Bank)	+	++	++	++	+
		Maintenance and development (IMD)	+	++	++	++	-
		Energy infrastructure (IMD)	+	++	++	++	-
		Future energy supply (IMD)	+	++	++	++	-
3.6 Public order and safety							
3.6.1	Public order and safety expenditure	Public expenditure on public order and safety (COFOG)	++	++	-	++	-
3.6.2	Other public order and safety input	Police staff (European Sourcebook of Crime and Criminal Justice)	-	++	-	+	-
3.6.3	Public order and safety outcomes and outcomes	Business cost of crime and violence (WEF)	+	++	++	++	-
		Organised crime (WEF)	+	++	++	++	-
		Persons convicted (European Sourcebook of Crime and Criminal Justice)	-	++	-	+	-
		Reliability of police services (WEF)	+	++	++	++	-
		Total criminal offences (European Sourcebook of Crime and Criminal Justice)	-	++	-	+	-
		Justice (IMD)	+	++	++	++	-
		Police satisfaction (EU ICS 2005)	+	+	-	-	-
		Burden of crime (EU ICS 2005)	+	+	-	-	-
		Personal security and private property (IMD)	+	++	++	++	-
3.7 General public services							
3.7.1	General public services expenditure	General public services expenditure (COFOG)	++	++	-	++	-
3.7.2	Other general public services inputs	---					
3.7.3	General public services outputs and outcomes	WEF index general public services (institutions, wastefulness of government spending and burden of government regulation)	+	++	++	++	-
		Public trust of politicians (WEF)	+	++	++	++	-
		Management of public finances (IMD)	+	++	++	++	-
		Global corruption barometer (Transparency International)	+	+	++	++	-
		Diversion of public funds (WEF)	+	++	++	++	-
		Corruption perception index (Transparency International)	+	++	++	++	-
		Bureaucracy (IMD)	+	++	++	++	-
		Bribing and corruption (IMD)	+	++	++	++	-

		QPF4: Structure and efficiency of revenue systems	Statistical reliability	Country coverage		Timeliness	Time coverage
				EU-27	Non-EU OECD MS		
4.1	Total revenue	Revenue structure (AMECO & OECD combined)	+	++	++	++	++
		Total receipts from taxes and social contributions (Eurostat)	++	++	-	+	-
		Total revenue - gen government (IMF)	++	++	++	++	++
		Total revenue - gen, central and local (Eurostat)	++	++	-	++	-
		Total tax receipts (Eurostat)	++	++	-	++	-
4.2	Direct taxes	Total taxes on capital - % of GDP (Eurostat)	++	++	-	++	-
		Total taxes on labour - % of GDP (Eurostat)	++	++	-	++	-
		Income taxation - % of GDP (Eurostat)	++	++	-	++	-
		Income taxation - corporations income including holding gains (Eurostat)	++	++	-	++	-
		Income taxation - individual income including holding gains (Eurostat)	++	++	-	++	-
		Income tax rates - corporate (combined) (OECD)	+	+	++	-	-
		Income tax rates - Personal, all-in, average (OECD)	+	+	++	-	-
		Income tax rates - Personal, all-in, marginal (OECD)	+	+	++	-	-
		Inactivity trap (OECD)	+	++	-	++	-
		Low wage trap (Eurostat)	++	++	-	++	-
		Net replacement rates (OECD)	+	++	-	++	-
		Unemployment trap	++	++	-	++	-
		Labour tax rates - implicit tax rate (Eurostat)	++	++	-	++	-
		Tax wedge - average personal income tax (67%) (Eurostat)	+	++	+	++	-
		Tax wedge - average personal income tax (100%) - OECD	+	+	++	-	-
		Tax wedge - marginal personal income tax (OECD)	+	+	++	-	-
4.3	Indirect taxes	Consumption taxation (Eurostat)	++	++	-	++	-
		Taxes and duties on imports excluding VAT (Eurostat)	++	++	-	++	-
		Taxes on production and imports (Eurostat)	++	++	-	++	-
		VAT - % of GDP (Eurostat)	++	++	-	++	-
		VAT - GST rates (OECD)	+	+	++	-	-
4.4	Social security contributions	Actual social security contributions (Eurostat)	++	++	-	++	-
		Social security contribution rates (OECD)	-	+	++	-	-
		Social security receipts by ESSPROS-type (Eurostat)	++	++	-	++	+
4.5	Tax administration	Ease of paying taxes (World Bank)	+	++	++	++	-
		Tax evasion (IMD)	+	++	++	++	-

		QPF5: Fiscal governance	Statistical reliability	Country coverage		Timeliness	Time coverage
				EU-27	Non-EU OECD MS		
5.1	Numerical fiscal rules	Numerical fiscal rules (fiscal & expenditure rules) (Commission services)	+	++	-	++	-
5.2	Medium-term budgetary frameworks	Medium-term budgetary frameworks (Commission services)	+	++	-	++	-
5.3	Budgetary procedures	Budgetary procedures index (Commission services)	-	++	-	-	-
5.4	Transparency	Public procurement (Eurostat)	+	++	-	++	-
		Transparency (IMD)	+				
5.5	Other - quality of governance	World bank governance indicators: Voice & accountability, Political stability, Government effectiveness, Regulatory quality, Rule of Law, Control of corruption)	+	++	++	++	-
		Public service (IMD)	+	++	++	++	-
		Human development index (UNDP)	++	++	++	++	-
		Policy direction of the government (IMD)	+	++	++	++	-
		Legal and regulatory framework (IMD)	+	++	++	++	-
		Adaptability of government policy (IMD)	+	++	++	++	-
		Government decisions (IMD)	+	++	++	++	-

Annex 2: Selected indicators used for the sample calculation of composite indicators

Dimension	Variable	Description	Unit	Original data source
QPF1	Government expenditure	Total expenditure; general government; ESA 1995 and former definition - spring 2008 economic forecast - UUTG - UUTGF	% GDP	AMECO
QPF2	Cylically-adjusted primary balance (CAPB)	Structural balance of general government excluding interest - adjustment based on potential GDP - excessive deficit procedure - spring 2008 economic forecast - UBLGBPS	% GDP	AMECO
QPF2	Structural balance	Structural balance of general government - Adjustment based on potential GDP - Excessive deficit procedure - pring 2008 economic forecast - UBLGAPS	% GDP	AMECO
QPF2	Deviation of structural balance from MTO	Distance of the 2007 structural fiscal balance from the country-specific MTO	% GDP	Commission services
QPF2	Government debt	General government consolidated gross debt - Excessive deficit procedure - ESA 1995 and former definition (linked series) - UDGGL	% GDP	AMECO
QPF2	S1 2007 scenario	S1 = gap to the debt-stabilising primary balance + additional adjustment required to reach a debt target of 60% in 2050 + additional adjustment required to finance the increase in public expenditure up to 2050.	% GDP	Commission services
QPF2	S2 2007 scenario	S2 = gap to the debt-stabilizing primary balance + additional adjustment required to finance the increase in public expenditure over an infinite horizon.	% GDP	Commission services
QPF3.1	Public investment	Gross fixed capital formation; general government - ESA 1995 and former definition merged - UIGGO - UIGGOF	% GDP	AMECO
QPF3.1	Public investment	Gross fixed capital formation; general government - ESA 1995 and former definition merged - UIGGO - UIGGOF	% GDP	AMECO
QPF3.1	Productive' spending	Public spending on transportation, R&D, education and health	% of GDP	Eurostat and OECD
QPF3.1	Productive' spending	Public spending on transportation, R&D, education and health	% primary government spending	Eurostat and OECD
QPF3.2	PISA	PISA total score	The mean performance of OECD students is set at 500 for the surveys.	OECD
QPF3.2	Edcuation attainment	Percentage of the population aged 25 to 64 having completed at least upper secondary education	% of the pop. aged 25-64	Eurostat
QPF3.2	Youth education attainment	Youth educational attainment	% of the pop. aged 20-24	Eurostat
QPF3.2	Early school leavers	Early school leavers: % of the population aged 18-24 with at most lower secondary education and not in further education or training	% of the pop. aged 18-24	Eurostat
QPF3.2	Quality of educational system	Quality of the educational system: the educational system in the country (1 = does not meet thte needs of a competitive economy, 7 = meets the needs of a competitive economy)	Score 1-7	WEF
QPF3.3	Life expectancy at birth	The mean number of years that a newborn child can expect to live if subjected throughout his life to the current mortality conditions (age specific probabilities of dying).	Number of years	Eurostat and OECD
QPF3.3	Life expectancy at 65	The mean number of years still to be lived by a man or a woman who has reached the age 65, if subjected throughout the rest of his or her life to the current mortality conditions (age-specific probabilities of dying).	Number of years	Eurostat and OECD
QPF3.3	Health adjusted life expectancy - females	Healthy Life Years (HLY) measures the number of remaining years that a person of a specific age is still expected to live in a healthy condition. A healthy condition is defined by the absence of limitations in functioning/disability.	Number of years	Eurostat
QPF3.3	Health adjusted life expectancy - males	Healthy Life Years (HLY) measures the number of remaining years that a person of a specific age is still expected to live in a healthy condition. A healthy condition is defined by the absence of limitations in functioning/disability.	Number of years	Eurostat
QPF3.3	Infant mortality rate	Ratio of the number of deaths of children under one year of age during the year to the number of live births in that year.	Deaths of children under one year of age per 1000 live births	Eurostat

Dimension	Variable	Description	Unit	Original data source
QPF3.4	Patents granted to residents	Number of patents granted to residents per 1000 000 population ("resident" filing refers to an application filed with the Office of or acting for the State in which the first named applicant in the application concerned has residence).	Per 1000 000 inhabitants	WIPO
QPF3.4	Patent applications	Total number of patent applications by milliard EUR of total R&D expenditure (GERD). Patent applications to the EPO by priority year at the national level.	Relative to gross domestic expenditure on R&D (GERD)	Eurostat
QPF3.5	Scientific publications	Number of papers (in all scientific fields) published in a 5-year interval period.	Per million inhabitants	ISI Web of Knowledge
QPF3.6	Citations per scientific publication	Average number of citations over a five year period (2000-2004).	Per scientific publication	ISI Web of Knowledge
QPF3.4	Technological readiness	Index based on 8 subindices: (1) availability of latest technologies, (2) firm-level technology absorption, (3) laws relating to ICT, (4) FDI and technology transfer, (5) mobile telephone subscribers - hard data, (6) internet users - hard data, (7) personal computers - hard data, (8) broadband internet subscribers - hard data.	Score 1-7	WEF
QPF3.4	Innovation index	Index based on 8 subindices: (1) capacity for innovation, (2) quality of scientific research institutions, (3) company spending on R&D, (4) University- industry research collaboration, (5) government procurement of advanced technology products, (6) availability of scientists and engineers, (7) utility patents - hard data and (1.2) intellectual property protection.	Score 1-7	WEF
QPF3.4	Basic research index	Basic research (0 = does not enhance long-term economic development, 10 = does enhance long-term economic development)	Score 0-10	IMD
QPF3.5	Length of motorways	Length of motorways per 1000 km of country size	Per 1000 km	Eurostat & CIA
QPF3.5	Length of railways	Length of railway tracks per 1000 km	Per 1000 km	Eurostat & CIA
QPF3.5	Fixed lines and mobile subscriptions	Fixed line and mobile phone subscribers	Units per 100 people	World Bank
QPF3.5	Internet users	Ratio of Internet users (ie. with access to the worldwide network) in the population	Users per 1000 people	IUT, WTD Report and database, and World Bank.
QPF3.5	Energy infrastructure	Energy infrastructure (0 = is not adequate and efficient, 10 = is adequate and efficient)	Score 0-10	IMD
QPF3.5	Infrastructure index	Index based on 8 subindices: (1) quality of overall infrastructure, (2) quality of roads, (3) quality of railroad infrastructure, (4) quality of port infrastructure, (5) quality of air transport infrastructure, (6) available seat kilometers - hard data, (7) quality of electricity supply and (8) telephone lines - hard data.	Score 1-7	WEF
QPF3.6	Persons convicted	Persons convicted in percentage of offenses (total criminal offences)	% total offenses	European Sourcebook of Crime and Criminal Justice
QPF3.6	Burden of crime	Percentage of respondents victimised once or more in the year preceding the survey.	% of respondents victimised	EU ICS 2005
QPF3.6	Business cost of crime	The incidence of common crime and violence (e.g. street muggings, firms being looted) (1 = imposes significant costs on businesses, 7 = does not impose significant costs on businesses)	Score 1-7	WEF
QPF3.6	Fairness of justice	Justice is (0 = not fairly administered, 10 = fairly administered)	Score 0-10	IMD
QPF3.6	Organised crime	Organised crime (mafia-oriented racketeering, extortion) in your country (1 = imposes significant costs on businesses, 7 = does not impose significant costs on businesses)	Score 1-7	WEF
QPF3.6	Reliability of police services	Police services (1 = cannot be relied upon to protect businesses from criminals, 7 = can be relied upon to protect businesses from criminals)	Score 1-7	WEF
QPF3.6	Personal security and private property	Personal security and private property (0 = are not adequately protected, 10 = are adequately protected)	Score 0-10	IMD
QPF3.6	Persons killed or injured in road traffic accidents	Persons killed or injured in road traffic accidents	per 10.000 vehicles	WHO & UNECE
QPF3.6	Police satisfaction	Percentage of respondents satisfied with police controlling crime in local area.	% of respondents satisfied.	EU ICS 2005
QPF3.7	Bribing and corruption index	Bribing and corruption (0 = exist, 10 = do not exist)	Score 0-10	IMD
QPF3.7	Corruption perception index	The TI CPI focuses on corruption in the public sector and defines corruption as the abuse of public office for private gain.	Score 0-10	Transparency International
QPF3.7	Corruption impact on parliament	Impact of corruption on parliament/legislature (1: not at all corrupt; 5: extremely corrupt)	Score 1-5	Transparency International
QPF3.7	Public trust of politicians	Public trust in the financial honesty of politicians is (1 = very low; 7 = very high)	Score 1-7	WEF
QPF3.7	Diversion of public funds	Diversion of public funds to companies, individuals or groups due to corruption (1 = is common, 7 = never occurs)	Score 1-7	WEF
QPF3.7	Bureaucracy index	Bureaucracy (0 = hinders business activity, 10 = does not hinder business activity)	Score 0-10	IMD
QPF3.7	Wastefulness of public spending index	Public spending in the country (1 = is wasteful, 7 = provides necessary goods and services not provided by the market)	Score 1-7	WEF

