Competitiveness under New Perspectives

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Contribution to the Project

European growth has been disappointing in the past two decades. Europe failed to catch up with the US in factor productivity, and is growing slower than the US economy in and after the financial crisis. Unemployment rate is about 10%. While Europe has a balanced external trade and relative stable export market shares, this is not the case for many Member countries and not for sophisticated industries. This calls for new policies to enhance competitiveness and to promote new industrial and service industries, probably measures different for regions, countries, but fitting into a broader strategy. Some concepts of competitiveness have been correctly criticised for overemphasising price competitiveness, disregarding social innovations, inclusiveness, and education, as well as modern services or ecological innovations as drivers of growth, new jobs and sustainability.

The object of this Milestone papers is first to discuss how the concept of competitiveness has evolved over time, and which further changes have to be made after the experiences of the financial crisis (as well as the five challenges defined in this research project: demography, globalisation, new technologies and post-industrialisation, ecological issues and climate change and welfare model under pressure). Secondly the paper will provide empirical facts, on the competitiveness of industries and countries in general over the past decade, and specifically with respect to the new challenges and changes necessary for the transition to a new growth path. It contributes in particular to the first central question, to some extent also to research question three. It is closely related to task 301.3 (where policy conclusions are derived from the new concepts and the empirical findings) and to all tasks in 302 (innovation policy) and 306 (industrial policy).

Keywords: Competitiveness, economic growth path, industrial policy, social capital as growth driver, sustainable growth

Jel codes: O25, L16

Abstract

This paper aims to redefine the term competitiveness to enhance its usefulness for the evaluation of country performance and for policy conclusions. We attempt to establish a definition that is adequate if economic policy strives for a new growth path that is more dynamic, socially inclusive and ecologically sustainable. We tentatively apply the proposed definition to evaluate the "competitiveness" of EU member states as well as to compare Europe's competitiveness with that of the US, Switzerland, Japan and China, where possible.

In the first part of the paper, we examine the evolution of the concept from a focus on "inputs" at the firm level (price or cost competitiveness) to economic structure and capabilities at the country level and finally to "outcome" competitiveness, where outcomes are defined in a broad sense and in the context of the WWWforEurope project. We propose to define competitiveness as the "ability of a country (region, location) to deliver the beyond-GDP goals for its citizens".

In the second part of the paper, the performance of the EU-27 countries is assessed along the dimensions described above. We begin with price competitiveness and then proceed to economic structure and countries' capabilities regarding innovation, education, the social system, institutions and environmental ambition. We conclude with outcome competitiveness in terms of economic, social and ecological outcomes. Overall, we compile a database of 68 indicators that describe these different aspects of competitiveness.

In the third part of the paper, we investigate empirically the relationship between "outcome" and "input" competitiveness for the EU-27 using panel data analysis for the period from 2000 to 2010. We construct a composite indicator for outcome competitiveness consisting of income, social and ecological pillars, following the beyond-GDP literature. This measure is then econometrically related to composite indicators of the three groups of input indicators: price competitiveness, economic structure, and capabilities. The results of panel regressions suggest that both economic structure and capabilities on aggregate are positively related to our measure of outcome competitiveness, while a negative relationship is found for the wage component of price competitiveness. Among the different dimensions of capabilities, ecological ambition and institutions are positively associated with outcome competitiveness. Overall, we conclude that a narrow focus on the price component of competitiveness neglects other aspects of the concept that are likely to be particularly important for high-income economies like the EU-27.

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Executive summary

In this study, we redefine the term competitiveness for the purpose of monitoring the process of transition to a more dynamic, socially inclusive and ecologically ambitious growth path. We then apply the new definition to assessing the post-crisis competitiveness of European economies, which we compare using individual indicators as well as a composite indicator on “outcome” competitiveness under new perspectives. This new indicator is useful for analysing countries’ progress towards socio-ecological transition; it is based on an income, a social and an ecological pillar. Further, we examine the “input” side of competitiveness, which has evolved from a focus on costs and productivity to economic structure and country capabilities.

We assemble 68 indicators on input and outcome competitiveness. For the most recent data available (generally 2010 or 2011), we first provide a descriptive analysis of input as well as outcome competitiveness under new and more traditional perspectives, where the latter typically involve per-capita income and employment. Second, we employ factor analysis and panel data econometrics to relate outcome competitiveness to its potential determinants, the inputs, for the EU-27 countries over the period from 2000 to 2010.

Proposed definition

We define competitiveness as the "ability of a country (region, location) to deliver the beyond-GDP goals for its citizens". With this definition, competitiveness has arrived at the country level, and the term is now closely connected to welfare assessments in the tradition of the beyond-GDP literature. It combines an evaluation of inputs or processes on the one hand with an assessment of output and goals on the other. This approach has the advantage over welfare functions derived in social welfare theory that it connects outcomes with measures that can be influenced by economic policy. Our new definition should help to avoid the misuse of the term by media and politicians in the narrow sense of price (cost) competitiveness, which has lead to the foregone conclusion that wages, taxes or energy costs should be reduced (“low road” to competitiveness). For high-income countries, growth and strategic management theory predict that productivity and capabilities determine long-term economic success. A productivity-enhancing social system and technology-based ecological ambition can support transition to a new path of development ("high road" to competitiveness).

Outcome competitiveness: Traditional indicators

Traditionally, outcome competitiveness has been measured by GDP per capita, employment and unemployment rates (which represent goals of the social welfare function) and public deficits, debt and current account positions (which represent constraints).

According to this definition, several Scandinavian (Sweden, Denmark) and smaller countries (Luxembourg, Austria, the Netherlands) lead in terms of outcome competitiveness. On average, the Southern European countries (Greece, Spain, Italy and Portugal) perform much less favourably than the new member countries from Central and Eastern Europe.

Outcome competitiveness under new perspectives

We relate competitiveness to the beyond-GDP goals, which is particularly relevant in view of the socio-ecological transition envisaged by the WWWforEurope project. We measure three pillars of outcome competitiveness: first, the income pillar starts with GDP but moves beyond it towards disposable household income and consumption expenditure. The social pillar summarises indicators that reflect outcomes of a country's socio-economic system (poverty risk, inequality, youth unemployment). Third, the ecological pillar evaluates environmental outcomes. All three pillars are constructed from sets of individual indicators using principal components factor analysis.

Income pillar

In addition to GDP per capita, this pillar considers per-capita measures of net national income, disposable household income and household final consumption expenditure. On disposable household income, several Scandinavian countries drop considerably compared to GDP, but France, Germany and Austria gain. Ranking countries by household consumption expenditure, the largest improvement occurs in Greece, which was largely debt-financed as is now known. This raises doubt whether household consumption really gets us closer to welfare than GDP, as some of the beyond-GDP literature argues.

Social pillar

The social pillar comprises indicators on poverty risk and the impact of social transfers, income distribution and unemployment. Across these indicators, the Scandinavian countries do particularly well, as do the Netherlands and Austria. It is striking that the new member countries from Central and Eastern Europe dramatically outperform the Southern European countries on social indicators like poverty risk and inequality, despite the fact that the latter have a significant lead over the former on the income indicators.

Ecological pillar

Here, we evaluate resource productivity, greenhouse gas emissions intensity, energy intensity and the share of electricity produced from renewable energy sources. Ecological outcomes in the new member countries from CEE are the least favourable, while some Southern, Scandinavian and smaller countries successfully exploit renewable energy sources or pursue ambitious environmental policies.

Determinants of competitiveness

Regarding the drivers of competitiveness or inputs, we follow the evolution of the concept of competitiveness and begin with price competitiveness, which focuses on factor costs and productivity. However, we emphasise elements of quality competitiveness as more important for industrialised countries with high incomes aiming for socio-ecological transition. In turn, quality competitiveness may be divided into structure of production and exports and five types of country capabilities.

Price competitiveness

Wages vary widely across Europe. For example, they are four times higher in the top-ranking countries compared to the new member countries. However, the wage differences are for the most part paralleled by differences in **productivity**, so that **unit labour costs** do not vary as widely. In Ireland, Sweden and Finland, the productivity lead is larger than the margin in wages. For most new member countries, the lag in productivity is much smaller than that in wages, yielding an excellent overall position in terms of unit labour costs. The Southern European countries still lag behind in terms of productivity, but their wage restraint since the crisis has led to a more favourable position in terms of unit labour costs in 2011.

Structure of production and exports

We assess countries' economic structure by analysing shares of sophisticated industries based on taxonomies developed at WIFO (e.g. technology-driven, high-skill intensive, eco-industries). Five countries have very advantageous **production structures**: Sweden, Germany, Ireland, the UK and France. Greece is the country with the largest structural problems. The share of innovation-intensive sectors is particularly low, while the country's position in education and knowledge-based services is somewhat better. For Lithuania, Romania, Bulgaria, Poland, but also for Portugal and Spain, most taxonomies indicate structural problems. Country rankings of **export structure** mostly resemble those on production. Ireland achieves the top position on several taxonomies, while Finland's export structure is much less favourable than its production structure. Regarding exports by eco- and renewables industries, the Scandinavian countries are in the lead, while France and the United Kingdom lag behind.

Country capabilities

We analyse five enablers of change and future growth discussed in modern growth and strategic firm theory: innovation, education, productivity-enhancing elements of the social welfare system, ecological ambition and institutions. Overall, the three Scandinavian countries Denmark, Sweden and Finland clearly stand out as the star performers on our capability indicators, followed by smaller countries like Austria and the Netherlands. Germany and France achieve top-five positions on innovation and the social system but less favourable ones on education, ecological ambition and institutions. Romania, Bulgaria and Greece consistently underperform across indicators.

Finland scores highly across all **innovation** indicators. Together with Sweden and Denmark, it spends a larger share of GDP on R&D than the US, followed by Germany and Austria, which have some weaknesses in tertiary education.

Our **education** indicators highlight the dominance of Scandinavian countries on education expenditure and lifelong learning; of Central European countries on vocational education in upper secondary school; and of France, the Netherlands and Spain on early childhood education participation.

Denmark does best overall on the productivity-enhancing elements of the **social system**, such as expenditure on active labour market policy or female labour force participation. The new member states, especially from Central and Eastern Europe, lag behind considerably.

Denmark also leads in terms of **ecological ambition**, followed by Slovenia and the Netherlands. With Hungary, Romania and Bulgaria, several new member countries lag behind on environmental ambition; similarly, ecological ambition is the only indicator group among capabilities where Finland is not ranked near the top.

On **institutions**, the Scandinavian countries and the Netherlands tend to do best. The low positions of Greece, Romania, Italy and Bulgaria suggest that their competitiveness could be improved if trust in and quality of governance were higher and regulations less stringent.

Comparison between EU, US, Switzerland and Japan

Wages and per-capita productivity in the EU-27 are, on average, about one third lower than in the US, so that overall unit labour costs are similar. Productivity differences are smaller for the total economy but larger in manufacturing. Differences to Japan are smaller, but differences to Switzerland are larger than to the US.

Regarding technology-driven and skill-intensive exports, Europe no longer trails the US; rather, it enjoys trade surpluses in all sophisticated sectors, while the US has deficits. Europe also has a far larger export share in eco-industries and renewables.

On average, the EU-27 lag behind the US on R&D expenditure and higher education. On the other hand, Europe invests more in early education, vocational training and active labour market policies. As far as institutions are concerned, Europe has stricter rules for labour and business, lower regulatory quality, and the rule of law in general is seen to be less stringent than in the US. On the other hand, voice and accountability (quality of the parliamentary system) is better in Europe and control of corruption is considered to be stricter. Environmental ambition is much more pronounced in Europe, as shown by higher environmental tax revenues, more recycling and a higher share of organic farming. Summarising all five capability groups, Switzerland does well on all. Europe, Japan and the US have different strengths, with Europe lagging on R&D and higher education – the two most important indicators for frontier countries – while it leads on indicators that are important for the transition to a more socially inclusive and ecologically sustainable economy.

The traditional output indicators give a lead to the US: GDP per capita (less in GDP per hour) and employment rates are higher, unemployment is lower. Higher public deficits and debts as well as a negative current-account balance are limitations. Japan does better than Europe on the traditional indicators, the exception being its extremely high public debt ratio; Switzerland performs best on all traditional indicators.

For the outcomes under new perspectives, the picture is different. The US still leads on the income pillar but clearly lags behind on the ecological pillar. Results are mixed for the social pillar, since the US has higher inequality and risk of poverty but lower youth and long-term unemployment. Thus if we broaden the outcome perspective to social inclusion and ecological performance, Europe partly overtakes the US.

Explaining outcomes econometrically

The large number of indicators used and their correlation with each other suggests extracting information using principal components factor analysis. We do this for outcomes - traditional and new perspectives - and for the groups of determinants - price competitiveness, economic structure and capabilities - and construct composite indicators from each group of our 68 individual indicators.

Regressing outcomes on its determinants indicates that not only labour costs, but also economic structure and capabilities are significantly related to outcomes under new perspectives and to traditional outcomes. One difference in results between the two outcomes measures is the importance of ecological capabilities for achieving new perspectives outcomes, while institutions dominate for traditional outcomes. We conclude from these results that a narrow focus on the price component of competitiveness neglects other important aspects of the concept. For high-income economies like the EU-27, a purely cost-based strategy for improving outcomes is therefore unlikely to be as successful as one that also leverages the positive effects of a favourable economic structure and strong capabilities.

Comparing the levels of new perspectives outcome competitiveness predicted by our preferred regression specification with the EU-27 countries' actual scores on the composite indicator, we find that Estonia, the UK and Bulgaria have, on average over the period from 2001 to 2010, not achieved the level of "new perspectives" outcome competitiveness that our model would predict given their price competitiveness, structure and capabilities. They thus have upward potential. Spain, Germany and Denmark appear to be close to potential, while for Malta, Slovakia and the Czech Republic, actual scores exceed those predicted by the model; hence reform in the areas of price competitiveness, economic structure and capabilities is advisable in order to maintain current levels of outcome competitiveness.

1. Aims and outline

The aim of this paper is twofold: first, to establish a concept of competitiveness that is adequate for the transition of economies to a socially inclusive and ecologically ambitious growth path – as envisaged by the WWWforEurope project – and relevant to Europe as an industrialised high-income region. Second, we apply this new concept to assess the competitiveness of the EU member states, to learn on which pillars it rests and which policy actions might improve it. The second goal is particularly important since growth in Europe has been disappointing over the past decades (and after the financial crisis) and unemployment is above 10 percent.

The paper is organised as follows. In the next section, we discuss the evolution of the term competitiveness from the firm perspective to the industry and macro level. Early analyses focused on low costs and soon included productivity (by itself or in relation to costs); this notion is known as price or cost competitiveness. Later, assessments of economic structure, technology and other capabilities (enablers) were added, and the result was called quality or technological competitiveness. Attention then shifted to evaluating outcomes instead of costs or capabilities. Competitiveness became associated with the ability of a region or country to create value added and employment or to improve living standards (see, for example, *European Commission*, 1998). Given that the aim of the WWWforEurope project is to analyse the preconditions necessary for a transition to a more socio-ecological European growth path, it makes sense to define competitiveness, specifically its "outcome" component, from the perspective of the ultimate aims of society. A similarly broad approach has recently been taken in the discussion on "beyond GDP", and the OECD has set up the "Better Life Index" to make this operational.[1]

In sections 3 to 5 of the paper, we assemble and analyse indicators on the different dimensions of competitiveness outlined above, combining traditional indicators used in the literature to date with new ones that emphasise the social and ecological aspects of input and outcome competitiveness. Section 3 analyses price competitiveness. Section 4 investigates the sophistication of production and exports as revealed by the structure of an economy (e.g. the share of technology-driven or high-skill industries). Section 5 looks at capabilities, that is, enablers of a "high-road", non-price concept of competitiveness. We collect indicators on (i) innovation, (ii) education, (iii) the social system as a "productive" force, (iv) incentives and preferences for ecologically sustainable behaviour, and (v) institutions.

Section 6 analyses outcomes. First, we report traditional outcomes like GDP and employment and then broader sets of outcome goals, among them social inclusiveness and ecological sustainability. We follow the literature on "beyond GDP" and the OECD Better Life Index in our evaluation of outcome competitiveness. Section 7 summarises our main findings on competitiveness under new perspectives for the European economies in comparison to the US, Japan and Switzerland.

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[1] *OECD* (2011); see also European Commission (2007), *German Sachverständigenrat* (1981).

Section 8 analyses econometrically the relationship between outcome competitiveness (success in achieving the beyond-GDP goals) and input competitiveness (costs/structure/ capabilities). Building on the database compiled for sections 3 to 6, we apply panel data estimation methods to the EU-27 countries over the period 2000 to 2010. This provides information on the importance of different drivers of competitiveness and therefore on the instruments that may be used to improve competitiveness under new perspectives. Section 9 concludes.

2. Developing a meaningful concept for the transition

2.1 From crisis towards a new growth path

Competitiveness of nations or regions is an evasive concept. It is usually not well-defined but persistently used by politicians, economists, business people and media.[2] It has regained attention in today's era of globalisation and - after the financial crisis - particularly in countries struggling to return to growth and limit unemployment. This holds for Southern Europe but also for other European economies and the US, which all attempt to stabilise and restructure their financial sectors and to refocus on their shrinking industrial base. The purpose of this paper is to define competitiveness from the perspective of an economy in transition to a new path of growth and development with high dynamics, more social inclusion and environmental sustainability. These are the goals of the EU 2020 strategy, and the WWWforEurope project has the mission to provide analytical support for the transition of Europe to a new growth path until 2020 and beyond. This transition should take place in an environment in which industrialised countries face multiple challenges including globalisation, tight public budgets, costly welfare systems, and ageing populations. Persistent disequilibria exist across countries within the euro area; high income differences (often increasing at least within countries) and climate change are additional challenges. We venture to link competitiveness to drivers of economic growth and to the ultimate aim of societies: to increase the welfare of their citizens, which we measure by means of the so-called "beyond GDP goals".

2.2 The many facets of "competitiveness"

2.2.1 Price competitiveness

Historically, the term competitiveness has been used primarily to draw attention to the cost position of firms or countries. It is still often used today when an economy (or a firm or industry) is challenged by new low-cost competitors. It is this narrow focus on costs that was criticised by *Krugman* (1994A, 1994B) as "elusive and meaningless" at the conceptual level and as "misleading or even dangerous" at the policy level, since this narrow interpretation implies that cost reduction is the only effective policy response. Complaints about losing competitiveness focus on wages as the main cost component, but they also extend to high energy prices and taxes. To some degree, this preoccupation with costs comes from the origin of the concept of competitiveness at the level of the firm. However, even at the firm level, the theory of the firm and management theory emphasise that success in oligopolistic markets depends on "competitive advantage" and capabilities generated by innovation (*Aiginger,* 2006).

Absolute cost levels decide neither about the survival of firms nor about the health of an economy; instead, they should be set in relation to productivity. The profitability of firms and the

[2] See *Aiginger* (1997, 1998, 2000); *Fagerberg* (1994), *Hölzl – Reinstaller* (2011), *Grilo – Koopman* (2006), *Grupp* (1995), *Krugman* (1996), *Krugman – Hatsopoulos* (1987), *Orlowski* (1982), *Oughton* (1997), *Peneder* (1999, 2003).

ability of an industry to sell internationally are not limited by costs if productivity is also high (and/or high prices can be charged). Profit margins are positive if the productivity lead (plus price advantage) of a firm or region is larger than the cost disadvantage. These "relative costs" are summarised in the concept of unit labour costs. On the practical side, it is not easy to find data for the absolute level of productivity (per capita or per hour) *and* the wage level in a consistent way.[3] Monitoring *changes* in unit labour costs is much more common and easier, although it also involves a number of statistical issues.[4]

The role of productivity is sometimes emphasised to the extent that some authors consider productivity as the only meaningful concept of competitiveness (*Porter*, 1990; *Kohler*, 2006). This may de-emphasise costs too much and distract from quality components.

Concepts of cost competitiveness in the narrow sense (costs only) or in the more balanced approach (looking at costs and productivity simultaneously) are complicated when all cost components (labour, capital, energy, taxes) or all productivity components (labour productivity, capital productivity, resource productivity, government efficiency) should be addressed. These extensions are usually implemented in cost benchmark studies, which look at individual cost components sequentially, or in studies on total factor productivity (TFP), which use a production function approach.[5]

2.2.2 Quality competitiveness

Later, competitiveness came to be seen as more than an accounting result comparing costs and revenues at one point in time. A broader interpretation of the term evaluates the sources of competitiveness of firms and countries as well as their future prospects. This involves examining the processes that lead to a favourable cost or productivity position and the opportunities to sustain or improve it. Competitiveness in this sense is about processes and abilities.[6] In the literature, terms like "quality competitiveness" or "technological competitiveness" are used to describe this broader interpretation, although both expressions could be seen as narrowly focusing on two specific aspects (quality and technology).

We investigate two components of this broader notion of competitiveness. The first is the *structure* of an economy, and the second are its *capabilities*, for instance in terms of the innovation and education system. The structural composition of the manufacturing sector, for example, can be analysed by breaking down value added or exports (i) by the main input used

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[3] In unit labour cost calculations, productivity is usually measured in real terms, while wages are measured in nominal terms. If both were measured in nominal terms, the relationship between the level of value added per employee and the wage level per employee degenerates into an inverse "wage ratio" (Y/W), which is traditionally interpreted as a result of industrial relations, market structure and capital intensity rather than as an indicator of price competitiveness.

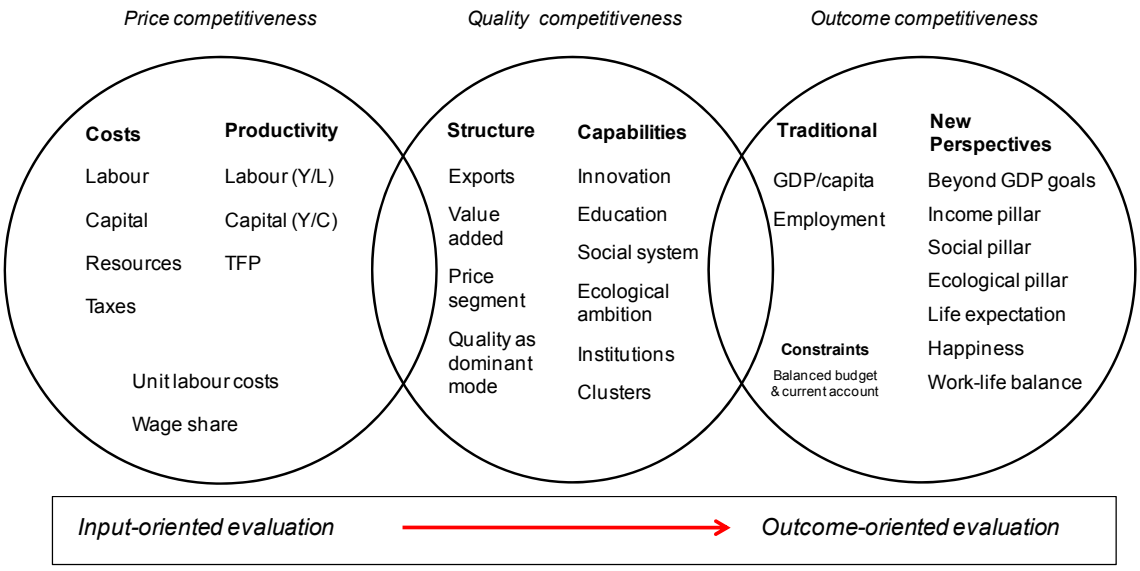
[4] These begin with the question whether to account for changes in currency values or not. Further, price indices used to deflate value added or production on the one hand and wages on the other hand can also differ.

[5] Information on TFP is more commonly provided *for* changes over time (e.g. in the EU KLEMS database) than for absolute comparisons, and practically never in a way that allows comparing TFP with a comprehensive cost evaluation ("total costs").

[6] This is reflected in the German expression for competitiveness, “Wettbewerbsfähigkeit" – literally, “the *ability* to compete”.

in an industry (differentiating for example between labour-intensive and technology-intensive industries), (ii) by the sophistication of inputs (e.g. low-skilled or high-skilled labour), (iii) by the extent and characteristics of services used/provided (transport services vs. knowledge input), and (iv) according to whether competition takes place mainly along the price or the quality dimension. We also report the share of production and exports in (v) innovation-intensive sectors and (vi) education-intensive sectors. Lastly, we assess the importance of ecological and renewables industries.[7]

Figure 1 **Towards a concept of competitiveness under new perspectives**



Source: Own conceptualisation for WWWforEurope.

