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2004:15

Comparing welfare of nations

Department of Economic Statistics

Avdelningen för Ekonomisk statistik

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Foreword

The unit for Economic Analysis at the Department of Economic Statistics, Statistics Sweden is newly founded. The main objective of Economic Analysis at Statistics Sweden is to improve economic statistics through analysis, and by developing differrent kinds of measurements of economic activities and development, and by giving information in order to increase the use and understanding of what is measured and how to interpret economic statistics. All this is done in close cooperation with other units within Statistics Sweden. This study is part of the analysis activity. Its subject is composite indicators, a much used and discussed statistical tool. The objective is to show how this tool can be used to increase the understanding of a complex reality. This report focuses on the analysis itself and not on the facts and figures.

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1 Comparing apples and oranges

The following report is an attempt to show how a complex reality can be illustrated using different statistical methods. The purpose of this report is not to exhibit the actual results of analysis, but rather to show the methods used to arrive at those results. The example chosen for analysis is a comparison of the level of welfare in OECD countries and the efficiency of these countries to create a high economic standard and welfare for their citizens.

Because welfare is an extremely ambiguous concept, it is very difficult to measure. There are no given answers on the meaning of the concept of welfare, nor any explanations on how to measure it. Attempts to do so are thus much debated.

In this report, welfare has consistently been described as a multifaceted concept. The common concept gross domestic product, GDP, is difficult to calculate, because we must combine measures for activities that are difficult to compare. These activities include services and goods that are sold on a market compared with goods and services that more or less are distributed freely. Nevertheless, these measures have a common yardstick called money. However, welfare is another matter. Its components cannot be measured with the same yardstick.

In order to compare these more complicated concepts, a composite indicator has been created. Although this method is rather controversial, it has been applied increasingly. And in fact, GDP itself is also a composite indicator.

In simple terms, a composite indicator is a way of putting apples and oranges together in order to decide which fruit basket is the most attractive. But this indicator can be problematic. For example, to someone who only likes grapes, it doesn't matter how many apples and oranges there are in the baskets.

Furthermore, many statisticians also believe that only single variables can be reported in a satisfactory way. But neither decision-makers nor the general public wants a report that looks like a huge catalogue where variable after variable is listed page after page as a base for their understanding. Even though subjectivity is inevitable, they prefer to find out which fruit basket is probably the most interesting, rather than a list that states how many twenty or so different kinds of fruit each basket contains.

Understanding that we do not live in a perfect world but rather that compromises are often necessary, OECD and the EU have begun a joint development project to design a manual to reduce the disadvantages of the methods[1] on how to create a composite indicator. The analysis presented here is similar to their preliminary recommendations. Even if these recommendations are followed, one must be aware that a composite indicator can only give an overall picture of a phenomenon, and thus can only be used as a point of departure for a more detailed analysis.

In this analysis, the composite indicator that is created is an attempt to measure welfare in the OECD countries. A sensitivity analysis of this chosen example has been conducted to study how the results are affected if certain partial components and extreme values are excluded. In addition, the significance of different valuations of variables is tested.

The correlations between these components have also been studied, as well as the correlations between them and the measurement of welfare. A composite indicator for the input has also been created. The significance of different valuations of the various inputs for the ranking of the countries has been studied for this index as well. The ability of the input indicator, and the factors that are included in it, to

[1] See www.oecd.org/sti/micro-policies or http://farmweb.jrc.cec.eu.int/ci.

explain the differences between countries in economic standard and welfare has also been tested. Finally, it has been studied which countries are most effective in creating economic standards and welfare, respectively.

Even if the purpose of the analysis is to illustrate how, with the help of different statistical techniques, a comparison of complex conditions between countries can be done, a number of interesting results have also emerged. Among these findings, the choice between leisure time and work on a national level is one of the large differences among OECD countries. Another is the relatively limited difference in ranking of countries that different valuations of welfare factors result in. Further, the ability of input factors to explain economic standard and respectively the inability concerning welfare is striking. The list of countries shown to be most effective in creating economic standard and welfare is also somewhat surprising.

1.2 Economic standard

This section discusses an appropriate measure for economic standard. Here it is argued that GNI is a better measure of a country's economic standard than GDP. Although differences are small for most countries, Ireland is a clear exception with a relatively average GNI and an overblown GDP.

The pursuit of happiness is a natural goal for humans. Their collective efforts via the political system in democracies of the world aim to ease these efforts and reduce human suffering when people are victims of hardship. Material resources are of great importance, both regarding individuals and the whole population. This is reflected, among other ways, in the different categories which nations are often divided into according to the economic resources at hand.

Comparisons of the standard of living in different countries have traditionally been made by comparing production results or use of these, e.g. the gross domestic product, GDP. Calculating GDP per inhabitant, or in other words, GDP per capita, has enabled comparisons between large and small countries.

In principle, production results can be used for consumption today or at a later point in time. To secure consumption possibilities in the future, resources are needed for investment. If resources set aside cannot replace today's production system consisting of machinery, buildings, communications or other things, future consumption possibilities will be reduced. On the other hand, room for future consumption will increase if resources set aside are sufficient to enlarge the production system.

Even in economies where countries exchange goods and services with each other, production and use balance each other. The country produces goods for export and consumes imported goods. In principle, temporary surpluses or deficits are balanced over the years. The advantage of exchanging goods and services with other countries is that a country can specialise in what they are best at, in relative terms, and trade those goods with goods that other countries have specialised in. By doing so, consumption will be higher than if the country produced everything by itself. The more imported goods consumers can obtain by producing export goods with a certain amount of effort, the more possibilities for consumption for that particular country. As with all trade, the object is to buy cheaply and sell at a high price.

But in order to get a picture of the actual income level of a country, we need to consider the flows of income from work and capital that pass the country's borders. Besides GDP, the concept of gross national income includes the net of four flows; return on capital entering the country, return on capital leaving the country, income from work coming in and income from work going out. This concept also includes tax payments and subsidies from international organisations. These sums are relatively large within the EU group.

When an enterprise or an individual of a country has invested in activities in other countries, either in the form of whole enterprises or separate shares, income in the form of return on capital flows into the country. This income can then be invested or consumed in that country. Likewise, other countries demand return on capital for that which has previously been invested in a country. This reduces a country's access to its own production results and thereby its income.

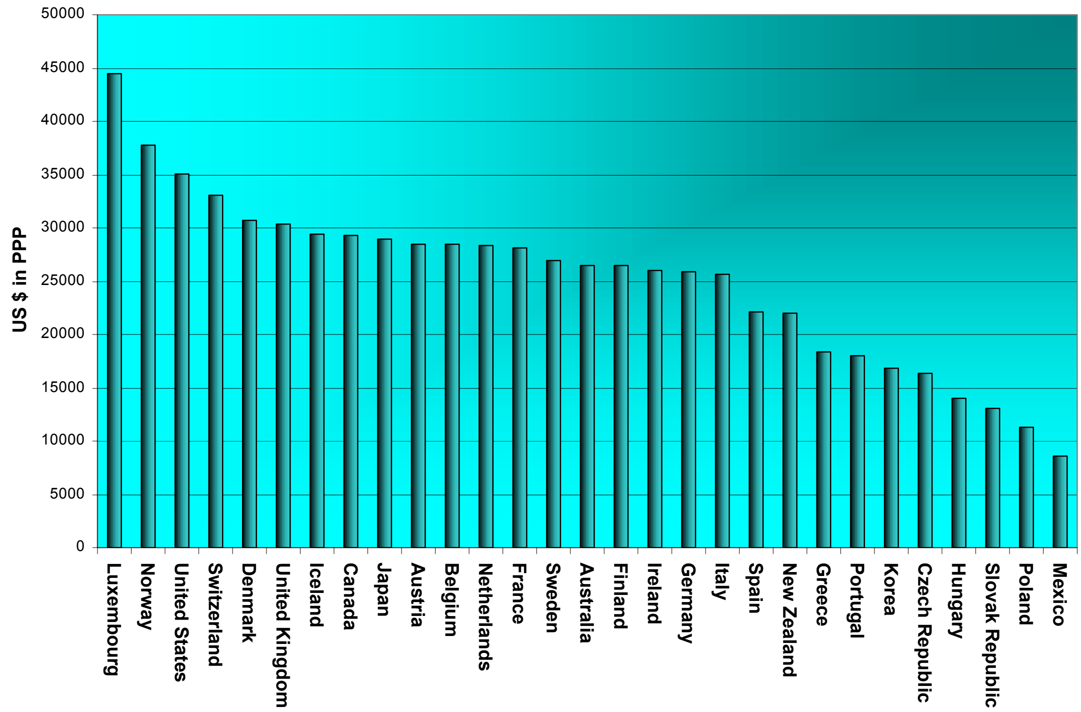
If a country has a net inflow of capital over a number of years in a row, that country must then give up a considerable share of its production results, the country's GDP, to other countries. The other side of the coin is a very strong probability of a considerably higher GDP than otherwise expected for that country. In most cases, these investments have created production that is much larger than it otherwise would have been, allowing for both payments to investors as well as larger consumption opportunities for the country itself.

The difference between direct investments and portfolio investments lies in their purpose. Does the investor want to influence activities, or does he/she merely want to invest in shares or bonds without any influence? These two types of investments give completely different flows of return on capital in the GNI terms. Direct investments are defined as investments that give at least a 10 per cent share of ownership in an enterprise, while other investments are normally considered as portfolio investments. In the case of direct investments, the entire gross profit is reported as an income flow for the investing country. Accordingly, that which has been reinvested in the enterprise in the form of replacement investments, new investments and other retained funds in the enterprise is reported as new investments. As a result, the flow of return on capital is very large in relation to investments.

However, in GNI terms, portfolio investments only result in capital flow that corresponds to direct returns in the form of dividends and interest. Capital gains, if any, are not reported, even if they have been realised and the profit has been sent home to the particular country. However, interest payments as a result of borrowing to finance the deficit in the balance of current payments are included in the GNI measure.

Regarding the group of employees, individuals receiving payment from other countries or international organisations for their work create monetary flows over borders that affect resources in different countries. Employees could be receiving payment from foreign employees because they have worked in a country for only a short time and take the income with them to their own country, consuming it there. Temporary assignments for clients in other countries also increase income in the country inhabited by the clients. Employees may also work for international organisations, and their salaries create an inflow in that country where they reside.

Figure 1
GNI per capita in PPP, 2002



Source: OECD and EUROSTAT

People living in border regions or who are long-distance commuters and are taxed in a country other than where they are employed is another category that supplies their home country with income. However, income is not reported as an income flow that affects GNI if people from developing countries settle in industrial countries and send part of their income back to relatives in their old home country. This income is reported as transfer payments in the same way as the considerably smaller flows that are generated by foreign aid donated by wealthy countries. This means that, in certain cases, transfers actually affect room for consumption for the population in a country, even if these transfers do not affect GNI measurement.

Figure 1 illustrates GNI levels for 29 countries in US dollars, adjusted by purchasing power. Besides Luxembourg, we see that Norway, USA and Switzerland have clearly higher GNI levels than other countries. Denmark leads the group of an entire 15 countries with an income between USD 25 000 and 30 000 per inhabitant. Sweden is relatively near the bottom of this group and has only a five per cent higher GNI level than Italy, the last country in this group. Spain and New Zealand are next in line with USD 22 000 per capita. Last on the list are eight countries in a steep downward curve starting with Greece at USD 18 000 and ending with Mexico at slightly more than USD 8 000 in GNI per capita, adjusted by purchasing power.

1.3 Economic resources are essential but other factors are also important for welfare

Despite having great bearing, opportunities for consumption are not the only thing of importance. Other factors are also valuable for the welfare of people. That is why a large number of organisations and researchers[2] have tried to include these factors in an expanded concept of welfare. The UN is one such organisation[3] where indicators for health and education have been included, while opportunities for consumption have been toned down. In these attempts to estimate welfare of nations, Sweden often is close to the top of the list. ***However, this article is not a new attempt in this tradition, but rather, as previously mentioned, similar to the report published by the Swedish Institute for Growth Policy Studies[4] at the end of 2003, focuses on comparing different methods to make these types of comparisons.***

1.4 Work is not everything

This section tries to assess the existing labour input in the different countries by determining how much has been set aside for leisure time in the form of shorter work weeks, longer holiday leave, early retirement, housewives and other reasons that people of working age are not part of the labour force. Of employed persons, Koreans take the lead by far in working the most hours per year, and the Icelanders have the highest proportion of people of working age that are employed. However, people from Netherlands, Italy and France have on the whole chosen to give up a significant share of their potential economic standard by using a large share of this potential in leisure time.