Dimension	Variable	Description	Unit	Original data source
QPF4a	Share of indirect taxes	Share of indirect taxes in total general government revenues	% of total revenue	Eurostat, AMECO and OECD
QPF4a	Share of consumption taxes	Share of consumption taxes in total general government revenues	% of total revenue	Eurostat, AMECO and OECD
QPF4b	Inactivity trap (average wage)	Marginal effective tax rate of a single worker when moving from social assistance to work at a wage level equivalent to the wage of the average production worker (manufacturing sector)	% of average wage	European Commission and OECD
QPF4b	Inactivity trap (low wage)	Marginal effective tax rate of a single worker when moving from social assistance to work at a wage level equivalent to 67% of the wage of the average production worker (manufacturing sector)	% of low wage (67% of average wage)	European Commission and OECD
QPF4c	Average tax wedge on average wage earners (average wage)	Average tax wedge on average wage earners (single person without children, at 100% of average wage)	% of average wage	OECD
QPF4c	Average tax wedge on low wage earners	Average tax wedge on low wage earners (single person without children, at 67% of average wage)	% of average wage	OECD
QPF4d	Net replacement rates (average wage)	Net replacement rates for unemployed single persons without children, at 100% of average wage	% of average wage	European Commission and OECD
QPF4d	Net replacement rates (low wage)	Net replacement rates for unemployed single persons without children, at 67% of average wage	% of average wage	European Commission and OECD
QPF4e	Corporate income tax rate	Combined central government and sub-central government (corporate income tax rate. Where a progressive (as opposed to flat) rate structure applies, the top marginal rate is shown.	%	OECD
QPF4e	Implicit corporate income tax rate	Computed as the ratio of total tax revenues of capital to a proxy of the potential tax base defined using the production and income accounts of the national accounts.	%	Eurostat
QPF4e	Profit tax-to-income tax ratio	Taxes on the income or profits of corporations-to-tax on individual or household income	%	Eurostat
QPF4f	Number of tax payments	Number of payments for corporate income tax, value added tax or sales tax and labour taxes, including payroll taxes and social contributions based on a case study company representative for the country.	Numbers per year	World Bank
QPF4f	Hours per tax payments	Time to prepare, file and pay (or withhold) corporate income tax, value added tax or sales tax and labour taxes, including payroll taxes and social contributions based on a case study company representative for the country.	Hours per year	World Bank
QPF5	Fiscal rules index	Coverage and strength of total fiscal rules	Standardised distribution - t-distribution; mean = 0, st.dev. = 1	ECFIN
QPF5	MTBF index	Index measures the quality of institutions for medium-term budgetary planning based on five components: existence of a national MTBF; connectedness between multiannual targets and the annual budget; involvement of the national Parliament; existence of coordination mechanisms; monitoring and enforcement.	Score 0-2	ECFIN
QPF5	Public procurement transparency	Indicator that estimates the amount of procurement for which calls for competition have been published in the Official Journal of the European Communities and the TED database, as a percentage of the total value of public procurement.	% of the total value of public procurement.	Eurostat, DG MARKT

Annex 3: Imputation of missing values

QPF category	Missing indicators (X_i^k)	Non-missing indicators ($X_{i}^{\bar{j}}$)	Countries concerned
QPF3.1 Education	PISA score (OECD)	Education attainment (Eurostat)	CY,MT
QPF3.2 Health	Health adjusted life expectancy (females, males)	Life expectancy at birth	BG, RO
QPF 3.4 R&D and innovation	Basic research (IMD)	Innovation indexWEF)	CY, LV, MT
QPF 3.5 Infrastructures	Length of motorways (World Bank)	Infrastructure index (WEF)	BG, EL, MT, RO
	Length of railways (World Bank)	Infrastructure index (WEF)	BG, CY, ES, LU, MT, RO
	Energy infrastructure (IMD)	Infrastructure index (WEF)	CY, LV, MT
QPF 3.6 Public order	Persons convicted (1) (European Sourcebook of Crime)	Average (1)-(4)	BG, CY, CT, LT, LU, LV, RO, SI, SK, PL
	Burden of crime (2) (EU ICS)		
	Business cost crime (3) (WEF)		
	Fairness of justice (4) (IMD)		
	Police satisfaction (EU ISC)	Reliability police services (WEF)	BG, CZ, CY, LT, LV
	Bribing corruption (IMD)	Corruption perception index (Transparency International)	CY, LV, MT
	Bureaucracy (IMD)	Wastefulness of public spending (World Bank)	CY, LV, MT
QPF 3.7 Quality of public administration	Corruption impact parliament	Corruption perception index (Transparency International)	BE, CY, HU, SK, MT, SI
QPF 4 Structure and efficiency of revenue systems	For BG and RO when all comparable data were missing, the average of RAMS was used		
	Average tax wedge (average wage)	Net replacement ratio (average wage)	BG, EE, CY, LV, LT, RO, SI
	Marginal tax wedge (average wage)	Net replacement ratio (average wage)	BG, EE, CY, LV, LT, RO, SI
	Marginal tax wedge (low wage)	Average tax wedge (low wage)	BG, EE, CY, LV, LT, RO, SI
	Implicit income tax rate	Total tax on capital-to-total tax on labour ratio	BG, CY, LV, LT, RO, SI
	Corporate income tax rate	Total tax on capital-to-total tax on labour ratio	BG, EE, CY, LV, LT, RO, SI
	Taxes on income(profits) of corporations-to-tax on individual or household income	Total tax on capital-to-total tax on labour ratio	DE
	Number of tax payments, hours per tax payements	EU27 average	CY, MT
QPF 5 Fiscal governance	Transparency (call for tenders in public procurement)	Transparency of government policy (IMD survey)	BG, RO

Annex 4: Detailed decomposition of composite indicators using simple weighted averages

		Table 5. Size of government (QPF1)		
		Total general government expenditure (Eurostat)		
		Level (% of GDP, 2007)	Score 1/	Rank
1	Belgium	BE	48.9	-6.5	23
2	Bulgaria	BG	37.8	15.4	7
3	Czech Republic	CZ	42.4	6.3	10
4	Denmark	DK	50.6	-9.8	25
5	Germany	DE	43.9	3.4	16
6	Estonia	EE	33.7	23.5	1
7	Ireland	IE	36.4	18.1	3
8	Greece	EL	43.3	4.6	13
9	Spain	ES	38.8	13.4	9
10	France	FR	52.6	-13.8	26
11	Italy	IT	48.5	-5.7	22
12	Cyprus	CY	43.9	3.4	16
13	Latvia	LV	38.0	15.0	8
14	Lithuania	LT	35.6	19.7	2
15	Luxembourg	LU	37.5	16.0	6
16	Hungary	HU	50.1	-8.8	24
17	Malta	MT	42.5	6.1	12
18	Netherlands	NL	45.9	-0.6	19
19	Austria	AT	48.2	-5.1	21
20	Poland	PL	42.4	6.3	10
21	Portugal	PT	45.8	-0.4	18
22	Romania	RO	36.9	17.2	4
23	Slovenia	SI	43.3	4.6	13
24	Slovakia	SK	36.9	17.2	4
25	Finland	FI	47.5	-3.7	20
26	Sweden	SE	52.6	-13.8	26
27	United Kingdom	UK	43.7	3.8	15
	EU-27		43.2	4.7	..
	EU-15		45.6	0.0	..
	EUR-15		44.5	2.3	..
	EUR-12		40.3	10.5	..

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -4 and -30 is deemed as low ('-'),
 between -4 and +4 as medium ('0'), and between +4 and +30 as high ('+').

Sources: Eurostat

2. Selected indicators to measure the fiscal position, debt and sustainability (QPF2)

		Cyclically adjusted primary balance of general government (Adjustment based on potential GDP - EDP)		Structural balance of general government (Adjustment based on potential GDP, EDP)		Deviation of structural balance from MTO		1. Fiscal position	2. General government consolidated gross debt (EDP: ESA95)		S1 2007 scenario 3/		S2 2007 scenario 4/		3. Sustainability	Overall average (1., 2., 3.) 2/	
		Level (% of GDP, 2007)	Score 1/	Level (% of GDP, 2007)	Score 1/	Level (% of GDP, 2007)	Score 1/	Score 1/	Level (% of GDP, 2007)	Score 1/	Level (% of GDP, 2007)	Score 1/	Level (% of GDP, 2007)	Score 1/	Score 1/	Score 2/	Rank
1 Belgium	BE	3.6	4.8	-0.2	-1.1	-0.8	-4.4	-0.2	84.9	-11.8	1.6	-4.9	3.0	-2.6	-3.8	-5.2	20
2 Bulgaria 5/	BG	4.1	7.2	2.9	12.1	3.1	13.1	10.8	18.2	12.8	-6.0	29.4	-4.5	25.1	27.2	17.0	1
3 Czech Republic	CZ	-1.2	-18.4	-4.2	-17.8	-1.3	-6.9	-14.4	28.7	9.0	5.6	-22.9	8.5	-22.9	-22.9	-9.4	26
4 Denmark	DK	5.4	13.7	3.2	13.6	2.9	12.6	13.3	26.0	10.0	-3.7	19.2	-2.6	18.0	18.6	13.9	2
5 Germany	DE	2.6	0.0	0.0	-0.3	-0.1	-1.6	-0.6	65.0	-4.4	0.5	0.1	1.8	1.8	1.0	-1.4	15
6 Estonia	EE	1.4	-5.8	2.4	9.8	1.3	5.0	3.0	3.4	18.3	-3.6	18.7	-2.6	18.0	18.4	13.2	3
7 Ireland	IE	1.2	-7.0	1.2	5.0	0.2	0.1	-0.6	25.4	10.2	1.3	-3.4	4.9	-9.7	-6.5	1.0	12
8 Greece 5/	EL	0.8	-8.9	-3.1	-13.4	-3.3	-16.0	-12.8	94.5	-15.3	1.2	-2.9	1.4	3.3	0.2	-9.3	25
9 Spain	ES	3.9	6.6	2.0	8.4	2.4	9.9	8.3	36.2	6.2	-0.3	3.8	2.7	-1.5	1.1	5.2	6
10 France	FR	0.0	-12.5	-2.5	-10.7	-2.7	-13.2	-12.1	64.2	-4.1	2.2	-7.4	3.0	-2.6	-5.0	-7.1	22
11 Italy	IT	3.5	4.2	-2.0	-8.8	-1.5	-7.9	-4.2	104.0	-18.8	1.3	-3.3	1.1	4.4	0.5	-7.5	24
12 Cyprus	CY	6.7	20.2	-0.6	-2.5	4.0	17.4	11.7	59.8	-2.5	-0.9	6.4	4.1	-6.7	-0.1	3.0	8
13 Latvia	LV	-0.8	-16.8	0.2	0.5	-0.4	-2.6	-6.3	9.7	16.0	0.2	1.8	1.5	2.9	2.3	4.0	7
14 Lithuania	LT	-0.6	-15.8	-1.2	-5.2	-0.4	-2.5	-7.9	17.3	13.2	0.5	0.2	2.0	1.1	0.6	2.0	10
15 Luxembourg	LU	3.0	1.8	1.2	4.7	3.6	15.5	7.3	6.8	17.0	3.1	-11.3	8.1	-21.5	-16.4	2.7	9
16 Hungary	HU	-0.6	-15.7	-5.5	-23.7	-4.2	-20.2	-19.9	66.0	-4.8	4.7	-18.7	6.9	-17.0	-17.9	-14.2	27
17 Malta	MT	0.9	-8.1	-2.3	-10.1	-2.4	-12.1	-10.1	62.6	-3.6	-0.2	3.5	-0.6	10.7	7.1	-2.2	17
18 Netherlands	NL	2.6	-0.2	-0.2	-0.8	1.1	4.0	1.0	45.4	2.8	2.2	-7.2	3.9	-6.0	-6.6	-0.9	14
19 Austria	AT	1.7	-4.3	-1.0	-4.6	-1.0	-5.4	-4.7	59.1	-2.3	-0.1	2.7	0.3	7.3	5.0	-0.7	13
20 Poland	PL	0.1	-12.3	-3.0	-13.0	-1.5	-7.7	-11.0	45.2	2.9	-1.7	10.1	-1.3	13.2	11.7	1.2	11
21 Portugal	PT	0.6	-9.8	-2.3	-10.1	-1.7	-8.9	-9.6	63.6	-3.9	1.9	-5.9	3.6	-4.9	-5.4	-6.3	21
22 Romania 5/	RO	-2.7	-25.9	-3.3	-14.3	-2.5	-12.3	-17.5	13.0	14.8	1.5	-4.3	1.9	1.4	-1.4	-1.4	16
23 Slovenia	SI	0.6	-9.6	-1.1	-4.7	0.3	0.6	-4.6	24.1	10.7	3.5	-13.4	7.0	-17.4	-15.4	-3.1	18
24 Slovakia	SK	-1.2	-18.6	-3.0	-13.0	-1.7	-8.7	-13.4	29.4	8.7	2.6	-9.2	4.4	-7.8	-8.5	-4.4	19
25 Finland	FI	6.4	18.6	4.4	18.3	2.9	12.6	16.5	35.4	6.5	-3.1	16.5	-0.5	10.3	13.4	12.1	4
26 Sweden	SE	4.6	9.9	2.7	11.3	0.8	2.8	8.0	40.6	4.6	-3.1	16.2	-1.2	12.9	14.5	9.0	5
27 United Kingdom	UK	-0.8	-16.8	-2.7	-11.7	--	--	-14.2	43.8	3.4	3.3	-12.3	4.8	-9.3	-10.8	-7.2	23
EU-27		1.7	-4.4	-0.7	-3.0	-0.1	-1.4	-3.1	43.4	3.5	0.5	-0.1	2.3	0.0	0.0	0.2	..
EU-15		2.6	0.0	0.0	0.0	0.2	0.0	-0.3	53.0	0.0	0.5	0.0	2.3	0.0	0.0	-0.1	..
EUR-15		2.5	-0.3	-0.4	-2.0	0.1	-0.6	-1.0	55.4	-0.9	0.9	1.8	2.9	2.3	-2.1	-1.3	..
EUR-12		2.5	-0.6	-0.2	-1.1	-0.1	-1.3	-1.0	57.0	-1.5	1.0	1.9	2.8	1.8	-1.9	-1.4	..