Capabilities provide information about the sources of success and failure of firms or industries and pave the ground for assessing their future prospects. Innovation and education affect firm growth, market positions and GDP growth, especially in industrialised countries. Indicators on research inputs and outputs, as well as on investment and participation in human capital formation at various stages are instrumental for this purpose. The importance of institutions has received increased attention over the past years (*Acemoglu*, 2003; *Rodrik et al.*, 2004; *Bouis et al.*, 2011). This includes the role of governance and the extent to which the public sector and regulation support or hinder firms in the long run. The rule of law, absence of corruption and trust in institutions are widely accepted as determinants of efficiency and growth for firms and countries. The importance of clusters (cooperation between firms in "related industries") for competitiveness has been analysed by *Porter* (1990, 2004), *Ketels* (2006), and *Ketels – Protsiv* (2013).

In the context of transition to a new growth path, the capability of the social system to enhance the productive capacity of an economy becomes important. Productivity-enhancing measures

[7] To assess economic structure, we mainly rely on taxonomies that refer to manufacturing. The taxonomies on innovation and education intensity also include services.

include retraining people if qualifications become obsolete, reducing inherited differences in education or increasing female labour force participation. As to the ecological aspect, *Porter* (2004) emphasises the sophistication of consumers providing incentives for firms to improve technologies and products in order to gain a first-mover advantage.[8] Demand by economic actors for alternative energy sources, changing habits in light of climate change, and environmental taxation could all contribute to environmental innovation and lower energy intensity. Thus, social and ecological activities may turn into productive forces that do not limit incomes and production but increase welfare. In other words, social inclusion and ecological ambition can be drivers of growth and development.

2.2.3 Outcome competitiveness

Competitiveness should not be assessed by looking at inputs proper (costs and productivity) or inputs more broadly (structure and capabilities) alone. Rather, it ought to be complemented by assessing outcomes ("the proof of the pudding is the eating").

Outcome competitiveness was initially measured using trade or current account balances, with deficit countries judged to be uncompetitive. The importance of the external-balance benchmark subsequently declined: on the one hand, fast-growing countries tend to have trade deficits; on the other hand, the current accounts of member countries were seen as meaningless in a currency union, where no currency reserves are necessary to compensate deficits and there is no national currency that can be devalued. Further, some countries' large surpluses were sometimes seen as the result of politically-motivated prevention of currency appreciations ("currency manipulation") and a resurgence of mercantilist policies. In the wake of the financial crisis, this neglect of rising current-account deficits proved a mistake (see *Aiginger*, 2010); the difference in the depth of the crisis in individual countries was found to be correlated with their current-account position (and its change). The current-account deficits of Greece, Portugal and Spain (accrued in the pre-crisis period) added to the problems of these Southern peripheral countries, as financial markets added up public and private debt as well as current-account deficits in calculating the risk of governments bonds (see *Aiginger et al.*, 2012).

However, balancing the current accounts is not the ultimate aim of society (at least as long as there are no large deficits). The ultimate aim of an economy should be to enable high and rising incomes, to provide employment opportunities and to improve living conditions. Current accounts (as well as public deficits) are thus shifted into the position of constraints that could destabilise growth. A typical definition of outcome competitiveness along these lines is offered by the *European Commission* (2001): "the ability of an economy to provide its population with high and rising standards of living and high rates of employment on a sustainable basis".

[8] See also *Vernon* (1966).

Fundamental assessments of outcomes thus began with GDP per capita as the main indicator of outcome competitiveness. Employment and unemployment indicators were then added to the analysis.[9]

In the context of transition to a more socially inclusive and environmentally sustainable path, the goals of social inclusion and sustainability are particularly important. The "social pillar" includes poverty reduction through transfers, limiting differences in net incomes through progressive taxation, guaranteeing pensions above poverty level, achieving gender equality and providing broad access to the health system. Ecological sustainability can be evaluated in terms of low CO2 emissions and energy intensity or a large share of energy produced from renewable sources. If the growth path should be sustainable, i.e. in line with the biophysical limits of the world, these goals need to be added to GDP in an analysis of outcome competitiveness.

The critique of GDP as central measure of economic performance and meaningful indicator of welfare is closely related to the "beyond GDP" debate (*Stiglitz et al.*, 2009). This approach measures the achievements of a society using a broader set of goals. Since the ultimate purpose of an economy's competitiveness is to serve the aims of its citizens, the beyond-GDP approach is a good point of departure to re-evaluate the concept.[10]

An alternative to broad sets of indicators as in "beyond GDP" is to measure welfare using comprehensive indicators that summarise many components contributing to well-being. Life expectancy is an example of a quantitative indicator; survey responses to questions on life satisfaction or personal "happiness" are subjective indicators.[11]

2.3 Proposed definition

Given the evolution of the concept over time, we propose to define competitiveness in light of the envisaged new growth path as the "ability of a country (region, location) to deliver the beyond-GDP goals for its citizens today and tomorrow".

The competitiveness of a country or region requires a set of viable firms and industries that are able to compete internationally, building on balanced costs and productivity. They have to be embedded in the structure of an economy and driven by capabilities developed privately or by the government. Current accounts as well as public-sector revenues and expenditures need to be balanced in the long run, but balanced accounts are not the ultimate aim. Given the objective of transition to a more socially inclusive and environmentally sustainable growth path, investments in the social and ecological system that make an economy more productive (in creating incomes and welfare) are an important part of competitiveness from the perspective of

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[9] *Aiginger* (2006B) defines evaluations of GDP as operationalisation 1 of output competitiveness, and evaluations of employment as operationalisation 2.

[10] There is much ongoing research on the measurement of "beyond GDP" to improve the approach and to customise it to the preferences of different societies. For example, the indicators making up the OECD's Better Life Index contain the following categories: housing, health, work and life balance, education and skills, social connections, civic engagement and governance, environmental quality, personal security and subjective well-being.

[11] The UN's human development index is a further example. It consists of three indicators: GDP per head, education and life expectancy.

the new growth path. The social system and environmental ambitions of (public and private) institutions can become a "productive force". The outcomes to which firms and countries should contribute are the beyond-GDP goals. Our definition is therefore an extension – particularly important for the aim of a transition – to those defining competitiveness as value added plus employment or high and increasing living standards (see Table I in the Annex for an overview on definitions proposed in literature).

2.4 Discussion of the proposed definition

2.4.1 Relation to theory

Our definition starts from the notion of a welfare function as defined in welfare theory. Social welfare consists of a bundle of goals, both material and immaterial. Material goals comprise income and employment, while immaterial goals may contain fairness of distribution, health, justice, freedom or the ability to follow personal preferences. It is open to choice which goals to include in the welfare function, which weights to give to these goals, and whether to emphasise dynamic or static aspects. Our operationalisation of the welfare concept is close to the "beyond GDP" debate – currently one of the most active branches of welfare theory – and to the aim of the WWWforEurope project, which is to support transition to a more dynamic, inclusive and sustainable growth path. The importance we attach to capabilities is based on strategic management theory, which emphasises competitive advantage, innovation and firm-specific capabilities, and on modern growth theory, which emphasises human capital, innovation and institutional quality. This choice of variables is also supported by our empirical analysis. Our definition thus comprises many elements of a "high road" to competitiveness (*Aiginger*, 2012) based on quality and innovation.

2.4.2 Monitoring the transition to a new growth path

The definition proposed involves important choices. Defining competitiveness as an ability to create welfare in general and to deliver the beyond-GDP goals in particular moves away from the emphasis on costs as a main driver of competitiveness and external balances as a main indicator of success. A low cost position derived from currency devaluations, cost-cutting and beggar-thy-neighbour policies are, in this view, ineffective tools for raising the long-run competitiveness of an industrialised country. Problems may arise when costs are too high relative to productivity, but when they are broadly in line – and the current account is balanced – further cost-cutting is an unhelpful strategy for rich countries. Reducing social expenditures and environmental ambition, together with other elements of a "low road" to competitiveness, are counterproductive for the transition to a new growth path.

Productivity is an important part of competitiveness, but it loses its singular relevance if the growth path should become more inclusive and sustainable. Higher resource productivity may be more important for welfare if sustainability is among the goals.

Economic structure is crucial for assessing competitiveness since it offers an outlook on future prospects. A country's capabilities (innovation and education system etc.) determine its welfare

position today but even more so in future. Emphasising structure and capabilities changes the nature of competitiveness from ex-post evaluation to an ex-ante concept.[12]

2.4.3 Dividing indicators into enablers and outcomes

Allocating indicators on the social system and sustainability to costs, capabilities or outcomes is difficult. In early competitiveness rankings, social expenditures and environmental standards were regarded as costs that diminished the price competitiveness of countries and locations. In the meantime, the literature has developed concepts of the social system as a "productive force" and of environmental sophistication as a creator of first-mover advantages, green jobs and export potential.

We should therefore distinguish between "enablers" and "corrective strategies". Some social measures like education and training, lifelong learning and childcare institutions may increase capabilities and thus productivity. On the other hand, social expenditures like unemployment benefits and pensions change the ex-post distribution, aiming at reducing poverty and income differences. Their purpose is not to increase an economy's productive capacity.

Similarly, some indicators on ecological sustainability may be seen to represent a productive force. Examples include subsidies for renewable energy fostering innovation and technical progress, or consumers' preferences for recycling and organically produced food. Other environmental expenditures could be counted on the cost side, such as expenditures on the noise insulation of motorways, clean-up of pollution and reconstruction after environmental disasters. These are corrective measures that restore environmental quality, thus improving welfare albeit at rather high costs.

2.4.4 Relation to welfare assessments

Defining competitiveness as the ability to deliver on the beyond-GDP goals is certainly unusual from the point of view of the firm or industry level, and it also differs from popular use in policy discussions. With the definition we propose here, the term competitiveness has arrived at the country level. A legitimate question that may arise is why we do not simply talk of "welfare analysis"[13] and abandon the term competitiveness when comparing economies.

The answer has different dimensions:

- Firstly, the notion of competitiveness (instead of welfare or living standards) engenders a focus on market processes, which is particularly relevant for open economies exposed to international competition. Welfare, on the other hand, tends to be regarded as a policy goal of the public sector, associated with public support and redistribution.

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[12] When trying to separate the components of competitiveness into costs, structure, capabilities and outcomes, we acknowledge that they are to an extent related. Productivity is partly determined by structure and capabilities, and labour productivity can be seen as a component nested in traditional outcomes as well as outcomes under new perspectives.

[13] *D'Aspremont - Gevers* (2002).

- Secondly, competitiveness emphasises the bottom-up character of welfare creation. Ultimately, welfare comes from firms and industries that compete successfully and generate jobs and income.
- Thirdly, using the term competitiveness to assess the contribution of firms and industries to the ultimate aims of society could help to reduce the misuse of the term to describe only cost factors. A case in point are claims that Europe loses competitiveness if taxes on energy or emissions are implemented, without taking into account that this may enhance long-term welfare by fostering innovation and mitigating climate change.

2.4.5 Relation to competitiveness rankings

A large and rapidly expanding number of competitiveness rankings are available today.[14] They use a multitude of indicators – partly hard data, partly survey results – to assess the competitiveness of countries. This has the advantage of measuring a wide range of economic aspects, which potentially reduces measurement error and helps cope with the complexity of the problem, such as differences in countries' starting position and socio-economic systems. A disadvantage of "large indicator approaches" is that they sometimes lack a clear concept.[15] Rankings usually combine indicators of outcome competitiveness with those of input or process competitiveness, and indicators on price competitiveness with data on external balances. In addition, they mix indicators on performance levels with indicators on changes in performance dynamics. Sometimes they implicitly favour the size of an economy.

2.4.6 Relation to *Delgado et al.* (2012)

The approach taken here resembles that of *Delgado – Ketels – Porter – Stern* (2012; henceforth also DKPS). They define outcome competitiveness using a modified concept of labour productivity: GDP per capita, where the denominator is the working-age population as a proxy for the potential instead of the actual labour force. Outcome is thus – in contrast to our approach – not a set of indicators containing social and ecological goals. The only outcome goal indirectly included in DKPS is, apart from productivity, maximum labour force utilisation. Hence in principle we could interpret DKPS' dependent variable as a two-goal welfare function, containing total labour productivity plus some employment measure (utilisation of labour market potential).

Further, DKPS derive a competitiveness index first by regressing this modified measure of labour productivity on its determinants, and then using the estimated coefficients to compute a competitiveness score for each country. This inspires the approach we take in section 8, regressing a set of beyond-GDP indicators on the determinants outlined above.

As determinants of "modified labour productivity", DKPS use composite indicators of macroeconomic performance (MACRO), microeconomic performance (MICRO) and of social and political institutions (SIPI). The composite indicators for MICRO and SIPI are constructed

[14] Examples include those of the International Institute for Management Development (IMD, a business school) and the World Economic Forum.

[15] This was the case especially in the beginning; recently, some rankings also provide theoretical background.

using principal component factor analysis. MACRO essentially consists of fiscal and monetary policy as well as output volatility. This category does not exist on its own in our approach, but some elements may be incorporated in institutional quality, and the absence of volatility and disequilibria is a constraint of our outcomes. MICRO is a broad set of indicators from corporate strategy to the business environment, and both MICRO and SIPI are captured by our capability indicators.

Thus a common ground exists between DKPS and our approach, with DKPS focusing more on productivity as the outcome goal, while our approach is motivated by a focus on the transition of the current economic system to a more inclusive and sustainable one (measured by beyond-GDP indicators). DKPS consider macroeconomic performance, microeconomic performance and institutions as drivers of competitiveness. We investigate costs (relative to productivity), economic structure and capabilities as driving forces.

2.5 Empirical setup

In sections 3 to 7, we use our proposed concept of competitiveness to provide a descriptive analysis of the EU member states' current performance. In addition, we compare the EU-27 to the US, and - where data are available - to Japan, Switzerland and, in rare instances, to China.

We start with price competitiveness (section 3) and proceed to economic structure (section 4), capabilities (section 5) and outcomes (section 6), where we begin with GDP per capita and employment and then include broader social and ecological outcomes.

For some indicators, data are available over a longer time period than for others. Our approach is to examine the most recent year available (generally 2010 or 2011, but sometimes only 2008). For comparisons over time, we relate this to the year 2000. We mainly use data on the EU-27 countries, which serve as a benchmark and which we sometimes generally refer to as "Europe". If possible, we also show data for the EU-15, which comprise all EU member states until 2004, and for the euro area, which currently has 17 members. The "new member states" complement the EU-15. They consist of ten countries from Central and Eastern Europe (CEE) as well as Cyprus and Malta. Section 7 relates Europe to the US, Japan and Switzerland.

In section 8, we analyse econometrically the relationship between outcomes and the input groups costs, structure and capabilities. To this end, we compile a panel dataset on the indicators described in sections 3 to 6, covering the period 2000 to 2010 for the EU-27. Table II in the Appendix contains an overview of the indicators. The main statistical information is extracted from each group of input and outcome competitiveness indicators by means of principal components factor analysis. We then use panel data analysis to investigate the relationship between the different input factors and outcome competitiveness under new perspectives.

3. Price competitiveness

3.1 Concept and operationalisation

The debate on competitiveness has long been dominated by concepts of price (cost) competitiveness. Recent examples include Germany's post-unification efforts at regaining competitiveness through wage restraint and losses of competitiveness in Southern Europe following strong wage increases. Thus, some politicians and the media still tend to equate competitiveness with low costs, despite a growing literature suggesting that overemphasising costs might lead to misleading policy conclusions at least for rich countries.

In theory, firm entry and exit depends not on wages but on average costs (costs divided by output), and short-run output is determined by marginal costs (cost changes incurred by the "last" unit of output). This implies that all types of costs, not only labour costs, as well as productivity are relevant for the viability of firms and industries. In homogenous industries, unit costs are crucial, and any firm with higher unit costs makes losses. In heterogeneous markets with vertical product differentiation, firms can co-exist with different costs if quality or consumer valuation of products differs to the same extent.

To evaluate the price competitiveness of the EU-27 member states, we therefore begin with absolute labour costs per employee and then proceed to labour productivity and unit labour costs.[16] We focus on the levels of these indicators as measures of current price competitiveness. Rates of change since 2000 are analysed separately (see box), where we also examine total factor productivity (TFP) growth.[17]

3.2 Descriptive analysis

In Figure 2, we present data on the levels of compensation per employee, labour productivity and unit labour costs (the ratio of the first two), both for the total economy and manufacturing.

Labour costs (compensation per employee) are lowest for the total economy in the new member countries in Central and Eastern Europe, despite some catch-up to the "old" member states of the EU-15 since 2000. The highest labour costs are registered by small economies like Luxemburg, the Netherlands, Denmark and Belgium (also Switzerland). The large European economies are located in the middle, with Germany at the bottom of this group, just above the EU-27 average. Manufacturing labour compensation exceeds compensation on aggregate in the high-income countries, while it is lower in most new member countries. Germany has comparatively high costs in manufacturing, albeit still below France and the smaller old member countries, while Irish compensation in this sector lies below the total economy.

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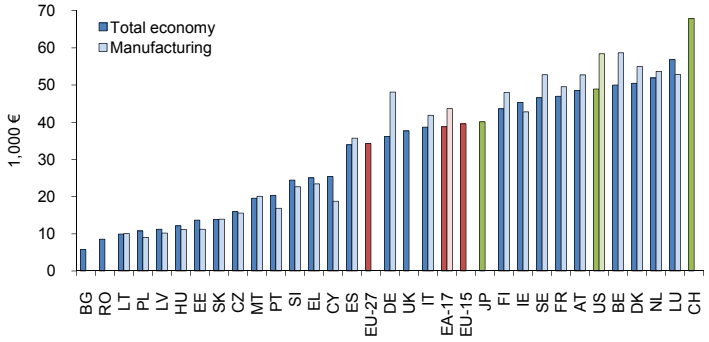
[16] For a comprehensive analysis of price competitiveness, see *ECORYS* (2011); for productivity see *Schröder* (2012).

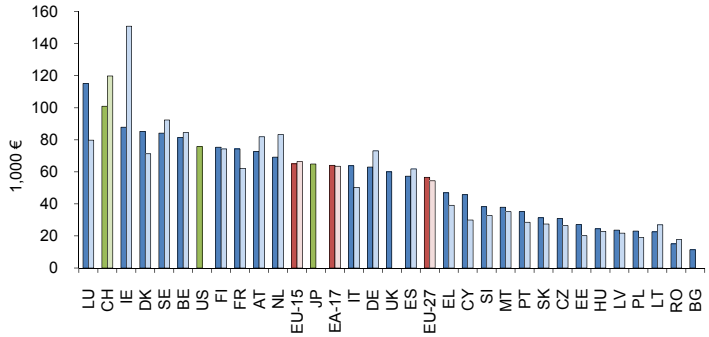
[17] The data used in this section were extracted from AMECO and Eurostat unless otherwise indicated; see Appendix Table II for definitions and sources. For international comparison, all data are given in a common currency, the euro. Since the focus in this section is on the price of inputs from the producers' side, the data are not adjusted for cross-country differences in purchasing power. For reasons of data availability, all indicators except TFP growth were computed on a per-person basis rather than per hour worked.

Figure 2 **Price competitiveness, 2011**

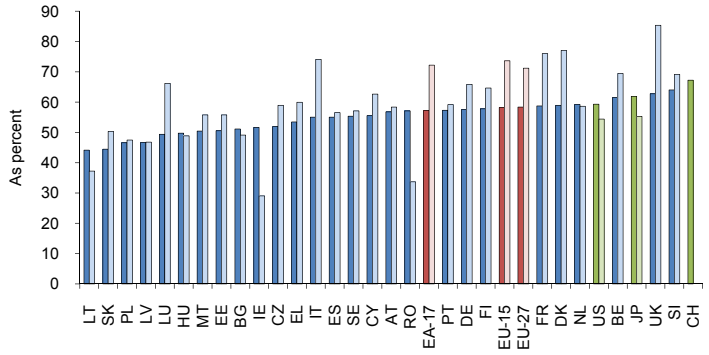
Compensation per employee



Output per person employed



Unit labour costs



Notes: Data in current (2011) euro prices and exchange rates. Countries ranked by total economy values.
Source: Eurostat (AMECO), WIFO calculations.

Regarding labour productivity (output per person employed), the ranking resembles the inverse of labour costs, with small Western countries ahead. Luxemburg and Ireland are particularly productive, so much so in comparison to labour compensation that in terms of unit labour costs, they can be found among the most price-competitive group of countries according to this measure, the new member countries.[18] This group has a labour cost advantage between 20 to

[18] However, the figures for Luxembourg and Ireland should be interpreted with caution. Luxembourg, with its large financial sector, is a special case. In Ireland, the low rate of corporation tax - currently at 12.5% - provides an

30 percent over the EU average, with the exception of Slovenia. In Sweden and Finland, unit labour costs are also comparatively low as these countries rank more highly on productivity than on wages. In the Netherlands, the UK and France, the reverse holds.[19] The Southern European countries still lag behind in terms of productivity, but their wage restraint since the crisis has led to a more favourable position in terms of unit labour costs in 2011 (except for Italian manufacturing).

Box: Changes in price competitiveness, 2000-2011

Economic policy is often more interested in changes in price competitiveness than in current levels. Therefore, although we are primarily interested in levels, we report here also the rates of change between 2000 and 2011 in labour compensation, labour productivity, unit labour costs and - where comparable cross-country data are available - in total factor productivity.

Both labour costs and productivity increased fastest over the period in the new member countries from Central and Eastern Europe. Overall, unit labour costs also increased in these countries (by about 4 percent per year on average), indicating that productivity rose more slowly than wages. Ireland, the Netherlands and Finland also registered comparatively large wage increases, but considerable productivity gains held unit labour costs in check (they even declined in Finnish manufacturing). In Denmark, productivity could not compensate the wage dynamics, so that unit labour costs increased by more than 2 percent p.a.

In the Southern European countries, wages rose faster than productivity until 2008. Since then, wages were cut and productivity improved slightly. Still, between 2000 and 2011, unit labour costs in Italy, Greece, Spain and Portugal increased between 2.5 and 2 percent per year on average. In Italy in particular, wages kept rising despite negative annual average productivity growth rates. In British, Swedish, German and Austrian manufacturing on the other hand, annual wage increases remained below productivity gains, leading to declining unit labour costs. In the UK, this was the case also for the total economy.

Total factor productivity (TFP) growth is an indicator of improvements in the productivity of all production factors combined. Calculated using the growth accounting approach, based on a standard neoclassical production function, TFP growth is that part of labour productivity growth that cannot be explained by the growth of capital and labour. Hence, it may be considered an underlying driver of labour productivity growth and an indicator of technological progress. It is therefore frequently analysed in studies on the sources of growth and competitiveness.[20]

The figures for TFP (see Figure I in the Appendix) are similar to those for labour productivity: high growth rates in the new member states, Finland, Sweden and the US; intermediate growth rates in the Netherlands, Germany and France; and lower or even negative growth in Belgium, Denmark and Italy. More surprising is Ireland's negative performance, which supports a cautious approach towards Irish productivity figures. Spanish TFP also declined until 2007, indicating that the country's wage increases up to the crisis may have been unsustainable. TFP growth in the manufacturing sector considerably exceeded that in the economy as a whole in most countries, and even Belgium and Denmark, with negative average annual TFP growth on aggregate, registered positive growth in manufacturing.

incentive for multinational companies to register their profits in the country. This implies that Irish value added (and hence productivity) figures may be artificially inflated upwards.

[19] In manufacturing, the overall picture is similar. In several new member countries, unit labour costs are lower than for the total economy, again with the exception of Slovenia. Manufacturing wages are also particularly high relative to productivity in the UK, Italy, France and Denmark.

[20] We use data from the 2009 release of the EU KLEMS Growth and Productivity Accounts. This database covers 16 countries (15 EU members and the US) over the period from 2000 to 2007.

4. Quality competitiveness: Economic structure

4.1 Concept and operationalisation

The structure of an economy allows an assessment of quality competitiveness today as well as likely future opportunities. Firm-specific competitive advantage is crucial for individual firms' long-term survival, and these can be created and sustained by innovation and skills. Particularly advanced industrial countries with higher incomes are more likely to be able to compete in the long run in industries where profitability is higher due to some vertical heterogeneity, such as heterogeneous products and competition in quality instead of prices. Thus firms in high-income countries are better positioned in the long term if their selling position is derived from a lead in technology or employee skills rather than from cheap labour, physical capital or energy. In industries without such advantages, production may be lost to new low-cost competitors. Since innovations usually generate rents, profits are higher in technology-driven, skill-intensive industries; since process and product innovations generate demand, growth rates are likely to be higher in industries where innovation, high skills, quality competition and new product characteristics (e.g. ecological content) are important.