In the early 1900s, the most important demand from unions was to reduce daily working time to 8 hours, their slogan being: ***"8 hours work, 8 hours rest and 8 hours sleep"***. But in today's society, work is emphasised as an increasingly important factor for well being and social relationships. Work has now changed character, and today includes many social contacts and interactions for a great number of people. Colleagues are thus more and more important, and more time is spent together with them than with friends, and sometimes even more than they spend with their family. Many now live for their work, instead of working to make a living.

This is probably most true for young and well-educated people. This phenomenon was under a lot of discussion in connection with the IT boom some years ago. However, soon it was seen that these very engaged people who enjoyed working long hours could be caught in what was known as the honey trap, being pushed to the limit and burned out by their workload, as the expressions were. These people found their work so stimulating that they did not take time to rest and do anything else but work, in order to have energy in the long run.

One of the most discussed problems in today's Swedish society is actually the large share of the labour force that is on long-term sick leave. However, most of those on long-term sick leave are not IT experts but rather employees from the public sector working with healthcare and care of children and elderly people. According to recent reports, an important cause of this, besides a lack of economic incentives, is constant re-organisation that has particularly affected those working in the public healthcare sector.

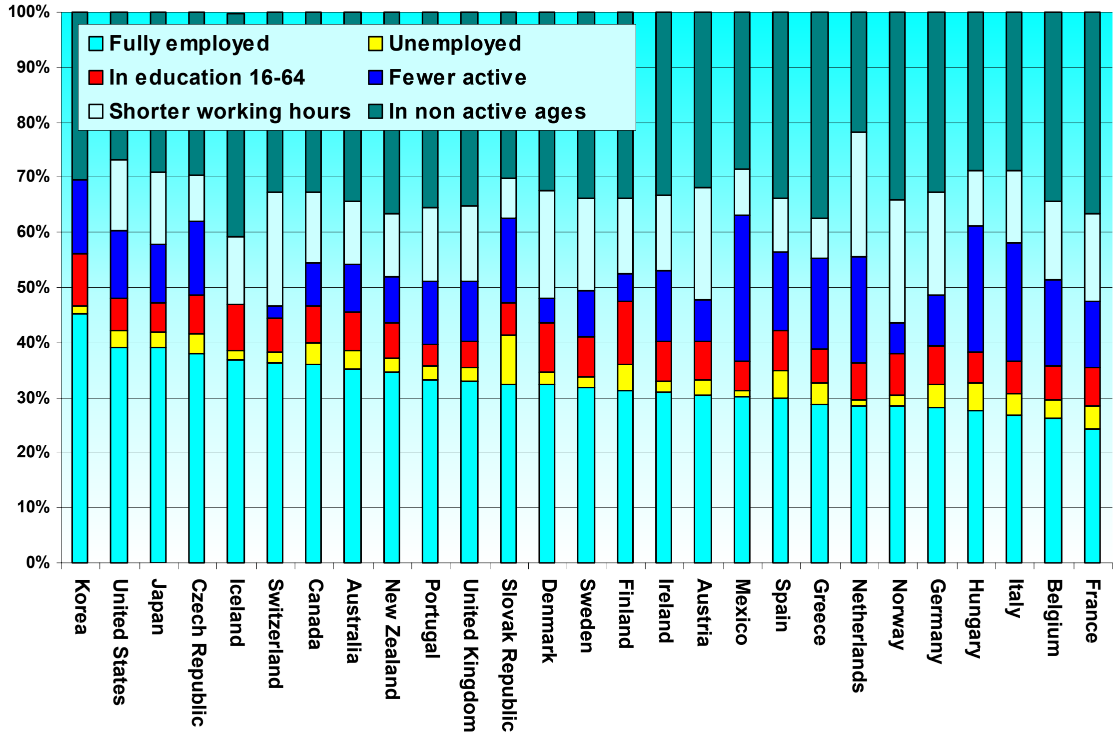
At the same time, many have more or less willingly entered early retirement due to labour market reasons, while others have chosen themselves to retire before reaching the statutory retirement age of 65. This has resulted in a drop in the actual retirement age in Sweden from 65 to around 60. Moreover, there have been lengthy

[2] One such example is described in the article "SCB: Välfärd och ofärd på 90-talet. Rapport 100 i serien Levnadsförhållande." EUROPEAN SOCIAL DEVELOPMENT TRENDS, Development Challenges of the "New Europe" by Richard Estes I (University of Pennsylvania)
[3] UNDP, 2004, Human Development Report 2004; "Cultural liberty in today's diverse world" United Nations Development Programme, New York.
[4] ITPS: A2003:012 "Swedish Growth and Welfare in Perspective" by Hans-Olof Hagén, Michael Olsson, Anders Wiberg and Kurt Lundgren

discussions about reduced working time in parallel with the debate on how to solve the crisis that will arise when those born during the 1940s retire.

One conclusion is that leisure time is a sought-after quality of life, as is work. However, leisure time reduces production opportunities. Thus, leisure time must be evaluated taking into consideration the resulting reduced consumption potential. Therefore, in this example the time that the generation of working age people do not work values as a positive quality of life, with the exception of unemployment and studies. Here, unemployment has been valued as a sacrifice equal to working. Normally, the burden on most people is much larger, but in this case it is a question of counting people, not evaluating suffering. Another group that is fully engaged but not employed consists of full time students. This group is especially dominated by the youngest age groups, since the working age population is defined as consisting of people between 16 and 64 years of age.

Figure 2
The population split into different groups



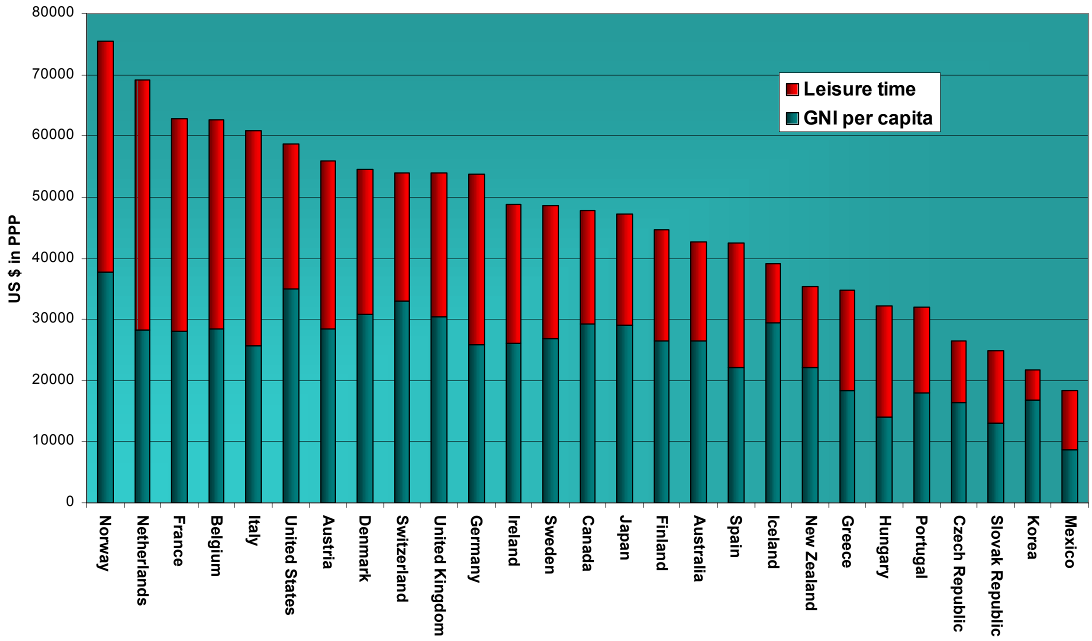
Sources: OECD and EUROSTAT. National Accounts and Education Statistics

However, it is not only the number of non-working persons in the working age population that differs between countries. Another significant difference is the actual working time of employed people. The difference in average working time of employed people in each country and in Korea, which has by far the longest average working time, has been translated to full-time employees (according to a Korean yardstick).

Figure 2 illustrates the considerable differences between OECD countries in the share of the population that is *not* of working age. This figure also shows those of working age, split into the groups that were earlier mentioned, as shares of the population in each country. However, because the share of those in education is taken from education statistics, there are some double calculations, since those who study but actually want to work are also included as unemployed, and also because some of those who study also work.

If the share of those who are of working age and who are employed or studying was equally as high in all countries as in Iceland, and all employed people were to work as much as those in Korea, the number of hours worked would drastically increase in nearly all countries. If all this time was put into production, a significantly higher production level should be the result. However, it is questionable if it is possible to work as many hours per employed person as in Korea, if an equally large share of those in active ages work as in Iceland.

Figure 3
Potential and actual GNI per capita, given constant productivity levels with an increased number of worked hours per person 16–64



Source: OECD, EUROSTAT and own calculations.

If this is plausible and the assumption is fulfilled that productivity would be the same as now, even if this untapped resource of potential working time was used for work, it would be possible to estimate a potential GNI. The difference between actual and potential GNI is then a measure of how much consumption has been chosen to be used as leisure time. This leisure time is naturally not the sum of individual choices, but rather an expression of how society has been organised.

Obviously, the assumption that productivity would be the same is unrealistic – those who are not included in the labour force are hardly as productive as those who are. If, for example, the labour market was organised as in the US so that a relatively large share of the labour force is employed, the average productivity would probably be lower than if the work input was limited to the degree as in the Netherlands.

This results in a somewhat biased comparison. For example, minimum wage levels in the Netherlands, Belgium and France have been set so high that a significant share of the less productive labour force is shut out from the labour market.

However, productivity is probably not affected by the difference in working frequency of women. It is also doubtful that the average productivity for those who have entered early retirement due to labour market reasons has been lower than average. According to a number of studies, this age group has a high level of productivity, except in the case of purely physical working duties.

However, it is not possible to conclude how much lower production would be on average, but it would probably only be about 20 to 30 per cent. As a result, the space for consumption that is illustrated as leisure time in figure 3 is overestimated in terms of production, but correct in terms of the labour force. Accordingly, the figure shows quite a good picture of how the choice between work and leisure time looks in the OECD countries.

The countries in the figure are ranked according to their potential GNI level. Norway does not only have the highest GNI level but also the highest potential GNI level. But significant reversals have occurred in the places immediately following Norway. The Netherlands, France, Belgium and Italy all have higher GNI potential than the US. However, this comparison is somewhat unjust as mentioned before. But when comparing countries that have the population that work most, Korea and Iceland, with the Netherlands, Italy, France and Hungary, the differences are dramatic. Korea and Iceland have a potential GNI that is only 30 per cent higher than the actual GNI, while the last-mentioned countries have a potential GNI that is more than twice the size of actual GNI.

Sweden's potential GNI is slightly above the average potential GNI, that is 80 per cent higher than the actual GNI.

1.5 What good is being rich if one is about to die?

This section discusses suitable indicators for health. According to the analysis of the selected indicators, Japanese women live longest, as do Icelandic and Japanese men. In addition, infant mortality is extremely high in Mexico, significantly so in the Czech Republic, but lowest in Japan.

However, other factors affect one's well being besides consumption space and leisure time. Not everything can be bought with money, even though economic resources are very important in many areas. Health is one of these other factors.

How to measure people's health is justifiably a debatable subject. However, nearly all illnesses and health aspects affect length of life. In principle, we can maintain that there is another dimension to health other than survival and that dimension is suffering. Many medicinal measures are primarily directed towards reducing patients' pain, and not towards extending their lives. Sometimes, the purpose is even limited to only increasing their comfort.

Of course, no international statistics exist on such a subjective occurrence as reduceing pain and increasing comfort, even if these occurrences would be of great significance for well being as well as for welfare. In addition, these measures most likely also increase length of life indirectly, just as many other factors that increase quality of life.

Besides average length of life for men and women, many people maintain that there is another variable that can illustrate other aspects of the state of health – namely, infant mortality. This measure is of course not independent of average length of life, as it has a direct effect. Nevertheless, infant mortality is an indicator of children's health and ambitions of health care of society in general, concerning both the level and distribution of health care.