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -4 and -30 is deemed as low ('-'), between -4 and +4 as medium ('0'), and between +4 and +30 as high ('+').
2/ Unweighted average. Data gaps were not filled.
3/ S1 = gap to the debt-stabilizing primary balance + additional adjustment required to reach a debt target of 60% in 2050 + additional adjustment required to finance the increase in public expenditure up to 2050.
4/ S2 = gap to the debt-stabilizing primary balance + additional adjustment required to finance the increase in public expenditure over an infinite horizon.
5/ No commonly agreed pension projections were available for Greece and the rise in age-related spending is therefore underestimated. Also, for Bulgaria and Romania no commonly agreed projections exist.

Sources: European Commission   European Commission   European Commission   European Commission   European Commission   European Commission

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3. Selected indicators to measure the composition of expenditure (QPF3.1)

			Gross fixed capital formation; general government (ESA 1995, AMECO) % of GDP			'Productive' spending (Public spending on transportation, R&D, education and health) % of GDP 3/			1. Average (indicators in % of GDP) 2/		Gross fixed capital formation; general government (ESA 1995, AMECO) % of primary government spending			'Productive' spending (Public spending on transportation, R&D, education and health) % of primary government spending 3/			2. Average (indicators in % of primary government spending) 2/		Overall average (using all four indicators) 2/	
			Level (% of GDP, 2007)	Score 1/	Rank	Level (% of GDP, 2006 or latest available)	Score 1/	Rank	Score 1/	Rank	Level (% of primary spending, 2007)	Score 1/	Rank	Level (% of primary govt. spend., 2005 or latest available)	Score 1/	Rank	Score 1/	Rank	Score 1/	Rank
1	Belgium	BE	1.7	-10.0	25	14.7	4.5	8	-2.7	23	3.8	-9.2	24	30.9	-0.3	12	-4.8	24	-3.8	23
2	Bulgaria	BG	4.8	22.9	4	9.9	-17.6	26	2.6	14	13.1	24.6	5	26.2	-11.2	26	6.7	9	4.7	11
3	Czech Republic	CZ	4.8	22.8	5	14.7	4.8	7	13.8	1	11.7	19.5	7	33.6	6.0	9	12.7	6	13.3	5
4	Denmark	DK	1.8	-8.5	23	16.1	11.5	2	1.5	16	3.7	-9.3	25	31.9	2.0	11	-3.7	23	-1.1	18
5	Germany	DE	1.5	-12.1	26	11.9	-8.2	19	-10.1	26	3.6	-9.7	26	27.1	-9.1	24	-9.4	27	-9.8	27
6	Estonia	EE	4.4	18.5	6	11.8	-9.1	21	4.7	11	13.1	24.7	4	35.2	9.8	6	17.3	5	11.0	6
7	Ireland	IE	4.2	16.2	7	13.4	-1.4	11	7.4	7	11.8	20.0	6	40.8	22.7	1	21.3	3	14.4	4
8	Greece	EL	3.0	3.8	18	9.3	-20.7	27	-8.4	25	7.7	5.1	15	24.0	-16.2	27	-5.6	25	-7.0	24
9	Spain	ES	3.8	11.8	11	11.9	-8.6	20	1.6	15	10.1	13.8	11	32.3	3.0	10	8.4	7	5.0	10
10	France	FR	3.3	6.7	15	15.3	7.5	4	7.1	8	6.6	1.0	17	30.2	-2.0	16	-0.5	17	3.3	13
11	Italy	IT	2.4	-3.0	21	13.4	-1.6	12	-2.3	21	5.4	-3.2	20	30.7	-0.7	13	-2.0	19	-2.1	22
12	Cyprus	CY	3.1	4.6	17	11.7	-9.5	22	-2.4	22	7.6	4.6	16	29.1	-4.4	21	0.1	15	-1.2	19
13	Latvia	LV	5.7	30.0	1	12.3	-6.7	16	11.6	2	15.2	30.0	1	35.0	9.2	7	19.6	4	15.6	3
14	Lithuania	LT	5.2	27.3	3	12.3	-6.6	15	10.4	4	15.0	30.0	1	37.4	14.8	3	22.4	1	16.4	2
15	Luxembourg	LU	3.8	12.1	10	11.6	-10.0	23	1.1	17	10.2	14.0	10	27.8	-7.6	23	3.2	13	2.1	15
16	Hungary	HU	3.6	10.0	13	13.0	-3.4	13	3.3	13	7.8	5.5	14	28.3	-6.3	22	-0.4	16	1.5	16
17	Malta	MT	4.1	14.9	9	12.5	-5.3	14	4.8	10	10.4	14.8	8	30.4	-1.5	14	6.6	11	5.7	9
18	Netherlands	NL	3.4	8.1	14	11.4	-10.5	24	-1.2	19	7.8	5.6	13	26.7	-9.9	25	-2.2	20	-1.7	21
19	Austria	AT	1.0	-17.1	27	14.1	2.1	10	-7.5	24	2.2	-14.7	27	30.2	-1.8	15	-8.3	26	-7.9	26
20	Poland	PL	4.1	15.5	8	12.0	-8.1	18	3.7	12	10.3	14.6	9	29.5	-3.6	20	5.5	12	4.6	12
21	Portugal	PT	2.4	-2.5	20	17.1	15.8	1	6.7	9	5.6	-2.5	19	37.8	15.8	2	6.7	10	6.7	8
22	Romania	RO	5.5	30.0	1	12.1	-7.4	17	11.3	3	15.3	30.0	1	37.3	14.6	4	22.3	2	16.8	1
23	Slovenia	SI	3.7	11.0	12	15.1	6.7	5	8.9	5	8.8	9.1	12	34.1	7.1	8	8.1	8	8.5	7
24	Slovakia	SK	1.9	-8.0	22	10.7	-13.9	25	-11.0	27	5.3	-3.7	22	29.5	-3.5	19	-3.6	22	-7.3	25
25	Finland	FI	2.5	-2.0	19	14.5	3.7	9	0.9	18	5.3	-3.5	21	29.7	-3.1	18	-3.3	21	-1.2	20
26	Sweden	SE	3.1	5.1	16	16.0	10.7	3	7.9	6	6.2	-0.5	18	29.9	-2.5	17	-1.5	18	3.2	14
27	United Kingdom	UK	1.8	-8.6	24	14.8	5.1	6	-1.7	20	4.4	-6.9	23	35.2	9.8	5	1.5	14	-0.1	17
	EU-27		3.4	7.5	..	13.1	-2.8	..	2.3	..	8.4	7.8	..	31.5	1.1	..	4.3	..	3.3	..
	EU-15		2.6	0.0	..	13.7	0.0	..	0.0	..	6.3	0.0	..	31.0	0.0	..	0.0	..	0.0	..
	EUR-15		2.9	2.8	..	13.2	-2.4	..	0.2	..	7.1	3.0	..	30.8	-0.5	..	1.2	..	0.7	..
	EUR-12		2.7	1.0	..	13.2	-2.3	..	-0.6	..	6.7	1.4	..	30.7	-0.8	..	0.3	..	-0.2	..

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed very poor ('--'), between -4 and -10 as poor ('-'),
between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ Unweighted averages for country groups.
3/ No data on public spending on transportation was available for BE, BG, EL, IT, CY, LU, HU and NL. For those countries the EU-27 average was assumed.

| Sources: | European Commission | European Commission and OECD | European Commission | European Commission and OECD |

		Total PISA score		Educational attainment (% of population aged 25 to 64 having completed at least upper secondary education)		Youth educational attainment (% of population aged 20-24 years having attained at least upper secondary education attainment level)		Early school leavers (% of population aged 18-24 with at most lower secondary education and not in further education or training)		Quality of education system (WEF survey; score 1-7)		Average 3/	
		Level (2006)	Score 1/	Level (2006)	Score 1/	Level (2007)	Score 1/	Level (2006)	Score 1/	Index (2007)	Score 1/	Score 1/	Rank
1 Belgium	BE	510.5	5.6	68.0	0.4	82.6	6.0	12.3	4.2	5.7	10.3	5.3	8
2 Bulgaria	BG	416.5	-30.0	77.4	6.6	83.3	6.7	16.6	-1.3	3.4	-14.7	-6.5	22
3 Czech Republic	CZ	501.8	1.8	90.5	15.2	91.8	15.5	5.5	13.0	4.4	-3.8	8.3	2
4 Denmark	DK	501.1	1.5	75.5	5.3	70.8	-6.1	12.4	4.1	5.8	11.4	3.2	14
5 Germany	DE	504.8	3.1	84.4	11.2	72.5	-4.3	12.7	3.7	4.9	1.6	3.0	15
6 Estonia	EE	515.6	7.8	89.1	14.3	80.9	4.3	14.3	1.7	4.3	-4.9	4.6	10
7 Ireland	IE	509.0	5.0	67.6	0.1	86.7	10.2	11.5	5.2	5.7	10.3	6.2	6
8 Greece	EL	464.1	-14.7	59.8	-5.0	82.1	5.5	14.7	1.1	3.3	-15.8	-5.8	21
9 Spain	ES	476.4	-9.3	50.4	-11.2	61.1	-16.0	31.0	-19.8	3.8	-10.4	-13.3	25
10 France	FR	492.8	-2.1	68.7	0.8	82.4	5.8	12.7	3.7	4.8	0.5	1.7	16
11 Italy	IT	468.5	-12.7	52.3	-10.0	76.3	-0.4	19.3	-4.8	3.4	-14.7	-8.5	24
12 Cyprus	CY	--	--	72.1	3.1	85.8	9.3	12.6	3.8	4.9	1.6	4.5	12
13 Latvia	LV	485.1	-5.5	85.0	11.6	80.2	3.6	16.0	-0.5	4.1	-7.1	0.4	19
14 Lithuania	LT	481.5	-7.1	88.9	14.1	89.0	12.6	8.7	8.8	4.1	-7.1	4.3	13
15 Luxembourg	LU	485.2	-5.4	65.7	-1.1	70.9	-6.0	15.1	0.6	4.2	-6.0	-3.6	20
16 Hungary	HU	492.4	-2.3	79.2	7.8	84.0	7.5	10.9	6.0	3.6	-12.6	1.3	18
17 Malta	MT	--	--	26.8	-26.8	54.7	-22.6	37.6	-28.3	4.8	0.5	-19.3	26
18 Netherlands	NL	520.8	10.1	73.2	3.8	76.2	-0.5	12.0	4.6	5.2	4.9	4.6	11
19 Austria	AT	502.2	2.0	80.1	8.3	84.1	7.6	10.9	6.0	5.2	4.9	5.7	7
20 Poland	PL	500.3	1.1	86.3	12.4	91.6	15.2	5.0	13.6	4.0	-8.2	6.8	5
21 Portugal	PT	470.9	-11.7	27.5	-26.3	53.4	-23.9	36.3	-26.6	3.5	-13.6	-20.4	27
22 Romania	RO	409.7	-30.0	75.0	5.0	77.4	0.7	19.2	-4.6	3.7	-11.5	-8.1	23
23 Slovenia	SI	505.9	3.6	81.8	9.5	91.5	15.1	4.3	14.5	4.1	-7.1	7.1	3
24 Slovakia	SK	488.4	-4.1	89.1	14.3	91.3	14.9	7.2	10.8	3.7	-11.5	4.9	9
25 Finland	FI	552.8	24.1	80.5	8.6	86.5	10.0	7.9	9.9	6.0	13.6	13.2	1
26 Sweden	SE	504.3	2.9	84.6	11.3	87.2	10.7	12.0	4.6	5.2	4.9	6.9	4
27 United Kingdom	UK	501.8	1.8	73.3	3.9	78.1	1.4	13.0	3.3	4.6	-1.7	1.7	17
EU-27		490.5	-3.1	70.8	2.2	79.7	3.1	14.5	1.4	4.5	-3.2	0.3	..
EU-15		497.7	0.0	67.4	0.0	76.7	0.0	15.6	0.0	4.8	0.0	0.0	..
EUR-15		497.2	-0.2	63.9	-2.3	76.5	-0.3	16.7	-1.5	4.6	-1.3	-1.3	..
EUR-12		496.5	-0.5	66.6	-0.6	76.2	-0.5	16.4	-1.0	4.6	-1.2	-1.0	..