We apply eight classifications to evaluate quality competitiveness in production and exports.[21] For production structure, we use data on value added, which are available only for the EU members from 2000 to 2008. For trade, we primarily use export data, which extend to Switzerland, the US, Japan and China until 2011.[22] For sake of brevity, we discuss countries' positions in the "top" segment of each taxonomy, highlighted in Italics below:

- The **first** taxonomy classifies industries according to the **main factor input used** (available for value added and exports, manufacturing only; see *Peneder*, 2002). It ranges from labour- and capital-intensive industries to marketing- and *technology-driven* industries.
- The **second** divides manufacturing industries into **four types of skills used** (available for value added and exports, manufacturing only; see *Peneder*, 2002). It includes low-, medium- and *high-skill intensive* industries.
- The **third** taxonomy clusters industries according to the **type of service inputs used** (available for value added and exports, manufacturing only; see *Peneder*, 2001). It includes transport services, retail and advertising services and *knowledge-based services* inputs.
- A **fourth** classifies industries according to **competitive mode**, i.e. whether success depends mainly on price or *quality* competition (available for value added and exports, manufacturing only; see *Aiginger*, 2000). This taxonomy classifies an industry as "revealed quality elastic" if quality not price determines the quantity exported. Revealed quality elasticity (RQE) may be high, medium or low, where the latter would indicate revealed price elasticity.

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[21] An example of studies using these taxonomies to examine the structural dimension of competitiveness at the European level is *Janger et al.* (2011).

[22] The data come from Eurostat, UN and IMF; see Appendix Table II for definitions and sources.

- The **fifth** taxonomy allows classifying industries according to the **intensity of innovation,** ranging from low to medium and *high* (available for value added and exports, manufacturing plus services; see *Peneder*, 2010).
- The **sixth** taxonomy classifies industries according to **education intensity**, ranging from low to medium and *high* (available for value added and exports, manufacturing plus services; see *Peneder*, 2007).
- Taxonomies **seven** and **eight** report the **shares of ecological and renewable industries** (available for exports, manufacturing only; see *Köppl et al.*, 2013).

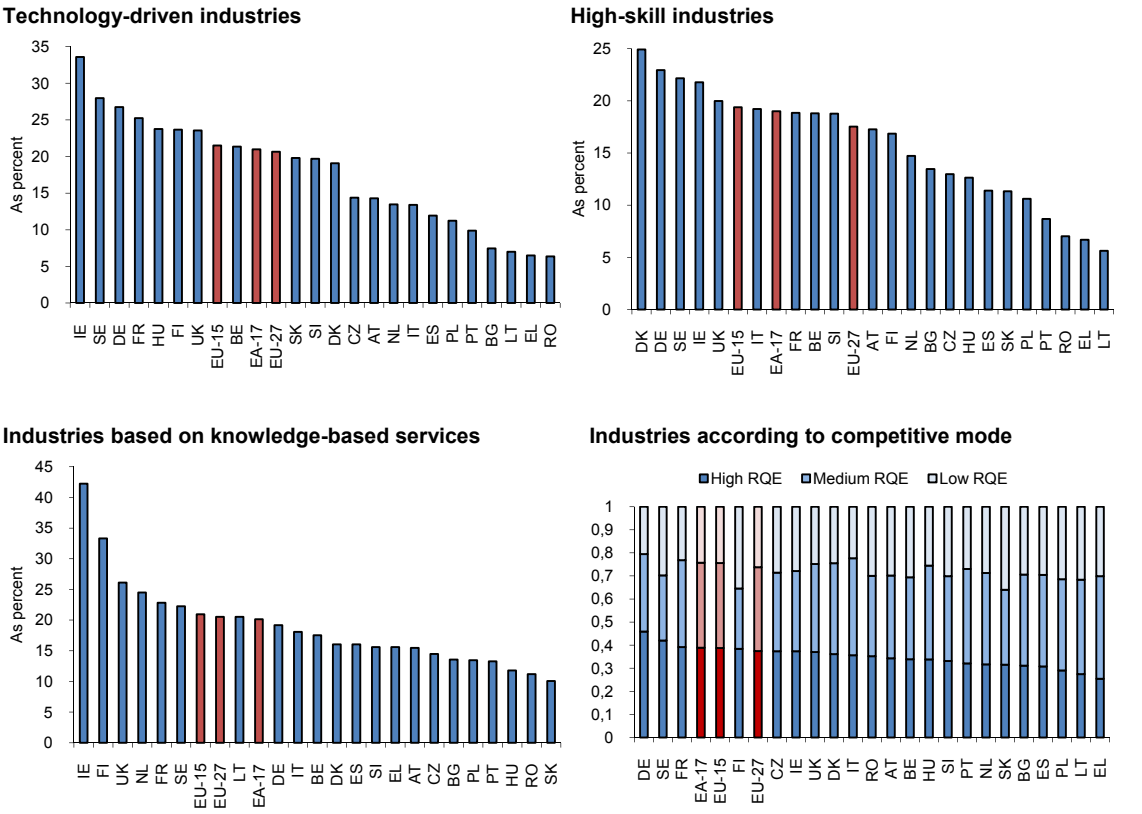
4.2 Structure of production

The best-performing group on most taxonomies consists of the following five countries: Sweden, Germany, Ireland, the UK and France. Sweden and Germany are among the first-ranked on almost all structural performance indicators. However, the share of education-intensive industries in both countries is relatively small, which indicates deficits in high value-added services sectors. Ireland scores highly on all manufacturing taxonomies except regarding industries in which quality competition dominates. Its position is heavily influenced by FDI, however. France comes third on quality competition, but is has deficits in high-skill intensive and innovation-intensive sectors. The UK and the Netherlands are on top for industries with high education intensity, and in general the Netherlands do better on taxonomies that involve services, while the UK lags behind in innovation-intensive sectors. Finland achieves the largest share of value added in industries with high innovation intensity and comes second on industries using knowledge-based services inputs. It is weaker in high-skill intensive industries and in those with high educational intensity.

Greece is the country with the largest structural problems. The share of innovation-intensive sectors is particularly low, while the country's position in education and knowledge-based services is somewhat better. Poland does not perform well on most taxonomies, which suggests that its recent success may have had more to do with its favourable unit labour costs (see Figure 2). Hungary does well in technology-driven and innovation-intensive industries (likely due to FDI) but it is weak in industries where education, knowledge and skills are important. For Lithuania, Romania, Bulgaria, but also for Portugal and Spain, most taxonomies indicate structural problems. Portugal, Italy, Spain and Greece have the largest shares of labour-intensive industries, while in Bulgaria and Romania, about half of value added is generated in low-skill intensive industries (not shown but available on request).

Overall, large countries and those in the Northern periphery tend to be in the top league more often than small countries. Belgium, the Netherlands, Denmark and Austria have a successful manufacturing sector despite mostly average or below-average ranks in terms of industrial structure. The bottom group consists of new member countries and those from the Southern periphery.

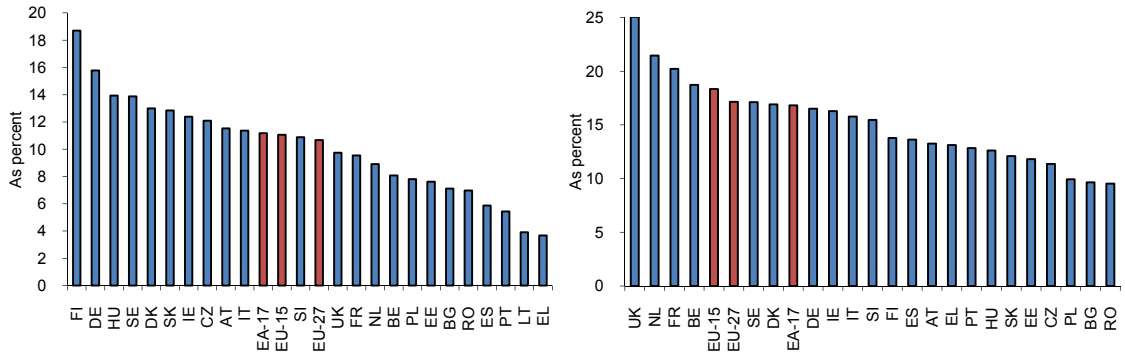
Figure 3 **Structure of production in manufacturing, 2008:**



Notes: Shares in manufacturing value added. Competitive mode: high, medium and low quality competition (revealed quality elasticity, RQE).

Source: Eurostat (SBS), WIFO calculations.

Figure 4 **Structure of production in manufacturing and services, 2008:**



Notes: Shares in manufacturing and services value added.

Source: Eurostat (SBS), WIFO calculations.

4.3 Structure of exports

The EU-27 countries' export structure partly resembles that of production (refer to Figure II and Figure III in the Appendix). Ireland achieves the top position on several taxonomies, a result of its high exports in ICT and pharmaceuticals.[23] Finland's export structure is much less favourable than its production structure: the country's rank declines by more than ten places in technology-driven industries, industries based on knowledge-based services inputs, and industries where quality competition dominates. Among the large European economies, France and Germany are never in the top three but always among the top then, with France ranking slightly better. This reflects the broader industrial structure in Germany, while France specialises in some high-tech areas (aircrafts, space, arms).

Hungary, Slovakia and the Czech Republic have a more sophisticated structure of exports compared to production. This may be due to multinational firms that chose these countries as their export base. Similar to the analysis based on value-added data in the previous section, Greece, Bulgaria, Lithuania and Portugal but also Italy and Poland are among the laggards according to the exports taxonomies.

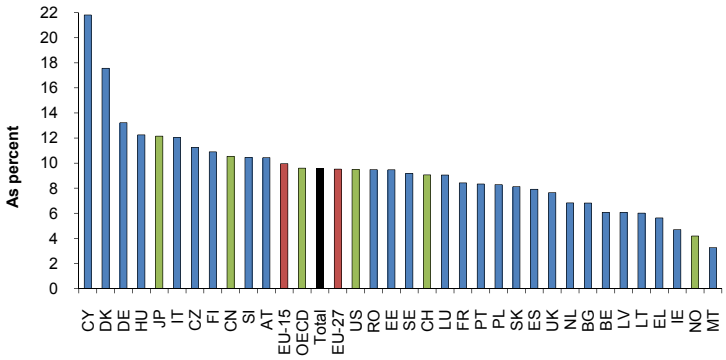
Concerning export shares of eco- and renewables industries, Denmark and Germany, Finland and Italy achieve high ranks.[24] France and the United Kingdom clearly lag behind, indicating a lower priority attached to environmental sustainability. Among the new member countries in Central and Eastern Europe, Hungary, the Czech Republic and Estonia reach the highest positions, while the majority of these countries is still in the lower third of the distribution.

[23] Cyprus and Malta also tend to be ranked near the top in exports. In Cyprus, the reason is a high share of pharmaceuticals exports; to a large extent, however, this is intra-industry trade, as imports are high in the same sectors.

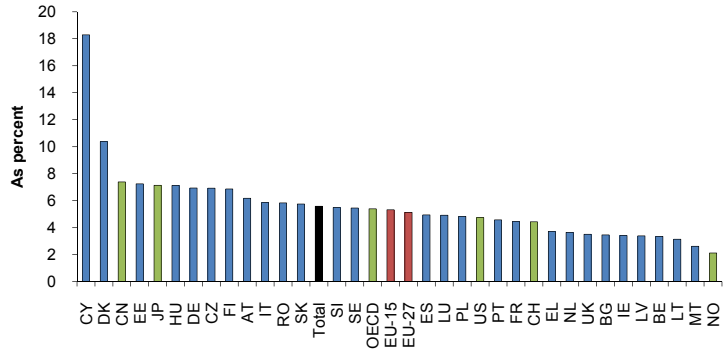
[24] The definitions of eco-industries and renewables are based on the classification by *OECD - Eurostat* (1999), expanded by *Köppl et al.* (2013). In the field of renewable energy, the latter is based on *Wind* (2010).

Figure 5 **Exports of eco- and renewables industries, Ø 2009-2011**

Export shares of eco-industries



Export shares of renewables industries



Notes: Total: all OECD countries, EU-27, China, India and Brazil.
Source: UNO (Comtrade), *Köppl et al.* (2013), WIFO calculations.

5. Quality competitiveness: Capabilities

5.1 Concept and operationalisation

The second element of quality competitiveness consists of factors that allow firms to upgrade and adapt to new opportunities, thus facilitating structural change. Based on the theoretical and empirical growth literature as well as strategic firm theory, we analyse five such factors, which we call “capabilities”: countries’ capacity for innovation, the education system, the social welfare system in its productivity-enhancing function, consumers’ and firms’ ecological ambition, and supportive institutions. These move us further away from the traditional cost focus of earlier studies on competitiveness (Figure 1).

In the long term, the ability of an economy to adapt to – or indeed to stay at the forefront of – technological change, depends substantially on the conduciveness of its economic environment to innovation and on the education level of its population. The literature on endogenous growth (e.g. *Lucas*, 1988; *Romer*, 1990; *Aghion – Howitt*, 1992; *Griffith et al.*, 2004; *Vandenbussche et al.*, 2006) provides theoretical and empirical evidence regarding the importance of these two factors.

A literature in social policy emphasises the "enabling" or "productive" nature of some social spending, in contrast to its redistributive component (*Giddens*, 1998; *Bock-Schappelwein et al.*, 2009). For instance, *Hemerijck* (2012) distinguishes between "service-oriented *capacitating*" and "benefit-transfer *compensating*" social programmes.[25] The former category includes active labour market policy measures, child-care provision and rehabilitation expenditures for the disabled, all of which serve to increase the ability of different social groups to participate in production and society at large.

Since *Porter – van der Linde* (1995), "sophisticated" consumers are seen as drivers for firms to generate new and better products, thus providing first-mover advantages. Indicators on citizens’ ecological preferences and the incentives faced by firms and consumers (e.g. taxes) in this regard are enablers of energy and resource efficiency and of the supply of ecological products.

The growth literature emphasises the importance of institutions and trust for economic growth and the functioning of society in general. Therefore we investigate indicators on institutions that are considered beneficial for competitiveness. Clusters may be considered a final element in this list of capabilities that raise the productive potential of economies. They are analysed in *Ketels – Protsiv* (2013).

When selecting indicators for each of the categories described above, we focus on those reflecting processes and capabilities rather than outcomes (see section 2.4.3). At the same time, our choice is determined by time-series availability for the purpose of panel data analysis in section 8. We take data from Eurostat and the OECD unless stated otherwise. For detailed definitions and sources of all indicators, the reader is referred to Table II in the Appendix.

[25] Emphases are from the original article.

5.2 Innovation

Our selection of innovation indicators is based on the European Commission's Innovation Union Scoreboard (or IUS) 2013, in particular those listed in the "enablers" category that are consistently available across countries and over time. We use the following:

- The **share of GDP spent on R&D** in the business enterprise and public sectors
- The number of **patent applications** to the European Patent Office (EPO) per billion GDP
- **Tertiary educational attainment** in the population aged 25 to 64, i.e. the percentage of the adult working-age population that has successfully completed higher education
- The percentage of the population aged 20 to 29 years that has graduated from a higher education degree in **mathematics, science and technology** (MST).

In Figure 6, the Scandinavian countries (Finland, Sweden and Denmark), but also Germany and Austria, are ahead on R&D expenditures and patent applications. Except for Finland, which scores highly across all four indicators, these countries do less well on tertiary educational attainment and the share of university graduates in MST subjects: Germany is at most average, while France comes second on MST graduates (see Appendix Figure IV). The UK and Ireland generally perform better on tertiary education than on R&D and patents. This is also the case for some new member countries (Lithuania, Slovakia, Czech Republic, Poland and Romania).

5.3 Education

With our choice of education indicators, we aim to reflect the growing recognition that in advanced knowledge-based economies, the acquisition of education and skills at all stages of the life cycle is crucial. The process of learning begins at the pre-primary level; well-developed systems of vocational or dual education in some countries facilitate school-to-work transitions for young people; and given rapid technological change, education and training during later stages of life ("lifelong learning") matters increasingly. Thus we select the following indicators:

- Public expenditure on **pre-primary** and **tertiary education levels** as a percentage of GDP
- The share of the population aged between 4 years and the starting age of compulsory education that **participates in early education**
- The percentage of all students in upper secondary education that attend **vocational education programmes**
- The share of adults aged between 25 and 64 years that participates in education and training, which is an indicator for **lifelong learning**.

Figure 7 highlights the dominance of Scandinavian countries on education expenditure and lifelong learning; of Central European countries on vocational education in secondary school; and of France, the Netherlands and Spain on early childhood education participation (see Figure IV in the Appendix). On the other hand, Germany's mediocre position vis-à-vis research and innovation is reinforced, with only average public expenditure levels on education and average adult participation in education and training. The UK spends the lowest share of GDP on tertiary education among Western European countries. Latvia is second only after Denmark on pre-primary education expenditure, while Slovenia is in the top ten on tertiary education expenditure, vocational training and lifelong learning.

5.4 The social system as a productive force

Following *Hemerijck's* (2012) concept of "service-oriented capacitating" social programme categories discussed in section 5.1, we select the following indicators:

- Public expenditure on **total active labour market policies**[26] as a percentage of GDP
- Public expenditure on **social protection benefits for sickness and health care, disability, and family and children**
- The **female labour force participation rate**, that is, the percentage of the female population aged between 25 and 64 years that is economically active.

All in all, the country that stands out as a star performer in Figure 8 is Denmark: it is at or near the top regarding all indicators presented. Belgium, Sweden, France and the Netherlands also do well, while the new member states, especially from Central and Eastern Europe, lag behind considerably. For example, the share of GDP spent on active labour market policy was more than 35 times higher in Denmark than in Romania in 2010 (1.4 versus 0.03 percent). Female employment rates are above 75 percent in Sweden and Denmark and between 50 and 60 percent in Italy, Greece, Romania and Hungary.

5.5 Ecological ambition

The indicators in this section gauge preferences for ecologically sustainable consumption and production, sustainable energy sources and incentives for ecological behaviour through taxes:

- The **share of oil and gas imports in GDP**, where a high share suggests traditional fossil fuel consumption
- **Recycling rates for packaging** and **municipal waste generation**
- The **share of organic farming** in total farm area
- Implicit **tax rates on energy** and **total environmental tax revenues** as a share of GDP
- The **share of environment-related technology patents** (WIPO definition) in total patent applications to the EPO
- **Environmental expenditures and investment** by industry and the public sector as a share of GDP

Within this category of capabilities, there is more variation across countries than for the other categories, and some outcomes are surprising (Figure 9 and Appendix Figure V). Overall, Denmark is in the lead, with low oil and gas imports, the highest recycling rate, high taxes on energy and the environment and the highest share of environment-related technology patent applications. Slovenia comes in second place, with medium positions on recycling, organic farming and patents and good positions on all other indicators. The Netherlands are next, despite high imports of oil and gas, low organic farming and low environmental patents. Austria also ranks highly, despite low energy and environmental tax revenues. The new member

[26] Active labour market policy measures (Eurostat definition) are temporary interventions that target people who are unemployed or at risk of becoming so. Expenditure on ALM policies includes public spending on training, employment incentives, and supported employment and rehabilitation measures, but also expenditures on direct job creation or start-up incentives.

countries, e.g. Hungary, Romania and Bulgaria, lag behind on environmental ambition, but so does Finland with low recycling, few patents and low environmental investment. Thus ecological ambition is the only category of capabilities where Finland does not rank near the top.

5.6 Institutions

On institutions, we employ the following indicators:

- Survey results on **trust in government** and **trust in parliament** from Eurobarometer
- An index on the **deregulation of labour markets** capturing hiring and firing regulations, centralised collective bargaining and other regulations
- An index on **business deregulation** capturing administrative regulations, the ease of starting a business, bureaucracy etc. Both labour and business deregulation indices come from the Economic Freedom of the World database.

In addition, we use the well-known quality of governance indicators from the World Bank:

- **Voice and accountability**
- **Regulatory quality**
- **Rule of law**
- **Control of corruption**

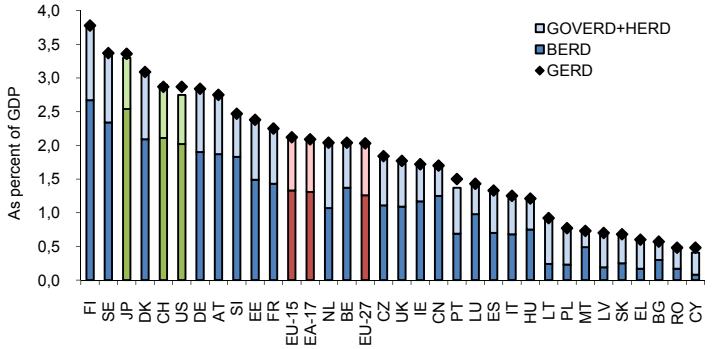
Figure 10 and Figure VI in the Appendix illustrate that similar countries perform well across all indicators. Taking them together, Denmark, Sweden and the Netherlands tend to do best, followed by Finland and Ireland. On the other hand, the low positions of Greece, Romania, Italy and Bulgaria suggest that their competitiveness could be improved if trust and quality of governance were higher and regulations less stringent. Between 2000 and 2010, the new member countries in particular improved their institutions (Czech Republic, Slovakia, Latvia, Bulgaria and Estonia). However, Sweden and Denmark also improved their performance. The Southern countries lost ranks, as did the United Kingdom, Germany and France.

5.7 Summary

Summarising all five components of capabilities analysed in this section, the Scandinavian countries Denmark and Sweden clearly come out on top. Germany and France achieve top-five positions on innovation and the social system but less favourable ones on education, ecological ambition and institutions. Romania, Bulgaria and Greece consistently underperform across indicators.

Figure 6 **Innovation indicators**

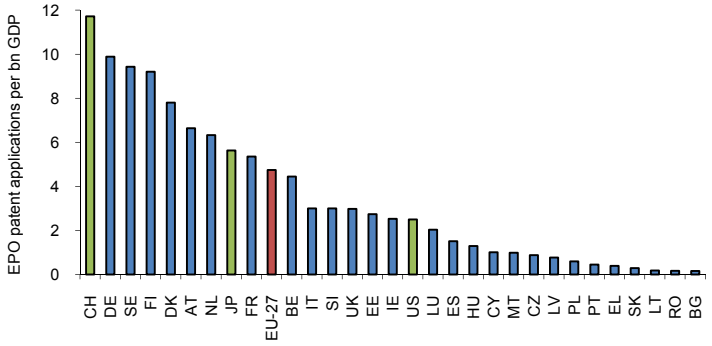
R&D expenditure: total vs. private and public sectors, 2011



Notes: Countries ranked by values for GERD in percent of GDP; GERD refers to total gross domestic expenditure on R&D; BERD refers to business-enterprise sector R&D expenditure; GOVERD+HERD refers to public-sector R&D expenditure (government and higher education). Data for Greece cover 2007; data for Japan, the US and China cover 2009; for Switzerland, GERD and BERD data refer to 2008, GOVERD+HERD to 2010.

Source: Eurostat and European Commission (2013), Innovation Union Scoreboard Database, WIFO calculations.

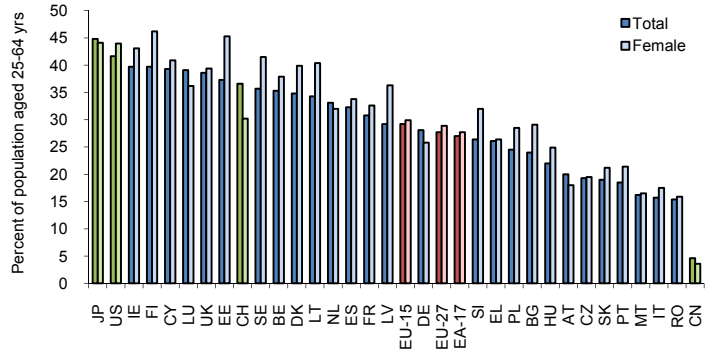
EPO patent applications per billion GDP (PPS), 2010



Notes: EPO denotes the European Patent Office; data for Malta and Latvia cover 2009. Data for the US and Japan should be interpreted with caution.