Table 1
Indicators for health

	Life expectancy of females	Life expectancy of males	Infant morality per 1000 births
Australia	82.4	77.0	5.3
Austria	81.7	75.9	4.8
Belgium	80.8	74.6	5.0
Canada	82.0	76.7	5.3
Czech Republic	78.5	72.1	4.0
Denmark	79.0	74.3	4.9
Finland	81.5	74.6	3.2
France	83.0	75.5	4.6
Germany	80.7	74.7	4.5
Greece	80.7	75.4	5.9
Hungary	76.5	68.2	8.1
Iceland	82.2	78.1	2.7
Ireland	79.2	74.2	5.8
Italy	82.9	76.7	4.3
Japan	84.9	78.1	3.1
Korea	79.2	71.7	6.2
Mexico	76.8	71.9	22.4
Netherlands	80.6	75.7	5.3
New Zealand	80.8	75.7	5.8
Norway	81.4	76.0	3.8
Portugal	80.3	73.5	5.0
Slovak Republic	77.6	69.5	6.2
Spain	82.9	75.6	3.9
Sweden	82.1	77.5	3.7
Switzerland	82.8	77.2	4.9
United Kingdom	80.4	75.7	5.5
United States	79.5	74.1	6.9

As a result, all of these variables are included in many of the designs for welfare measurements, which nearly always include health. This example of welfare indicators has therefore included a health indicator where life expectancy of men and women and infant mortality have been included (see table 1). The average life expectancy for women seems to be relatively similar, and varies from 85 years in Japan to 68.8 in Mexico. The average life expectancy of men varies even less, since Icelandic and Japanese men live only 10 years longer than Czech men, and all others lie between these extremes. However, if we shift the perspective and only count time after age 65, a relatively common official retirement age, the differences are considerably greater. In all these countries, women consistently live longer than men. Thus you could say that this difference is a somewhat unusual measure of gender equality. According to the table, this difference is smallest in Iceland and largest in Hungary.

However, concerning infant mortality, the share of children who die before reaching age 1, the differences are greater even if we do not include Mexico's extremely high value. This is because Hungary's value is nearly three times that of Japan's.

1.6 The environment is also significant for welfare

This section discusses suitable indicators for the environment. The selected indicators show that the geographically large countries with heavy industry such as Australia, Canada and the US have by far the highest emissions of environmentally hazardous gases per inhabitant. However, New Zealand and the Czech Republic are at the other end of the scale.

In the end, the environment is also a question of survival and affects all aspects of health. But the effects on health may only be visible a relatively long time afterwards, so it is a good idea to also include the environment in the concept of welfare. The state of the environment will then be a kind of early warning of health aspects and the quality of life in the future. Besides, the threat of a worsening environment usually affects how we regard quality of life, long before it can be traced as an effect on length of life.

Besides health risks, a worsening environment can also deteriorate quality of life in other ways, while a good environment can be seen as quality of life in itself. All in all, it is preferable to include the environment in the design of this welfare indicator.

Many different environmental indicators exist, of which some measure the local environment and others the global environment. Optimally, the indicators for this analysis should only measure the national environment. But due to a lack of data, other environmental indicators that only measure the global situation, or both local and global effects, must be used. This is not necessarily a big problem, since it is highly likely that there is a clear correlation between how the local environment and the global environment are treated. It is a question of aspiration levels of environmental policy makers.

Good data is available for emissions of pollutants containing sulphur, nitrogen and carbon dioxide. Emissions of these three environmental threats are measured in number of tons per year and inhabitants, and have therefore been chosen as indicators of the environmental situation in each country.

Standardisation of indicators

The six basic variables for health and environment that have been chosen as an illustration in this example have all been standardised so that they vary between 0 and 100. The country with the lowest value of a variable has been given 0 as value, and the country with the highest value has been given 100.

The index for the country i = 100*((basic value for country i – basic value for the country with the lowest basic value)/(basic value for the country with the highest basic value – basic value for the country with the lowest basic value)).

The negative factors of emissions and child mortality have been reversed to positive indexes by turning the scale so that the country with the lowest emission has received a value of 100, and those with the highest have received 0.

Table 2 shows the standardised values for the three environment indicators and the standardised composite indicator for environment. Here we see a considerable spread with an extreme group making large contributions to the environmental load consisting of Australia, the US and Canada. Far from these countries we find the Netherlands and Japan. However, the differences between the other countries are much less significant, even though countries with the lowest environmental load such as New Zealand, the Czech Republic and Switzerland are clearly below the level of Sweden. Relatively normal values exist in Sweden, but the country also has much in common in geography and industrial structure with the extreme group, and may therefore be at a disadvantage due to the indicators chosen.

These two indices for health and environment have been aggregated to a total index for health and environment, respectively. All included factors have been given the same weights when aggregated. The choice to give life expectancy for men the same weight as for women almost goes without saying. The alternative would be to weigh with the share of each group in the population, but these differences are so small that they would not influence the results.

Table 2
Standardised indices

	Sulphur oxides	Nitrogen oxides	Carbon dioxide	Environ-ment
Australia	100	100	88	0
Austria	1	9	29	89
Belgium	18	19	50	72
Canada	83	63	79	23
Czech Republic	0	2	16	97
Denmark	24	22	51	69
Finland	7	6	42	83
France	1	22	36	82
Germany	38	19	21	75
Greece	12	27	48	72
Hungary	11	13	16	89
Iceland	52	20	28	68
Ireland	58	8	11	76
Italy	42	16	45	66
Japan	32	65	23	60
Korea	13	11	22	87
Mexico	23	9	35	79
Netherlands	3	22	94	60
New Zealand	9	0	0	100
Norway	2	12	45	82
Portugal	8	33	31	77
Slovak Republic	38	8	25	78
Spain	36	20	12	79
Sweden	32	10	23	80
Switzerland	3	13	10	94
United Kingdom	17	12	35	80
United States	64	59	100	23

By choosing the same weight on the indicator for infant mortality as for average life expectancy, we obtain a weight for average life expectancy that is twice as high. The reason in letting it weigh more is because it is the most important health variable. However, it is not necessary to give the indicator for infant mortality the same weight as the indicator for each life expectancy. These new composite indicators have been standardised in turn in the way described above.

In the same way, standardised variables have been obtained for economic standard and leisure time. Economic standard is measured as GNI per capita adjusted for the relative price level in each country (PPP adjusted[5]). As mentioned above, a country's standard concerning leisure time can be broken down into the share of the working age population that are not working, studying or are unemployed and that time which employed persons work less, compared to that country which has the highest number of hours worked per employed person. A country's leisure time is the sum of these two components that are then standardised in the same way as described for the other factors.

In this example, a total index has also been designed that weighs the different parts together to what is known as a welfare index. However, this index has not been standardised and only consists of an arithmetic mean of the incorporated components. This means that when constructing the index for welfare, equal weights have also been chosen for the incoming variables for economy, leisure time, health and environment. Like the weights in this example, the choice of the incoming variables

[5] PPP = Purchasing Power Parities is a way to compare price levels between countries. An explanation is available on OECD's website http://www.oecd.org/statsportal

is only a reasonable choice of many potential ones, but the overall purpose of this analysis is to illustrate the technique.

However, the equal weights for economic standard and leisure time are fairly evident since there is a clear situation of exchangeability between leisure time – work – production of goods and services – consumption of these. Weighing health and environment equally is reasonable since these factors are completely independent measures, both of significant weight. Finally, since these two areas are evaluated equally to the two areas economic standard–leisure time, we obtain an implicit equal evaluation of economic potential and other factors.

As already explained, it is easy to justify that even other significant factors for welfare such as gender equality etc should be included. Level of education is also sometimes included in welfare measures, since consumption possibilities increase with higher levels of education. This view is mainly relevant when comparing developing countries. Level of education can also appear to belong to the indicators for inputs, i.e. the resources a country uses to create welfare.

1.7 Differences in welfare not so great

This section presents the values of the welfare index for the different OECD countries. Norway is ranked on top followed by Switzerland, France, the Netherlands, Austria and Italy. However, the US and Canada are listed further down on the list.

Table 3
Welfare and its components[6]

	Economic standard	Leisure time	Health	Environ-ment	Welfare
Norway	100	67	74	82	81
Switzerland	84	43	83	94	76
France	67	72	78	82	75
Netherlands	68	100	66	60	74
Austria	68	63	73	89	74
Italy	58	85	83	66	73
Sweden	63	55	83	80	70
Belgium	68	77	64	72	70
United Kingdom	75	54	65	80	69
Japan	70	41	100	60	68
Germany	59	64	64	75	66
Spain	46	49	79	79	63
Ireland	60	60	53	76	62
New Zealand	46	35	66	100	62
Denmark	76	48	54	69	62
Finland	61	26	70	83	60
Iceland	71	3	88	68	58
Greece	33	54	64	72	56
Portugal	32	56	57	77	56
United States	91	44	52	23	52
Canada	71	33	77	23	51
Czech Republic	27	33	45	97	50
Hungary	18	79	12	89	50
Australia	61	33	80	0	44
Mexico	0	86	0	79	41
Korea	28	0	42	87	39
Slovak Republic	15	38	26	78	39

[6] Similar to the other tables that illustrate different aspects for the selected welfare index, this table includes all OECD countries except Luxembourg, Poland and Slovenia, for which there is no information available.

This example of welfare measures shows relatively small differences between countries. Those countries on top have a value that is only a little more than twice as high as those on the bottom. When comparing between the countries at the top of the list of countries with the greatest economic resources and with those that top this list with an extended concept of welfare, we recognise two countries, Norway and Switzerland. This is illustrated in table 3.

However, other countries such as France, Netherlands and Italy then follow. Sweden has a relatively high position in this list, but is nevertheless topped by 6 countries.

Sweden has limited leisure time, good health and a relatively limited environmental load but not a particularly high GNI, and this is the reason for these results. Spain also is rather high on the list, above Ireland and Denmark. The US and Canada are placed modestly between Portugal and the Czech Republic. This is because the US is only strong in one factor, high economic standard, while at the same time is very weak on the environmental side. Korea, with its hard-working labour force comes in second to last, just before the economically weak country of Mexico. The high leisure factor and limited environmental load are reasons for Mexico's position here.

However, it is not known how much leisure time in Mexico is voluntary, or if unemployment is sharply underestimated. An adjustment in this direction would probably give a more realistic picture of welfare in Mexico.

2 Sensitivity analysis

2.1 Importance of choice of indicators

The following section presents a sensitivity analysis of the welfare index by studying the effects of removing components, sub-components and extreme values. An attempt to find correlations between the different indicators is also made.

2.1.1 Norway and Switzerland have stable positions

This section studies how the ranking order of countries is affected when the environmental indicator and the health indicator are respectively excluded. Norway and Switzerland have stable positions on top, and most of the other countries are not strongly affected either. But for two countries the differences are dramatic – Australia and Hungary improve their positions sharply when the environment and respectively health indicators are respectively removed.

Since the choice of components in the welfare concept are hardly unquestionable, it is important to study the significance of different choices for evaluating welfare in different countries.

This example illustrates a comparison between the basic alternative and two alternatives when the health and environment variables have been excluded respectively. As shown in table 4, the difference for most countries is not so dramatic. However, when the health variable is removed from the welfare index, values for four countries are sharply reduced – Australia, Canada, Iceland and Japan. Meanwhile, values for Hungary and Mexico are significantly improved.

Welfare measurement is significantly affected for considerably more countries when the environment indicator is excluded, but nevertheless for no more than one third of the countries. When the indicator for environment is removed, values clearly drop for Korea, Mexico, New Zealand, the Slovak Republic, the Czech Republic and Hungary, while values improve for Australia, Canada and USA.

For Sweden's part, the country’s relative position is weakened somewhat when each of these indicators are excluded. Several other countries also have higher values when both these factors are included.