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between -4 and +4 as average ('0'),
between +4 and +10 as good ('+') and between +10 and +30 as very good ('++'). Some indicators, such as early school leavers, have been multiplied with minus 1 so that higher values reflect better outcomes.
2/ Unweighted average.
3/ Data gaps have not been filled for the calculation of the overall average.

Sources: OECD   Eurostat   Eurostat   Eurostat

5. Overview of estimated education efficiency scores

#	Country		2 inputs (teachers-student ratio, hours in school), and 1 output (PISA 2003 indicator)						Sutherland et al. (2007) - Stochastic frontier approach 4/	2 inputs (teachers per 100 students and socio-economic background) and 2 outputs (average PISA score and homogeneity of PISA score)				2 inputs (cumulative expenditure per student and socio-economic background) and 2 outputs (average PISA score and homogeneity of PISA score)				Percentile efficiency ranking, bias-corrected input oriented scores.		Average 8/ 9/	
			Alfonso and St. Aubyn (2006) - DEA output efficiency 1/		Alfonso and St. Aubyn (2006) - DEA output efficiency (bias corrected) 2/		Alfonso and St. Aubyn (2006) - DEA output efficiency (fully corrected) 3/			Sutherland et al. (2007) - DEA technical input efficiency 5/		Sutherland et al. (2007) - DEA technical output efficiency 5/		Sutherland et al. (2007) - DEA cost input efficiency 6/ using PPP		Sutherland et al. (2007) - DEA cost output efficiency 6/ using PPP		Verhoeven et al. (2007) - Overall efficiency (spending vs. outcomes), total spending in education		Score 8/ 9/	Rank
			Estimated efficiency	Rank	Estimated efficiency	Rank	Estimated efficiency	Rank	Estimated efficiency	Estimated efficiency	Rank	Estimated efficiency	Rank	Estimated efficiency	Rank	Estimated efficiency	Rank	Percentile education 7/	Rank		
1	Belgium	BE	1.06	8	1.06	5	1.10	22	0.97	0.83	8.0	0.94	5	0.84	16	0.94	18	57.4	18	1.8	9
2	Bulgaria	BG	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3	Czech Republic	CZ	1.07	9	1.08	10	1.09	6	0.96	0.84	7	0.94	5	0.85	13	0.96	5	17.6	5	7.6	6
4	Denmark	DK	1.09	13	1.11	14	1.18	23	0.95	0.79	10	0.95	4	0.80	22	0.95	12	61.2	19	-7.0	16
5	Germany	DE	1.08	12	1.10	12	1.17	21	0.96	0.81	9	0.91	8	0.83	18	0.91	27	56.4	16	-10.5	17
6	Estonia	EE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7	Ireland	IE	1.08	11	1.09	11	1.16	19	0.96	0.90	3	0.98	1	0.90	5	0.97	4	41.8	10	10.4	4
8	Greece	EL	1.18	21	1.19	21	1.17	20	0.93	0.79	10	0.93	6	0.80	22	0.92	25	46.3	11	-11.3	18
9	Spain	ES	1.13	18	1.14	18	1.11	9	0.94	0.89	4	0.97	2	0.90	5	0.96	5	55.4	15	6.9	8
10	France	FR	1.07	10	1.08	9	1.12	14	--	0.90	3	0.95	4	0.91	4	0.94	18	66.4	20	-6.3	13
11	Italy	IT	1.15	19	1.16	19	1.16	18	0.96	0.82	8	0.93	6	0.82	20	0.93	22	74.7	22	-3.3	12
12	Cyprus	CY	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	Latvia	LV	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
14	Lithuania	LT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
15	Luxembourg	LU	--	--	--	--	--	--	0.95	0.78	11	0.93	6	0.78	24	0.93	22	100.0	28	-13.1	19
16	Hungary	HU	1.11	15	1.12	15	1.08	4	0.95	0.86	6	0.95	4	0.84	16	0.96	5	31.8	6	7.2	7
17	Malta	MT	--	--	--	--	--	0	--	--	--	--	--	--	--	--	--	--	--	--	--
18	Netherlands	NL	1.04	6	1.07	6	1.11	13	0.96	0.87	5	0.95	4	0.88	12	0.95	12	57.2	17	-0.4	10
19	Austria	AT	1.10	14	1.10	13	1.17	22	0.95	0.84	7	0.94	5	0.85	13	0.94	18	80.0	25	-6.3	14
20	Poland	PL	--	--	--	--	--	--	0.96	0.89	4	0.96	3	0.93	3	0.98	1	17.5	4	15.5	3
21	Portugal	PT	1.16	20	1.17	20	1.07	1	0.97	0.95	1	0.98	1	0.94	1	0.98	1	54.4	13	19.6	1
22	Romania	RO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
23	Slovenia	SI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
24	Slovakia	SK	1.12	17	1.13	16	1.11	10	0.95	0.84	6	0.95	4	0.90	5	0.96	5	5.2	1	8.3	5
25	Finland	FI	1.00	1	1.04	1	1.10	8	0.97	0.89	4	0.98	1	0.90	5	0.98	1	35.3	7	16.1	2
26	Sweden	SE	1.00	1	1.05	4	1.12	15	0.95	0.81	9	0.94	5	0.82	20	0.94	18	75.4	23	-6.6	15
27	United Kingdom	UK	--	--	--	--	--	--	0.96	0.82	8	0.94	5	0.85	13	0.94	18	73.9	21	-2.5	11
	EU-27		1.09	--	1.11	--	1.13	--	--	0.85	--	0.95	--	0.86	--	0.95	--	--	--	1.4	
	EU-25		1.09	--	1.11	--	1.13	--	--	0.85	--	0.95	--	0.86	--	0.95	--	--	--	1.4	
	EU-15		1.09	--	1.11	--	1.13	--	--	0.85	--	0.95	--	0.85	--	0.95	--	--	--	-0.8	
	EUR-15		1.09	--	1.11	--	1.13	--	--	0.86	--	0.95	--	0.86	--	0.95	--	--	--	0.3	
	EUR-12		1.09	--	1.11	--	1.13	--	--	0.86	--	0.95	--	0.86	--	0.95	--	--	--	0.3	
28	Australia	AU	1.04	7	1.05	3	1.08	3	0.96	0.84	7	0.95	4	0.84	16	0.95	12	52.4	12	5.7	--
29	Canada	CA	--	--	--	--	--	--	0.95	0.77	12	0.97	2	--	--	--	--	14.8	3	5.2	--
30	Iceland	IS	--	--	--	--	--	--	0.93	0.70	15	0.95	4	0.70	27	0.95	12	41.1	9	-9.6	--
31	Japan	JP	1.02	4	1.04	2	1.13	17	0.97	0.92	2	0.96	3	0.94	1	0.96	5	55.0	14	10.1	--
32	Korea	KR	1.00	1	1.08	8	1.07	2	0.97	0.89	4	0.96	3	0.90	5	0.96	5	14.6	2	15.5	--
33	Mexico	MX	--	--	--	--	--	--	--	0.90	3	0.96	3	0.90	5	0.96	5	--	--	--	--
34	New Zealand	NZ	1.04	5	1.07	7	1.09	5	0.96	0.84	7	0.95	4	0.83	18	0.95	12	37.0	8	5.4	--
35	Norway	NO	1.11	16	1.13	17	1.25	25	0.91	0.71	14	0.93	6	0.72	26	0.93	22	76.0	24	-20.1	--
36	Switzerland	CH	--	--	--	--	--	--	0.96	0.90	3	0.95	3	0.89	11	0.95	12	86.4	26	2.7	--
37	Turkey	TR	1.26	22	1.34	23	1.11	12	0.96	0.92	2	0.97	2	--	--	--	--	--	--	--	--
38	United States	US	--	--	--	--	--	--	0.93	0.74	13	0.92	7	0.77	25	0.92	25	94.3	27	-17.5	--
	OECD		1.09	--	1.11	--	1.12	--	--	0.84	--	0.95	--	0.85	--	0.95	--	52.8	--	0.8	

1/ The difference between the score and 1 indicates by how much (in %) output could be increased while using the same inputs.
2/ Corrected by taking into account the correlation between the scores and environmental variables (here log of per capita GDP and parental education attainment).
3/ Corrected by environmental variables (here log of per capita GDP and parental education attainment). Corrections were computed as the changes in
scores by artificially considering that per capita GDP and parental education attainment varied to the samp
4/ Exponential distribution of inefficiency (see Sutherland, 2007, Table 2, p. 24). Dependent variable are the PISA scores, explanatory variables are
5/ Bootstrap estimates with 2 inputs (teachers per 100 students and socio-economic background) and 2 outputs (average PISA score and homogeneity of PISA score).
6/ Bootstrap estimates with 2 inputs (cumulative expedniture per student and socio-economic background) and 2 outputs (average PISA score and homogeneity of PISA score).
7/ Indicates percentile of ranking.
8/ The average has been calculated as the average rank of a country in seven estimations reported in the table above. From the Afonso and St. Aubyn (2006) study only the fully corrected efficiency estimates (third column in table above) were used. The rank of a country was first standardised
to range from 0 to 1 to account for the different numbers of countries covered in each study.
9/ Data gaps have not been filled.

Sources: Afonso, A. and M. St. Aubyn, 2006a, "Cross-country Efficiency of Secondary Education Provision: A Semi-Parametric Analysis with Nondiscretionary Inputs," in Economic Modelling, 23 (3), pp. 476-491.
Sutherland, D., R. Price, I. Joumard, and C. Nicq, 2007, "Performance Indicators for Public Spending Efficiency in Primary and Secondary Education," OECD Economics Department Working Paper No. 546 (Paris: OECD).
Verhoeven, M., V. Gunnarsson, and S. Carcillo, 2007, "Education and Health in G7 Countries: Achieving Better Outcomes with Less Spending," IMF Working paper 07/263 (Washington: International Monetary Fund).

		Life expectancy at birth (years)		Life expectancy at 65 (years)		Health adjusted life expectancy - females (years)		Health adjusted life expectancy -males (years)		Infant mortality rate (per 1,000 live births)		Average 2/	
		Years (2006 or latest available)	Score 1/	Years (2006 or latest available)	Score 1/	Level (2006 or latest available)	Score 1/	Level (2006 or latest available)	Score 1/	Level (2006 or latest available)	Score 1/	Score	Rank
1 Belgium	BE	79.5	-4.5	19.0	-0.7	61.9	-0.6	61.7	-0.3	3.1	1.5	-0.9	8
2 Bulgaria	BG	72.7	-30.0	14.8	-30.0	--	--	--	--	9.2	-30.0	-30.0	26
3 Czech Republic	CZ	76.8	-30.0	16.8	-30.0	59.9	-5.1	57.9	-8.9	3.1	1.5	-14.5	19
4 Denmark	DK	78.4	-17.9	17.8	-17.6	68.2	13.3	68.4	14.9	4.0	-6.4	-2.7	11
5 Germany	DE	79.9	0.3	19.0	-0.7	55.1	-15.7	55.0	-15.5	3.8	-4.7	-7.2	16
6 Estonia	EE	73.1	-30.0	16.3	-30.0	52.2	-22.1	48.0	-30.0	5.0	-15.2	-25.5	24
7 Ireland	IE	79.7	-2.1	18.6	-6.3	64.1	4.2	62.9	2.5	3.7	-3.8	-1.1	9
8 Greece	EL	79.5	-4.5	18.5	-7.7	67.2	11.1	65.7	8.8	3.8	-4.7	0.6	6
9 Spain	ES	81.1	14.9	20.1	14.9	63.1	2.0	63.2	3.1	3.7	-3.8	6.2	4
10 France	FR	80.9	12.5	20.6	21.9	64.3	4.7	62.0	0.4	3.8	-4.7	7.0	2
11 Italy	IT	81.0	13.7	19.7	9.2	67.0	10.6	65.8	9.0	3.8	-4.7	7.6	1
12 Cyprus	CY	80.6	8.8	18.8	-3.5	57.9	-9.5	59.5	-5.2	6.2	-25.7	-7.0	15
13 Latvia	LV	70.9	-30.0	15.5	-30.0	53.1	-20.1	50.6	-25.4	8.7	-30.0	-27.1	25
14 Lithuania	LT	71.1	-30.0	15.8	-30.0	54.3	-17.5	51.2	-24.1	5.9	-23.1	-24.9	23
15 Luxembourg	LU	79.4	-5.7	18.8	-3.5	62.1	-0.2	62.2	0.9	1.8	12.9	0.9	5
16 Hungary	HU	73.5	-30.0	16.0	-30.0	53.9	-18.4	52.0	-22.3	5.9	-23.1	-24.7	22
17 Malta	MT	79.5	-4.5	17.9	-16.2	70.1	17.5	68.5	15.2	6.5	-28.3	-3.3	13
18 Netherlands	NL	80.0	1.5	18.7	-4.9	63.1	2.0	65.0	7.2	4.1	-7.3	-0.3	7
19 Austria	AT	80.1	2.8	19.2	2.2	59.6	-5.7	57.8	-9.1	3.7	-3.8	-2.7	12
20 Poland	PL	75.3	-30.0	17.0	-28.9	66.6	9.8	61.0	-1.8	6.0	-24.0	-15.0	20
21 Portugal	PT	78.9	-11.8	18.6	-6.3	56.7	-12.2	58.4	-7.7	0.0	28.6	-1.9	10
22 Romania	RO	72.6	-30.0	15.2	-30.0	--	--	--	--	12.0	-30.0	-30.0	26
23 Slovenia	SI	78.3	-19.1	18.3	-10.5	59.9	-5.1	56.3	-12.5	3.1	1.5	-9.2	18
24 Slovakia	SK	74.4	-30.0	15.6	-30.0	56.4	-12.8	54.9	-15.7	6.1	-24.8	-22.7	21
25 Finland	FI	79.6	-3.3	19.3	3.6	52.4	-21.7	51.7	-22.9	2.7	5.0	-7.9	17
26 Sweden	SE	81.0	13.7	19.4	5.0	63.1	2.0	64.2	5.4	2.5	6.7	6.6	3
27 United Kingdom	UK	79.1	-9.4	18.4	-9.1	65.0	6.2	63.2	3.1	4.5	-10.8	-4.0	14
EU-27		77.7	-10.5	17.9	-16.0	60.7	-3.3	59.5	-5.3	4.7	-9.3	-8.7	--
EU-15		79.9	0.0	19.0	0.0	62.2	0.0	61.8	0.0	3.3	0.0	0.0	--
EUR-15		79.9	-0.1	19.0	-0.6	61.6	-1.2	61.0	-1.7	3.6	-2.8	-1.3	--
EUR-12		80.0	1.1	19.2	1.8	61.4	-1.8	61.0	-2.0	3.2	0.9	0.0	--