Source: Eurostat, WIFO calculations.

Tertiary educational attainment, 2012

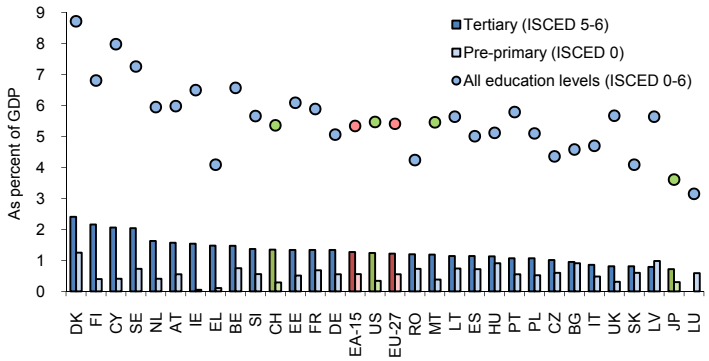


Notes: Data refer to the percentage of the (total or female) population aged 25-64 years that has completed tertiary education (International Standard Classification of Education (ISCED) levels 5 and 6). Countries ranked by tertiary educational attainment in the total population aged 25-64 years. Data for the US, Japan and China cover 2010.

Source: Eurostat, OECD, WIFO calculations.

Figure 7 **Education indicators**

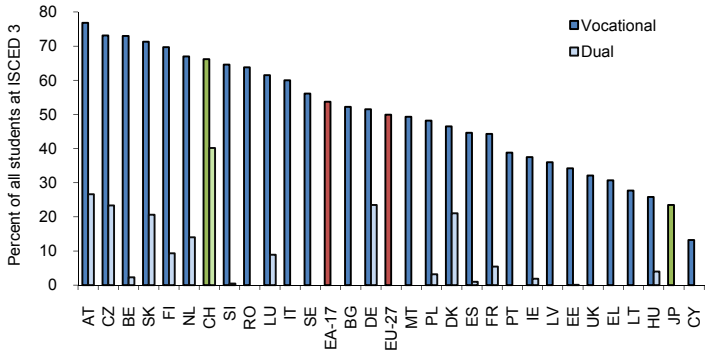
Public expenditure on education, 2009



Notes: Countries ranked by percentage of GDP spent on tertiary education (International Standard Classification of Education (ISCED) levels 5 and 6). Data for Luxembourg cover 2007; for Greece, expenditure data for tertiary education and all levels combined cover 2005, data for pre-primary education expenditure cover 2004.

Source: Eurostat.

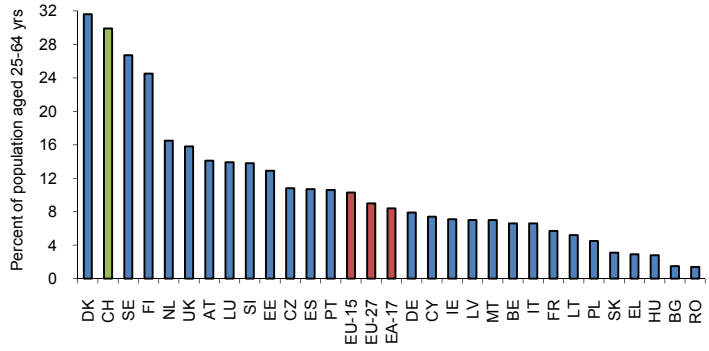
Upper secondary education pupils in vocational and dual programmes, 2010



Notes: "Dual" refers to combined school- and work-based education programmes. Countries ranked by the percentage of students in upper secondary education (ISCED level 3) attending programmes with vocational orientation. Data for Slovenia cover 2009.

Source: Eurostat, OECD, WIFO calculations.

Adults participating in education and training, 2012

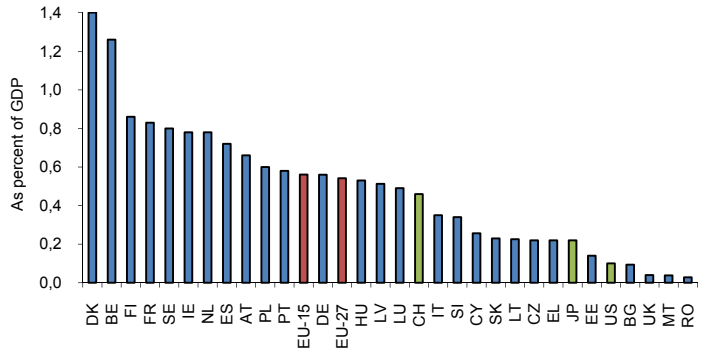


Notes: The adult population covers the age group between 25 and 64 years.

Source: Eurostat.

Figure 8 **Indicators on the social system as a productive force**

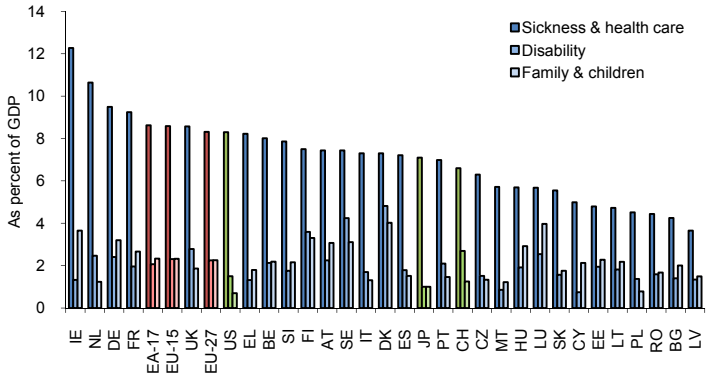
Public expenditure on active labour market policy, 2010



Notes: Countries ranked by percentage of GDP spent on total active labour market policy measures. Data for UK, EU-15 and EU-27 cover 2009.

Source: Eurostat, OECD.

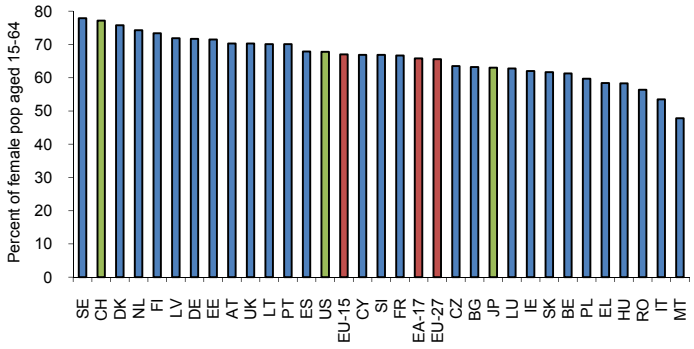
Public expenditure on social protection benefits, 2010



Notes: Countries ranked by percentage of GDP spent on sickness and health care. Data for USA and Japan cover 2009.

Source: Eurostat, OECD.

Female labour force participation rate, 2012

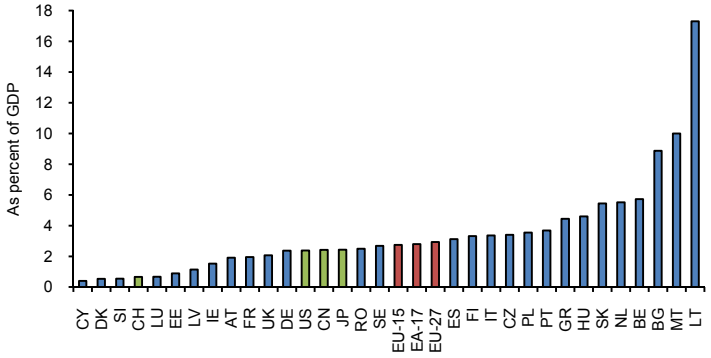


Notes: Countries ranked by percentage of the female population aged 15-64 years that is economically active. Data for the USA and Japan refer to 2011.

Source: Eurostat, OECD.

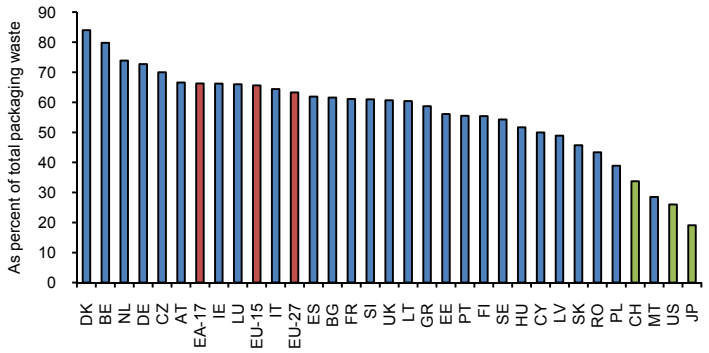
Figure 9 **Indicators on ecological ambition**

Oil and gas imports, 2010



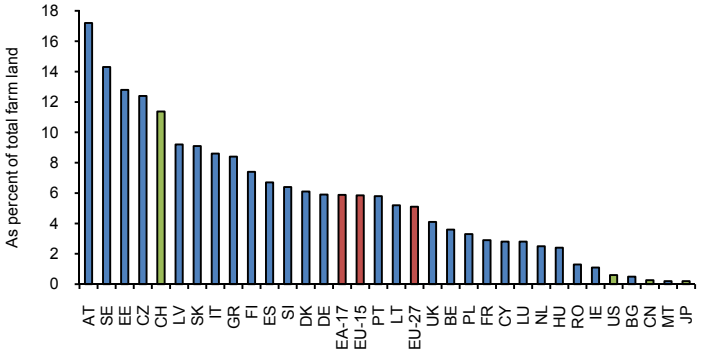
Source: OECD, WIFO calculations.

Recycling rates for packaging waste, 2010



Source: Eurostat, WIFO calculations.

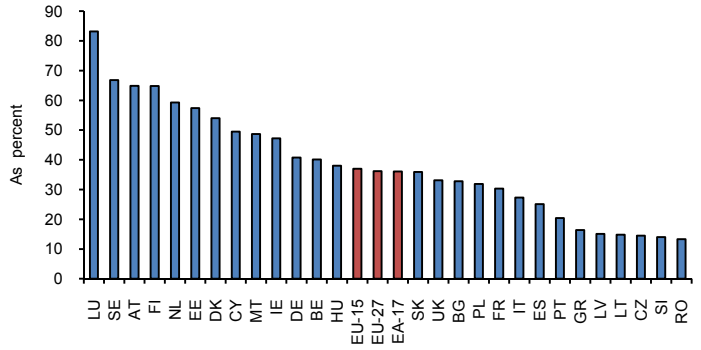
Share of organic farming in total farm area, 2010



Source: Eurostat, WIFO calculations.

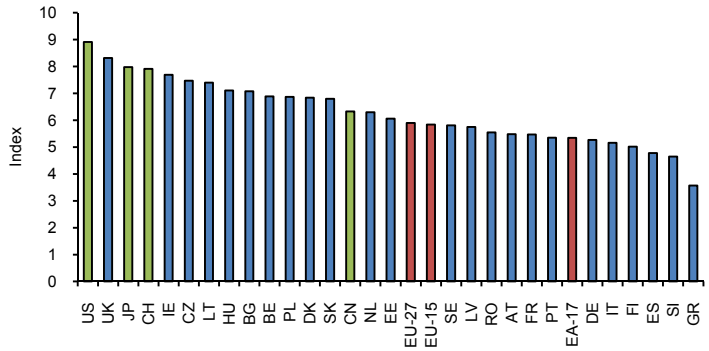
Figure 10 **Indicators on supportive institutions**

Trust in government, 2011



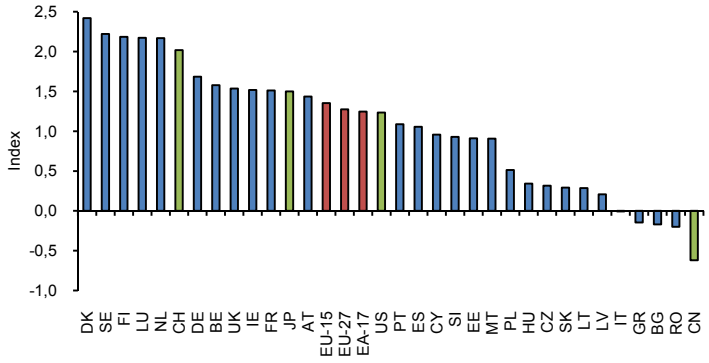
Notes: Respondents are asked whether they "tend to trust" government; the range of the indicator is between 0 and 100 percent.
Source: Eurobarometer 2011.

Labour market deregulation index, 2010



Notes: Index ranges from 0 to 10, with high values indicating less regulation.
Source: Economic Freedom of the World Database, Frazer Institute (*Gwartney et al*., 2012).

Control of corruption, 2010



Notes: Index ranges from -2.5 to 2.5, with more positive values indicating better performance.
Source: Worldwide Governance Indicators, 2012 Update, World Bank (*Kaufmann et al.*, 2010).

6. Outcome competitiveness under new perspectives

Traditionally, analyses of outcome competitiveness examine GDP per capita as well as employment and unemployment rates (see *Aiginger,* 2006). Broader concepts also include the budget deficit, public debt and current-account deficits. However, improving fiscal or external balances is not an aim in itself; rather, it is a constraint that becomes binding if deficits are persistent. A set of indicators on the traditional approach is provided in section 6.1.

Defining competitiveness as the "ability of a country, region or location to deliver the beyond-GDP goals" requires indicators on the beyond-GDP goals, and – considering the aims of the WWWforEurope project – especially indicators that are useful for evaluating progress on socio-ecological transformation (section 6.2). We aggregate the indicators into three pillars of "competitiveness under new perspectives": an income pillar, a social pillar and an ecological pillar.

6.1 Outcome competitiveness: Traditional indicators

Across the six traditional indicators we consider, Luxembourg, Sweden, the Netherlands, Denmark and Austria achieve the highest ranks. As Figure 11 shows, the Netherlands come first on **employment** and second on **GDP per capita** and **unemployment**. The country takes an intermediate position on the **budget deficit** and **debt**, while its **current account** is in surplus (Appendix Figure VII). Germany and Finland are close to the top group. France is around the average in Figure 11 and even below in Figure VII due to its high public debt and negative current account.

On the other hand, Greece, Portugal and Spain are ranked lowest across all traditional indicators. On average, the Southern European countries (Greece, Spain, Italy and Portugal) perform substantially worse than the new member countries from Central and Eastern Europe.

6.2 Outcome competitiveness under new perspectives

While the beyond-GDP goals are numerous, we focus on three pillars. The income pillar starts with GDP per capita but moves towards disposable household income and consumption expenditure. The social pillar summarises indicators that reflect outcomes of a country's socio-economic system (poverty risk, inequality, youth unemployment). The ecological pillar reports ecological outcomes such as resource productivity, emissions and energy intensity.

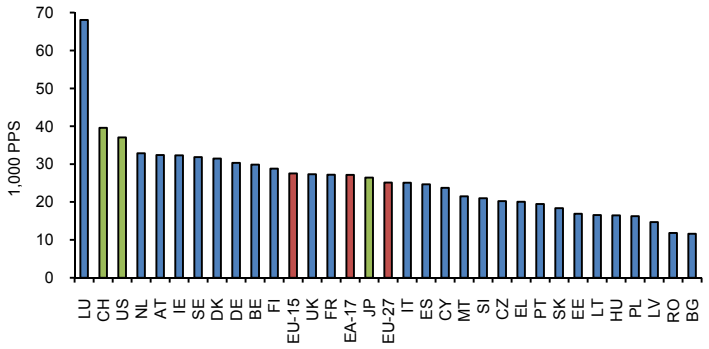
6.2.1 Income pillar

On the income pillar, we start with **GDP per capita**. First, we deduct depreciation, which is a cost that does not contribute to welfare, resulting in **net national income** (NNI). Compared to GDP, the UK climbs some ranks since depreciation is lower in its large services sector. Ireland loses ranks due to its large manufacturing and construction sectors.

Second, we move to the household level and examine **net disposable household income** after taxes and social transfers (NDHI). On this measure, the Netherlands, Denmark and Sweden drop considerably, while France, Germany and Austria make gains.

Figure 11 **Traditional outcome indicators**

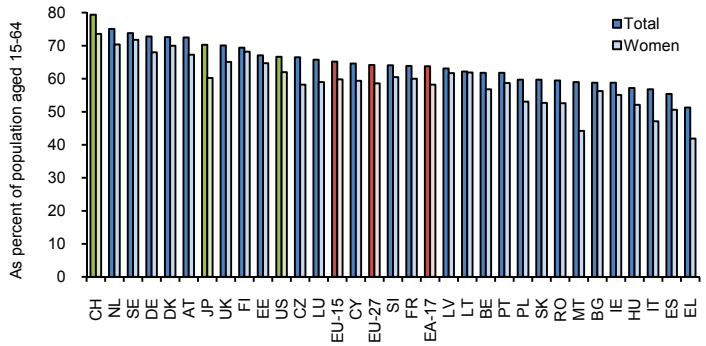
GDP per capita, 2011



Notes: Data for Luxembourg and Ireland should be interpreted with caution.

Source: Eurostat.

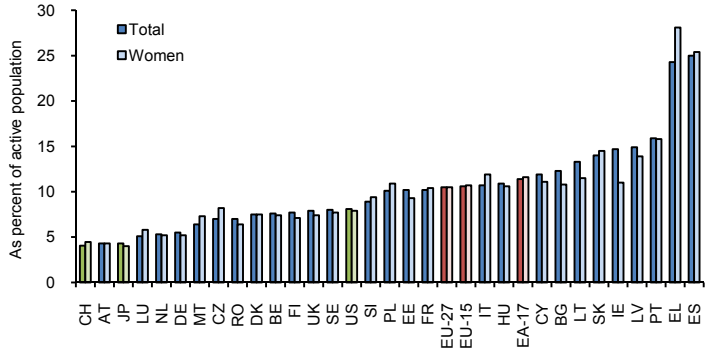
Employment rate, 2012



Notes: Countries ranked by the percentage of employed persons in the total population aged 15-64 years. Data for the US and Japan refer to 2011.

Source: Eurostat, OECD.

Unemployment rate, 2012



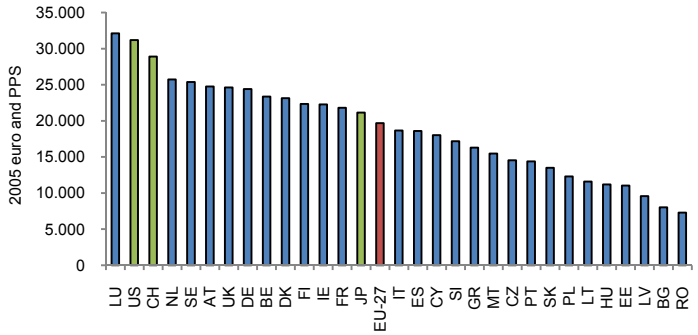
Notes: Countries ranked by the percentage of unemployed persons in the total active population. Data for Switzerland refer to 2011.

Source: Eurostat, OECD.

Finally, we move from income to consumption and consider **household final consumption expenditure** (HFCE). Luxembourg is still on top, followed by the UK, Austria and Germany. The largest change compared to NDHI occurs in Greece, which jumps from rank 14 to rank 7. Similarly, the UK moves up. However, high consumption expenditure may be debt-financed and therefore potentially unsustainable. Overall, the indicators we consider for the income pillar are highly correlated with each other.

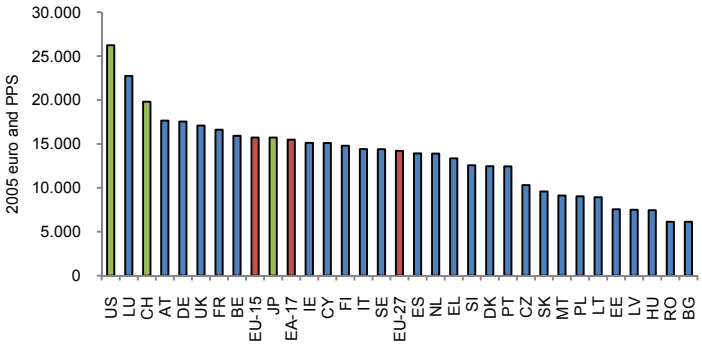
Figure 12 **New perspectives outcomes: Income pillar**

Net national income (NNI) per capita, 2010



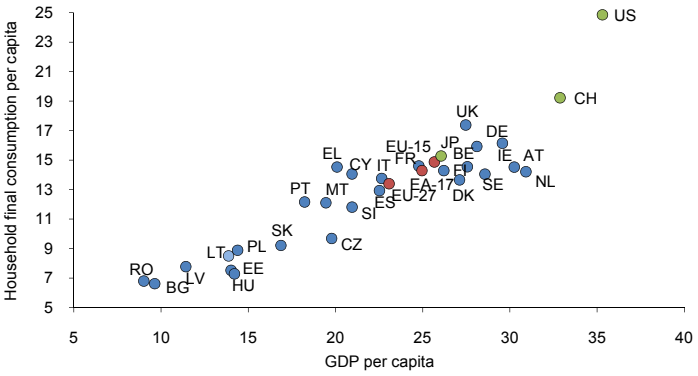
Notes: Data in thousands of 2005 euros, adjusted for differences in purchasing power using the PPS exchange rate for 2005.

Net disposable household income (NDHI) per capita, 2010



Notes: Data refer to net disposable income of households and non-profit institutions serving households per head of population. Data in 1,000s of 2005 euros, adjusted for differences in purchasing power using the PPS exchange rate for 2005. Data for Romania cover 2009.
Source: Eurostat (AMECO), WIFO calculations.

Household final consumption expenditure (HFCE) vs. GDP per capita, 2010



Notes: GDP per capita and HFCE per capita in 1,000s of 2005 euro in PPS. Excluding Luxembourg.

6.2.2 Social pillar

The social pillar contains indicators that characterise outcomes of countries' socio-economic systems in terms of poverty risk, income distribution and unemployment. We consider the following (for sources see again Table II in the Appendix):

- **At-risk-of-poverty rates** after social transfers, both in the total and the elderly populations (aged 65 and over)
- The **impact of social transfers**, computed as the difference between at-risk-of-poverty rates before and after transfers
- Income inequality measured by the **Gini coefficient** of disposable income and the ratio of the shares of income received by the top and the bottom quintiles of the income distribution (**S80/S20 income quintile share ratio**)
- The **youth unemployment rate** and the **long-term unemployment rate**
- The **employment gender gap**, measured as the difference between male and female employment rates

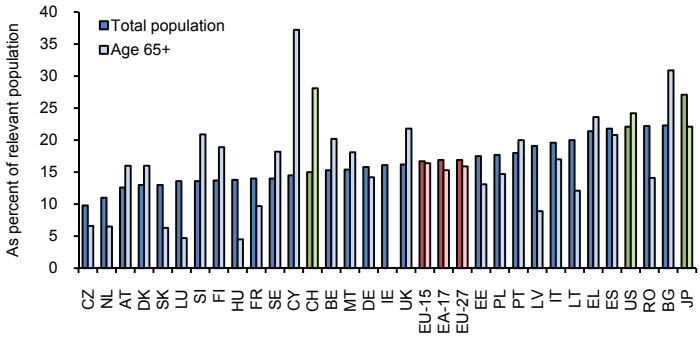
Evaluating countries' performance across these indicators (Figure 13 and Appendix Figure VIII), the Netherlands come first, followed by the Scandinavian countries and Austria. Some new member countries also score highly, such as the Czech Republic, which has the lowest risk of poverty in the total population of all EU-27 countries. Slovenia and Hungary are also in the top 10 due to low poverty risk and income inequality. Germany and France do only average overall.

At the other end, Spain and Greece come last; Spain has the highest youth unemployment rate, while in Greece, social transfers have the smallest impact in reducing poverty across all EU-27 countries. Other weak performers are Italy (large employment gender gap and second-smallest impact of social transfers), Latvia (highest poverty risk) and Bulgaria (second-highest old-age poverty risk).

On average, the Southern European countries (Greece, Spain, Portugal and Italy) lag behind the new member countries from Central and Eastern Europe on the social indicators considered here.