Table 4
Differences between different welfare measures

	Welfare base	Welfare without health indicator	Welfare without environment indicator
Norway	81	83	80
Switzerland	76	74	70
France	75	74	72
Netherlands	74	76	78
Austria	74	74	68
Italy	73	70	76
Sweden	70	66	67
Belgium	70	72	69
United Kingdom	69	70	65
Japan	68	57	70
Germany	66	66	63
Spain	63	58	58
Ireland	62	65	58
New Zealand	62	60	49
Denmark	62	64	59
Finland	60	57	53
Iceland	58	47	54
Greece	56	53	50
Portugal	56	55	48
United States	52	53	62
Canada	51	42	60
Czech Republic	50	52	35
Hungary	50	62	37
Australia	44	32	58
Mexico	41	55	29
Korea	39	38	24
Slovak Republic	39	44	26

2.1.2 Infant mortality is a sensitive factor

This section tests the effects of excluding infant mortality from the health indicator, and removing the extreme observation for Mexico. In the first case here, Mexico comes out ahead, while in the second case, three European ex-communist countries lose out – the Czech Republic, the Slovak Republic and Hungary.

Since the two indicators for health and environment both comprise three sub-components each, there is a definite need to also study how sensitive these sub-indicators are. As informed earlier, the indicator for health includes life expectancy for women and men respectively, and infant mortality. Even if the difference between average life expectancy between both sexes varies somewhat between countries, the differences are small. Accordingly, it is out of the question to only include one of the sexes, since we can hardly evaluate men and women differently.

However, it is certainly wise to study the effects of exclusion of the infant mortality factor on the value of each country's health index. We see that this would involve a clear improvement for one country, Mexico, which has by far the highest infant mortality rate among OECD countries. Because Mexico greatly differs from the other countries, all of them receive relatively high values when Mexico is included. Likewise, all countries receive considerably lower values on the health indicator when infant mortality is excluded. However, countries with relatively worse values for infant mortality compared to life expectancy are of course affected the most. Those countries losing out most when Mexico is excluded are all the previous communist countries – the Czech Republic, Hungary and the Slovak Republic, followed by Korea.

Perhaps a pattern can be seen here. When countries have advanced a bit along the path of development, infant mortality is affected first, while it takes more time and resources before health improvements have an impact on average life expectancy. That Irish people hardly live longer than Koreans is another sign of the same phenolmenon, i.e. not only are many years with good economic resources needed to increase the general state of health, but also of the fact that Ireland's high GDP per capita is somewhat of an illusion.

However, the fact that EU's richest country Denmark has an average life expectancy at the same level as Ireland clearly shows that good health care, as indicated by this country's low infant mortality, is not sufficient in itself. Other health factors such as lifestyle are also of great importance for average life expectancy.

Countries that lose nothing when Mexico is excluded are Japan and Iceland, but even Sweden and Finland have such low figures that they are hardly affected by which country is at the low water mark.

2.1.3 Correlations between health indicators

This section studies the correlations between the different health indicators. It is apparent that mutual correlations are very strong.

It is also of great interest to study how strong the relationships between the different sub-components for health factors are. The usual way to create a measurement on their interdependence is by using a correlation matrix where we can study how the variation in a variable is correlated with a variation in another variable. If the variables are identical, the value is 1, and if there is no correlation, the value is 0.

Table 5
Correlations between the different health indices in their original form and between them and the standardised health indicator itself

Pearson Correlation Coefficients, N = 27
Prob > |r| under H0: Rho=0

	Life expectancy of females	Life expectancy of males	Infant morality per 1000 births	Health index
Life expectancy of females	1.00000	0.87266 < .0001	0.92242 < .0001	-0.39883 0.0393
Life expectancy of males	0.87266 < .0001	1.00000	0.87137 < .0001	-0.58228 0.0014
Child morality per 1000 births	0.92242 < .0001	0.87137 < .0001	1.00000	-0.43343 0.0239
Health index	-0.39883 0.0393	-0.58228 0.0014	-0.43343 0.0239	1.00000

This is given that a high value on the one variable coexists with a high value of the other variable. In the following table, however, it is obvious to expect that a high value of infant mortality is correlated with a low value of average life expectancy for both men and women. Then the possible values are between 0 and –1 instead. Those figures that are below state the probability for which there is no correlation. For example, a value of 0.01 means that there is only one time per 100 that the assumption stating there is a correlation is wrong.

Normal limits are one time per 100, or possibly one time per 20, i.e. 0.05. Table 5 illustrates that the correlations between the different basic variables in their original form are well correlated with each other and with the standardised health indicator.

In addition, the strong correlation between average life expectancy and infant mortality is not caused by Mexico's extreme observation concerning infant mortality, since the correlation is strengthened if this country is excluded. Therefore it is doubtful that, as was intended, the indicator for infant mortality partly complements the other measures and tells its own story.

The conclusion is rather that the formation of the health indicator is not important, providing that it contains one or some of these selected variables.

2.1.4 Environment indicator is also relatively insensitive to variations in its design with the given components

This section studies the effects on ranking order of the countries if one of the sub-components for environment is removed from the environment indicator. We see that the Netherlands is extremely sensitive concerning which indicators are included, and a handful of countries with the US and Japan in the lead are relatively sensitive. Further, the correlations between the different environment indicators are tested. These correlations are apparently strong.

The environment indicator, the second composite sub-component in the welfare index, is based on three completely parallel indicators. As explained earlier, these measure all emissions of each group of gases, measured in tons per inhabitant. Therefore, the sensitivity test should be the same for all three indicators. Accordingly, one sub-component at a time is excluded so that three different variations of the environment indicator are created, each based on two variables. These are then compared with the base indicator for environment. The general picture we then get is one marked by relatively high stability, where Australia, Canada and the US are at the bottom and New Zealand and Czech Republic are at the top, regardless of measures. Sweden's values of the indicators are also relatively alike.

However, one environment indicator with only nitrogen and carbon dioxide but not sulphur is very advantageous for the Netherlands. Many other countries such as Finland, Norway and the US also clearly benefit from the exclusion of sulphur in the indicator. See table A.1.1 in appendix 1. There are also a number of countries that have relatively small sulphur emissions, and are thus at a disadvantage when this factor is excluded. Japan, Ireland and Spain are examples.

When nitrogen emissions are excluded, Japan is the top winner, while Italy, Netherlands and the US are on the losing side. Finally, the indicator that excludes carbon dioxide is favourable for the Netherlands, the US, Denmark, Finland, Norway and Belgium. The Netherlands has relatively high rates of sulphur and carbon dioxide emissions because of their refineries. In absolute numbers, these emissions rates are still nothing compared to those of Australia, Canada and the US.

Since there are three countries with considerably higher rates of emissions per capita than other countries, a test has been done to determine the consequences for values of other countries if these three countries are excluded from the comparison. Due to the design of standardisation, nearly all the other countries receive higher values, both for the included components and the environment indicator. Since the Netherlands has nearly the same rate of carbon dioxide emissions as the US, the leading polluter, the effect for the Netherlands, however, is only slight. The difference is somewhat greater for the nitrogen indicator, except for Japan, that will now be the new target.

However, a greater number of countries are strongly affected concerning sulphur emissions, since the country with the second greatest emission rate has a signify-cantly lower figure than Australia. This means that countries that did not have as low emission rates as most of the countries had increased sulphur rates by about 30 units. Among these countries, we see the new target as Iceland, followed by Italy, United Kingdom, Germany and Sweden.

Since none of the countries with consistently high emission rates remain, the effects on the environment indicator are dramatic. Now Japan receives the worst values, but since the differences between many other countries are now quite small, even these values are very low. Japan's previous value was 60 and all other countries had a higher value. Now, only 6 of the remaining 24 countries have values for the environment indicator above 70, and 11 countries have values below 50. For example, Sweden's value falls from 80 to 52.

As we have seen, the environment indicators are relatively alike for most of the countries. Table A.1.2 in appendix one shows that each basic variable for the different environmental components is well correlated with the standardised environment indicator. These basic variables are also mutually well correlated. However, carbon dioxide emissions per capita have a somewhat weaker correlation with sulphur dioxide emissions per capita. Apparently, there is a basic force that explains all the three selected environment indicators. This force is most probably the environmental ambitions of each country, and it seems to more and more take on other factors such as the formation of the energy sector, the industrial structure and the character of the transport sector. In addition, similar to the health indicator, the exact formation of the environment indicator does not seem to be so important for results, given that only one or some of the components are included.

2.1.5 Mutual correlations between welfare indicators are limited

This section analyses the correlations between the different components of the welfare index. We find that the only correlation that is strong is the one between health and economic standard. Indicators for environment and leisure time are completely independent of the other factors, with one exception. There is a slight tendency to a negative correlation between environment and economic standard.

It is time we now study the correlation between the composite indicators for health and environment together with the simple indicators for economy and leisure time. The comparative correlation matrix shows very mixed results that are shown in table A.1.3, appendix 1. The correlation between economy and health is very strong, so we see that good health and good economy go hand in hand. Otherwise there are no particularly strong correlations. Leisure time and health seem to have little to do with one another. Good economic standard does not result in a better environment, but it does not seem to be obtained at the cost of the environment. Perhaps there is a weak tendency towards the last-mentioned phrase. It may also be true that these forces balance each other. When we measure environment in this way, there is no correlation with health. This means that, with one exception, it seems that the selected components are measuring independent aspects of welfare.

The general conclusion is that the method of evaluation and weighting of the indicator for economic standard relative to the health indicator does not seem so important. However, evaluation of leisure time and environment in relation to the above-mentioned factors and how they are weighted against each other is of great importance for the value of the welfare indicator.

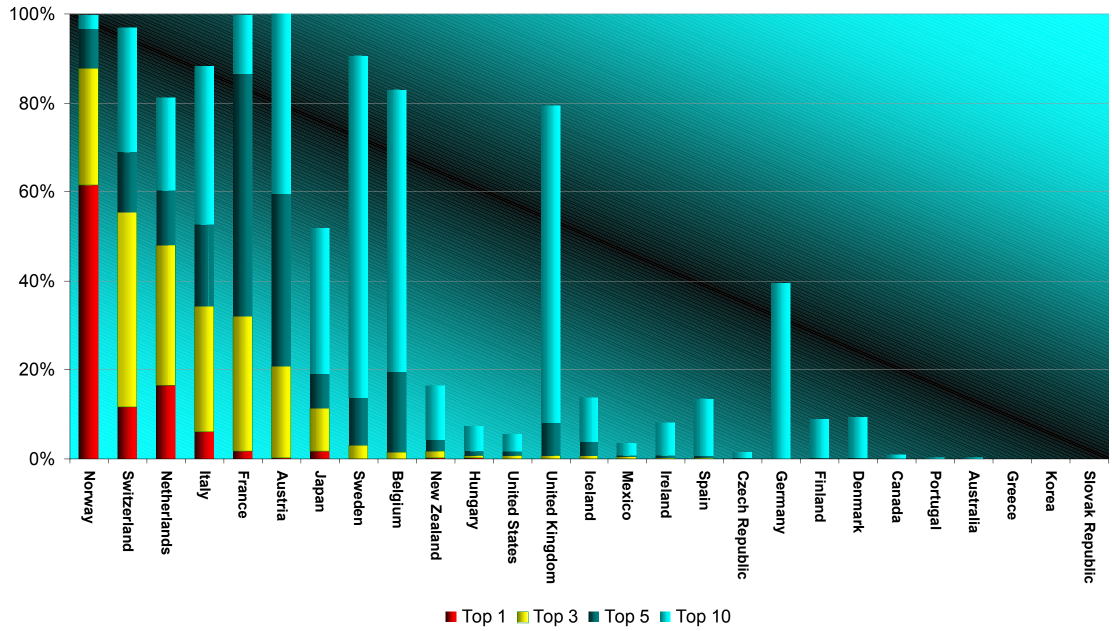
2.2 How robust is the ranking order of countries for changes in the weight system?

This section studies the importance of the choice of weights for the incoming components in the welfare index with regards to ranking of countries. In nearly all combinations, Norway is the country with the highest value in the welfare indicator, closely followed by a group of countries consisting of the Netherlands, Switzerland, Italy, France and Austria.

To analyse the importance of which weight that has been given to the different factors, a comprehensive sensitivity analysis has been done. In this analysis, the 8 different standardised indicators have been weighed with random weights, after which of the different countries have been ranked according to the value on their welfare index. This has been done for a million alternative weights. However, in order to avoid biased results, we have considered health indicators and environmental indicators to be parts in an index on a higher level, while the indicators for economic standard and leisure time have not built up any sub-indicators.