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'),
between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ Unweighted average.
3/ Data gaps have not been filled.

Sources: Eurostat and OECD   Eurostat   Eurostat   Eurostat

		Patents granted (per million inhabitants)		Number of patent applications (bn. EUR of total R&D expenditure)		Scientific publications (per million inhabitants)		Citations per scientific publication		Technological readiness (WEF survey; index 1-7)		Innovation (WEF survey; index 1-7)		Basic research (IMD survey; index 0-10)		Average (total) 2/	
		Level (2006 or latest available)	Score 1/	Level (2004 or latest available)	Score 1/	Level (2004 or latest available)	Score 1/	Level (2004 or latest available)	Score 1/	Index (2007)	Score 1/	Index (2007)	Score 1/	Index (2008)	Score 1/	Score	Rank
1 Belgium	BE	40.2	-7.6	239.9	3.8	0.6	4.1	6.2	8.5	4.8	-1.7	4.7	2.4	6.6	3.4	1.8	8
2 Bulgaria	BG	8.9	-12.9	37.6	-15.8	0.1	-19.8	2.9	-10.6	3.1	-27.1	3.0	-20.6	7.6	12.0	-13.5	26
3 Czech Republic	CZ	25.8	-10.1	50.1	-14.5	0.3	-10.6	3.8	-5.3	4.1	-12.1	4.0	-7.8	5.6	-4.7	-9.3	17
4 Denmark	DK	18.6	-11.3	165.2	-3.4	0.9	14.1	4.4	-2.0	5.6	10.5	5.1	7.2	7.1	7.6	3.2	6
5 Germany	DE	187.5	17.2	394.3	18.7	0.5	-4.2	7.0	13.6	5.1	1.7	5.5	11.7	4.2	-16.2	6.1	2
6 Estonia	EE	2.2	-14.1	67.2	-12.9	0.3	-11.1	5.8	6.1	5.1	2.0	3.8	-10.4	5.0	-9.4	-7.1	14
7 Ireland	IE	80.9	-0.8	117.3	-8.1	0.5	-0.5	5.3	3.2	4.7	-4.2	4.5	-0.2	6.7	4.0	-0.9	10
8 Greece	EL	28.9	-9.6	43.2	-15.2	0.4	-7.8	3.8	-5.4	3.3	-24.4	3.2	-17.1	3.3	-23.1	-14.7	27
9 Spain	ES	43.5	-7.1	112.4	-8.5	0.4	-7.8	0.0	-27.8	4.3	-9.0	3.6	-12.6	--	--	-12.1	21
10 France	FR	150.5	11.0	197.9	-0.3	0.5	-4.6	6.0	7.5	4.9	-0.8	4.7	1.8	--	--	2.4	7
11 Italy	IT	--	--	292.4	8.8	0.4	-8.8	5.4	3.9	4.4	-8.4	3.5	-14.3	5.9	-2.5	-3.5	13
12 Cyprus	CY	8.0	-13.1	0.0	-19.4	0.2	-14.7	3.0	-10.1	3.9	-16.1	3.3	-16.9	5.9	-2.2	-13.2	25
13 Latvia	LV	35.3	-8.5	165.1	-3.4	0.1	-22.1	2.2	-14.6	4.0	-13.7	3.1	-19.1	5.0	-9.9	-13.0	24
14 Lithuania	LT	17.3	-11.5	12.7	-18.2	0.2	-17.5	4.6	-0.9	4.0	-13.3	3.5	-14.3	--	--	-12.6	22
15 Luxembourg	LU	49.0	-6.2	187.8	-1.3	0.2	-14.3	3.6	-6.4	5.4	6.6	4.2	-4.8	6.9	5.7	-2.9	12
16 Hungary	HU	13.9	-12.1	76.4	-12.0	0.2	-14.3	4.5	-1.3	3.9	-15.2	3.6	-12.2	6.7	4.0	-9.0	16
17 Malta	MT	45.6	-6.7	327.7	12.3	0.1	-21.1	4.6	-1.0	4.3	-10.1	3.2	-17.0	4.6	-13.1	-8.1	15
18 Netherlands	NL	110.6	4.2	402.1	19.4	0.8	9.1	4.1	-3.7	5.7	10.6	4.9	4.2	5.1	-8.7	5.0	3
19 Austria	AT	160.5	12.7	255.4	5.3	0.6	0.4	6.0	7.7	5.2	3.5	4.8	2.7	6.0	-1.4	4.4	5
20 Poland	PL	29.4	-9.5	77.9	-11.9	0.2	-16.6	6.9	12.9	3.4	-22.2	3.3	-16.5	5.0	-9.6	-10.5	20
21 Portugal	PT	9.2	-12.9	95.1	-10.2	0.3	-12.0	5.7	5.8	4.3	-9.7	3.7	-10.9	3.9	-18.1	-9.7	19
22 Romania	RO	24.4	-10.3	91.0	-10.6	0.1	-22.1	3.3	-8.3	3.3	-24.4	3.1	-19.0	6.7	4.3	-12.9	23
23 Slovenia	SI	107.3	3.7	174.4	-2.5	0.6	-0.1	4.2	-3.2	4.3	-9.6	3.8	-10.4	7.3	9.4	-1.8	11
24 Slovakia	SK	13.4	-12.2	159.5	-4.0	0.2	-15.2	2.2	-14.7	4.1	-12.7	3.4	-14.7	7.0	6.7	-9.5	18
25 Finland	FI	136.6	8.6	213.6	1.2	0.8	12.8	5.4	4.2	5.4	6.3	5.7	14.4	5.7	-3.5	6.3	1
26 Sweden	SE	131.5	7.8	123.3	-7.5	1.0	18.7	3.2	-9.3	5.9	13.9	5.5	12.6	5.8	-3.1	4.7	4
27 United Kingdom	UK	49.3	-6.1	171.6	-2.8	0.6	0.9	4.8	0.4	5.3	5.0	4.8	3.0	6.2	0.0	0.1	9
EU-27		58.8	-4.5	157.4	-4.2	0.4	-6.8	4.4	-1.9	4.5	-6.5	4.0	-6.6	5.9	-2.2	-4.8	14.0
EU-15		85.5	0.0	200.7	0.0	0.6	0.0	4.7	0.0	4.9	0.0	4.6	0.0	6.4	2.2	-0.7	9.8
EUR-15		82.7	-0.5	203.5	0.3	0.5	-4.6	4.7	-0.2	4.6	-4.3	4.2	-4.5	7.5	10.6	-2.7	11.9
EUR-12		90.7	0.9	212.6	1.1	0.5	-2.8	4.9	0.9	4.8	-2.4	4.4	-1.9	6.8	5.0	-1.5	10.7

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ Unweighted average using all indicators.
3/ Data gaps have not been filled.

Sources:	Eurostat	Eurostat	ISI Web of Knowledge	ISI Web of Knowledge	World Economic Forum	World Economic Forum	IMD

8. Indicators on the efficiency of R&D (QPF3.4)

Score 1/		Efficiency scores [One output (patents by millions of inhabitants) and one input (gross expenditure in R&D in % of GDP)] 2/			Efficiency scores [One output (publications by millions of inhabitants) and three inputs (higher education R&D expenditure; business R&D expenditure and government R&D expenditure in % of GDP)] 2/		
		Level (Efficiency score)	Score 1/	Rank	Level (Efficiency score)	Score 1/	Rank
1 Belgium	BE	0.83	2.4	9	0.71	5.7	6
2 Bulgaria	BG	0.57	-18.1	18	0.24	-22.3	22
3 Czech Republic	CZ	0.46	-26.8	21	0.43	-11.0	14
4 Denmark	DK	0.85	3.9	7	0.86	14.6	1
5 Germany	DE	0.81	0.8	10	0.56	-3.2	10
6 Estonia	EE	0.90	7.9	4	0.36	-15.2	17
7 Ireland	IE	0.66	-11.0	16	0.62	0.3	8
8 Greece	EL	0.68	-9.4	15	--	--	--
9 Spain	ES	0.66	-11.0	16	0.49	-7.4	12
10 France	FR	0.88	6.3	6	0.55	-3.8	11
11 Italy	IT	0.80	0.0	12	0.46	-9.2	13
12 Cyprus	CY	0.50	-23.6	20	0.31	-18.1	20
13 Latvia	LV	0.28	-30.0	25	0.18	-25.9	24
14 Lithuania	LT	0.43	-29.1	23	0.19	-25.3	23
15 Luxembourg	LU	0.90	7.9	4	0.35	-15.7	18
16 Hungary	HU	0.70	-7.9	14	0.38	-14.0	15
17 Malta	MT	0.81	0.8	10	0.18	-25.9	24
18 Netherlands	NL	0.73	-5.5	13	0.75	8.1	5
19 Austria	AT	0.92	9.4	2	0.57	-2.6	9
20 Poland	PL	0.29	-30.0	25	0.30	-18.7	21
21 Portugal	PT	0.52	-22.0	19	0.34	-16.3	19
22 Romania	RO	0.20	-30.0	25	0.15	-27.7	26
23 Slovenia	SI	0.46	-26.8	21	0.69	4.5	7
24 Slovakia	SK	0.42	-29.9	24	0.38	-14.0	15
25 Finland	FI	0.91	8.7	3	0.76	8.7	3
26 Sweden	SE	1.00	15.7	1	0.76	8.7	3
27 United Kingdom	UK	0.85	3.9	7	0.82	12.3	2
EU-27		0.67	-10.4	--	0.48	-8.2	--
EU-15		0.80	0.0	--	0.61	0.0	--
EUR-15		0.74	-4.9	--	0.52	-5.4	--
EUR-12		0.78	-2.0	--	0.56	-3.2	--
28 Australia	AU	--	--	--	--	--	--
29 Canada	CA	--	--	--	--	--	--
30 Iceland	IS	--	--	--	--	--	--
31 Japan	JP	0.89	7.1	--	0.89	16.4	--
32 Korea	KR	--	--	--	--	--	--
33 Mexico	MX	--	--	--	--	--	--
34 New Zealand	NZ	--	--	--	--	--	--
35 Norway	NO	0.77	-2.4	--	0.77	9.3	--
36 Switzerland	CH	0.94	11.0	--	0.94	19.4	--
37 Turkey	TR	0.27	-30.0	--	0.27	-20.5	--
38 United States	US	0.90	7.9	--	0.90	17.0	--
OECD-8		0.88	5.9	--	0.88	15.5	--
OECD-11		0.75	-3.6	--	0.75	8.3	--
OECD-30		0.74	-5.1	--	0.60	-0.7	--

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30, is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ Estimates using a stochastic frontier approach.

Source: European Commission (2009) "Measuring the efficiency of public spending on R&D", (forthcoming).