Figure 13 **New perspectives outcomes: Social pillar**

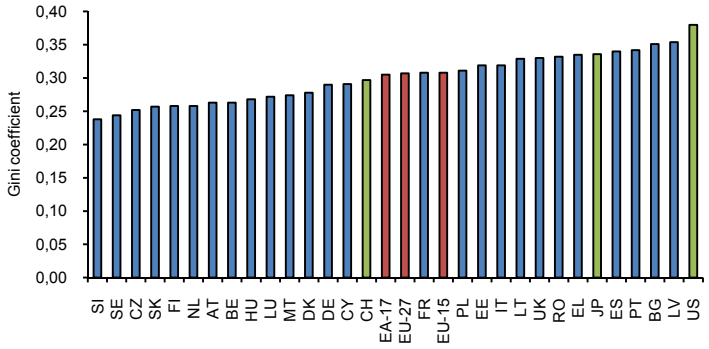
At-risk-of-poverty rates after social transfers, 2011



Notes: Countries ranked by values for at-risk-of-poverty rates after social transfers in the total population. For both series, the poverty threshold is defined as 60 percent of median equivalised income after social transfers. The series "Age 65+" describes old-age poverty. Data for the USA and Japan cover 2010 and 2009 respectively.

Source: Eurostat, OECD.

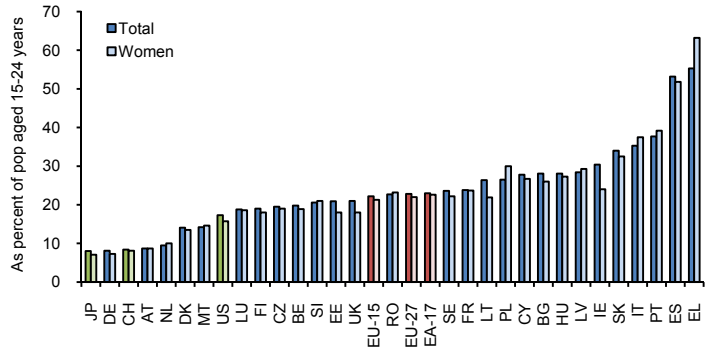
Gini coefficient of disposable income, 2011



Notes: The Gini coefficient relates cumulative proportions against the cumulative proportions of income. It ranges between 0 in the case of perfect equality and 1 in the case of perfect inequality; data for Japan 2009, for the US 2010.

Source: Eurostat, OECD.

Youth unemployment rate, 2012



Notes: Countries ranked by percentage of unemployed persons in the total active population aged 15-24 years. Data for the USA and Japan cover 2011.

Source: Eurostat, OECD.

6.2.3 Ecological pillar

Regarding ecological outcomes, we consider:

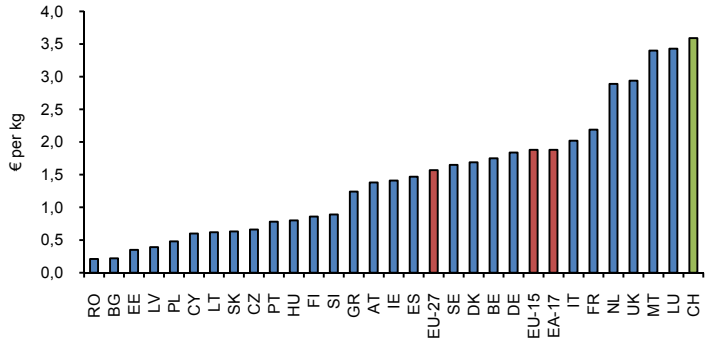
- **Resource productivity**, i.e. output produced per unit of materials input
- The intensity of **greenhouse gas emissions**: tons of carbon dioxide (CO2) and nitrogen oxide (NOx) emitted per GDP or inhabitant
- **Energy intensity** of production
- The share of **electricity produced from renewable energy sources**

While resource productivity is high in small countries (Luxemburg and Malta) and in large countries with a relatively small manufacturing base (UK, France and Italy), it is low in the new member counties. CO2 intensity is low in countries using nuclear power (France, Sweden), hydropower (Austria) or solar and wind energy (Spain and Portugal). The share of electricity generated from renewable sources (Appendix Figure IX) is highest in Austria, Sweden, and Portugal. In Sweden, this results from the country's sustained policy efforts towards sustainability, and it is among the best performers across all indicators in this section. On the other hand, several new member countries (the Czech Republic, Poland and Estonia) take the last places. While France, Germany and the UK are in the top ten, Belgium and Finland do not

do well overall, consistent with our findings on ecological ambition in section 5.5. In general, the indicators we consider here are not highly correlated with each other.

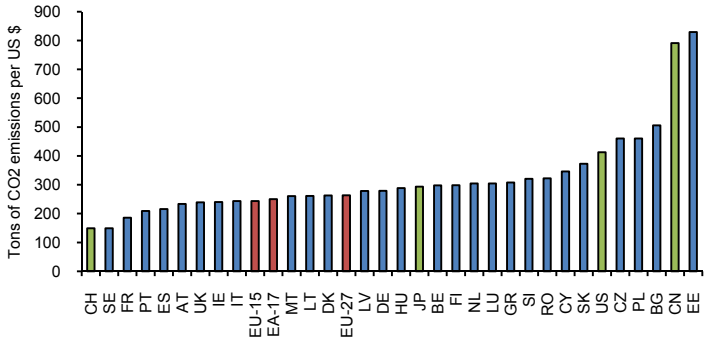
Figure 14 **New perspectives outcomes: Ecological pillar**

Resource productivity, 2010



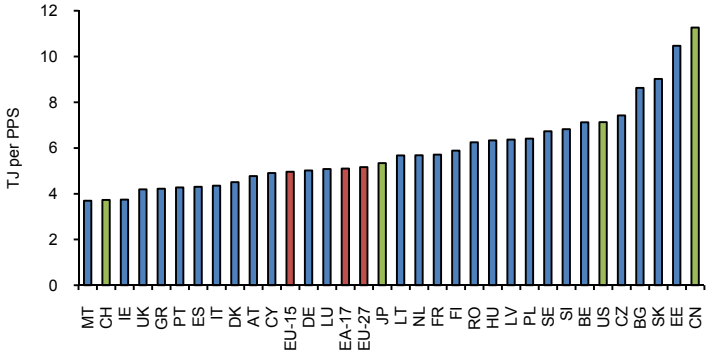
Notes: GDP per kg of domestic material consumption; euro in current prices.
Source: Eurostat.

CO2 intensity, 2010



Notes: Tons of CO2 emissions from fuel combustion relative to GDP at PPS.
Source: IEA, Energy Balances.

Energy intensity, 2010



Notes: Terajoule of total primary energy supply relative to GDP at PPS.
Source: IEA, Energy Balances.

6.2.4 New perspectives: Summary

Comparing country groups across the three pillars of outcomes under new perspectives, it is striking that the new member countries from Central and Eastern Europe dramatically outperform the Southern European countries on social indicators like poverty risk and inequality, despite the fact that the latter have a significant lead over the former on the income indicators.

The Scandinavian countries do well on all dimensions of outcome competitiveness that we consider, particularly on the social pillar. Small countries like the Netherlands and Austria also score highly on income as well as social indicators.

Ecological outcomes in the new member countries from CEE are the least favourable, while some Southern (Portugal, Spain, Italy), Scandinavian (Sweden) and small (Austria) countries exploit renewable energy sources or pursue ambitious environmental policies.

Overall, broadening the concept of outcome competitiveness beyond the dominant perspective of GDP per capita clearly paints a more diverse picture of the EU-27, highlighting strengths and weaknesses of different country groups on different pillars.

7. Comparison of the EU, US, Japan and Switzerland

We now use our framework to examine the competitiveness of the European Union compared to that of the US, Japan and Switzerland.

7.1 Price competitiveness

On average across the EU-27, wages and per-capita productivity are about one-third lower than in the US and even lower compared to Switzerland. They are also lower than in Japan, although Japanese labour compensation is roughly equal to that in the euro area (EU-17). However, wage dispersion within the European Union is high: in four small countries (Luxemburg, Denmark, Belgium and Netherlands), wages are higher than in the US, while in the new member countries, they are on average less than 30 percent of the US level.[27]

Unit labour cost levels in the US and the EU-27 are roughly equal for the total economy, since the productivity gap with the US is of similar size as the wage gap. In manufacturing however, Europe's productivity gap is larger, and wages increased faster between 2000 and 2011 than in the US. Thus in manufacturing, there is scope for improvement in Europe.

Table 1 **Labour costs and productivity relative to the US, 2011**

	Compensation per employee Current prices		Output per person employed Current prices		Unit labour costs	
	Total economy	Manufacturing	Total economy	Manufacturing	Total economy	Manufacturing
	US = 100				Levels (wage share)	
EU-15	80.8	77.1	85.8	73.0	0.582	0.696
EA-17	79.2	74.7	84.6	69.8	0.573	0.667
EU-27	70.0	60.8	74.7	59.9	0.584	0.680
Switzerland	138.8	.	133.3	131.8	0.672	.
Japan	82.0	74.7	85.7	86.8	0.619	0.553
United States	100.0	100.0	100.0	100.0	0.593	0.544
	EU-27 = 100					
EU-15	115.4	126.9	114.8	122.0		
EA-17	113.2	122.9	113.2	116.7		
EU-27	100.0	100.0	100.0	100.0		
Switzerland	198.1	.	178.5	220.2		
Japan	117.1	122.8	114.8	145.0		
United States	142.8	164.5	133.9	167.1		

Source: Eurostat (AMECO), WIFO calculations.

7.2 Export structure

Europe trailed the for a long time US regarding the sophistication of its export structure, but by 2011 it had caught up or even taken the lead (see Figures in section 0). The share of technology-driven and skill-intensive industries is now roughly equal. Switzerland has much

[27] In manufacturing, the wage gap of the EU-27 to the US is even larger: the wage premium in US manufacturing is some 65 percent (34 percent against the EU-17). Only Belgian manufacturing pays similar wages to the US.

higher export shares in both respects and Japan is close to Europe. The US and Japan have slightly higher export shares than Europe in industries with knowledge-based services inputs, while shares of quality-dominated industries are similar in Europe and the US. Switzerland excels in the latter as well as in skill-intensive industries.

As far as ecological and renewables industries are concerned, China and Japan are ahead in both types of industries. Europe has higher export shares than the US and Switzerland comes last. Only Denmark does consistently better than China and Japan in "green" industries.

The relative position of the US is even more unfavourable if we look at trade instead of exports. Since US imports are also sophisticated, the US has trade deficits in all four sophisticated sectors. In technology-driven industries, the deficit amounts to 178m euro, while Europe enjoys a surplus of 101m euro. Similar results – US deficits and surpluses in Europe – also hold for skill-intensive, knowledge-based and quality-dominated industries.

Thus Europe concentrates on sophisticated industries. Switzerland is the champion and has improved its structure in this regard, while the EU and the US both now have lower export shares than in 2000. This partly reflects the inroads of China, which has increased its shares. The US has lost export shares to an extent that trade balances are now negative.

Table 2 **Export structure and trade balance, 2011**

	Exports				Trade balance				
	Technology-driven industries	High-skill industries	Knowlegde-based services	High RQE	Technology-driven industries	High-skill industries	Knowlegde-based services	High RQE	Manu-facturing
	Percentage shares				mn euro				
EU-15	33.2	27.9	18.8	51.4	93,427	181,308	23,486	298,116	252,637
EA-17	33.0	26.3	17.8	50.9	108,276	169,473	22,296	304,991	323,804
EU-27	34.2	28.5	19.6	52.1	101,173	165,938	12,008	304,250	261,594
Switzerland	41.0	41.1	16.7	69.0	22,037	33,318	5,731	41,882	30,865
Japan	35.4	22.0	22.7	51.4	82,740	52,952	50,437	134,326	167,893
United States	32.0	23.2	22.3	45.0	-177,993	-79,886	-33,874	-192,297	-367,757
China	30.4	19.9	19.9	35.4	128,877	92,350	13,079	158,774	519,460

Source: Eurostat (Comext), UNO (Comtrade), WIFO calculations.

7.3 Capabilities

Europe still trails the US, Japan and Switzerland on **innovation and education** (see Figures in section 5): R&D expenditures and tertiary educational attainment are much lower. In particular, it is European firms' R&D expenditure that is lagging behind, while government spending is about equal. On the other hand, Europe's share of graduates in mathematics, science and technology is considerably higher than the US'.[28]

Total education expenditure is about the same in relation to GDP, but somewhat less in Japan. Pre-primary education gets more money and more children are involved in Europe than in the US. Enrolment in vocational programmes is about 50 percent in Europe, low in Japan, and we

[28] See Appendix Figure IV.

have not data for the US. However, country differences on this measure are large in the EU, ranging from 75 percent in Austria to less than 30 percent in Latvia and Hungary.

Europe spends more on average on the productivity-enhancing elements of the **social system**. On active labour market policy, the EU-27 spend twice as much as Japan and four times as much as the US. While social protection benefits for the disabled, children and families are higher, those for sickness and health care are about the same in Europe and the US but lower in Japan and Switzerland. Europe is unable to exploit the potential of its well-educated female workforce: the average female labour force participation rate is 65 percent, two percentage points below the US and 12 points below Switzerland.

Europe leads in most indicators on **environmental ambition**. For example, recycling rates are 63 percent in the EU-27, while Switzerland, the US and Japan lag behind almost all EU countries with rates between 20 and 33 percent. Environmental tax revenues from are three times higher in the EU-27 compared to the US and one third higher than in Japan (see Appendix Figure V). The average share of organic farming is 5 percent in the EU and near zero in the US and Japan.[29]

As far as **institutions** are concerned, the EU on average ranks similar to the US on voice and accountability (quality of the parliamentary system) and control of corruption, but lower on regulatory quality and the rule of law. Switzerland excels on all these indicators, while Japan lags behind except on corruption control. Europe's labour markets are highly regulated compared to the US, Japan and Switzerland. Average business regulation in the EU-27 is only slightly stricter than in the US and Japan but considerably stricter than in Switzerland.

7.4 Traditional outcome indicators

The traditional output indicators suggest a lead of the US over the EU-27: GDP per capita and employment rates are higher, unemployment is lower (see Figures in section 6).[30] However, public deficits and debt are higher in the US and the current account is negative, while the EU-27 current account is balanced, with deficits in the South and large surpluses in the Netherlands, Sweden, Germany and Denmark (see Appendix Figure VII). Japan does better on the traditional indicators except that that public debt is extremely high; Switzerland leads on all traditional indicators.

7.5 Outcome indicators under new perspectives

Under new perspectives, the picture is different. The US still leads on the income pillar but clearly lags behind on the ecological pillar. Results are mixed for the social pillar, since the US has higher inequality and risk of poverty but lower youth and long-term unemployment.

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[29] However, within Europe, this figure varies between 18 percent in Austria and 0.5 percent in Bulgaria.

[30] GDP per capita at PPS is 50 percent higher in the US than in EU-27 (40 percent vs. euro area). The EU-27 also trails Switzerland (42 percent) and Japan (10 percent) in this regard. Swiss and Japanese employment rates are above the US rate, while Europe trails the US by two percentage points. Unemployment rates during the "great recession" have on average been similar so far in the EU and the US; it rose more initially in the US, and currently it is considerably higher in the EU-27. Switzerland and Japan have had the lowest unemployment rates.

7.5.1 Income pillar

The indicators on the income pillar are highly correlated with each other, so there are no major changes across columns in 0. The lead of the US increases with net disposable household income and household final consumption expenditure.

Table 3 **Outcomes under new perspectives: Income pillar EU vs. US, 2011**

	GDP at PPS	Net national income NNI	Net disposable household income NDHI	Household final consumption expenditure HFCE
		Per capita data		
		US = 100		
EU-15	72.7	70.2	58.9	58.6
EA-17	70.7	67.5	58.3	56.4
EU-27	65.5	63.1	53.5	52.9
Switzerland	92.9	88.8	74.9	76.1
Japan	72.2	66.3	59.4	60.3
United States	100.0	100.0	100.0	100.0
		EU-27 = 100		
EU-15	110.9	111.3	110.3	110.7
EA-17	108.0	107.0	109.0	106.6
EU-27	100.0	100.0	100.0	100.0
Switzerland	141.8	140.7	140.0	143.9
Japan	110.2	105.1	111.2	114.0
United States	152.6	158.6	187.0	189.0

Source: Eurostat (AMECO), WIFO calculations.

7.5.2 Social pillar

The US and Japan respectively register the highest inequality and the highest at-risk-of-poverty rate in the total population among all countries we consider (Figure 13 and Appendix Figure VIII). Social transfers in the US are also among the least effective in reducing poverty. Swiss inequality is below the EU average, and so is poverty risk in the total population, but old-age poverty risk is high.

On the other hand, the US has lower youth and long-term unemployment rates than the EU, as does Switzerland. Similarly, the employment gender gap in the US is about one-third lower. Japan has the second-highest gap after Malta, and long-term unemployment is above the EU average.

Since there are several EU countries with similarly low youth and long-term unemployment rates as the US (mostly Scandinavian, small and new member countries), the extreme youth and long-term unemployment rates in Southern Europe highlight severe country-specific labour market problems.

7.5.3 Ecological pillar

CO2 emissions and energy intensity - the two indicators on which we have data for the US - are about 50 percent higher in that country compared to Europe, while Japan is close to the EU-27

average. Switzerland, on the other hand, does consistently better than almost all EU members across the ecological outcome indicators.

The Yale University Environmental Performance Index 2012, which contains more indicators covering the US, confirms the US' ecological deficit: while the US is in 49th place, the average rank for EU-27 is 28.[31]

7.5.4 Conclusions on outcomes under new perspectives

On the whole, the US outperforms Europe on traditional macroeconomic outcome indicators except deficits, debt and the current account. However, if we broaden the outcome perspective to social inclusion and ecological performance, Europe partly overtakes the US.

[31] See http://epi.yale.edu/epi2012/rankings.

8. Econometric analysis: Relating outcome competitiveness to its determinants

To investigate the relationship between "outcome" and "input" competitiveness econometrically, we build on the database of 68 indicators compiled for the descriptive analysis in sections 3 to 6 (see Table II in the annex for a complete list). Since the indicators contained in each of these groups are potentially highly correlated with each other, we first carry out a factor analysis based on principal components (PCA). This allows us to investigate the correlation structure within each indicator group, to identify variables that do not fit well into the groups we assigned them to, and to reduce the dimensionality of the data by extracting fewer (transformed) dimensions that explain a large proportion of the overall variance.[32]

Factor analysis based on PCA yields so-called factor loadings for each indicator which measure the correlation between indicator and factor. We use these to construct weights for combining the individual indicators in each group into a composite indicator. To do this, we follow the guidelines in *OECD* (2008) and *Annoni – Kozovska* (2010), as well as *Delgado et al.* (2012). We then use the composite indicators as dependent and independent variables in the econometric analysis.

To estimate the relationship between our measures of input and outcome competitiveness based on our dataset of 27 EU countries observed from 2000 to 2010, we use the following panel data model for country *i* and year *t*:

$$NPO_{it} = \beta_1 Price_{i,t-1} + \beta_2 Structure_{i,t-1} + \beta_3 Capabilities_{i,t-1} + \eta_t + u_{it},$$

where NPO stands for new perspectives outcomes, $Price$ for price competitiveness, $Structure$ for economic structure and $Capabilities$ refers to the indicators discussed in section 5. The error term u_{it} is assumed to have a mean of zero. η_t represents a period-specific fixed effect, such as macroeconomic shocks affecting all countries, and is accounted for by year dummies. For estimation, we use OLS and within-groups (WG) methods. In the latter case, the error term takes the form $u_{it} = \mu_i + v_{it}$, where v_{it} is a mean-zero error term and μ_i is a region-specific fixed effect that may be correlated with the other explanatory variables included in the model.

We lag the explanatory variables by one year to reduce concerns of endogeneity, that is, of correlation between the regressors and the error term. For this strategy to be valid, the error term needs to be serially uncorrelated. Therefore, we use standard errors that are robust to serial correlation in addition to heteroskedasticity. Since our variables are essentially generated

[32] Principal components analysis (PCA) decomposes each group of indicators into fewer, so-called "principal", components based on the eigensystem of their covariance matrix. The principal components are linear combinations of the indicators, which are orthogonal – that is, uncorrelated with each other – and account for most of the variance within the group. Factor analysis, in turn, assumes that each indicator can be explained by a linear combination of uncorrelated factors that are common to all indicators in the group (as well as some factors that are unique to each indicator). One approach, which we follow here, is to use PCA to extract the first principal components and to treat them as common factors (*OECD*, 2008).

regressors, which may result in biased and inconsistent estimates of the standard errors, we alternatively bootstrap the standard errors.

For comparison, we also estimate the equation using as the dependent variable a composite indicator based on the group of traditional outcome indicators discussed in section 6.1. We call this "traditional outcomes", or TO_{it}.

8.1 Data

First, missing values were interpolated for some series to obtain a complete dataset covering the period from 2000 to 2010. For this purpose, we mostly used linear interpolation.

Second, to prepare the data for factor analysis and composite indicator construction, we examined the distribution of each indicator by means of descriptive statistics and histograms – both in the overall cross-section and in each year – for skewness and outliers, which could distort the results. Skewness (in absolute values) is equal to or greater than 1 for several indicators, so we applied scale transformations to address it. The choice of scale transformation was based on inspection of histograms and skewness tests for the indicators transformed according to *Tukey*'s (1977) ladder of powers. For details of individual scale transformations, see 0 in the annex.

Third, all indicators were normalised by subtracting the mean and dividing by the standard deviation across countries, where both statistics refer to the initial year 2000 to allow for time variation in the indicators. As a result, all indicators have means of zero and standard deviations equal to 1 (z-scores), making them directly comparable in terms of units of measurement (the standard deviation).[33]

Finally, we checked that the orientation of all transformed and normalised indicators is in line with our concept of competitiveness. If necessary, indicators were reversed to ensure that more positive scores signal higher competitiveness. For example, the indicator *impact of social transfers*, originally consisting of negative values (percent reduction of poverty risk), was negated. Other indicators that were negated after normalisation include *compensation per employee*, *unit labour costs*, *energy dependence*, the *unemployment rate*, and *debt as a share of GDP*; furthermore, all indicators belonging to the social pillar of outcomes under new perspectives (*poverty, inequality* and the remaining *unemployment* indicators), as well as *energy intensity* were reversed (see again 0 in the annex).

8.2 Factor analysis and composite indicator construction

For each of the indicator groups listed in Table II, a factor analysis was carried out, using the principal components method to extract the common factors. The resulting factor loadings are then used to aggregate the 68 individual indicators into composite indicators, which we use as

[33] We also investigated the robustness of the factor analysis results to using an alternative normalisation procedure that is commonly used (min-max), where the minimum is subtracted from each indicator value and the result is divided by the difference between maximum and minimum. The results were very similar.

dependent and independent variables for the regressions in section 8. This procedure is outlined in more detail in the box below.

Box: Factor analysis and composite indicator construction

First, the fit of the variables within each group was evaluated using statistics on communality (squared multiple correlations), sampling adequacy (Kaiser-Meyer-Olkin measure) and internal consistency (Cronbach's alpha); these allow a judgement on how well the indicators are able to explain each other, whether a lower-dimensional representation of the data is possible, and whether the indicator groups are internally consistent. All these statistics are based on the correlations between the variables in the group and are available with factor analysis in Stata.

As a result of this initial analysis, a few non-fitting indicators were excluded from some groups (shown in italic font in Table II). Those remaining all performed satisfactorily regarding the statistics discussed above. They may therefore be considered mutually consistent measures of the components of competitiveness that we assigned them to. This provides some ex-post, data-driven support for our choice of variables.

Next, factor analysis was applied to each group, where we always retain the first common factor explaining at least 50 percent (and frequently more than 60 percent) of the variance. Table IV in the annex provides an overview of the results. It shows that the ecological component of capabilities does least well, while the income pillar of new perspectives outcomes does best. We also carried out a separate factor analysis on the labour compensation subgroup of the price competitiveness indicators; this is our preferred measure of price competitiveness, given that otherwise both dependent and independent variables comprise measures of labour productivity.

Finally, we use the factor loadings derived from factor analysis to compute weights that we apply to the (scale-transformed and normalised) indicators in each group, resulting in one single remaining – composite – variable per group.[34] Within many groups, the obtained weights are fairly similar across indicators, highlighting that they tend to measure similarly relevant and complementary aspects of the variation among them. For example, in the group "new perspectives outcomes – income pillar", for which the factor analysis is the most successful in terms of the statistics reported in Table IV, the four indicators each receive a weight very close to 0.25. Other groups for which indicators have roughly equal weights are the labour compensation component of price competitiveness (weights of 0.5 on each indicator), the social and ecological subgroups of capabilities, the traditional outcome indicators and the ecological pillar of the new perspectives outcome indicators.[35] Summary statistics and a correlation matrix for the composite indicators thus constructed are provided in Table V in the Appendix.