This technique has been used in "The Micro policy Project" in the Directorate for Science, Technology and Industry (DSTI) at OECD, and by the analysis institute FORA which works for the ministry of industry and finance in Denmark.[7] The program generates a list of the number of times each country has been ranked with the highest value on the welfare index, the second highest value etc. down to the 27th place and the lowest value. To obtain an overall picture of the results, a figure has been made showing how often each country has come first, among the 3 best, among the 5 best, and finally the 10 best. The choice of these limits is based on how the structure of the actual results looked.

Figure 4
The robustness of the ranking of countries according to the welfare index for different weights for the sub-indices



As shown in figure 4, Norway comes in first in over 60 per cent of the times, i.e. more than 600 000 times, and there are no others that come first even every fifth time. However, the Netherlands and Switzerland do so more than 100 000 times, while Sweden does so just 631 times, and Germany only once. Following Norway is the tight group consisting of the Netherlands and Switzerland as already mentioned, and Italy, France and Austria.

We can also identify a group that is clearly outdistanced by these, but in turn completely dominates over the other countries. This group consists of Sweden, Belgium and the United Kingdom. These countries comprise the top 10 in 80 to 90 per cent of the time, and sometimes they even end up among the top 5 or top 3.

[7] Anders Herz Larsen at FORA has kindly given the program that has been used to us. FORA's innovation study is an example where it has been used. "Et Benchmark Studie af Innovation og Innovationspolitik" af Jens Nyholm og Lotte Langkilde, available on FORA's website www.foranet.dk

Japan and Germany are the only other countries that are among the top 10 relatively often.

Sweden places 7.8, or eighth place on average, but only six countries have a higher average place in environmental calculations where alternative weights have been used. This is not a coincidence, but rather the average results are very close to the ranking obtained when consistently selecting equal weights. Sweden came in seventh place in table 3.1 above. This is one reason for choosing equal weights if there are no strong analytical reasons for choosing something else. However, the value of the robustness test lies mainly in the analysis of stability in the position of the countries with different alternative weights. For example, Sweden ranks higher than fifth place in less than seven per cent of the time, and is worse than tenth place in 9 per cent of the time. This applies to all combinations of the 8 basic variables, regardless of how they are weighted, given than consideration has been taken that the three basic variables for health and environment, respectively, have been weighted together to their own indicator on the middle level. Accordingly, the stability of Sweden's position is significant.

3 What is the cost of welfare?

3.1 Presentation of a composite indicator for the input factor

This section presents a composite indicator for the input factor. Sensitivity for selected weights is tested in the same way as for the welfare index. Further, the correlations between the differrent components are analysed. In four out of five combinations of weights for the four incoming sub-components, USA is given the highest value for the input indicator. USA is followed successively by a number of countries that consistently differ somewhat from the country it immediately follows. These are: the Netherlands, Denmark, Iceland, Sweden, Norway, Korea and Japan. The correlation between the components that can be said to form indicators on the knowledge society; quality of the labour force, formation of knowledge and IT use are strongly correlated. However, the quantitative input of labour is independent of all these other indicators.

To determine if a country has succeeded in producing welfare effectively, the results must relate to the resources a country has invested to obtain welfare. The vital resource is labour, and since there is comparable data for the share of the population of working age, which is the relevant measure in this case, the choice is simple.

However, in addition to quantity, quality is also significant. The broadest available measure of quality of the labour force is the level of education of the labour force, measured in a number of ways. The different creators of the composite indicator also use this type of measure when they choose their indicators of the quality of the labour force.

Most of these measures give similar ranking order of countries, and a readily available measure is the share of the labour force that has post-secondary education. However, this results in unreasonably high values for Sweden, since Sweden has a relatively large number in the labour force that has shorter, non-academic post-secondary education. Therefore, this example uses the share of the labour force that has at least three years of post-secondary academic education.

Besides the level of education of the labour force, other formation of knowledge is also important. Therefore, other indicators such as research, development and innovation activities are often included among the selected input indicators. In this example, R&D costs per inhabitant, adjusted for differences in cost levels among countries (PPP adjusted), have been used. This is because R&D costs in relation to GDP, which is the most frequent R&D measure, do give a good picture of priorities of nations, but not such a good picture of the size of investments when comparing with other countries. When using the measure of R&D share of GDP, it seems that countries that have a lower GDP level, such as Sweden, make larger investments in new knowledge than they actually do, compared to wealthier countries such as the US and Switzerland.

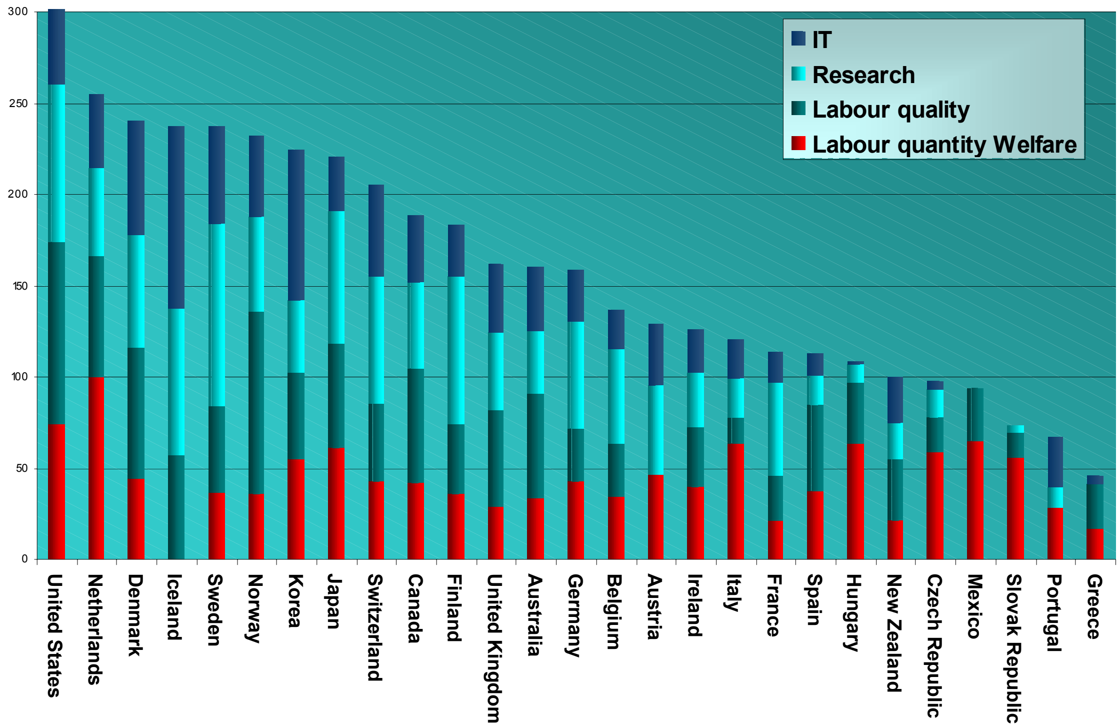
Another area of growth is IT development. The IT revolution is very important for development in many areas, even though it is not directly evident that IT investments have led to larger production profits. This applies on a more aggregated level, but studies of individual enterprises or smaller groups of enterprises have shown clear effects of more developed IT use. Combinations of organisational changes and IT investments[8] have produced results.

However, it is a general consensus that the IT revolution has had effects, even if the evidence has been relatively hard to see. Therefore, measures of IT standard in countries have been included among the input factors. Here we have chosen the

[8] One of the early studies that included a large number of enterprises is the ITPS report "Enterprises in Transition, Learning Strategies for Increased Competitiveness" ITP S A2001:001. It is available on ITPS's website 222.itps.se

simple and easily accessible measure of percentage of inhabitants with access to the Internet. This measure gives a broad picture of both IT skills and IT use, which are both vital for IT maturity in society.

Figure 5
The input index and its components



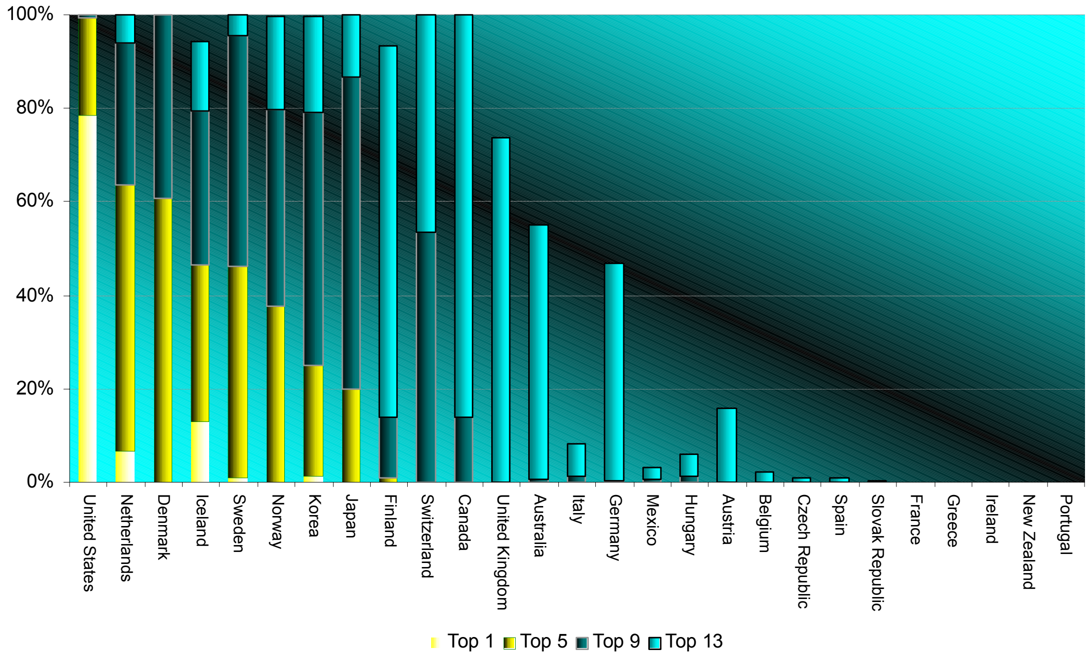
Source: OECD

All of these indicators have been standardised in the same way as earlier the welfare indicators. Figure 5 shows the results of ranking orders of the countries according to the sum of these four indicators. It is apparent that the US has the highest values on this indicator, followed by the Netherlands, Iceland and Korea. The four Nordic countries Denmark, Iceland, Sweden and Norway then follow with nearly the same values. However, countries such as France and Italy have made much smaller investments, and Slovak Republic, Portugal and Greece have hardly invested at all.

As illustrated in figure 6, the sensitivity analysis strengthens USA's top position markedly. However, Iceland's and Korea's positions seem a bit more uncertain and relatively dependent on the choice of weight system. On the other hand, the Netherlands and Denmark have a stronger position for most of the alternative weight combinations, compared to the basic alternative with equal weights.

Figure 4 also shows significant differences between countries concerning which areas have received the greatest investments. Nevertheless, it seems that those countries that have invested the most have done so in several areas, and the reverse. Labour input is the one exception that does not seem to have any correlations with the other inputs. This was of course expected, considering that labour input is a result of the demographic structure and is defined as the percentage of the population of working age.

Figure 6
Test of robustness of the ranking of countries for different weighs for the input indices



Accordingly, those countries with a small percentage of working age inhabitants are countries with both many older persons and many children. So for example, even if there is reason to assume that Internet use is higher in countries with many young people in the population, Internet use is also lower if the country has an unusually old population. This means that a comparison between a group of countries that include both those with many youngsters and those with many elderly people with a group of countries that includes many people of working age cannot be expected to show any differences.

The hypotheses as sketched above are tested with the help of a correlation matrix. The three factors that make up different aspects of the knowledge society, the indicators for quality of the labour force, formation of knowledge and IT use are mutually very well correlated with each other but not at all with the labour input (see table A.1.4 in appendix 1).

4 Do investments result in improved economic standard and welfare?

This section shows the result of tests of the hypotheses; that input variables can explain some of the differences between countries in economic standard and welfare.

4.1 Effects on knowledge society

The analysis reported in this section shows that inputs can explain significant parts of differences between countries in economic standard.

Before studying the correlations between these variables and the welfare indicator, a test is done to see if these variables explain economic standard, the basic welfare variable. The definition of the labour variable then needs to be adjusted to refer to the number of hours worked per inhabitant, when only economic standard is to be defined. The degree of leisure time has then no value as an input factor.