			Length of motorways (per 1000 km per country size)		Length of railways (per 100 km per country size)		Fixed line and mobile phone subscribers (per 100 people)		Broad band access (per 100 people)		Internet users (per 100 people)		Energy infrastructure (IMD survey; index 0-10)		Overall infrastructure (WEF; index 1-7)		Average (total) 2/ 3/	
			Level (2004 or latest available)	Score 1/	Level (2004 or latest available)	Score 1/	Level (2006 or latest available)	Score 1/	Level (2007 or latest available)	Score 1/	Level (2006 or latest available)	Score 1/	Index (2008)	Score 1/	Index (2007)	Score 1/	Score 1/	Rank
1	Belgium	BE	57.2	18.7	206.1	18.2	136.4	-12.6	25.6	3.1	45.8	-3.2	7.8	4.6	5.7	2.4	4.5	5
2	Bulgaria	BG	--	--	--	--	138.5	-11.4	7.4	-21.1	24.3	-15.0	5.4	-12.6	2.9	-30.0	-18.0	26
3	Czech Republic	CZ	6.6	-8.6	206.6	18.3	146.5	-6.8	15.7	-10.0	34.5	-9.4	7.8	4.7	4.2	-15.2	-3.9	11
4	Denmark	DK	23.4	0.5	--	--	164.4	3.5	36.2	17.4	58.3	3.7	8.5	10.1	6.1	8.0	7.2	3
5	Germany	DE	33.7	6.0	198.5	17.1	168.1	5.6	24.1	1.2	46.9	-2.6	8.0	6.7	6.7	14.8	7.0	4
6	Estonia	EE	2.1	-11.0	35.1	-7.5	163.9	3.2	20.7	-3.3	56.6	2.7	6.6	-3.8	4.4	-13.2	-4.7	12
7	Ireland	IE	2.7	-10.7	--	--	159.0	0.4	16.2	-9.4	33.7	-9.9	5.5	-11.6	4.0	-17.6	-9.8	19
8	Greece	EL	--	--	21.4	-9.6	155.0	-1.9	9.1	-18.8	18.4	-18.3	5.2	-14.3	4.4	-13.2	-12.7	22
9	Spain	ES	20.4	-1.2	--	--	146.3	-6.9	17.7	-7.3	42.1	-5.2	5.3	-13.6	5.5	0.1	-5.7	16
10	France	FR	16.1	-3.5	76.3	-1.3	139.7	-10.7	25.2	2.7	49.1	-1.4	8.9	12.8	6.5	12.4	1.6	7
11	Italy	IT	--	--	73.9	-1.7	164.7	3.7	18.3	-6.5	49.0	-1.4	4.9	-15.8	3.9	-19.0	-6.8	17
12	Cyprus	CY	29.0	3.5	--	--	153.8	-2.6	10.3	-17.2	46.2	-3.0	--	--	4.9	-6.7	-5.2	13
13	Latvia	LV	0.0	-12.2	40.0	-6.8	124.2	-19.6	6.4	-22.4	46.8	-2.7	--	--	3.9	-19.0	-13.8	24
14	Lithuania	LT	6.4	-8.7	33.7	-7.7	162.3	2.3	15.0	-10.9	31.9	-10.9	5.0	-15.8	4.1	-17.3	-9.9	20
15	Luxembourg	LU	--	--	--	--	207.9	28.4	23.5	0.4	73.4	12.0	7.6	3.5	5.4	-1.0	8.7	1
16	Hungary	HU	6.1	-8.9	136.9	7.8	132.3	-15.0	15.0	-10.9	34.8	-9.3	6.6	-4.1	3.9	-18.8	-8.4	18
17	Malta	MT	--	--	--	--	135.2	-13.3	15.0	-10.9	31.5	-11.1	--	--	4.1	-16.6	-13.0	23
18	Netherlands	NL	56.4	18.3	67.7	-2.6	143.6	-8.5	33.6	13.9	89.0	20.6	8.3	8.5	5.8	4.8	7.9	2
19	Austria	AT	20.0	-1.4	67.3	-2.7	154.8	-2.0	19.0	-5.7	50.7	-0.5	8.4	9.0	5.7	2.9	0.0	9
20	Poland	PL	1.8	-11.2	124.0	5.9	126.5	-18.3	7.6	-20.8	28.8	-12.5	5.3	-13.2	3.0	-29.9	-14.3	25
21	Portugal	PT	19.9	-1.4	30.3	-8.3	155.4	-1.7	15.2	-10.7	30.3	-11.7	7.3	1.0	5.0	-5.8	-5.5	15
22	Romania	RO	--	--	--	--	100.1	-30.0	9.9	-17.7	32.4	-10.6	4.2	-21.1	2.6	-30.0	-21.9	27
23	Slovenia	SI	23.8	0.7	108.2	3.5	132.4	-14.9	17.1	-8.2	62.3	5.9	5.6	-11.1	4.3	-14.0	-5.4	14
24	Slovakia	SK	6.5	-8.7	74.9	-1.5	112.4	-26.3	8.2	-20.0	41.8	-5.4	6.8	-2.7	3.8	-20.6	-12.2	21
25	Finland	FI	1.9	-11.1	25.4	-9.0	144.1	-8.2	33.3	13.4	55.5	2.2	7.0	-0.6	5.8	4.8	-1.2	10
26	Sweden	SE	3.5	-10.3	34.1	-7.7	165.2	3.9	25.8	3.5	76.9	13.9	8.2	7.7	5.7	3.2	2.0	6
27	United Kingdom	UK	14.9	-4.1	134.8	7.5	170.5	7.0	25.4	3.0	55.4	2.1	6.0	-8.0	5.7	3.2	1.5	8
	EU-27		16.8	-3.1	89.2	0.6	148.3	-5.8	18.4	-6.4	46.2	-3.0	6.7	-3.3	4.7	-8.8	-4.9	--
	EU-15		22.5	0.0	85.1	0.0	158.4	0.0	23.2	0.0	51.6	0.0	7.1	0.0	5.5	0.0	-0.1	--
	EUR-15		25.6	1.6	87.5	0.4	153.1	-3.0	20.2	-4.0	48.3	-1.9	6.9	-1.6	5.2	-3.4	-2.4	--
	EUR-12		25.4	1.5	85.2	0.0	156.3	-1.2	21.7	-2.0	48.7	-1.6	7.0	-0.8	5.4	-1.2	-1.0	--

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between
 -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ Unweighted average using all indicators.
3/ Data gaps have not been filled.

Sources:	Eurostat and CIA	Eurostat and CIA	World Bank	World Bank	World Bank	IMD	World Economic Forum

			Persons convicted (% of offenses)		Burden of crime (survey; % of persons victimised once or more)		Business cost of crime and violence (WEF survey; index 1-7)		Fairness of justice (WEF survey; index 1-7)		Organised crime (WEF survey; index 1-7)		Personal security and private property (IMD survey; index 0-10)		Persons killed or injured in road traffic accidents (per 10,000 road vehicles)		Reliability of police services (WEF survey; index 1-7)		Police satisfaction (EU ISC survey; % satisfied with police controlling crime in local area)		Average (total) 2/ 3/	
			Level (2003 or latest available)	Score 1/	Level (2005 or latest available)	Score 1/	Index (2007)	Score 1/	Index (2008)	Score 1/	Index (2007)	Score 1/	Index (2008)	Score 1/	Level (2005 or latest available)	Score 1/	Index (2007)	Score 1/	Index (2005 or latest available)	Score 1/	Score 1/	Rank
1	Belgium	BE	15.9	-1.7	17.8	-7.1	5.5	-2.1	6.6	-0.6	6.1	1.4	7.3	-1.7	116.3	-17.5	5.4	-5.8	71.0	2.5	-3.6	15
2	Bulgaria	BG	21.7	3.9	--	--	3.7	-28.4	2.1	-22.9	3.4	-30.0	3.1	-30.0	38.0	8.3	3.1	-30.0	--	--	-19.4	27
3	Czech Republic	CZ	18.5	0.7	--	--	5.3	-5.1	4.2	-12.5	5.5	-6.4	6.5	-9.3	76.2	-4.3	3.8	-30.0	--	--	-11.4	20
4	Denmark	DK	29.2	11.1	19.3	-10.7	6.5	12.4	8.9	10.6	6.7	9.1	8.9	12.0	33.5	9.8	6.6	14.3	82.0	13.4	9.1	2
5	Germany	DE	13.4	-4.2	13.1	4.3	6.4	11.0	8.3	7.5	6.5	6.5	8.5	8.6	89.7	-8.7	6.6	14.3	74.0	5.4	5.0	3
6	Estonia	EE	20.5	2.7	20.2	-12.9	5.4	-3.6	6.4	-1.8	5.9	-1.2	6.9	-5.7	54.6	2.8	4.7	-17.5	46.0	-22.5	-6.6	18
7	Ireland	IE	37.0	18.7	22.1	-17.5	5.2	-6.5	7.7	4.5	6.0	0.1	7.8	2.1	44.3	6.2	5.6	-2.5	78.0	9.4	1.6	6
8	Greece	EL	14.1	-3.5	12.3	6.3	5.9	3.7	5.0	-8.6	6.2	2.7	6.3	-10.8	41.5	7.1	4.7	-17.5	57.0	-11.5	-3.6	14
9	Spain	ES	12.5	-5.0	9.0	14.3	5.0	-9.4	5.3	-8.9			5.7	-16.5	55.0	2.7	5.6	-2.5	58.0	-10.5	-5.4	17
10	France	FR	12.8	-4.7	12.0	7.0	5.1	-8.0	7.2	2.2	5.9	-1.2	7.7	1.8	31.6	10.4	5.8	0.9	60.0	-8.5	0.0	9
11	Italy	IT	8.9	-8.5	12.6	5.5	4.6	-15.3	3.4	-16.4	3.6	-30.0	5.7	-15.9	84.5	-7.0	4.8	-15.8	65.0	-3.5	-11.9	21
12	Cyprus	CY	21.2	3.4	--	--	5.7	0.8	--	--	5.9	-1.2	--	--	50.3	4.3	5.0	-12.5	--	--	-1.7	11
13	Latvia	LV	--	--	--	--	5.4	-3.6	--	--	5.7	-3.8	--	--	69.7	-2.2	4.3	-24.2	--	--	-8.6	19
14	Lithuania	LT	20.6	2.8	--	--	5.0	-9.4	3.5	-16.4	5.3	-8.9	4.7	-25.2	58.0	1.7	4.0	-29.2	--	--	-13.5	24
15	Luxembourg	LU	--	--	12.7	5.3	5.9	3.7	7.5	3.8	6.1	1.4	8.4	7.6	34.1	9.6	5.8	0.9	62.0	-6.5	3.2	4
16	Hungary	HU	25.0	7.0	10.0	11.8	5.5	-2.1	5.0	-9.0	5.5	-6.4	7.4	-0.8	105.6	-14.0	4.8	-15.8	70.0	1.5	-3.1	13
17	Malta	MT	--	--	--	--	6.0	5.2	--	--	6.4	5.2	--	--	47.4	5.2	5.5	-4.1	--	--	2.9	5
18	Netherlands	NL	9.2	-8.2	19.8	-11.9	5.0	-9.4	8.0	6.2	5.7	-3.8	7.9	3.2	42.4	6.9	5.9	2.6	70.0	1.5	-1.5	10
19	Austria	AT	6.5	-10.9	12.2	6.5	6.4	11.0	8.8	10.3	6.7	7.8	9.2	14.9	119.4	-18.5	6.2	7.6	54.0	-14.5	1.6	7
20	Poland	PL	28.3	10.3	15.0	-0.3	--	--	3.6	-15.7	4.1	-24.4	4.3	-28.3	45.3	5.9	4.0	-29.2	41.0	-27.4	-13.6	25
21	Portugal	PT	16.9	-0.8	10.4	10.9	5.9	3.7	2.5	-21.3	6.5	6.5	7.1	-4.1	75.4	-4.0	5.4	-5.8	67.0	-1.5	-1.8	12
22	Romania	RO	27.7	9.7	--	--	--	--	3.0	-18.5	4.6	-18.0	3.8	-30.0	21.6	13.7	3.9	-30.0	--	--	-14.7	26
23	Slovenia	SI	9.6	-7.9	--	--	5.8	2.2	4.4	-11.6	5.7	-3.8	6.4	-10.1	195.8	-30.0	4.6	-19.2	--	--	-12.4	22
24	Slovakia	SK	24.3	6.4	--	--	5.4	-3.6	3.5	-16.4	5.0	-12.8	5.8	-15.7	83.6	-6.7	4.1	-27.6	--	--	-13.0	23
25	Finland	FI	37.6	19.2	12.7	5.3	6.7	15.4	7.8	4.9	6.7	9.1	8.2	6.2	33.2	9.9	6.7	16.0	90.0	21.4	11.9	1
26	Sweden	SE	9.1	-8.4	16.2	-3.2	5.9	3.7	8.3	7.8	6.3	4.0	8.1	5.2	59.3	1.3	5.7	-0.8	65.0	-3.5	0.7	8
27	United Kingdom	UK	25.0	7.0	21.0	-14.8	4.7	-13.8	7.1	1.8	5.7	-3.8	6.1	-12.6	87.8	-8.1	5.4	-5.8	75.0	6.4	-4.8	16
	EU-27		19.4	1.6	14.9	-0.1	5.5	-1.9	5.7	-5.2	5.7	-4.3	6.7	-6.9	66.5	-1.1	5.1	-10.6	65.8	-2.7	-4.3	--
	EU-15		17.7	0.0	14.9	0.0	5.6	0.0	6.8	0.0	6.0	0.0	7.5	0.0	63.2	0.0	5.7	0.0	68.5	0.0	0.0	--
	EUR-15		16.6	-1.1	13.9	2.4	5.7	0.4	6.3	-2.4	5.9	-0.6	7.4	-1.1	70.7	-2.5	5.6	-2.9	67.2	-1.4	-1.1	--
	EUR-12		16.8	-0.9	13.9	2.4	5.6	-0.2	6.4	-1.7	5.9	-0.8	7.5	-0.4	64.0	-0.3	5.7	-0.6	67.2	-1.4	-0.4	--

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between -4 and +4 as average ('0'),
between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ Unweighted average using all indicators.
3/ Data gaps have been filled by using the country score for a representative value (see Annex 3).