For capabilities, a two-stage factor analysis is implemented. First, we extract the first common factor from each of the subgroups (innovation and education, the social system, institutions and ecological ambition). On these, a further factor analysis is then carried out, so that we have both one overall measure of capabilities as well as its individual subgroups available as regressors. The weights derived from factor analysis that are used to aggregate the four subgroups are 0.29 for innovation and education, 0.29 for the social system, 0.26 for institutions and 0.17 for the ecological component.

[34] To compute the weights, the factor loadings are rotated (using the varimax rotation) to maximise the loadings of the variables on one factor. The rotated loadings are then squared and standardised to sum to 1, in line with OECD (2008).

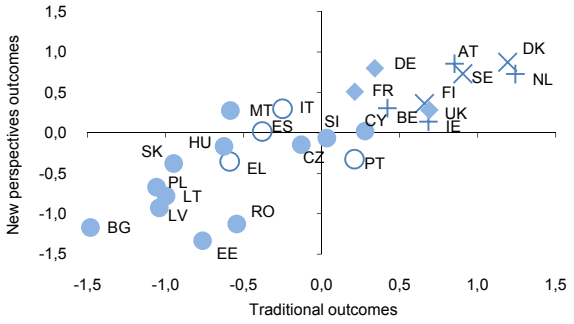
[35] In the overall price competitiveness group, the factor loadings and computed weights are roughly equal for the labour compensation and productivity indicators, and they are smaller and also approximately equal for the unit labour cost indicators. Among the indicators on economic structure, the value-added shares of skill- and innovation-intensive manufacturing industries and those with a high RQE obtain the smallest weights (between 0.001 and 0.04), while the export shares of technology-driven industries and those using knowledge-based services inputs get the largest weights (about 0.20). In the capabilities group on innovation and education, early education participation, upper secondary students in programmes with a vocational orientation and higher education graduates from maths, science and technology subjects are downweighted considerably (weights around 0.01), while the remainder receive weights of similar size to each other. Among institutions, the business deregulation index receives a lower weight (0.10) than the four indicators on quality of governance (between 0.22 and 0.23). Within the social pillar of the new perspectives outcome indicators, the youth unemployment rate has a substantially smaller weight (0.02) than the rest.

To construct the dependent variable *NPO*, we extract the first common factor from each of the income, social and ecological pillars of outcomes under new perspectives. Since the results of a second-stage factor analysis (as for capabilities above) indicate that the three pillars do not have enough in common to warrant the use of a factor model, we aggregate the first common factors of the three pillars using equal weights of 0.33 to obtain *NPO*. Compared to traditional assessments of outcome competitiveness therefore, the status of social and ecological outcomes is enhanced: they receive the same weight as the income pillar. While this is driven by methodological considerations, it is also in line with the aims of the WWWforEurope project with its emphasis on social inclusions and ecological sustainability. An alternative approach that consists of running three separate regressions with the individual pillars as dependent variables is currently the subject of further research.

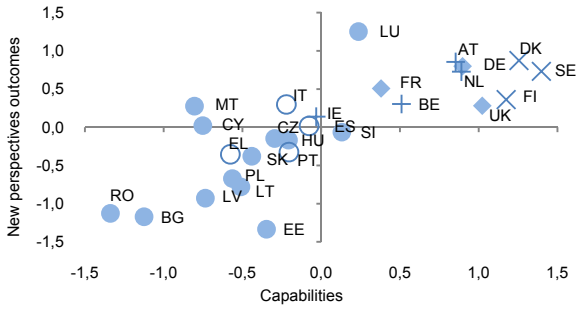
Graphical inspection of the correlations between the composite indicators for new perspectives outcomes and traditional outcomes (Figure 15, top panel) reveals that the two are fairly highly correlated on average over our sample period. Similarly, as shown by the second panel of the figure, our measure of capabilities is positively associated with *NPO*. The Scandinavian countries are ahead on both the outcome measures and capabilities, while Bulgaria and other new member states lag behind on both. Economic structure is positively correlated with capabilities as well as new perspectives outcomes (middle panel). The last two panels of the figure suggest that the income and ecological pillars of *NPO* are positively correlated, while there is little association between income and social pillars. It therefore does not seem to be the case that richer countries, which achieve larger values on the income pillar, are on average characterised by less inequality and poverty risk, i.e. score better along the social pillar.

Figure 15 **Correlation between composite indicators, time averages 2000-2010**

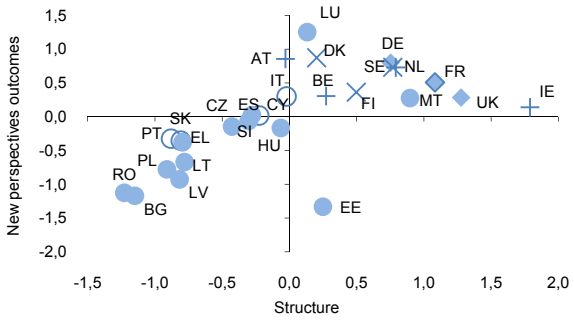
Outcomes under new perspectives vs. traditional outcomes



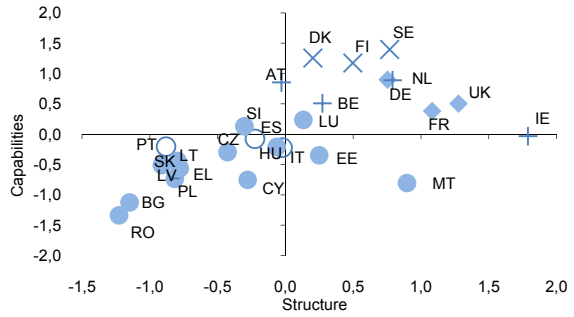
New perspectives outcomes vs. capabilities



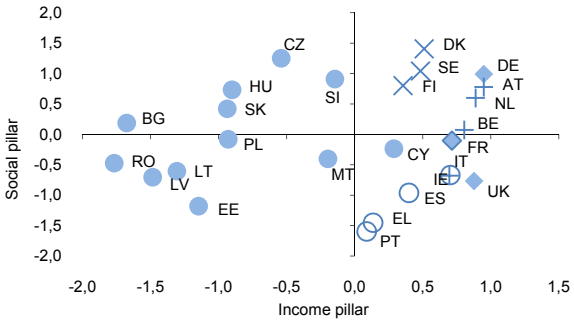
New perspectives outcomes vs. structure



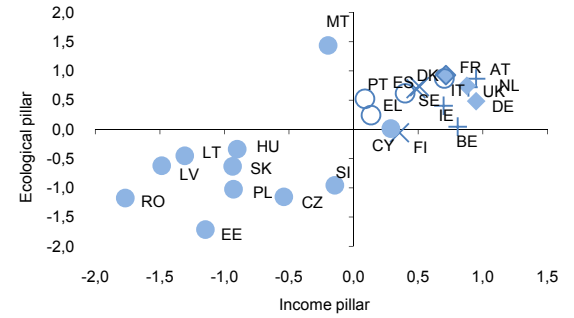
Capabilities vs. structure



Social pillar vs. income pillar



Ecological pillar vs. income pillar



Notes: Excluding Luxembourg. Country groupings: Scandinavian countries: Denmark, Finland, Sweden; large European countries: Germany, France, United Kingdom; new member countries: Bulgaria, Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, Slovakia; Southern Europe: Spain, Greece, Italy, Portugal.

Source: Eurostat, OECD, IEA, Energy Balances, WIFO calculations.

8.3 Panel data estimates

Table 4 and Table 5 present OLS estimates for our panel of 27 countries and 11 years. The dependent variable in Table 4 is the composite indicator of new perspectives outcomes (*NPO*), and in Table 5, it is the composite indicator of traditional outcomes (*TO*). All regressions account for period-specific fixed effects. The results of within-groups (WG) regressions, which also control for country-specific fixed effects, are shown in Table 6.

Table 4 **OLS regressions: New perspectives outcomes vs. structure and capabilities**

Dependent variable: NPO_{it} (Standard errors)	(i) **OLS** (robust)	(ii) **OLS** (robust)	(iii) **OLS** (bootstrapped)	(iv) **OLS** (robust)	(v) **OLS ex LU** (robust)	(vi) **OLS** (robust)	(vii) **OLS ex LU** (robust)
$Price_{i,t-1}$							
$Wages_{i,t-1}$				-0.308**	-0.235*	-0.248**	-0.216*
				(0.133)	(0.131)	(0.107)	(0.115)
$Structure_{i,t-1}$	0.320***	0.362***	0.362***	0.198	0.222*	0.255**	0.272***
	(0.093)	(0.110)	(0.114)	(0.121)	(0.119)	(0.100)	(0.095)
$Capabilities_{i,t-1}$	0.556***			0.243*	0.305**		
	(0.101)			(0.146)	(0.143)		
$InnoEdu_{i,t-1}$		-0.318	-0.318			-0.293	-0.205
		(0.229)	(0.229)			(0.183)	(0.208)
$Social_{i,t-1}$		0.340	0.340			0.227	0.217
		(0.242)	(0.224)			(0.173)	(0.179)
$Institutions_{i,t-1}$		0.329**	0.329*			0.228	0.176
		(0.153)	(0.172)			(0.146)	(0.145)
$Ecological_{t-1}$		0.231***	0.231**			0.163*	0.152*
		(0.073)	(0.092)			(0.089)	(0.089)
R^2	0.748	0.801		0.802	0.805	0.834	0.824
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No
Country number	27	27	27	27	26	27	26
Observations	270	270	270	270	260	270	260

Notes: Standard errors in all columns are robust to heteroskedasticity and serial correlation (Huber-White sandwich estimator of variance, with standard errors clustered on countries). In column (iii), standard errors are bootstrapped with 1500 replications, where resampling is based on individual years for each country and the random-number seed is set to 1. ***, ** and * indicate significance at the 1 percent, the 5 percent and the 10 percent levels respectively. Constant terms and time dummies not reported.

Source: WIFO calculations.

Column (i) begins with the first time lags of our composite indicators of economic structure and capabilities as explanatory variables, while in column (ii) we use the individual components of capabilities instead of the aggregate composite. Our preferred measure of price competitiveness, the composite indicator based on labour compensation (*Wages*), is introduced only in columns (iv) to (vii) because of potentially remaining endogeneity concerns. In columns (v) and (vii), Luxembourg is dropped from the sample since it turned out to be an outlier on many of the indicators described in sections 3 to 6.

Column (i) in both Table 4 and Table 5 suggests that there is a positive and significant association between economic structure and the aggregate measure of capabilities on the one hand, and new perspectives and traditional outcomes measures on the other, controlling only for period-specific effects. When the individual subgroups of capabilities replace the aggregate measure in column (ii), the coefficient on economic structure remains significant and even increases in size in Table 4 but becomes insignificant in Table 5. At the same time, both the ecological and institutions subgroups of capabilities are significantly and positively associated with new perspectives as well as traditional outcomes. The coefficient on ecological ambition is larger and more significant in Table 4, while this is the case for the coefficient on institutions in Table 5. Using bootstrapped estimates of the standard errors in column (iii) does not lead to any substantive changes in the estimates, and this also holds for all other columns in Table 4 and Table 5.[36]

Table 5 **OLS regressions: Traditional outcomes vs. structure and capabilities**

Dependent variable: TO_{it}	(i) **OLS**	(ii) **OLS**	(iii) **OLS**	(iv) **OLS**	(v) **OLS ex LU**	(vi) **OLS**	(vii) **OLS ex LU**
(Standard errors)	(robust)	(robust)	(bootstrapped)	(robust)	(robust)	(robust)	(robust)
$Price_{i,t-1}$							
$Wages_{i,t-1}$				-0.260*	-0.156	-0.235**	-0.167
				(0.132)	(0.100)	(0.115)	(0.107)
$Structure_{i,t-1}$	0.226***	0.106	0.106	0.124	0.156**	0.005	0.034
	(0.065)	(0.071)	(0.095)	(0.075)	(0.071)	(0.092)	(0.091)
$Capabilities_{i,t-1}$	0.721***			0.457***	0.545***		
	(0.093)			(0.148)	(0.130)		
$InnoEdu_{i,t-1}$		0.005	0.005			0.029	0.226
		(0.238)	(0.260)			(0.191)	(0.162)
$Social_{i,t-1}$		0.041	0.041			-0.065	-0.097
		(0.202)	(0.212)			(0.168)	(0.172)
$Institutions_{i,t-1}$		0.566***	0.566***			0.471***	0.364***
		(0.171)	(0.197)			(0.144)	(0.131)
$Ecological_{i,t-1}$		0.199**	0.199*			0.134	0.110
		(0.091)	(0.102)			(0.099)	(0.097)
R^2	0.748	0.786		0.780	0.800	0.811	0.816
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No
Country number	27	27	27	27	26	27	26
Observations	270	270	270	270	260	270	260

Notes: Standard errors in all columns are robust to heteroskedasticity and serial correlation (Huber-White sandwich estimator of variance, with standard errors clustered on countries). In column (iii), standard errors are bootstrapped with 1500 replications, where resampling is based on individual years for each country and the random-number seed is set to 1. ***, ** and * indicate significance at the 1 percent, the 5 percent and the 10 percent levels respectively. Constant terms and time dummies not reported.

Source: WIFO calculations.

There is no evidence across both tables that the composite indicators of innovation and education and of social capabilities are significantly related to either new perspectives or

[36] Results with bootstrapped standard errors for the remaining columns are available upon request.

traditional outcomes indicators, holding constant the other explanatory variables. Some degree of multicollinearity may lead to this outcome, given the high correlation between the innovation/education and social capabilities indicators (0.88, see Table V in the Appendix). When we introduce the individual components of capabilities separately into column (ii) – as in columns (i) to (iv) in Appendix Table VI and Table VII – each is highly significant and positive.

It is not surprising that our results are generally similar when using new perspectives and traditional outcome measures as dependent variables, considering that the two are also highly correlated (0.85, see Figure 15 and Table V). The main differences between Table 4 and Table 5 are that economic structure tends to be significantly associated with NPO but less so with TO, and that ecological ambition seems to matter more for NPO while the institutions variable is more important for TO.

Column (iv) adds the labour compensation component of price competitiveness, $Wages$, to the specification in column (i). The coefficient estimates in Table 4 and Table 5 indicate that higher wages are significantly negatively related to outcome competitiveness, as our conceptual framework would suggest. While this holds generally both for outcomes under new as well as traditional perspectives, size and significance of the estimate are more robust across columns (v) to (vii) in Table 4 than in Table 5.

Our preferred specification in Table 4 is column (v), where Luxembourg is omitted, and all variables have the expected signs and are significant. Compared to column (i), the size of the coefficients on structure and capabilities declines, but not by more than two standard errors. The magnitude of the estimates suggests that a rise in wages by one standard deviation is associated with a 0.249-point decrease in the composite indicator on new perspectives outcomes. On the other hand, an improvement in economic structure or capabilities by one standard deviation is associated with a 0.172-point increase (0.214 points in the case of capabilities) in new perspectives outcomes.[37] These changes are not inconsiderable given that the sample mean of NPO is 0.107.

When introducing the individual subgroups of capabilities in column (vii) of Table 4, the coefficients on wages and structure retain their signs and remain significant, but of the capability components, only ecological ambition appears to matter for outcomes under new perspectives.

Our results are comparable to *Delgado – Ketels – Porter – Stern* (2012) insofar as there is some overlap between the indicators contained in our innovation/education and institutions variables as well as their explanatory variables MICRO and SIPI, for both of which they find significant positive effects. Also, their dependent variable, GDP per working-age population, is closer to our traditional outcomes than to NPO, which includes many more aspects of outcome competitiveness. The significant and sizeable relationship that we find between institutions and TO is therefore a result we share with DKPS.

[37] The standard deviations of wages, economic structure and capabilities are 1.06, 0.775 and 0.701 respectively. See Table V in the Appendix.

In Table 6, we report the results of estimating our main equation with *NPO* as the dependent variable using the within-groups estimator. This controls for omitted country-specific fixed effects that may be correlated with the included explanatory variables and may thus lead to biased OLS estimates. Similar to Table 4, the coefficient estimate on the ecological component of capabilities is significant and positive, while the coefficient on wages is significant and negative. Across all columns of Table 6, neither coefficient differs from its counterparts in Table 4 by more than two standard errors, suggesting that the OLS estimates may not be too unreliable. The coefficients on economic structure and the remaining capability variables are not significantly different from zero. This could be due to the rather low within-country time-series variation present in these indicators over our relatively short time span. Therefore, we draw our main conclusions from the OLS estimates in Table 4 and Table 5.

Table 6 **WG regressions: New perspectives outcomes vs. structure and capabilities**

Dependent variable: NPO_{it} (Standard errors)	(i) **WG** (robust)	(ii) **WG** (robust)	(iii) **WG** (bootstrapped)	(iv) **WG** (robust)	(v) **WG ex LU** (robust)	(vi) **WG** (robust)	(vii) **WG ex LU** (robust)
$Price_{i,t-1}$							
$Wages_{i,t-1}$				-0.291***	-0.294***	-0.369***	-0.390***
				(0.091)	(0.102)	(0.108)	(0.138)
$Structure_{i,t-1}$	-0.049	-0.037	-0.037	-0.0001	0.012	0.036	0.048
	(0.058)	(0.058)	(0.076)	(0.057)	(0.066)	(0.058)	(0.082)
$Capabilities_{i,t-1}$	0.202			0.200	0.225		
	(0.174)			(0.135)	(0.136)		
$InnoEdu_{i,t-1}$		0.035	0.035			0.095	0.106
		(0.122)	(0.124)			(0.110)	(0.114)
$Social_{i,t-1}$		-0.009	-0.009			-0.103	-0.096
		(0.126)	(0.133)			(0.084)	(0.099)
$Institutions_{i,t-1}$		0.005	0.005			0.006	0.003
		(0.088)	(0.090)			(0.074)	(0.079)
$Ecological_{i,t-1}$		0.137**	0.137**			0.163***	0.172***
		(0.060)	(0.062)			(0.056)	(0.062)
R^2	0.979	0.980		0.980	0.979	0.982	0.980
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	No
Country number	27	27	27	27	26	27	26
Observations	270	270	270	270	260	270	260

Notes: Standard errors in all columns are robust to heteroskedasticity and serial correlation (Huber-White sandwich estimator of variance, with standard errors clustered on countries). In column (iii), standard errors are bootstrapped with 1500 replications, where resampling is based on individual years for each country and the random-number seed is set to 1. ***, ** and * indicate significance at the 1 percent, the 5 percent and the 10 percent levels respectively. Constant terms and time dummies not reported.

Source: WIFO calculations.

Overall, we conclude from the OLS results in Table 4 and Table 5 that on the “input” side, a narrow focus on the price component of competitiveness neglects important other aspects of the concept. In addition to wages, we also find that economic structure and capabilities on aggregate are significantly related to outcomes under new perspectives as well as to traditional outcomes. For high-income economies like the EU-27, a purely cost-based strategy for improving outcomes is therefore unlikely to be as successful as one that also leverages the

positive effects of a favourable economic structure and strong capabilities. Clearly however, compared to wage cuts, improvements in the other two factors require a longer time horizon to materialise.

On the "outcome" side, one difference in results between the two outcomes measures is the importance of ecological capabilities for achieving new perspectives outcomes, while institutions dominate for traditional outcomes. On the whole however, similar input factors matter for both traditional and new perspectives outcomes, which further underlines the importance of considering a wider range of inputs than factor prices only.

8.3.1 Actual versus predicted levels of outcome competitiveness under new perspectives

To provide some further quantitative interpretation of our preferred specification in column (v) of Table 4, we compute the predicted levels of NPO for each EU-27 country based on their values of *wages*, *structure* and *capabilities* as well as the estimated coefficients in column (v). We call the time average of this measure $\widehat{NPO}_i$ and compare it with the actual (time-averaged) values of NPO_i computed in section 8.2.

Table 7 **Actual vs. predicted levels of NPO, time averages 2001-2010**

Country	NPO_i	$\widehat{NPO}_i$	Rank	Country	NPO_i	$\widehat{NPO}_i$	Rank
Belgium	0.475	**0.654**	9	Lithuania	-0.633	**-0.553**	22
		(0.104)				(0.101)	
Bulgaria	-1.155	**-0.855**	25	Hungary	0.026	-0.186	16
		(0.098)				(0.157)	
Czech Republic	0.048	-0.260	17	Malta	0.389	-0.158	15
		(0.127)				(0.209)	
Denmark	0.799	0.794	3	Netherlands	0.835	0.808	2
		(0.104)				(0.068)	
Germany	0.688	0.685	7	Austria	0.852	0.618	10
		(0.071)				(0.098)	
Estonia	-1.010	**-0.267**	18	Poland	-0.657	**-0.591**	24
		(0.154)				(0.088)	
Ireland	0.426	**0.725**	5	Portugal	-0.226	-0.271	19
		(0.183)				(0.089)	
Greece	-0.134	-0.295	20	Romania	-1.103	**-0.882**	26
		(0.078)				(0.103)	
Spain	0.064	**0.069**	12	Slovenia	0.236	-0.047	13
		(0.061)				(0.100)	
France	0.783	0.657	8	Slovakia	-0.176	-0.524	21
		(0.094)				(0.100)	
Italy	0.244	0.136	11	Finland	0.502	**0.725**	6
		(0.101)				(0.089)	
Cyprus	0.110	-0.070	14	Sweden	0.948	0.854	1
		(0.147)				(0.104)	
Latvia	-0.824	**-0.558**	23	United Kingdom	0.490	**0.791**	4
		(0.113)				(0.115)	

Notes: Standard errors in brackets; predicted values based on Table 4 column (v); predicted values that exceed actual values in bold; "rank" refers to predicted values.

Those countries for which the actual values NPO_i lie below the predicted values $\widehat{NPO_i}$ are given in bold font in Table 7. This indicates that these countries have, on average from 2001 to 2010, not achieved the level of "new perspectives" outcome competitiveness that our model in column (v) of Table 4 would predict.[38] In other words, the regression residuals for these countries are negative. They could do better and have upward potential in terms of NPO given their price competitiveness, economic structure and capabilities. Estonia - one of the laggards in terms of average $\widehat{NPO_i}$, ranked at 18 among all countres - registers the largest negative gap between actual and predicted outcomes, followed by the UK and Bulgaria. Other new member countries from CEE like Latvia and Romania are also in this group, as is Finland - like the UK one of the top performers in terms of average $\widehat{NPO_i}$.

For Spain, Germany and Denmark, actual and predicted levels are very close, which one could interpret to suggest that they have made almost full use of their cost advantages, structure and capabilities and have come close to achieving their potential.

On the other hand, the remaining countries in Table 7 have on average achieved higher levels of actual NPO_i than our model would predict between 2001 and 2010. These good positions may thus not be sustainable over the longer term. Small positive gaps between actual and predicted outcomes exist for the Netherlands, Portugal and Sweden, which attained the highest average level of new perspectives outcomes among all EU-27 countries. Malta has the largest gap, followed by Slovakia and the Czech Republic.[39] These countries could avoid medium- to long-term decline by tackling reforms in the areas of price competitiveness, economic structure and capabilities.

[38] Note that the sample period for the computations in Table 7 starts in 2001 since we lose the first observation by using time lags of the explanatory variables in the regressions.

[39] *DKPS* (2012), how undertake a similar exercise, note that in their sample, Greece and Spain are among the countries with the largest positive gaps between actual and predicted levels of outcome competitiveness (GDP per working-age population in their case).

9. Conclusion

We have developed a new definition of competitiveness that we hope will be useful for assessing transition to a new path of more dynamic, socially inclusive and ecologically sustainable growth. In addition, the definition should be useful for revealing individual countries' strengths and weaknesses, particularly those related to a "high road" to competitiveness. We have applied the new framework to analyse the performance of the EU-27 member states and to compare it to the US, Japan and Switzerland. Both descriptive and econometric analyses have offered new insights that the old concept of price competitiveness and traditional outcome evaluations could not provide.