The correlation between this measure of labour input and the three other input variables is, with the exception of the Internet indicator, equally as weak as for the above mentioned labour input for welfare (see table 6).

The correlation between labour input and Internet use also applies even if Korea and Iceland (which have the highest Internet use and the highest labour inputs) are not included. This means there is a clear correlation between the number of hours worked per inhabitant and Internet use in OECD countries in general. Thus, labour has, up to now, been the determining factor for Internet use.

Table 6
Correlations between the different input indices

Pearson Correlation Coefficients, N = 27
Prob > |r| under H0: Rho=0

	Labour quantity Economic standard	Labour quality	Research	IT
Labour quantity Economic standard	1.00000	0.29025 0.1419	0.22907 0.2504	0.50837 0.0068
Labour quality	0.29025 0.1419	1.00000	0.51881 0.0056	0.49965 0.0080
Research	0.22907 0.2504	0.51881 0.0056	1.00000	0.65980 0.0002
IT	0.50837 0.0068	0.49965 0.0080	0.65980 0.0002	1.00000

An essential question is then if these investments seem to have any effect on economic standard. Of the four indicators for labour, quality of the labour force, knowledge formation and IT level are all, except for the first-mentioned, strongly correlated with economic standard, as shown in table 7. This also applies when Korea and Iceland are excluded.

In a correlation matrix, the correlation between different factors is in pairs. This allows us to see if a higher value of a variable is related to a higher value of another variable. But this correlation may be illusory. There may be another factor in the background. For example, the correlation between the IT indicator and economic standard may be due to the fact that a high economic standard requires many well-educated people, and these people are relatively frequent Internet users. So given the education level, perhaps economic standard is not higher in countries with considerable Internet use. This means that if we are to determine if IT maturity really affects economic standard, we need to hold the other factors, in this case labour input, education and research, constant. This is done in a regression analysis.

An estimation of a simple linear regression, where the difference in economic standard between OECD countries is explained by the above-mentioned input variables, is shown to be very successful. A linear regression with all four variables namely explains two thirds (adjusted for degree of freedom R^2=0.67) of the differences between values of countries for the indicator on economic standard (see table A.1.5 in appendix 1).

Table 7
Correlation between the different input indices and the economic standard

Pearson Correlation Coefficients, N = 27
Prob > |r| under H0: Rho=0

Labour quantity Economic standard	-0.00459 0.9819
Labour quality	0.61502 0.0006
Research	0.75045 <.0001
IT	0.51617 0.0058

However, the Internet variable does not contribute to the explanation, and the labour variable has a negative sign. As a result, we cannot see any effect of increased Internet use, given the quality of labour and the scope of research inputs. If the Internet variable is excluded, all the other variables continue to clearly contribute to the explanation (they are still significant) and maintain their signs. This means that countries that have a higher quality of labour and larger research investments have a higher standard of living. But it also means that, given these investments, countries where people work more have a lower economic standard.

An explanation for this phenomenon could be that there is a negative factor that interacts with the labour input, which is not included in the regression. It may also be because a simple linear model is not sufficiently adapted to the material. A generalised linear model is a more advanced model that can better use the data.

When the correlation is tested with a generalised linear model, the results are relatively alike regarding the impact on economic standard, with one important exception. The labour input no longer affects the results (it is no longer significant), as illustrated in table 8. This is a less unreasonable result, but it should be a positive and clear correlation between labour impact and economic results, even considering the impact of the other factors.

It is therefore probable that one or more underlying factors also interact with economic standard and are negatively connected with labour input per inhabitant. There is such a factor that results in a decrease in labour input with an increase in living standard: working time per employee falls with increasing economic standard as a successively increasing part of welfare is taken out in more leisure time.

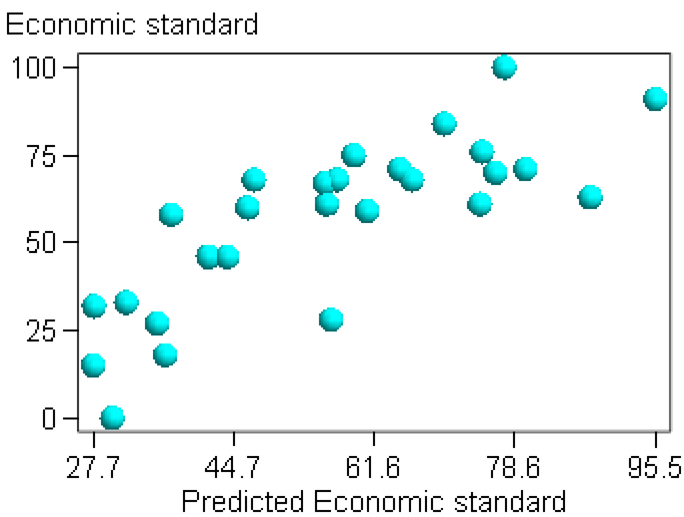
Table 8
The relationship between the economic standard and the input indicators. A generalised linear regression model with the economic standard as dependent variable

Pearson Correlation Coefficients, N = 27
Prob > |r| under H0: Rho=0

	Economic standard
Labour quantity Economic standard	-0.00459 0.9819
Labour quality	0.61502 0.0006
Research	0.75045 <.0001
IT	0.51617 0.0058

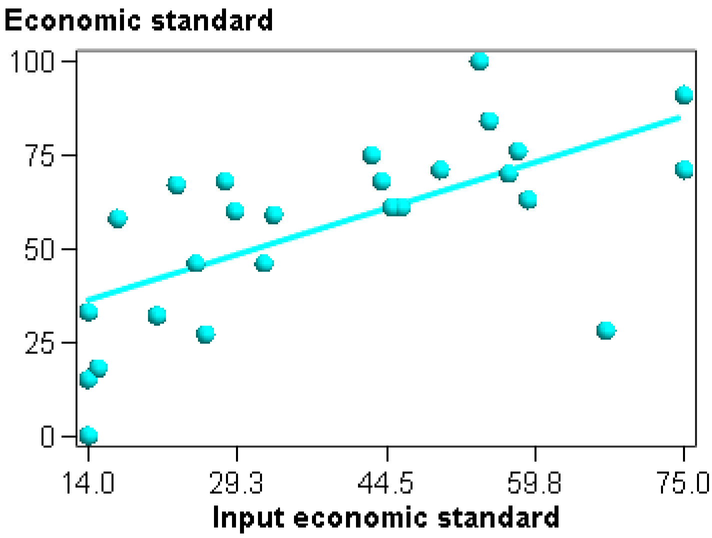
A simple regression where GDP per capita is explained by the labour force share of the population and average working time per employee confirms this (see table A.1.6 in appendix 1). Three fifths of the differences are explained, and both variables are significant but with different signs. This means that the size of the labour force explains much of the economic standard, while the average working time drops in keeping with an increase in economic standard.

Figure 7
Regression analyses. Relationship between the estimated values of economic standard, explained by labour quality and research, and observed values



This is further confirmed when average working time is included in the simple linear equation with the four input variables. Average working time then becomes significant and receives a negative sign while the labour force variable becomes insignificant.

Figure 8
An illustration of the relationship between the estimated values of economic standard, explained by the input indicator, and observed values

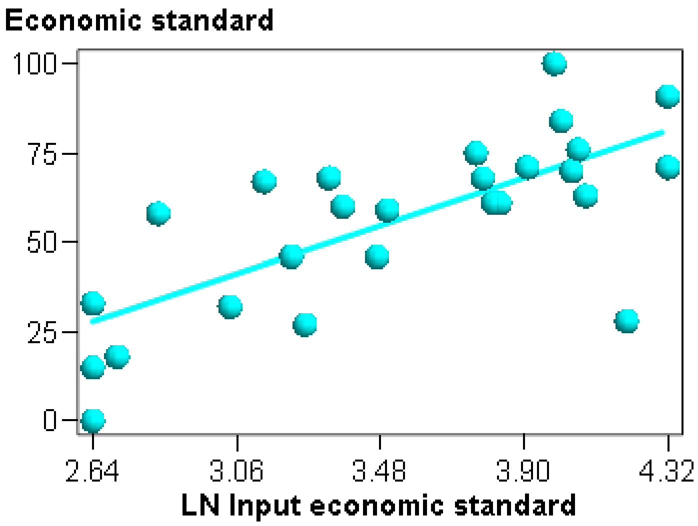


When the Internet variable is excluded from the original generalised regression, none of the other correlations are changed markedly. The labour variable still does not explain anything. A final version of this regression where the labour variable is also removed and research and education variable alone explain economic standard, the correlation is strong, as illustrated in figure 7 where the original values are compared with estimated ones.

Then a test is done to see if the combined composite indicator for total inputs can explain anything of the difference in economic standard. We see that this indicator explains slightly less than 40 per cent (adjusted for degree of freedom R2=0.38) of the variations in economic standard between countries (see table A.1.7 appendix 1). Accordingly, results are considerably worse than when the different incoming components' relative significance is determined by the material in the form of a regression.

However, a generalised variant of this regression gives a relatively good explanation as illustrated in figure 8, where economic standard is compared with that standard that would have been obtained if the input indicator explained everything. Nevertheless, there are clear deviants that, despite considerable inputs, have not obtained a higher standard. As seen earlier, the extreme case is Korea, represented by the point in the far lower right corner of the figure.

Figure 9
An illustration of the relationship between the estimated values of the economic standard, explained by the logged value of the input index in a generalised regression



We also see that the correlation seems to be steeper in the beginning and then slackens out. Taking this into consideration when estimating the correlations between the economy and the logarithm for inputs, nearly half of the variations in economic standard can be explained. The general model variant of this further gives a somewhat better correlation. As seen in figure 9, the point is now closer to the line, and there is no longer a tendency that a curved line would better fit the observations.

In conclusion, this analysis shows that both the input indicators and the composite indicator for inputs are relevant measures that can explain important parts of the differences in economic standard between countries.

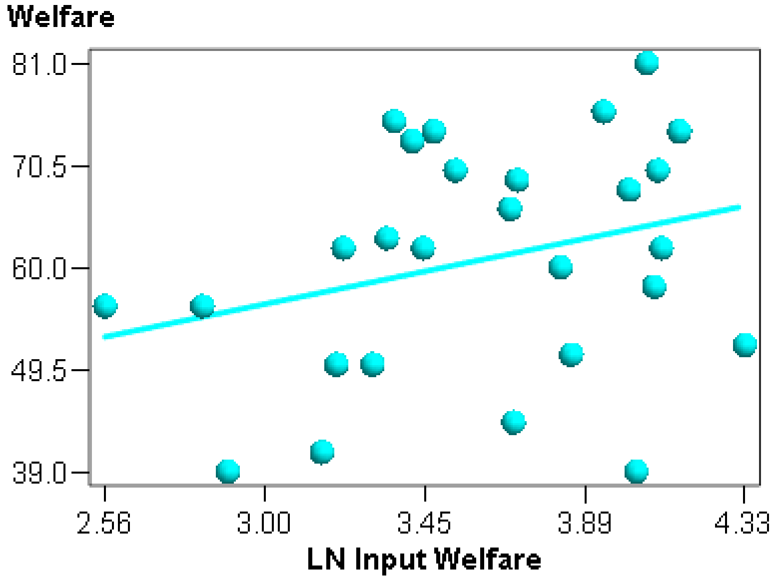
4.2 Welfare is a more difficult concept to explain

This section studies the possibilities of the input factors to explain differences in welfare between countries. We find that this is not possible.

Now it is time to turn to the more complex welfare indicator to investigate if these input indicators can also explain the differences in welfare between countries, measured with this example of a welfare indicator. However, a simple linear regression with all four input indicators as explaining factors gives meagre results. These input indicators could explain only 10 per cent of the variations in value of the welfare indicator.

It is also only the R&D indicator that is significant, and it is also the only indicator that has a positive sign. If the indicator lying farthest away from giving any contribution to the explanation (the education variable) is removed, results are somewhat better and 14 per cent can be explained. But aside from the research indicator, the other variables still do not have any explanatory value and negative signs. We also see that when all combinations have been tested, only the research indicator can partly explain variations in the welfare indicator.