Sources: European Sourcebook of Crime and Criminal Justice   World Economic Forum   World Economic Forum   World Economic Forum   IMD   WHO and UNECE   World Economic Forum   EU ISC

		Corruption perception index (Transparency International; index 1-5)		Corruption's impact on parliament/ legislature (Transparency International; index 1-5)		Public trust in financial honesty of politicians (WEF survey; index 1-7)		Diversion of public funds (WEF survey; index 1-7)		Bribing and corruption (IMD survey; index 0-10)		1. Average corruption indicators 2/ 3/		3. Bureaucracy (IMD survey; index 0-10)		4. Wastefulness of government expenditure (IMD survey; index 0-10)		Average (total; 1., 2., 3.) 2/	
		Index (2007)	Score 1/	Index (2007)	Score 1/	Index (2007)	Score 1/	Index (2007)	Score 1/	Index (2008)	Score 1/	Score 1/ 2/ 3/	Rank	Index (2008)	Score 1/	Index (2008)	Score 1/	Score 1/ 2/ 3/	Rank
1 Belgium	BE	7.1	-3.7	--	--	3.6	-4.8	5.3	-2.3	5.6	-2.0	-3.3	11	2.7	-5.0	3.8	-3.3	-3.9	13
2 Bulgaria	BG	4.1	-24.2	4.2	-30.0	1.8	-20.4	2.6	-30.0	0.7	-27.3	-26.4	27	1.4	-14.1	2.6	-20.3	-20.3	26
3 Czech Republic	CZ	5.2	-16.7	3.4	-10.5	1.9	-19.6	3.1	-27.3	2.3	-19.2	-18.7	21	2.9	-3.7	2.6	-20.3	-14.2	21
4 Denmark	DK	9.4	12.0	2.5	12.7	6.0	15.9	6.6	12.5	8.7	13.4	13.3	1	6.5	21.2	5.1	15.1	16.5	1
5 Germany	DE	7.8	1.0	3.0	-0.2	4.5	2.9	5.9	4.5	6.5	2.3	2.1	7	2.7	-4.8	4.2	2.4	-0.1	9
6 Estonia	EE	6.5	-7.8	3.1	-2.8	3.2	-8.3	4.5	-11.4	5.4	-3.1	-6.7	12	4.7	8.8	3.9	-1.9	0.1	8
7 Ireland	IE	7.5	-1.0	2.8	5.0	3.3	-7.4	5.6	1.1	6.0	-0.2	-0.5	9	4.8	9.8	3.5	-7.5	0.6	7
8 Greece	EL	4.6	-20.8	3.4	-10.5	3.0	-10.0	4.1	-15.9	2.1	-20.1	-15.5	18	1.6	-12.3	3.5	-7.5	-11.8	19
9 Spain	ES	6.7	-6.5	3.1	-2.8	3.1	-9.2	4.5	-11.4	5.3	-3.6	-6.7	13	2.5	-6.0	4.0	-0.5	-4.4	14
10 France	FR	7.3	-2.4	2.9	2.4	3.4	-6.6	5.2	-3.4	5.8	-1.4	-2.3	10	2.6	-5.7	3.8	-3.3	-3.8	12
11 Italy	IT	5.2	-16.7	3.7	-18.2	2.2	-17.0	3.6	-21.6	2.6	-17.6	-18.2	20	1.3	-14.7	2.4	-23.1	-18.7	25
12 Cyprus	CY	5.3	-16.0	--	--	3.5	-5.7	4.9	-6.8	--	--	-12.1	17	--	--	4.1	0.9	-3.4	10
13 Latvia	LV	4.8	-19.4	4.0	-25.9	2.1	-17.8	3.8	-19.3	--	--	-20.4	23	--	--	3.6	-6.1	-10.9	18
14 Lithuania	LT	4.8	-19.4	4.0	-25.9	2.7	-12.6	3.5	-22.7	1.7	-22.1	-20.6	24	1.7	-12.2	3.2	-11.8	-14.9	22
15 Luxembourg	LU	8.4	5.1	3.2	-5.3	5.3	9.9	5.9	4.5	7.6	8.0	4.5	5	3.6	1.5	4.4	5.2	3.7	6
16 Hungary	HU	5.3	-16.0	--	--	2.3	-16.1	3.8	-19.3	2.4	-18.7	-17.2	19	2.6	-5.9	2.5	-21.7	-15.0	23
17 Malta	MT	5.8	-12.6	--	--	3.6	-4.8	5.2	-3.4	--	--	-9.2	15	--	--	3.7	-4.7	-6.2	15
18 Netherlands	NL	9.0	9.2	2.7	7.5	5.4	10.7	6.1	6.8	7.4	6.9	8.2	4	3.7	1.9	4.9	12.3	7.5	4
19 Austria	AT	8.1	3.1	2.9	2.4	4.7	4.7	5.9	4.5	7.2	5.9	4.1	6	4.6	8.1	4.4	5.2	5.8	5
20 Poland	PL	4.2	-23.5	3.9	-23.3	2.3	-16.1	3.5	-22.7	2.3	-19.0	-20.9	25	1.4	-14.0	2.8	-17.5	-17.5	24
21 Portugal	PT	6.5	-7.8	3.6	-15.6	3.3	-7.4	5.1	-4.5	3.6	-12.3	-9.5	16	2.6	-5.7	3.4	-9.0	-8.1	16
22 Romania	RO	3.7	-27.0	3.9	-23.3	1.7	-21.3	3.2	-26.2	1.1	-25.5	-24.6	26	0.8	-17.8	2.5	-21.7	-21.4	27
23 Slovenia	SI	6.6	-7.2	--	--	3.3	-7.4	4.7	-9.1	3.8	-11.6	-8.5	14	2.4	-7.4	3.4	-9.0	-8.3	17
24 Slovakia	SK	4.9	-18.8	--	--	2.1	-17.8	3.7	-20.5	2.5	-18.4	-18.9	22	2.5	-6.4	3.0	-14.6	-13.3	20
25 Finland	FI	9.4	12.0	2.5	12.7	5.7	13.3	6.5	11.4	8.0	9.8	11.8	2	4.8	9.3	5.0	13.7	11.6	2
26 Sweden	SE	9.3	11.3	2.5	12.7	5.1	8.1	6.4	10.2	7.8	9.1	10.3	3	5.0	10.7	4.3	3.8	8.2	3
27 United Kingdom	UK	8.4	5.1	3.1	-2.8	3.8	-3.1	5.8	3.4	6.4	1.7	0.9	8	2.2	-8.2	3.8	-3.3	-3.5	11
EU-27		6.5	-7.7	3.3	-6.8	3.4	-6.2	4.8	-8.2	4.7	-6.9	-7.6	--	3.0	-3.0	3.6	-5.5	-5.4	--
EU-15		7.6	0.0	3.0	0.0	4.2	0.0	5.5	0.0	6.0	0.0	0.0	--	3.4	0.0	4.0	0.0	0.0	--
EUR-15		7.0	-4.3	3.1	-2.1	3.9	-2.6	5.2	-3.0	5.5	-2.8	-3.7	--	3.1	-2.4	3.9	-1.9	-2.6	--
EUR-12		7.3	-2.4	3.1	-2.1	4.0	-1.7	5.3	-2.2	5.6	-2.0	-2.1	--	3.1	-2.0	3.9	-1.3	-1.8	--

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').
2/ Unweighted average using all indicators.
3/ Data gaps have been filled by using the country score for a representative value (see Annex 3).

Sources: Transparency International   Transparency International   World Economic Form   World Economic Form   IMD   World Economic Form   IMD

		Share of indirect taxes in total general government revenues		Share of consumption taxes in total general government revenues		Sub-average (1) tax structure 6/	Inactivity trap (Single worker, average wage) 3/		Inactivity trap (Single worker, at 67% of average wage) 3/		Sub-average (2) inactivity trap 6/	Average tax wedge on average wage earners (Single person, no children, average wage) 4/		Average tax wedge on low wage earners (Single person, no children, at 67% of average wage) 4/		Sub-average (3) tax wedge 6/	Net replacement rates for unemployed single persons without children, at 100% of average wage 5/		Net replacement rates for unemployed single persons without children, at 67% of average wage 5/		Sub-average (4) net replacement ratio 6/
		Level (%, 2007)	Score 1/	Level (%, 2007)	Score 1/	Score 1/ 2/ 6/	Level (% of av. wage; 2006)	Score 1/	Level (% of av. wage; 2006)	Score 1/	Score 1/ 2/ 6/	Level (%; 2006)	Score 1/	Level (%; 2006)	Score 1/	Score 1/ 2/ 6/	Level (%; 2006)	Score 1/	Level (%; 2006)	Score 1/	Score 1/ 2/ 6/
1 Belgium	BE	26.6	-11.8	22.7	-10.8	-11.3	61.9	-5.0	65.0	-1.9	-3.4	55.5	-16.1	49.2	-13.1	-14.6	55.8	3.7	74.5	-3.1	0.3
2 Bulgaria	BG	42.1	30.0	44.2	30.0	30.0	--	--	--	--	--	--	--	31.1	8.2	8.2	--	--	--	--	--
3 Czech Republic	CZ	26.3	-13.0	27.3	5.0	-4.0	45.0	5.9	52.8	3.8	4.8	42.9	-0.4	40.1	-2.4	-1.4	50.0	8.1	54.8	14.5	11.3
4 Denmark	DK	32.2	6.6	27.9	7.0	6.8	75.8	-13.9	88.1	-12.7	-13.3	41.3	1.5	39.3	-1.4	0.0	62.3	-1.3	85.8	-13.2	-7.3
5 Germany	DE	28.6	-5.3	23.2	-9.0	-7.2	63.7	-6.1	67.8	-3.2	-4.6	52.2	-12.0	47.4	-11.0	-11.5	61.1	-0.3	60.6	9.3	4.5
6 Estonia	EE	36.5	20.9	36.2	30.0	25.4	35.3	12.2	40.4	9.6	10.9	--	--	38.4	-0.4	-0.4	54.2	4.9	55.5	13.8	9.4
7 Ireland	IE	36.9	21.9	32.4	22.4	22.2	61.0	-4.4	76.3	-7.2	-5.8	22.3	25.1	16.3	25.7	25.4	54.2	4.9	74.4	-3.1	0.9
8 Greece	EL	30.0	-0.8	28.8	10.1	4.7	24.7	19.0	17.3	20.4	19.7	42.3	0.3	35.4	3.2	1.7	36.7	18.3	49.9	18.9	18.6
9 Spain	ES	28.7	-4.9	24.8	-3.4	-4.1	39.0	9.8	44.0	7.9	8.8	38.9	4.5	35.9	2.6	3.6	61.4	-0.6	76.4	-4.8	-2.7
10 France	FR	30.3	0.3	22.3	-12.0	-5.9	52.8	0.9	61.4	-0.2	0.3	49.2	-8.2	44.5	-7.6	-7.9	67.5	-5.3	74.6	-3.2	-4.3
11 Italy	IT	31.5	4.4	22.8	-10.2	-2.9	26.5	17.8	21.3	18.5	18.2	45.9	-4.1	41.5	-4.0	-4.1	63.0	-1.8	63.5	6.7	2.4
12 Cyprus	CY	42.6	30.0	36.9	30.0	30.0	40.0	9.2	53.0	3.7	6.4	--	--	11.9	30.0	30.0	46.1	11.1	58.9	10.8	10.9
13 Latvia	LV	33.7	11.6	34.6	29.9	20.8	46.5	5.0	53.8	3.3	4.1	--	--	41.8	-4.4	-4.4	84.6	-18.4	83.1	-10.8	-14.6
14 Lithuania	LT	34.4	13.8	32.9	24.0	18.9	34.7	12.5	37.1	11.1	11.8	40.6	-3.0	--	--	-3.0	67.9	-5.6	72.7	-1.6	-3.6
15 Luxembourg	LU	31.2	3.4	26.4	1.8	2.6	59.0	-3.1	67.6	-3.1	-3.1	37.5	6.2	30.6	8.8	7.5	86.4	-19.7	84.8	-12.3	-16.0
16 Hungary	HU	34.9	15.5	34.4	29.2	22.3	47.4	4.4	42.8	8.5	6.4	54.4	-14.7	42.9	-5.7	-10.2	63.1	-1.9	70.9	0.1	-0.9
17 Malta	MT	36.2	19.8	33.5	26.2	23.0	54.8	-0.4	60.5	0.2	-0.1	--	--	18.4	23.2	23.2	44.1	12.6	57.4	12.1	12.4
18 Netherlands	NL	27.5	-8.9	26.7	3.1	-2.9	72.0	-11.4	84.9	-11.2	-11.3	44.0	-1.8	40.6	-3.0	-2.4	69.0	-6.4	80.2	-8.2	-7.3
19 Austria	AT	29.4	-2.5	25.1	-2.4	-2.5	58.0	-2.4	64.4	-1.6	-2.0	48.5	-7.4	43.5	-6.4	-6.9	55.0	4.3	55.0	14.3	9.3
20 Poland	PL	35.2	16.5	31.3	18.5	17.5	51.0	2.1	58.9	0.9	1.5	42.8	-0.3	42.5	-5.2	-2.8	50.8	7.5	74.3	-2.9	2.3
21 Portugal	PT	35.0	15.7	--	--	15.7	36.2	11.6	37.9	10.7	11.2	37.4	6.4	31.7	7.5	6.9	82.4	-16.7	77.0	-5.4	-11.0
22 Romania	RO	37.3	23.2	38.4	30.0	26.6	--	--	--	--	--	--	--	42.2	-4.9	-4.9	--	--	--	--	--
23 Slovenia	SI	34.6	14.6	30.8	16.8	15.7	67.9	-8.8	73.0	-5.7	-7.2	--	--	41.2	-3.7	-3.7	77.0	-12.5	92.3	-19.1	-15.8
24 Slovakia	SK	32.7	8.4	35.4	30.0	19.2	29.0	16.2	28.6	15.1	15.7	38.5	5.0	35.6	2.9	4.0	64.4	-2.9	61.5	8.5	2.8
25 Finland	FI	24.8	-17.8	25.8	-0.1	-9.0	62.9	-5.6	72.4	-5.4	-5.5	43.7	-1.4	38.9	-1.0	-1.2	52.8	5.9	86.4	2.3	4.1
26 Sweden	SE	29.8	-1.2	22.2	-12.4	-6.8	63.6	-6.0	77.1	-7.6	-6.8	45.4	-3.5	46.0	-9.3	-6.4	60.8	-0.2	81.7	-9.6	-4.9
27 United Kingdom	UK	30.5	0.9	27.3	5.0	3.0	56.5	-1.4	68.0	-3.3	-2.4	34.1	10.4	30.4	9.1	9.8	40.5	15.3	58.1	11.6	13.4
EU-27		32.6	7.8	26.1	0.9	9.2	50.6	2.3	56.6	2.0	2.2	43.0	-0.6	37.0	1.3	1.3	60.5	0.1	69.9	1.0	0.6
EU-15		30.2	0.0	25.8	0.0	0.2	54.2	0.0	60.9	0.0	0.0	42.5	0.0	38.1	0.0	0.0	60.6	0.0	71.0	0.0	0.0
EUR-15		31.6	4.6	27.4	5.3	4.5	52.0	1.4	57.8	1.5	1.4	43.1	-0.7	35.1	3.5	3.1	60.8	-0.2	69.9	1.0	0.4
EUR-12		30.0	-0.5	25.9	0.2	0.0	51.5	1.8	56.7	2.0	1.9	43.1	-0.7	38.0	0.1	-0.3	62.1	-1.2	69.9	0.9	-0.1