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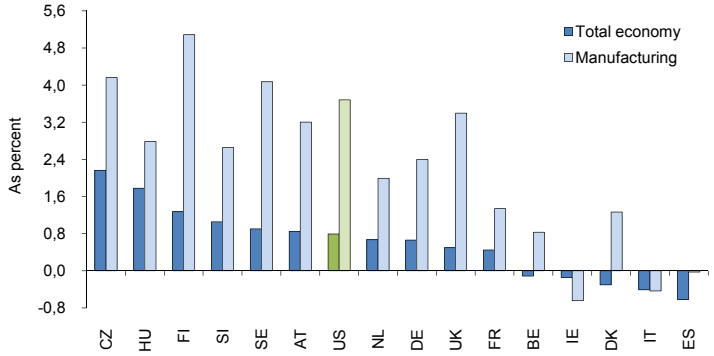
Annex

Table I **Definitions of competitiveness: Proposition and related previous definitions**

New definition: "The ability of a country (region, location) to deliver the beyond-GDP goals for its citizens, today and tomorrow"
Related previous definitions:
Uri (1971): "…the ability to create the preconditions for high wages".
The German Sachverständigenrat (1981): "…ability to develop specialty products and technical solutions which generate income growth under full employment".
Scott - Lodge (1985): "…a nation state's ability to produce, distribute and service goods in the international economy...., and to do so in a way that earns a rising standard of living".
Aiginger (1987): "Competitiveness of a nation is the ability to (i) sell enough products and services (to fulfil an external constraint); (ii) at factor incomes in line with the (current and changing) aspiration level of the country; and (iii) at macro-conditions of the economic, environmental, social system seen as satisfactory by the people."
Fagerberg (1988): "the ability of a country to realise central economic policy goals, especially growth in income and employment, without running into balance of payment difficulties"
Hatsopoulos et al. (1988): "The proper test of competitiveness, then, is not simply the ability of a country to balance its trade, but its ability to do so while achieving an acceptable rate of improvement in its standard of living."
Porter (1990): "The only meaningful concept of competitiveness at the national level is national productivity".
Competitiveness Policy Council (1994): "The ability to sell products on international markets, while incomes in the domestic markets increase in a sustainable way."
IMD (1994): "World competitiveness is the ability of a country or a company to, proportionally, generate more wealth than its competitors in the world markets".
European Commission (1995): "…ability to increase or to maintain the living standard relative to comparable economies (e.g. developed industrialised countries), without long run deterioration of external balance".
OECD (1995): "…the ability of companies, industries, regions, nations or supra-national regions to generate, while being and remaining opened to international competition, relatively high factor income and factor employment levels".
Von Tunzelmann (1995): "Historians have tended to equate competitiveness ... with political, technical, commercial leadership".
Oughton - Whittam (1997): "long run growth in productivity and hence rising living standards, consistent with increasing employment or the maintenance of near full employment"
World Economic Forum (2000): "Competitiveness is the set of institutions and economic policies supportive of high rates of economic growth in the medium term."
European Commission (2001): "the ability of an economy to provide its population with high and rising standards of living and high rates of employment on a sustainable basis."
Porter (2004): "True competitiveness, then is measured by productivity … Here, we define competitiveness concretely, show its relationship to a nation's living standard…. The micro-economic foundations of productivity rest on … the sophistication of competition in the country … and the quality of micro-economic business environment in which they operate."
European Commission (2011): "Ultimately, competitiveness is about stepping up productivity, as this is the only way to achieve sustained growth in per capita income – which in turn raises living standards".
Janger et al. (2011): "… define competitiveness as the ability to raise standards of living and employment, while maintaining a sustainable environment and sustainable external balances"
Delgado et al. (2012): "Foundational competitiveness" is "the expected level of output per working-age individual that is supported by the overall quality of a country as a place to do business" and "Competitiveness is what underpins wealth creations and economic performance".
Peneder (2001): "ability ... to create high factor incomes along a sustainable path, taking into consideration a society's social, ecological and economic constraints with respect to long-term development."

Figure I **Further indicators on price competitiveness**

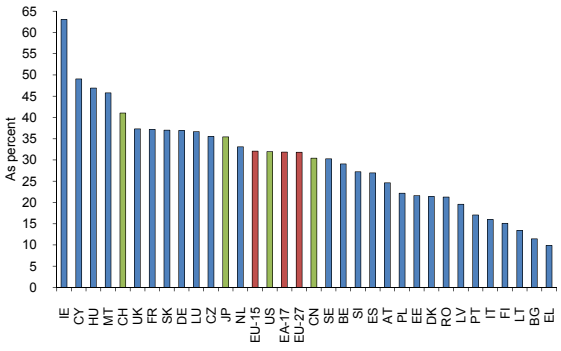
Average annual growth rate of total factor productivity, 2000-2007



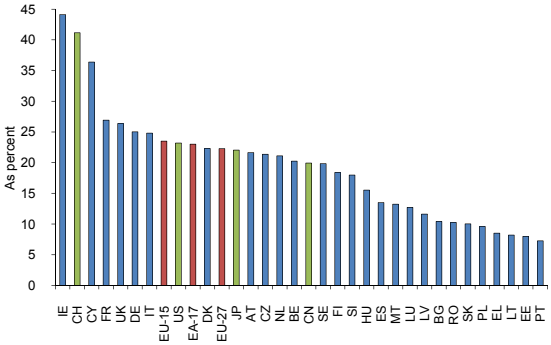
Notes: Data for Slovenia cover 2000-2006. Countries ranked by total economy values. Manufacturing data classification is NACE rev.1.1.
Source: EU KLEMS (2009 release, 2011 update, NACE rev. 1.1), WIFO calculations.

Figure II **Structure of exports in manufacturing, 2011**

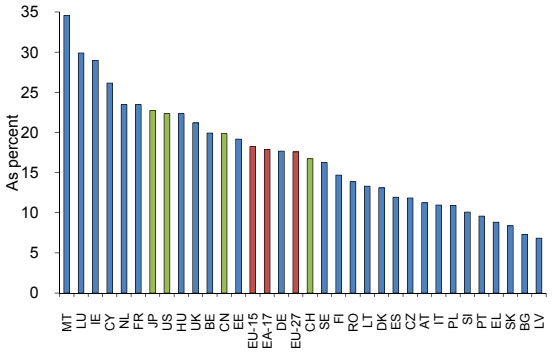
Technology-driven industries



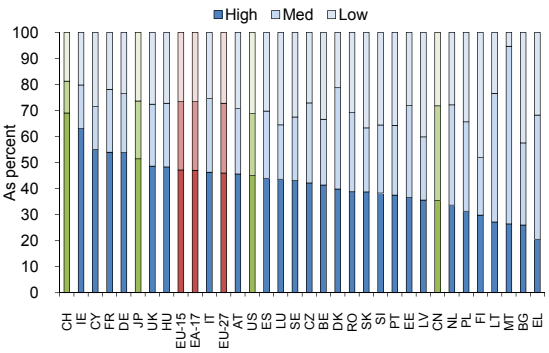
High-skill industries



Industries based on knowledge-based services



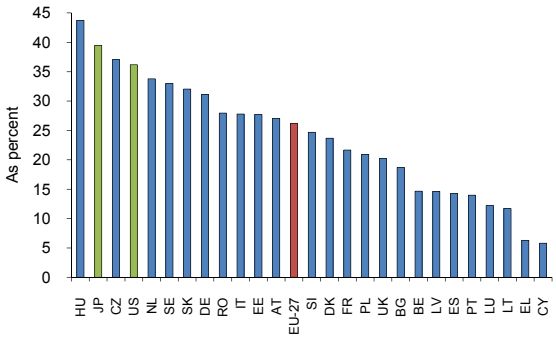
Industries according to competitive mode



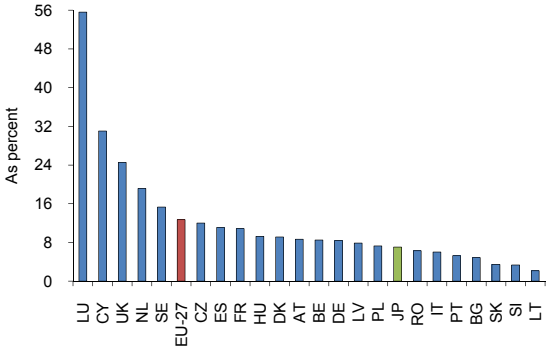
Notes: Shares in exports of manufacturing including Intra-EU exports. Competitive mode: high, medium and low RQE (revealed quality elasticity).
Source: EU (Comext), UNO (Comtrade), WIFO calculations.

Figure III **Structure of exports in manufacturing and services, 2011**

Industries with high innovation intensity



Industries with high education intensity

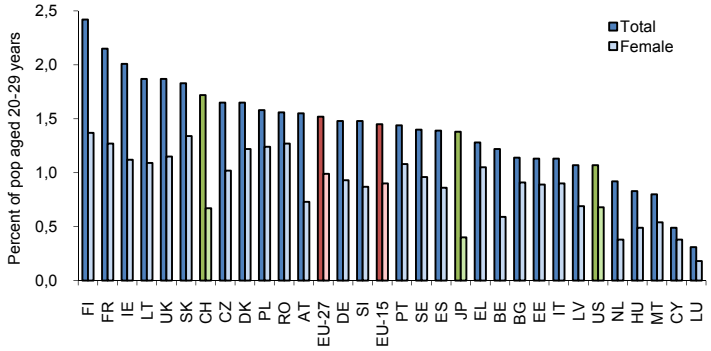


Notes: Shares in exports of manufacturing and services including Intra-EU exports. High innovation intensity: US figures 2010; services excluding travel, construction services, merchanting and other trade-related services, operational leasing services, personal, cultural and recreational services, government services. High education intensity: services excluding merchanting and trade-related services.

Source: EU (Comext, EBOP), UNO (Comtrade), IMF (BOP), WIFO calculations.

Figure IV **Further innovation and education indicators**

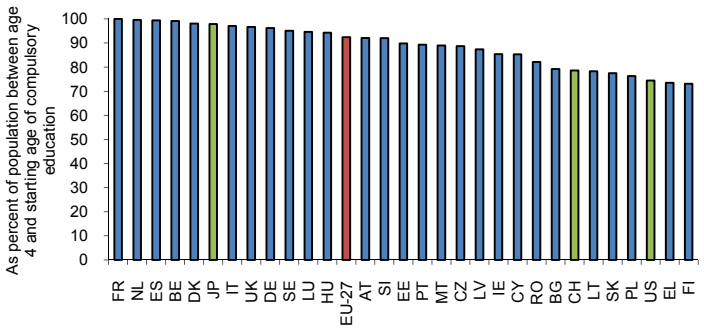
Tertiary education graduates in mathematics, science and technology, 2010



Notes: Countries ranked by the percentage of graduates from tertiary education (ISCED 5-6) programmes in mathematics, science and technology fields in the total population aged 20-29 years. Data for Italy cover 2008.

Source: Eurostat, WIFO calculations.

Participants in early education, 2010

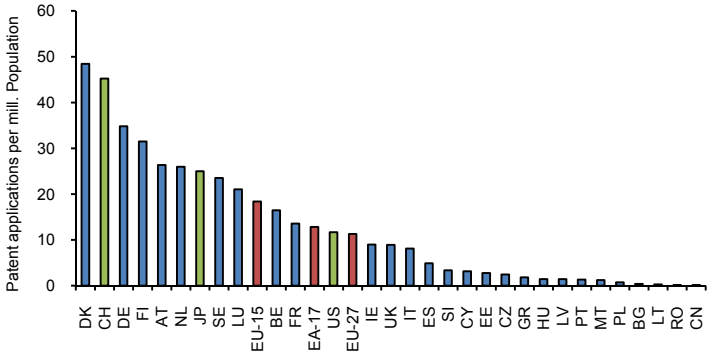


Notes: Countries ranked by the percentage of early education participants between the age of 4 and the starting age of compulsory education in the total population of the corresponding age group.

Source: Eurostat.

Figure V **Further indicators on ecological ambition**

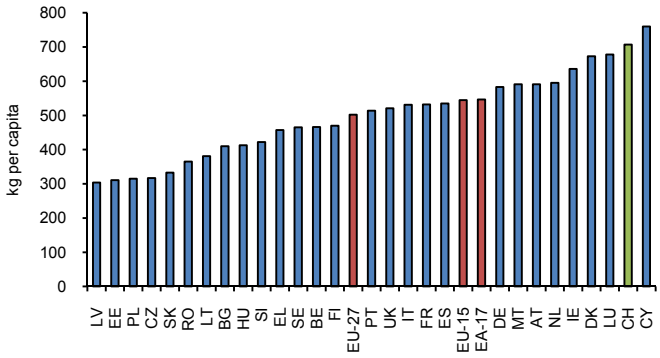
Applications of environment-related technology patents, Ø 2005-2009



Notes: WIPO classification.

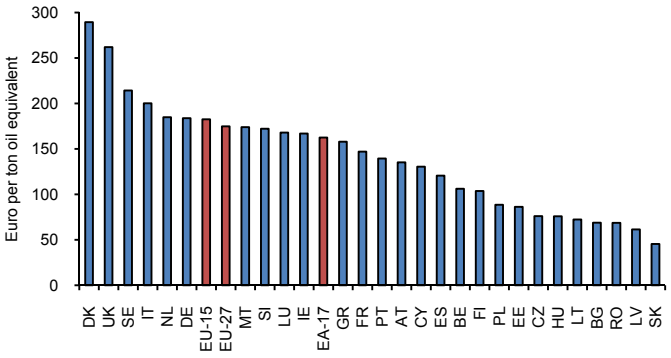
Source: OECD, REGPAT Database, January 2013, WIFO calculations.

Municipal waste generation, 2010



Source: Eurostat, WIFO calculations.

Energy tax rate, 2010

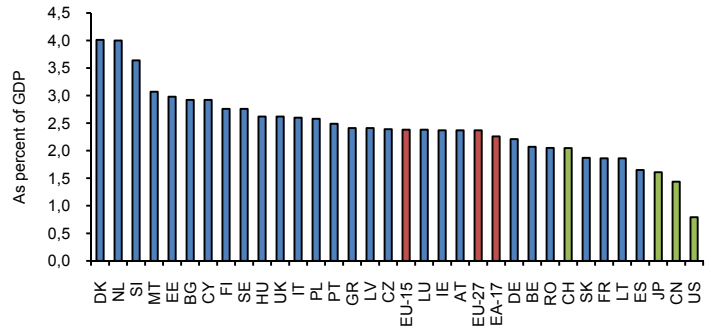


Notes: The indicator expresses energy tax revenues in relation to final energy consumption (euro per ton oil equivalent, deflated with the final demand deflator).

Source: Eurostat, WIFO calculations.

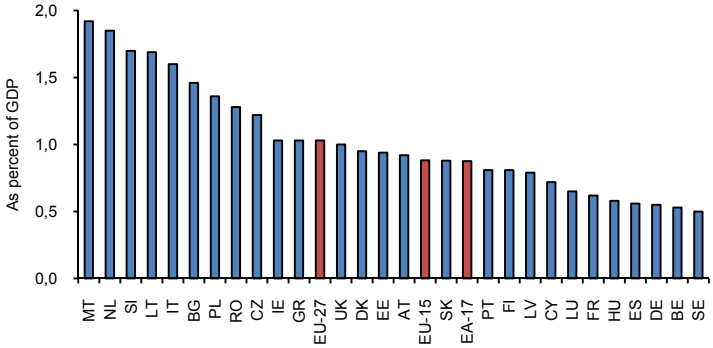
Figure V **Continued**

Total environmental tax revenues, 2010



Source: Eurostat, WIFO calculations.

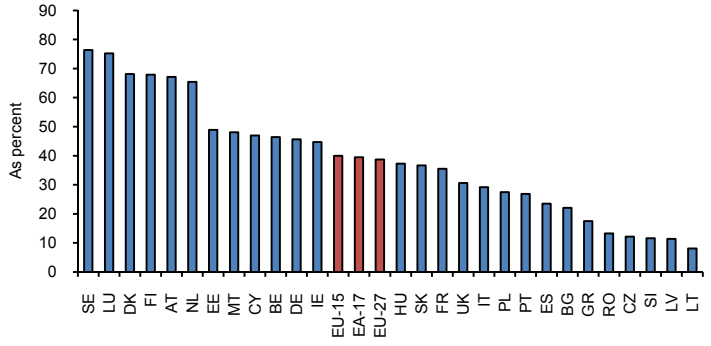
Current environmental expenditure and investment, 2009



Source: Eurostat, WIFO calculations.

Figure VI **Further indicators on supportive institutions**

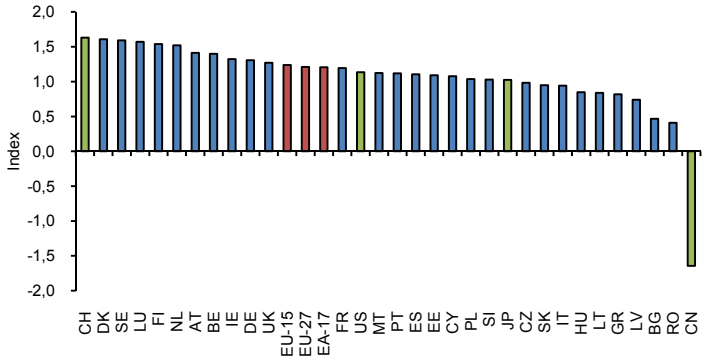
Trust in parliament, 2010



Notes: Respondents are asked whether they "tend to trust" parliament; the range of the indicator is between 0 and 100 percent.
Source: Eurobarometer 2011.

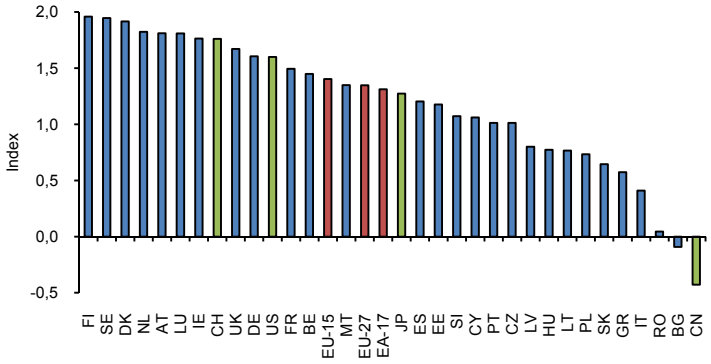
Figure VI **Continued**

Voice and accountability, 2010



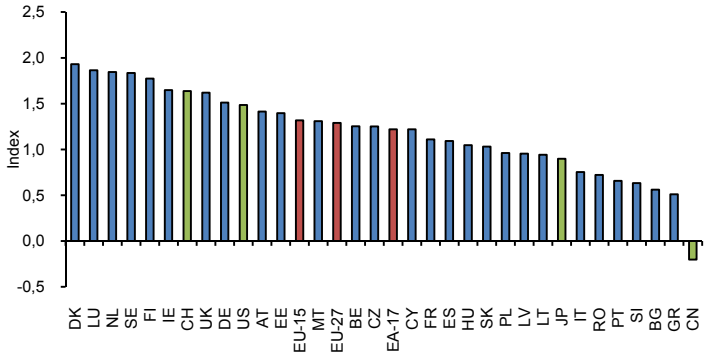
Notes: Index ranges from -2.5 to 2.5, with more positive values indicating better performance.
Source: Worldwide Governance Indicators, 2012 Update, World Bank (*Kaufmann et al.*, 2010).

Rule of law, 2010



Notes: Index ranges from -2.5 to 2.5, with more positive values indicating better performance.
Source: Worldwide Governance Indicators, 2012 Update, World Bank (*Kaufmann et al.*, 2010).

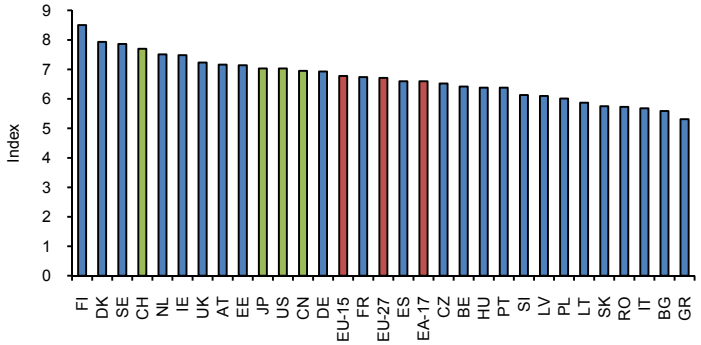
Regulatory quality, 2010



Notes: Index ranges from -2.5 to 2.5, with more positive values indicating better performance.
Source: Worldwide Governance Indicators, 2012 Update, World Bank (*Kaufmann et al.*, 2010).

Figure VI **Continued**

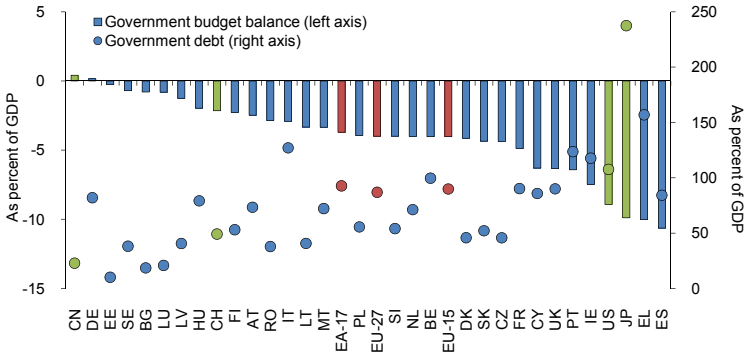
Business deregulation index, 2010



Notes: The index ranges from 0 to 10, with high values indicating less regulation.
Source: Economic Freedom of the World Database, Frazer Institute (*Gwartney et al.*, 2012).

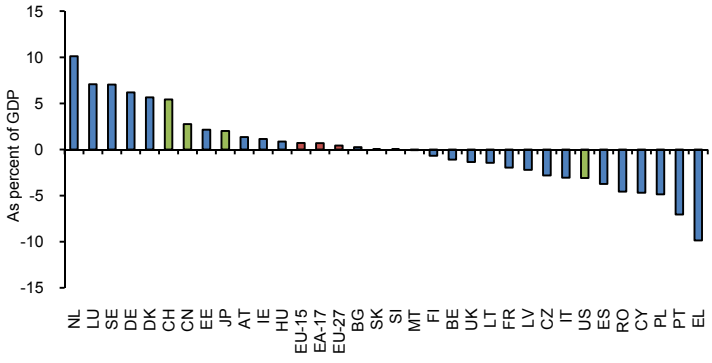
Figure VII **Further traditional outcome indicators: Constraints**

Government budget balance and government debt, 2012



Notes: Countries ranked by values for government budget balance as percent of GDP (left axis).
Source: European Commission, IMF.

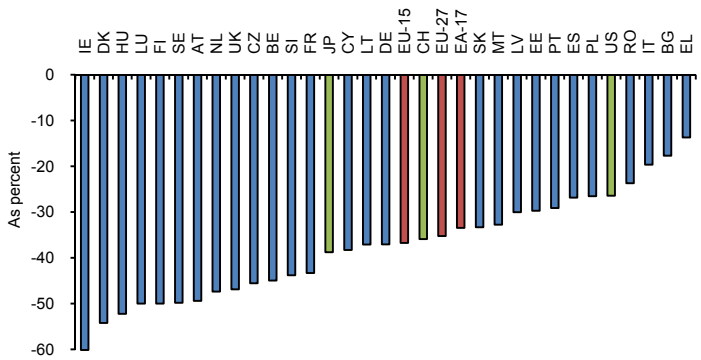
Current account balance, 2011



Source: IMF, OECD, OeNB.

Figure VIII **New perspectives outcomes, further indicators: Social pillar**

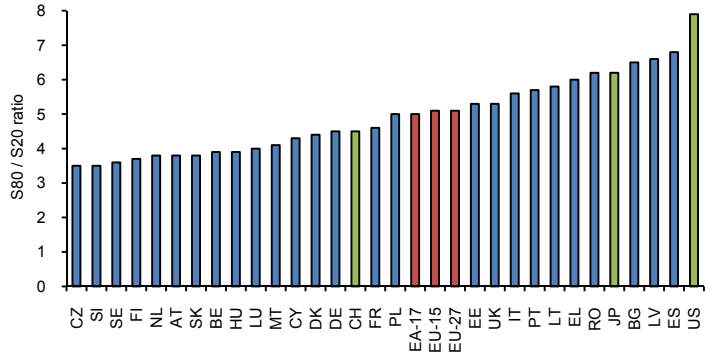
Poverty reduction by social transfers, 2011



Notes: Comparison between at-risk-of-poverty rates before and after social transfers; data for Japan 2009, for the US 2010.