Figure 10
An illustration of the relationship between the estimated values of the welfare index, explained by the logged value of the input index in a generalised linear regression model



If the composite input indicator is used to explain the welfare indicator instead of the separate indicators, the results are even more meagre, if not completely non-existent. The composite input indicator can only explain a few percentage points of the welfare indicator's variations. Even if the input indicator is presented with logged values, the result is very weak. Less than five per cent can be explained by the variation. The spread around the estimated relationship is very significant even with a generalised linear estimation, as illustrated in figure 10.

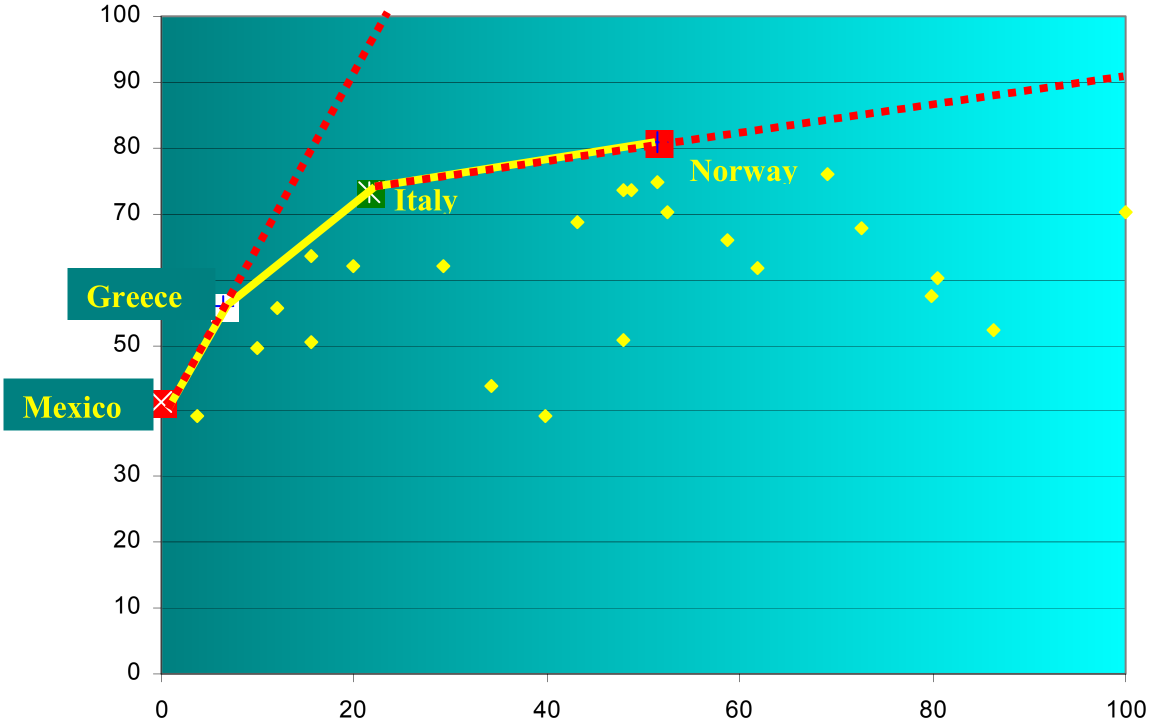
In conclusion, there are apparently other factors than those selected that can explain the variations in the composite indicator for welfare.

4.3 Which countries are best at creating high economic standard and high quality welfare?

This section analyses which countries are most efficient in creating economic standard and welfare with the aid of frontier production functions. We see that Greece, Italy and Norway are on the efficiency frontier concerning economic standard. The same is true regarding welfare, with the exception of Italy.

As shown above, there is a considerable variation in values of the welfare indicator between different countries, even if they have about the same value on the input indicator. Korea, Iceland and the US are among those countries that have high values on the input index, but considerably lower values on the welfare index. Meanwhile countries such as Italy and France have high values on the welfare indicator with low inputs. Those countries that have obtained a relatively high welfare with small investments can be regarded as efficient in this respect. An effective instrument to find out which countries belong in this category (and how far behind other countries are) is known as the frontier production function. Figure 11 illustrates this kind of frontier production function. In this example only R&D expenditures are used as inputs, since in our example it was the only variable that could explain some of the variations of the welfare indicator. However, this does not mean that it is sufficient to increase R&D expenditures to reach higher levels of welfare. This example is only an illustration.

Figure 11
The welfare front as a result of R&D expenditure per inhabitant



The different points represent each country's combination of R&D expenditure and welfare. Those countries that, at a given value on the R&D indicator, have the highest values of welfare are at the front. Accordingly, no other countries are as efficient in creating welfare with the help of R&D expenditures. All countries that are not at the front could increase their efficiency either by increasing welfare, i.e. by approaching the front in a vertical direction upwards, or by reducing R&D expenditure, i.e. by moving in a horizontal direction to the left. As illustrated in the figure, the front consists of Mexico, Greece, Italy and Norway. Mexico formally is at the front because this country has the lowest R&D expenditure, and is thus given the indicator value 0 by standardisation. As a result, no country can formally be seen as more efficient, but this result has no relevance.

In general, no country has higher welfare than those at the front, unless they have a higher value on the R&D indicator at the same time. The line between the countries at the front is a combination of the values of these countries and also comprises a part of the front.

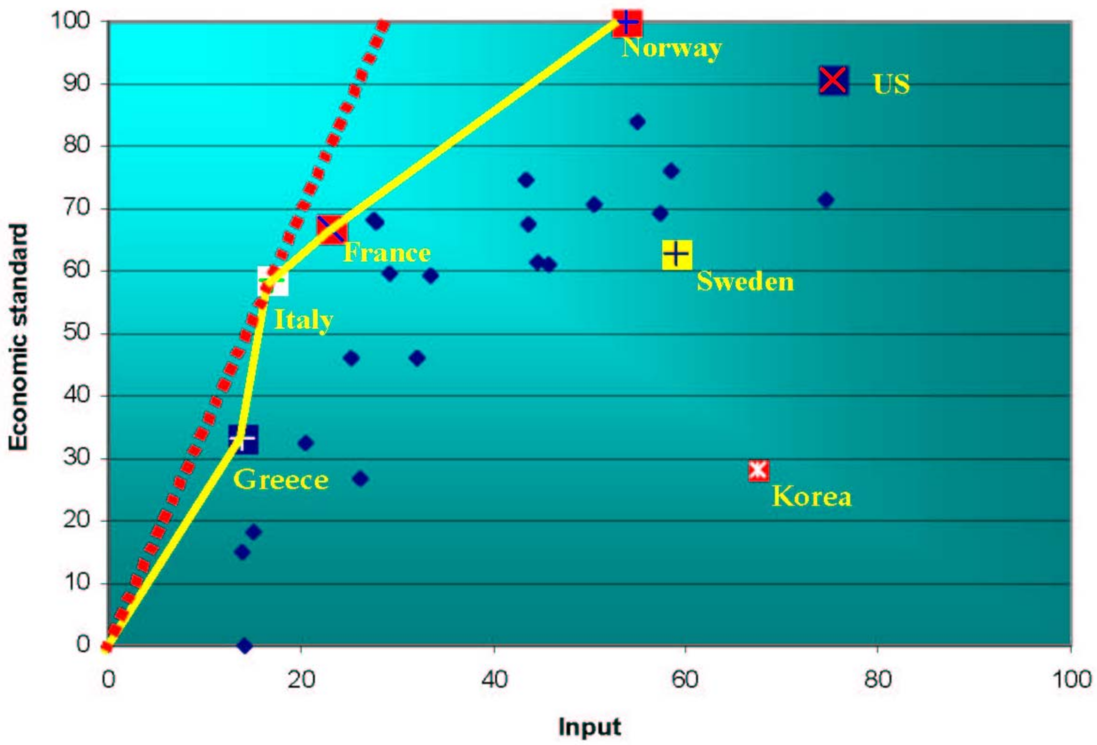
This kind of a frontier production function has also been estimated for the indicator for economic standard and the indicator for the inputs. In this case, the countries that shape the front are then Greece, Italy, France and Norway. On the other hand, Sweden is clearly far from the front, as seen in figure 12.

Italy is the most efficient country, since it has the greatest value of the production variable relatively to the input variable, which is the definition of productivity. This proportion is illustrated by the broken line from the origin of the coordinates through the point that represents Italy.

However, the concept of welfare is much more complex than economic standard alone, even if economic standard is a major factor, as shown in the analysis above. To minimise subjectivity, we can define the production measure of the welfare indicator as consisting of eight different measures, incomparable among themselves. These measures are the standardised basic variables in this example of a welfare indicator. This means that a country with a higher value on 7 of these indicators than all other countries but lower on the eighth can nevertheless not be regarded as having a higher welfare standard. In the same way, the inputs are broken down into the four sub-components that are evaluated independently.

This kind of frontier production function gives a front where most of the countries are situated. In fact, very few countries have lower values on all welfare indicators and higher values on all input factors than all other countries or a combination of some of these countries. Only four countries are in this category: Korea, Canada, Denmark and Germany.

Figure 12
A frontier production function with the indicator for economic standard as the production variable and the input indicator as the input variable



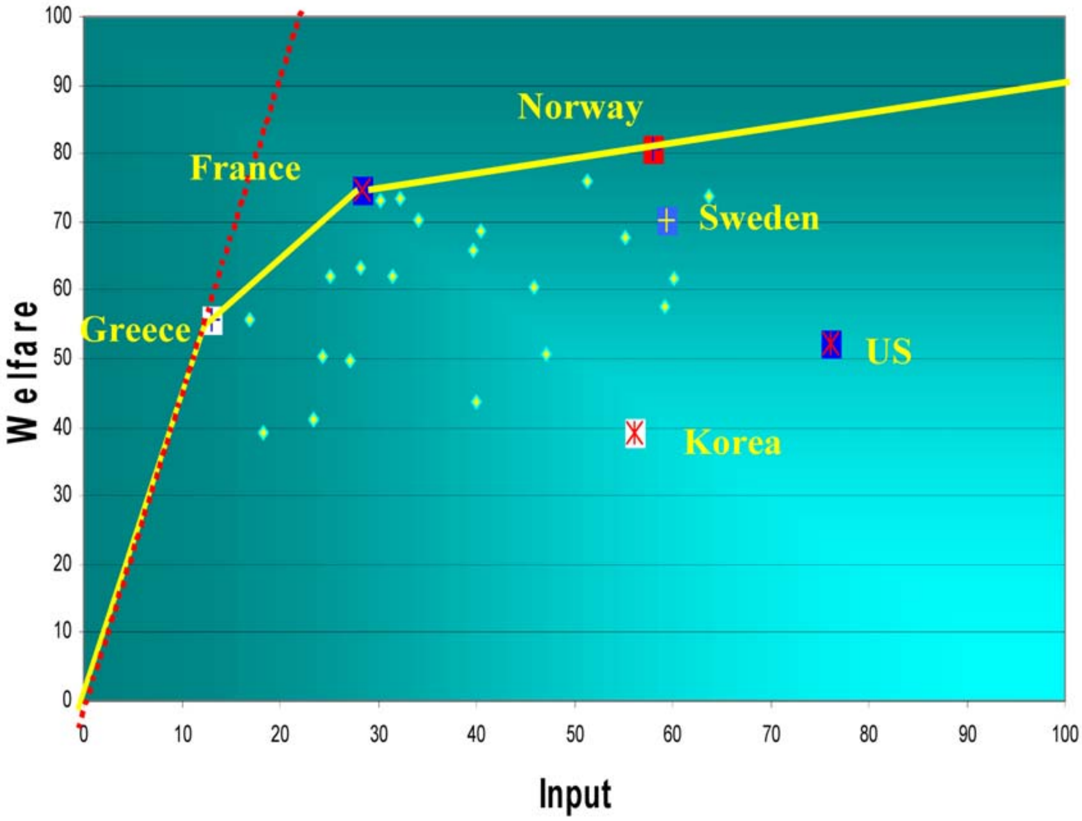
If we accept that the input variables can be weighted together to the combined input indicator, more countries would be included, but the majority of countries still make up the front. Sweden is among the countries that are not included in the front now, since a combination of Japan and Italy has reached a higher welfare level, given the inputs.