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++'). Some indicators have been multiplied with minus 1 so that higher values reflect better outcomes.

2/ Unweighted average.

3/ Marginal effective tax rate of a single worker when moving from social assistance to work at a wage level equivalent (67%) to the wage of the average production worker (manufacturing sector)

4/ Tax wedges – between labour costs to the employer and the corresponding net take-home pay of the employee – are calculated by expressing the sum of personal income tax, employee plus employer social security contributions together with any payroll tax, as a percentage of labour costs.

5/ Ratio of net income when not working (mainly provided by the unemployment benefits if unemployed or by means-tested benefits if on social assistance) to net income in work for different income groups. Lower replacement rate is associated with a greater incentive to work.

6/ Data gaps have not be European Commission, AMEEurostat

| Sources: | Ameco | Ameco | European Commission and OECD | OECD | OECD | European Commission and OECD |

	Corporate income tax rate		Implicit corporate income tax rate		Taxes on the income or profits of corporations-to-tax on individual or household income		Sub-average (5) corporate taxation 6/	Number of tax payments		Hours per tax payments		Sub-average (6) tax administration	Total average including all sub-averages (1., 2., 3., 4., 5., 6)	
	Level (%; 2007)	Score 1/	Level (%; 2006) 1/	Score 1/	Level (%; 2006)	Score 1/	Score 1/ 2/ 3/	Level (per year; 2007)	Score 1/	Level (per year; 2007)	Score 1/	Score 1/ 2/ 3/	Score 1/ 2/ 3/	Rank
1 Belgium BE	34.0	-9.0	21.7	2.9	30.3	-2.9	-3.0	11.0	3.8	156.0	3.6	3.7	-4.7	26
2 Bulgaria BG	--	--	15.4	9.3	133.3	30.0	19.7	17.0	-5.2	616.0	-30.0	-17.6	10.1	5
3 Czech Republic CZ	24.0	7.2	23.4	1.2	107.1	30.0	12.8	12.0	2.3	930.0	-30.0	-13.9	1.6	13
4 Denmark DK	25.0	5.6	29.8	-5.3	17.6	-11.1	-3.6	9.0	6.7	135.0	5.9	6.3	-1.8	22
5 Germany DE	38.9	-17.0	--	--	--	--	-17.0	16.0	-3.7	196.0	-0.7	-2.2	-6.3	27
6 Estonia EE	--	--	6.2	18.6	26.8	-5.2	6.7	10.0	5.3	81.0	11.7	8.5	10.1	4
7 Ireland IE	12.5	26.0	--	--	44.9	6.4	16.2	9.0	6.7	76.0	12.2	9.5	11.4	3
8 Greece EL	25.0	5.6	18.8	5.8	58.7	15.2	8.9	21.0	-11.1	264.0	-7.9	-9.5	7.3	7
9 Spain ES	32.5	-6.6	49.3	-25.0	59.2	15.5	-5.4	8.0	8.2	298.0	-11.6	-1.7	-0.3	17
10 France FR	34.4	-9.7	34.7	-10.2	36.7	1.2	-6.2	23.0	-14.1	132.0	6.2	-3.9	-4.6	25
11 Italy IT	33.0	-7.4	27.5	-3.0	27.3	-4.9	-5.1	15.0	-2.2	360.0	-18.2	-10.2	-0.3	18
12 Cyprus CY	--	--	33.9	-9.4	119.6	30.0	10.3	--	--	--	--	--	17.5	1
13 Latvia LV	--	--	9.6	15.2	38.3	2.2	8.7	7.0	9.7	219.0	-3.1	3.3	3.0	12
14 Lithuania LT	--	--	10.7	14.2	40.6	3.6	8.9	24.0	-15.6	166.0	2.6	-6.5	4.4	11
15 Luxembourg LU	30.4	-3.2	--	--	66.7	20.3	8.6	22.0	-12.6	58.0	14.2	0.8	0.1	16
16 Hungary HU	20.0	13.8	--	--	34.3	-0.4	6.7	24.0	-15.6	340.0	-16.1	-15.8	1.4	14
17 Malta MT	--	--	--	--	66.2	20.0	20.0	--	--	--	--	--	15.7	2
18 Netherlands NL	25.5	4.8	12.7	12.1	52.9	11.5	9.5	9.0	6.7	180.0	1.1	3.9	-1.8	20
19 Austria AT	25.0	5.6	21.6	3.1	24.7	-6.5	0.7	22.0	-12.6	170.0	2.1	-5.2	-1.1	19
20 Poland PL	19.0	15.4	22.4	2.2	52.2	11.0	9.6	41.0	-30.0	418.0	-24.5	-27.2	0.1	15
21 Portugal PT	26.5	3.2	18.9	5.8	54.5	12.5	7.2	8.0	8.2	328.0	-14.8	-3.3	4.4	10
22 Romania RO	--	--	--	--	100.0	30.0	30.0	96.0	-30.0	202.0	-1.3	-15.6	9.0	6
23 Slovenia SI	--	--	--	--	50.8	10.2	10.2	22.0	-12.6	260.0	-7.5	-10.1	-1.8	21
24 Slovakia SK	19.0	15.4	18.4	6.3	112.0	30.0	17.2	31.0	-26.0	344.0	-16.5	-21.3	6.3	8
25 Finland FI	26.0	4.0	15.4	9.4	25.8	-5.8	2.5	20.0	-9.6	269.0	-8.5	-9.1	-3.0	24
26 Sweden SE	28.0	0.7	23.5	1.1	27.9	-4.5	-0.9	2.0	17.2	122.0	7.3	12.2	-2.3	23
27 United Kingdom UK	30.0	-2.5	21.4	3.3	37.7	1.8	0.8	8.0	8.2	105.0	9.1	8.7	5.6	9
EU-27	26.8	2.7	21.8	2.9	43.4	5.4	6.4	19.5	-8.9	257.0	-7.2	-4.6	3.0	..
EU-15	28.4	0.0	24.6	0.0	34.9	0.0	0.9	13.5	0.0	189.9	0.0	0.0	0.2	..
EUR-15	28.6	-0.3	25.4	-0.9	45.6	6.8	3.8	15.8	-3.4	211.3	-2.3	-2.9	2.2	..
EUR-12	28.6	-0.3	24.5	0.1	40.2	3.4	1.4	15.3	-2.7	207.3	-1.9	-2.3	0.1	..

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'), between -4 and +4 as average ('0'),
between +4 and +10 as good ('+') and between +10 and +30 as very good ('++'). Some indicators have been multiplied with minus 1 so that higher values reflect better outcomes.
2/ Unweighted average.
3/ Data gaps have not been filled.

Sources: OECD   Eurostat   Eurostat   World Bank   World Bank

Scores 1/		Fiscal rules index		Medium term budgetary frameworks index		Transparency: Value of calls for tender in % of the total value of public procurement		Average 2/ 3/	
		(2008)	Scores 1/	(2008)	Scores 1/	(2006)	Scores 1/	Score 1/ 2/ 3/	Rank
1 Belgium	BE	0.4	-4.0	1.4	4.0	16.4	-3.1	-1.0	14
2 Bulgaria	BG	1.8	10.8	0.8	-8.1	--	--	1.3	11
3 Czech Republic	CZ	1.0	1.8	1.4	4.0	19.4	-0.7	1.7	10
4 Denmark	DK	1.7	9.6	1.6	8.0	20.3	0.0	5.9	4
5 Germany	DE	0.9	1.6	1.4	4.0	10.2	-8.0	-0.8	13
6 Estonia	EE	1.5	7.2	1.0	-4.0	42.1	17.2	6.8	3
7 Ireland	IE	0.4	-4.6	0.6	-12.1	25.7	4.3	-4.1	20
8 Greece	EL	-1.0	-20.3	0.4	-16.2	60.1	30.0	-2.2	18
9 Spain	ES	1.6	9.3	1.6	8.1	28.8	6.7	8.0	1
10 France	FR	0.7	-0.8	1.0	-4.0	19.5	-0.7	-1.8	17
11 Italy	IT	-0.1	-10.1	1.4	4.1	21.1	0.6	-1.8	16
12 Cyprus	CY	-1.0	-20.3	0.4	-16.2	37.2	13.3	-7.7	24
13 Latvia	LV	-0.1	-9.8	0.6	-12.1	84.4	30.0	2.7	7
14 Lithuania	LT	0.1	-7.6	1.0	-4.0	29.7	7.4	-1.4	15
15 Luxembourg	LU	1.4	6.6	0.4	-16.2	10.3	-8.0	-5.8	22
16 Hungary	HU	0.4	-5.0	0.2	-20.1	31.7	9.0	-5.4	21
17 Malta	MT	-1.0	-20.3	1.2	0.1	11.9	-6.7	-9.0	25
18 Netherlands	NL	1.5	7.9	1.6	8.0	9.1	-8.8	2.4	9
19 Austria	AT	0.2	-6.5	1.6	8.1	9.8	-8.3	-2.2	19
20 Poland	PL	1.7	9.7	0.8	-8.0	28.4	6.4	2.7	8
21 Portugal	PT	-0.6	-15.5	0.4	-16.2	12.4	-6.3	-12.6	27
22 Romania	RO	-0.4	-13.9	0.8	-8.0	--	--	-11.0	26
23 Slovenia	SI	0.4	-4.9	1.4	4.0	26.0	4.4	1.2	12
24 Slovakia	SK	0.0	-9.3	1.0	-4.0	11.9	-6.6	-6.7	23
25 Finland	FI	1.3	5.9	1.6	8.0	18.8	-1.2	4.2	5
26 Sweden	SE	1.4	6.3	1.6	8.0	17.0	-2.6	3.9	6
27 United Kingdom	UK	2.1	14.3	1.4	4.0	25.5	4.1	7.5	2
EU-27		0.6	-2.3	1.1	-2.8	25.1	3.8	-0.9	..
EU-15		0.8	0.0	1.2	0.0	20.3	0.0	0.0	..
EUR-15		0.3	-5.1	1.1	-2.1	21.1	0.6	-2.2	..
EUR-12		0.6	-2.5	1.1	-1.7	20.2	-0.1	-1.5	..

1/ Scores range from -30 to +30. Assuming a normal distribution a value between -10 and -30 is deemed as very poor ('--'), between -4 and -10 as poor ('-'),

between -4 and +4 as average ('0'), between +4 and +10 as good ('+') and between +10 and +30 as very good ('++').

2/ Unweighted average.

3/ Data gaps have not been filled.

Sources: European Commission   European Commission   Eurostat