Source: Eurostat, OECD.

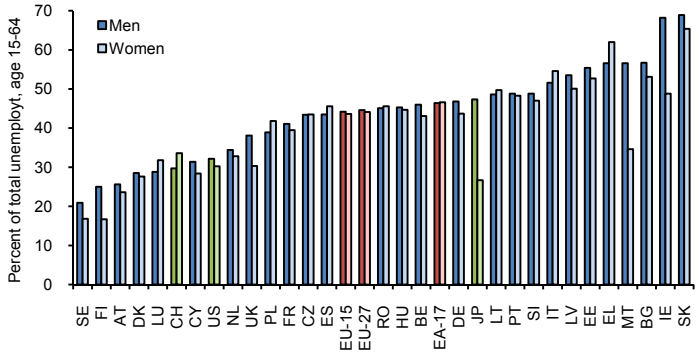
Ratio of top vs. bottom income quintiles (S80/S20), 2011



Notes: The S80/S20 income quintile share ratio is the share of all income received by the top quintile divided by the share of the first quintile; data for Japan 2009, for the US 2010.

Source: Eurostat, OECD.

Long-term unemployment as percent of total unemployment, 2012

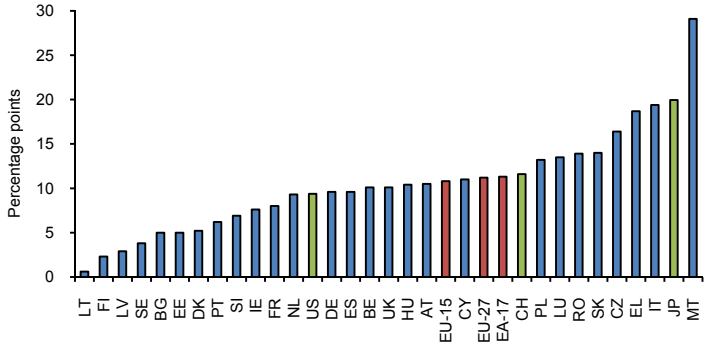


Notes: Long-term unemployment refers to unemployment spells of 12 months' duration or longer. Countries ranked by percentage of male long-term unemployed in the total unemployed population aged 15 to 64 years. Data for the USA and Japan cover 2011.

Source: Eurostat, OECD.

Figure VIII **Continued**

Employment gender gap, 2012

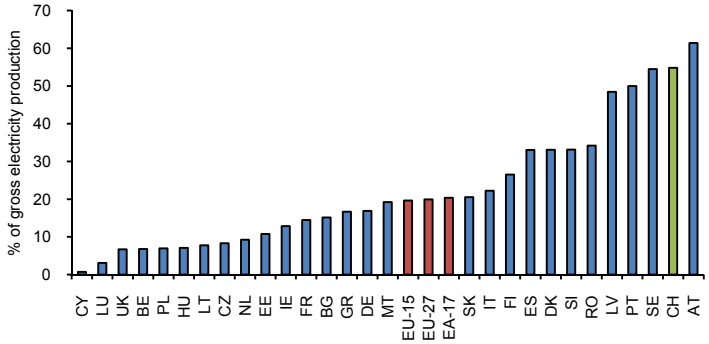


Notes: The employment gender gap is defined as the difference in percentage points between the male and female employment rates in the age group 15-64 years. Data for the USA and Japan cover 2011.

Source: Eurostat, OECD.

Figure IX **New perspectives outcomes, further indicators: Ecological pillar**

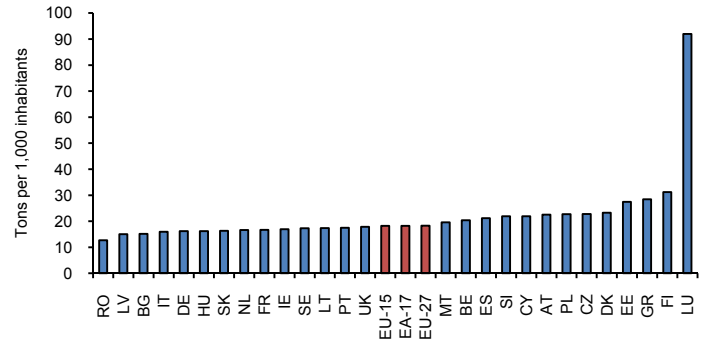
Electricity produced from renewable energy sources, 2010



Notes: Euro in current prices. CO2 emissions from fuel combustion relative to GDP at PPS. Total Primary Energy Supply relative to GDP at PPS.

Source: Eurostat.

NOx emissions per 1000 inhabitants, 2010



Source: Eurostat.

Table II **List of indicators in sections 3 to 6**

Note: Indicators in italics (16) are dropped following principal components factor analysis

No.	Indicator name	Units	Source	Years available
PRICE COMPETITIVENESS				
1	Compensation per employee, total economy	2005 euros	AMECO	2000-2010
2	Compensation per employee, manufacturing			
3	GDP per person employed, total economy			
4	GDP per hour worked, total economy			
5	GVA per person employed, manufacturing			
6	Unit labour costs nominal, total economy: compensation per employee (current prices) / GDP per person employed (constant prices)	Percent		
7	Unit labour costs real, total economy: compensation per employee (current) / GDP per person employed (current)			
8	Unit labour costs real, manufacturing: compensation per employee (current) / GVA per person employed (current)			
Note: Unit labour cost definitions according to AMECO database				
ECONOMIC STRUCTURE - VALUE ADDED SHARES + EXPORT SHARES				
9	Share of technology-driven industries in total manufacturing value added	Percent	Eurostat (Structural Business Statistics), WIFO taxonomies, WIFO calculations	2000-2008 (extrapolated to 2010)
10	Share of high-skill industries in total manufacturing value added			
11	Share of industries using knowledge-based services inputs in total manufacturing value added			
12	Share of industries with high RQE in total manufacturing value added			
13	Share of industries with high innovation intensity in total manufacturing + services value added			
14	Share of industries with high education intensity in total manufacturing + services value added			
15	Share of technology-driven industries in total manufacturing exports		EU (Comext, EBOP), UN (Comtrade), IMF (BOP), WIFO taxonomies and calculations	2000-2010
16	Share of high-skill industries in total manufacturing exports			
17	Share of industries using knowledge-based services inputs in total manufacturing exports			
18	*Share of industries with high RQE in total manufacturing exports*			
Note: Shares of industries with high innovation and education intensity in total manufacturing and services exports, and shares of eco-industries and renewables in total exports were excluded as they are available only from 2003/4 onwards. RQE stands for revealed quality elasticity.				
CAPABILITIES - INNOVATION+EDUCATION				
19	Tertiary educational attainment in the population aged 25-64	Percent	Eurostat, OECD	2000-2010 (some interpolated)
20	R&D expenditure in the public sector as share of GDP (GOVERD+HERD)			
21	R&D expenditure in the private sector as share of GDP (BERD)			
22	Patent applications to the European Patent Office	GDP in 2005 PPS		
23	*Higher education (ISCED5-6) graduates from maths, science and technology (MST) programmes as share of population aged 20-29*	Percent		
24	Total public expenditure on tertiary education as share of GDP			
25	*Total public expenditure on pre-primary education as share of GDP*			
26	*Participants in early education (4-years-old to starting age of compulsory education)*	Percent of age group		
27	*Students in upper secondary education with vocational orientation (ISCED 3-VOC) as share of all students at ISCED level 3*	Percent		
28	*Women among students in ISCED 5-6 as share of all students at this level*			
29	Share of the population aged 25-64 participating in education and training (lifelong learning)			
CAPABILITIES - SOCIAL SYSTEM				
30	Public expenditure on active labour market policies as share of GDP	Percent	Eurostat, OECD	2000-2010 (some interpolated)
31	Social protection benefits as share of GDP: sickness & health care			
32	Social protection benefits as share of GDP: disability			
33	Social protection benefits as share of GDP: family & children			
34	Female labour force participation in the age group 15-64			

Table II **Continued**

No.	Indicator name	Units	Source	Years available
	CAPABILITIES - INSTITUTIONS			
35	*Labour market deregulation index*	Index scores (0 to 10)	Economic Freedom of the World Database, Frazer Institute	2000-2010, interpolated
36	Business deregulation index			
37	Voice and accountability	Index scores (-2.5 to 2.5)	Worldwide Governance Indicators, World Bank	
38	Regulatory quality			
39	Rule of law			
40	Control of corruption			
	Note: Trust in government and parliament excluded since data only available from 2004 onwards.			
	CAPABILITIES - ECOLGICAL			
41	*Energy dependence: share of oil/gas imports in GDP*	Percent	Eurostat, OECD, IEA	2000-2010 (some interpolated)
42	Municipal waste generation	kg / GDP		
43	Recycling rates for packaging waste as share of total packaging waste	Percent		
44	*Environmental tax revenues as share of GDP*			
45	Share of organic farming as share of total land area used for farming			
46	*Share of environment-related technology patents (WIPO definition) in total patent applications to the EPO*			
	Note: Implicit tax rate on energy and environmental expenditure + investment as share of GDP excluded due to insufficient data availability.			
	OUTCOME INDICATORS - TRADITIONAL			
47	GDP per capita	2005 PPS	Eurostat, OECD	2000-2010
48	Employment rate in the population aged 15-64	Percent		
49	Unemployment rate as share of active population of all ages			
50	*Budget deficit as share of GDP*		EC, IMF, OECD, OeNB	
51	*Gross national debt as share of GDP*			
52	Current account balance as share of GDP			
	OUTCOME INDICATORS - NEW PERSPECTIVES - INCOME PILLAR			
47	GDP per capita	2005 PPS	AMECO, Eurostat	2000-2010 (some interpolated)
53	Net national income per capita			
54	Net disposable household income per capita			
55	Household final consumption expenditure per capita			
	OUTCOME INDICATORS - NEW PERSPECTIVES - SOCIAL PILLAR			
56	At-risk-of-poverty rate after social transfers in the total population	Percent	Eurostat, OECD	2000-2010 (some interpolated)
57	At-risk-of-poverty rate in the population aged 65 years or over			
58	Impact of social transfers: Comparison between at-risk-of-poverty rate before and after social transfers (total): % reduction			
59	S80/S20 income quintile share ratio	Ratio		
60	Gini coefficient of equivalised disposable income	Index score (0 to 1)		
61	*Long-term unemployment (12 months +) as share of total unemployment, age 15-64*	Percent		
62	Youth unemployment rate			
63	*Employment gender gap*: difference between the male and female employment rates in the age group 15-64 years	Percentage points		
	OUTCOME INDICATORS - NEW PERSPECTIVES - ECOLOGICAL PILLAR			
64	Resource productivity: GDP per kg of domestic material consumption	GDP / kg	Eurostat, AMECO, IEA	2000-2010
65	CO2 intensity: tons of CO2 emissions from fuel combustion per GDP	Tons / GDP PPP		
66	Energy intensity: terajoule of total primary energy supply per GDP	TJ / GDP PPP		
67	*Share of electricity production from renewable energy sources*	Percent		
68	*NOx emission intensity*	Tons / 1000 inhabitants		

Table III **Scale transformation of indicators in section 8**

Note: As in Table II, indicators in italics (15) are dropped following principal components analysis

Log transformation:

No.	Indicator name
5	GVA per person employed, manufacturing
22	Patent applications to the European Patent Office
29	Share of the population aged 25-64 participating in education and training (lifelong learning)
32	Social protection benefits as share of GDP: disability
36	Business deregulation index
41	*Energy dependence: share of oil/gas imports in GDP*
46	*Share of eco-innovations in total patents as share of total PCT patent applications*
47	GDP per capita
49	Unemployment rate as share of active population of all ages
64	Resource productivity

Square-root transformation:

13	Share of industries with high innovation intensity in total manufacturing + services value added
21	R&D expenditure in the private sector as share of GDP (BERD)
23	*Higher education (ISCED5-6) graduates from maths, science and technology (MST) programmes as share of population aged 20-29*
30	Public expenditure on active labour market policies as share of GDP
45	Share of organic farming as share of total land area used for farming
53	Net national income per capita
57	At-risk-of-poverty rate in the population aged 65 years or over
59	S80/S20 income quintile share ratio
62	Youth unemployment rate
63	*Employment gender gap*
66	Energy intensity (total primary energy supply per GDP)
67	*Share of electricity production from renewable energy sources*

Inverse square-root transformation:

17	Share of industries using knowledge-based services inputs in total manufacturing exports
42	Municipal waste generation
65	CO2 intensity (CO2 emissions from fuel combustion per GDP)
68	*NOx emission intensity*

Note: To obtain correct indicator orientation, the z-scores are also negated due to inverse - except for last three where inverse yields correct orientation

Inverse transformation:

11	Share of industries using knowledge-based services inputs in total manufacturing value added
24	Total public expenditure on tertiary education as share of GDP
44	*Environmental tax revenues as share of GDP*

Note: To obtain correct indicator orientation, the z-scores are also negated due to inverse

Square transformation:

8	Unit labour costs real, manufacturing: compensation per employee (current) / GVA per person employed (current)

Cubic transformation:

34	Female labour force participation in the age group 15-64

Table IV **Overview of factor analysis results: Properties of first common factors**

	Eigenvalue	Proportion of variance explained	Average SMC	Overall KMO	Alpha
Price competitiveness	5.31	0.66	0.79	0.81	0.91
Wages	1.97	0.98	0.94	0.50	0.98
Economic structure	4.85	0.54	0.68	0.74	0.89
Capabilities total	3.05	0.76	0.66	0.80	0.89
Innovation+Education	4.48	0.50	0.59	0.82	0.85
Social system	2.92	0.58	0.41	0.82	0.81
Institutions	4.07	0.81	0.77	0.89	0.94
Ecological ambition	1.81	0.60	0.25	0.63	0.67
Traditional outcomes	2.47	0.62	0.48	0.66	0.77
NPO - Income pillar	3.86	0.97	0.96	0.80	0.99
NPO - Social pillar	3.83	0.64	0.73	0.75	0.87
NPO - Ecological pillar	2.24	0.75	0.48	0.72	0.82

Notes: NPO is short for "new perspectives outcomes". SMC is the squared multiple correlations statistic, which is available for each indicator in the group; we report the average. KMO is the Kaiser-Meyer-Olkin measure of sampling adequacy. *Kaiser* (1974) suggests the following categorisation of KMO values: 0.90 to 1 - "marvellous", 0.80 to 0.89 -"meritorious", 0.70 to 0.79 - "middling" and 0.60 to 0.69 - "mediocre". Alpha stands for Cronbach's alpha, a measure of internal consistency. To interpret it, one rule of thumb suggests that values above 0.90 are "excellent", between 0.70 and 0.89 "good" and 0.60 to 0.69 "acceptable". However, the statistic is not robust to the number of indicators, so it should be interpreted with caution.

Source: WIFO calculations.

Table V **Summary statistics and correlation matrix of composite indicators**

Summary Statistics

Composite indicator	Mean	Std. Dev.	Min	Max
Price Competitiveness	0.014	0.196	-0.459	0.696
Wages	-0.185	1.060	-1.816	1.308
Structure	0.100	0.775	-1.405	1.933
Capabilities	0.160	0.701	-1.358	1.639
Innovation/Education	0.184	0.788	-1.514	1.966
Capabilities: Social	0.130	0.757	-1.383	1.990
Capabilities: Institutions	0.007	0.818	-2.153	1.525
Capabilities: Ecological	0.392	0.777	-1.502	1.883
Traditional outcomes	0.142	0.733	-1.559	1.674
New perspectives outcomes	0.107	0.666	-1.449	1.276
NPO: Income	0.262	0.874	-1.768	2.480
NPO: Social	-0.147	0.925	-2.397	1.405
NPO: Ecological	0.209	0.823	-2.077	1.616

Notes: 297 observations (27 countries, 11 years)

Table V **Continued**

Correlation matrix

	Price Competitiveness	*Wages*	***Structure***	***Capabilities***	*Innovation/ Education*	*Capabilities: Social*	*Capabilities: Institutions*	*Capabilities: Ecological*	***Traditional outcomes***	***New perspectives outcomes***	*NPO: Income*	*NPO: Social*	*NPO: Ecological*
Price Competitiveness	1												
Wages	-0.706***	1											
Structure	0.652***	-0.695***	1										
Capabilities	0.582***	-0.846***	0.601***	1									
Innovation/Education	0.492***	-0.791***	0.615***	0.960***	1								
Capabilities: Social	0.489***	-0.768***	0.457***	0.938***	0.880***	1							
Capabilities: Institutions	0.685***	-0.832***	0.741***	0.897***	0.852***	0.769***	1						
Capabilities: Ecological	0.361***	-0.556***	0.213***	0.702***	0.583***	0.612***	0.453***	1					
Traditional outcomes	0.700***	-0.846***	0.658***	0.833***	0.774***	0.719***	0.857***	0.556***	1				
New persp. outcomes	0.734***	-0.870***	0.719***	0.805***	0.725***	0.718***	0.820***	0.555***	0.849***	1			
NPO: Income	0.799***	-0.901***	0.685***	0.735***	0.642***	0.601***	0.787***	0.567***	0.850***	0.888***	1		
NPO: Social	0.309***	-0.391***	0.351***	0.552***	0.530***	0.567***	0.461***	0.362***	0.494***	0.634***	0.301***	1	
NPO: Ecological	0.605***	-0.737***	0.641***	0.573***	0.500***	0.485***	0.657***	0.351***	0.623***	0.796***	0.778***	0.111*	1

Notes: 297 observations (27 countries, 11 years); *** and * indicate significance at the 1 percent and the 10 percent levels respectively.

Table VI **OLS regressions: New perspectives outcomes vs. price, structure, capabilities**

Table 4 columns (ii) and (vii), introducing sub-components of capabilities separately

Dependent variable: NPO_{it} (Standard errors)	(i) **OLS** (robust)	(ii) **OLS** (robust)	(iii) **OLS** (robust)	(iv) **OLS** (robust)	(v) **OLS ex LU** (robust)	(vi) **OLS ex LU** (robust)	(vii) **OLS ex LU** (robust)	(viii) **OLS ex LU** (robust)
$Price_{i,t-1}$								
$Wages_{i,t-1}$					-0.329**	-0.270***	-0.311**	-0.307**
					(0.126)	(0.092)	(0.118)	(0.112)
$Structure_{i,t-1}$	0.382***	0.428***	0.199*	0.544***	0.210*	0.260**	0.149	0.287**
	(0.105)	(0.090)	(0.111)	(0.081)	(0.120)	(0.115)	(0.104)	(0.125)
$Capabilities_{i,t-1}$								
$InnoEdu_{i,t-1}$	0.383***				0.142			
	(0.096)				(0.131)			
$Social_{i,t-1}$		0.438***				0.214**		
		(0.089)				(0.083)		
$Institutions_{i,t-1}$			0.529***				0.212*	
			(0.098)				(0.111)	
$Ecological_{i,t-1}$				0.395***				0.180*
				(0.077)				(0.102)
R^2	0.656	0.726	0.717	0.715	0.785	0.800	0.794	0.802
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	No	No	No	No	No	No	No	No
Country number	27	27	27	27	26	26	26	26
Observations	270	270	270	270	260	260	260	260

Notes: Standard errors in all columns are robust to heteroskedasticity and serial correlation (Huber-White sandwich estimator of variance, with standard errors clustered on countries). ***, ** and * indicate significance at the 1 percent, the 5 percent and the 10 percent levels respectively. Constant terms and time dummies not reported.

Source: WIFO calculations.

Table VII **OLS regressions: Traditional outcomes vs. price, structure, capabilities**

Table 5 columns (ii) and (vii), introducing sub-components of capabilities separately

Dependent variable: TO_{it} (Standard errors)	(i) **OLS** (robust)	(ii) **OLS** (robust)	(iii) **OLS** (robust)	(iv) **OLS** (robust)	(v) **OLS ex LU** (robust)	(vi) **OLS ex LU** (robust)	(vii) **OLS ex LU** (robust)	(viii) **OLS ex LU** (robust)
Price$_{i,t-1}$								
Wages$_{i,t-1}$					-0.229**	-0.292**	-0.238***	-0.357***
					(0.095)	(0.118)	(0.082)	(0.102)
Structure$_{i,t-1}$	0.266***	0.388***	0.019	0.528***	0.121	0.205**	-0.014	0.228**
	(0.091)	(0.075)	(0.095)	(0.080)	(0.073)	(0.083)	(0.081)	(0.084)
Capabilities$_{i,t-1}$								
InnoEdu$_{i,t-1}$	0.564***				0.416***			
	(0.102)				(0.095)			
Social$_{i,t-1}$		0.516***				0.273**		
		(0.089)				(0.126)		
Institutions$_{i,t-1}$			0.749***				0.493***	
			(0.111)				(0.090)	
Ecological$_{i,t-1}$				0.449***				0.198**
				(0.088)				(0.088)
R^2	0.669	0.669	0.753	0.641	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	No	No	No	No
Country dummies	No	No	No	No	26	26	26	26
Country number	27	27	27	27	260	260	260	260
Observations	270	270	270	270	Yes	Yes	Yes	Yes

Notes: Standard errors in all columns are robust to heteroskedasticity and serial correlation (Huber-White sandwich estimator of variance, with standard errors clustered on countries). ***, ** and * indicate significance at the 1 percent, the 5 percent and the 10 percent levels respectively. Constant terms and time dummies not reported.

Source: WIFO calculations.

Table VIII **WG regressions: New perspectives outcomes vs. price, structure, capabilities**

Table 6 columns (ii) and (vii), introducing sub-components of capabilities separately

Dependent variable: NPO_{it} (Standard errors)	(i) **WG** (robust)	(ii) **WG** (robust)	(iii) **WG** (robust)	(iv) **WG** (robust)	(v) **WG ex LU** (robust)	(vi) **WG ex LU** (robust)	(vii) **WG ex LU** (robust)	(viii) **WG ex LU** (robust)
Price$_{i,t-1}$								
Wages$_{i,t-1}$					-0.311**	-0.297**	-0.296**	-0.335***
					(0.123)	(0.134)	(0.129)	(0.100)
Structure$_{i,t-1}$	-0.034	-0.034	-0.029	-0.035	0.029	0.039	0.035	0.031
	(0.058)	(0.067)	(0.058)	(0.049)	(0.069)	(0.077)	(0.069)	(0.057)
Capabilities$_{i,t-1}$								
InnoEdu$_{i,t-1}$	0.070				0.110			
	(0.115)				(0.114)			
Social$_{i,t-1}$		0.031				-0.011		
		(0.129)				(0.100)		
Institutions$_{i,t-1}$			0.020				0.029	
			(0.085)				(0.078)	
Ecological$_{i,t-1}$				0.140**				0.170***
				(0.057)				(0.053)
R^2	0.978	0.978	0.978	0.979	0.979	0.978	0.978	0.980
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country number	27	27	27	27	26	26	26	26
Observations	270	270	270	270	260	260	260	260

Notes: Standard errors in all columns are robust to heteroskedasticity and serial correlation (Huber-White sandwich estimator of variance, with standard errors clustered on countries). ***, ** and * indicate significance at the 1 percent, the 5 percent and the 10 percent levels respectively. Constant terms and time dummies not reported.

Source: WIFO calculations.

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Project Information

Welfare, Wealth and Work for Europe

A European research consortium is working on the analytical foundations for a socio-ecological transition

Abstract

Europe needs change. The financial crisis has exposed long-neglected deficiencies in the present growth path, most visibly in the areas of unemployment and public debt. At the same time, Europe has to cope with new challenges, ranging from globalisation and demographic shifts to new technologies and ecological challenges. Under the title of Welfare, Wealth and Work for Europe – WWWforEurope – a European research consortium is laying the analytical foundation for a new development strategy that will enable a socio-ecological transition to high levels of employment, social inclusion, gender equity and environmental sustainability. The four-year research project within the 7th Framework Programme funded by the European Commission was launched in April 2012. The consortium brings together researchers from 33 scientific institutions in 12 European countries and is coordinated by the Austrian Institute of Economic Research (WIFO). The project coordinator is Karl Aiginger, director of WIFO.

For details on WWWforEurope see: www.foreurope.eu

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WWWFOR EUROPE
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	Institute for Financial and Regional Analyses	GEFRA	Germany
	Goethe University Frankfurt	GUF	Germany
	ICLEI - Local Governments for Sustainability	ICLEI	Germany
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