If the purpose is to measure welfare or efficiency in creating welfare, these results clearly indicates that we need to compare apples and oranges. Otherwise this task is more or less an impossible mission. By accepting the four main components of economic standard, leisure time, health and environment instead of the eight basic variables, we could attempt to simplify this task. However, this would not lead to more clear results. The number of factors would need to be drastically limited to obtain meaningful results when the number of observations is only 27.

One way to use this technique to study the welfare indicator alone is to assume that the inputs are equal for all countries. However, with 8 indicators, even this approach would result in a large majority, 20 countries at the welfare frontier. Sweden would also be situated at the front. When the indicators are limited to 4, nearly half of the countries, or 13, are still at the front. However, Sweden then is dominated by a combination of Italy, Japan and Switzerland.

Nevertheless, an estimation of a front where welfare is the only production factor and the input index the only input factor provides results that can be interpreted. Those countries that now define the front are Greece, France and Norway. Of these countries, Greece has the highest welfare productivity. The return to scale then decreases, and relatively greater inputs are needed to obtain higher welfare levels.

Figure 13
A frontier production function with the welfare indicator as the production variable and the input indicator as the input variable



This means that Sweden has a significantly farther route to the front in the horizontal direction than in the vertical one. Sweden needs to increase its welfare from 70 units to about 82.5 units to reach the front, which on these welfare levels is defined as Norwegian productivity. Instead, it would be possible for French productivity to reach the Swedish level of welfare with only 27 units in inputs, instead of Sweden's 59 units. But Swedish inefficiency is nothing compared to that of Korea or even the US (see figure 13).

5 In conclusion, it is necessary to compare apples and oranges when evaluating fruit baskets

The general conclusion of this analysis is that if we want to compare the complex concept of welfare in different countries, we must be ready to evaluate and compare factors of very different character. Since there are no undisputable choices, different evaluations and access to data can lead to more or less separate conclusions of analyses of the same phenomenon.

For this reason it is very important for credibility of results that the data that is used and choices that have been made are openly reported. It is also important that a comprehensive sensitivity analysis has been carried out and is presented together with the main results. Furthermore, it is worthwhile to point out that the technique with random weights is a very relevant and effective instrument in the sensitivity analysis of the weight system. Concerning comparisons of efficiency, the frontier production function is also a good tool.

Work in drawing up guidelines that the OECD and EU via the JRC Institute have begun is consequently of great importance in order that this type of analysis will be accepted among statistical experts to a greater degree than today.

Finally, even if the composite indicators provides a valuable base for preparing basic information for political processes, we must realize that these results only give us an overview of one area. When forming concrete political measures, a more detailed analysis of separate phenomena is required.

Then what has the analysis of the chosen example of a welfare index and the attempt to illustrate this measure in different ways provided us with? First, a general reservation must be made, namely that the conducted analysis has in no way shown what the consequences would have been if other factors had been included. It is of course possible to justify with very good reasons why many other aspects of welfare should be included in this example.

However, it is certain that Norway obviously seems to have a very high level of welfare. Switzerland, the Netherlands, France and Austria have also reached a high level, independently of how the other factors are included or evaluated. Sweden together with Belgium and the UK also reach an acceptable level for most of the combinations.

Concerning inputs however, a number of other countries emerge such as the US, Denmark, Iceland and Korea. Results for the last two mentioned countries are still relatively uncertain because of their dependency on the choice of weights. But the two first mentioned countries apparently invest the most and also obtain a great deal in economic standard, but considerably less in welfare. Among the countries that top the welfare list but invest modestly are the Netherlands, France, Italy and Austria. Norway and Switzerland are also situated lower down concerning investments compared to their placement regarding welfare. In terms of efficiency, Norway, France and Greece are on top, but at completely different welfare levels.

Normally one would expect a country as successful as Norway to have a lesson or two to teach other countries on how to organise a society and pursue a policy on how to create a high level of welfare for its inhabitants. But in Norway's case, the high earth interest rate in the form of extensive oil assets has played a vital roll in the country's achievements. Thus, we can hardly assume that these results indicate anything other than that is important to have a good standing with higher powers. France and Greece are probably more interesting countries to study. But since these countries are on very different welfare levels, it is probably most relevant for Korea to study Greece in more detail, while Denmark should study France or Italy, which are situated near the front.

In general, it is also apparent that other factors besides those that create economic standard are important to study, if the goal is to obtain a high level of welfare (as has been defined in this example).

Appendix 1

Table A.1.1
Alternative definitions of the Environment indicator

	Environment index base value	Environment without Sulphur oxides	Environment without Nitrogen oxides	Environment without Carbon dioxides
Australia	0	0	0	0
Austria	89	96	88	96
Belgium	72	80	72	81
Canada	23	23	15	27
Czech Republic	97	100	96	100
Denmark	69	77	63	78
Finland	83	94	78	94
France	82	89	84	89
Germany	75	71	72	72
Greece	72	81	67	82
Hungary	89	88	90	89
Iceland	68	63	61	65
Ireland	76	66	66	68
Italy	66	70	57	72
Japan	60	49	74	52
Korea	87	88	85	89
Mexico	79	84	73	85
Netherlands	60	88	50	88
New Zealand	100	96	100	97
Norway	82	94	79	94
Portugal	77	79	83	80
Slovak Republic	78	76	70	78
Spain	79	71	78	73
Sweden	80	79	74	80
Switzerland	94	92	97	93
United Kingdom	80	85	76	86
United States	23	35	14	39

Table A.1.2
The relationships between the different pollution indicators

Pearson Correlation Coefficients, N = 27
Prob > |r| under H0: Rho=0

	Sulphur oxides	Nitrogen oxides	Carbon dioxide	Environment
Sulphur oxides	1.00000	0.70415 <.0001	0.43032 0.0251	-0.82870 <.0001
Nitrogen oxides	0.70415 <.0001	1.00000	0.63838 0.0003	-0.90800 <.0001
Carbon dioxid	0.43032 0.0251	0.63838 0.0003	1.00000	-0.81046 <.0001
Environment	-0.82870 <.0001	-0.90800 <.0001	-0.81046 <.0001	1.00000

Table A.1.3
The relationships between the different Welfare indicators

Pearson Correlation Coefficients, N = 27
Prob > |r| under H0: Rho=0

	Economic standard	Leisure time	Health	Environment
Economic standard	1.00000	-0.01450 0.9428	0.71207 <.0001	-0.31358 0.1112
Leisure time	-0.01450 0.9428	1.00000	-0.19687 0.3250	0.09269 0.6457
Health	0.71207 <.0001	-0.19687 0.3250	1.00000	-0.22782 0.2531
Environment	-0.31358 0.1112	0.09269 0.6457	-0.22782 0.2531	1.00000

Table A.1.4
The relationships between the different Input indicators

Pearson Correlation Coefficients, N = 27
Prob > |r| under H0: Rho=0

	Labour quantity Welfare	Labour quality	Research	IT
Labour quantity Welfare	1.00000	0.16441 0.4125	-0.06889 0.7328	-0.20539 0.3041
Labour quality	0.16441 0.4125	1.00000	0.51881 0.0056	0.49965 0.0080
Research	-0.06889 0.7328	0.51881 0.0056	1.00000	0.65980 0.0002
IT	-0.20539 0.3041	0.49965 0.0080	0.65980 0.0002	1.00000

Table A.1.5
The relationship between the Economic standard and the input indexes. A Linear Regression Model with the Economic standard as dependent variable

R-Square	0.6994
Adj R-Sq	0.6448

Parameter Estimates

Variable	Parameter Estimate	Pr > |t|
Intercept	29.24461	0.0003
Labour quantity Economic standard	-0.31595	0.0430
Labour quality	0.33759	0.0217
Research	0.48287	0.0031
IT	0.13006	0.4880

Table A.1.6
The relationship between the GNI per capita in PPP and the Labour Force/ Population and average hours worked per employed. A Linear Regression Model with the GNI per capita in PPP as dependent variable

Root MSE	R-Square	0.6230
Dependent Mean	Adj R-Sq	0.5916

Parameter Estimates

Variable	Parameter Estimate	t Value
Intercept	10419	0.77
Labour force/Population	78206	3.96
Hours per employed	-13.91077	-3.49

Table A.1.7
The relationship between the Economic standard and the Input index. A Linear Regression Model with the Economic standard as dependent variable

R-Square	0.4051
Adj R-Sq	0.3813

Parameter Estimates

Variable	t Value	Pr > |t|
Intercept	2.96	0.0067
Input economic standard	4.13	0.0004

Table A.1.8
The relationship between the Economic standard and the Input index. A Generalised Linear Regression Model with the Economic standard as dependent variable

R-Square	0.4051
Adj R-Sq	0.3813

Parameter Estimates

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	24.89658	8.41374	2.96	0.0067
Input economic standard	0.80591	0.19533	4.13	0.0004

Table A.1.9
The relationship between the Welfare index and the Input indicators. A Linear Regression Model with the Welfare index as dependent variable

R-Square	0.2446
Adj R-Sq	0.1073

Parameter Estimates

Variable	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	58.25241	8.10491	7.19	<.0001
Labour Quantity Welfare	-0.06328	0.11946	-0.53	0.6016
Labour Quality	-0.17459	0.53138	-0.33	0.7456
Research	0.02599	0.01041	2.50	0.0205
IT	-0.02412	0.02348	-1.03	0.3153

Table A.1.10
The relationship between the Welfare index and the Input index. A Generalised Linear Regression Model with the Economic standard as dependent variable.

Analysis Of Parameter Estimates

Parameter	DF	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1	33.3204	17.7361	3.53	0.0603
LN Input Welfare	1	7.6231	4.8871	2.43	0.1188
Scale	1	11.2855	1.5358		

Appendix 2

Table A.2.1
Base data for the Welfare sub indicators

	GNI per capita	Leisure time	Life expec-tancy of females	Life expec-tancy of males	Child morality per 1000 births	Sulphur oxides	Nitrogen oxides	Carbon dioxide
Australia	26460	0.31	82.4	77	5.3	95.7	135.1	18
Austria	28508	0.41	81.7	75.9	4.8	5	22.6	8.4
Belgium	28415	0.46	80.8	74.6	5	20.1	35.7	11.8
Canada	29251	0.3	82	76.7	5.3	80	89.7	16.5
Czech Republic	16410	0.31	78.5	72.1	4	3.9	14.8	6.3
Denmark	30719	0.36	79	74.3	4.9	25.8	38.6	12
Finland	26413	0.28	81.5	74.6	3.2	10.1	19.9	10.5
France	28061	0.44	83	75.5	4.6	5.2	38.9	9.6
Germany	25891	0.41	80.7	74.7	4.5	38.4	35.5	7.1
Greece	18330	0.38	80.7	75.4	5.9	14.6	45.6	11.5
Hungary	13953	0.46	76.5	68.2	8.1	14.3	28.3	6.3
Iceland	29380	0.2	82.2	78.1	2.7	51.4	36.3	8.2
Ireland	26035	0.4	79.2	74.2	5.8	57.6	21.6	5.5
Italy	25623	0.49	82.9	76.7	4.3	42.2	32.2	11
Japan	28946	0.33	84.9	78.1	3.1	33.4	91.7	7.4
Korea	16870	0.19	79.2	71.7	6.2	16	25.8	7.3
Mexico	8615	0.49	76.8	71.9	22.4	24.8	23.4	9.4
Netherlands	28312	0.54	80.6	75.7	5.3	7.1	38.8	19
New Zealand	22049	0.31	80.8	75.7	5.8	12.2	12	3.7
Norway	37736	0.42	81.4	76	3.8	5.7	26.6	11
Portugal	18030	0.38	80.3	73.5	5	11.5	53.1	8.7
Slovak Republic	13034	0.32	77.6	69.5	6.2	39.1	21.7	7.7
Spain	22080	0.36	82.9	75.6	3.9	37	36.5	5.7
Sweden	26911	0.38	82.1	77.5	3.7	33.2	24.1	7.5
Switzerland	33060	0.34	82.8	77.2	4.9	6.8	28.2	5.4
United Kingdom	30379	0.38	80.4	75.7	5.5	19.9	26.9	9.3
United States	35037	0.34	79.5	74.1	6.9	62.7	84.4	19.9

Table A.2.2
Standardised base data for the Welfare sub indicators

	GNI per capita	Leisure time	Life expec-tancy of females	Life expec-tancy of males	Child morality per 1000 births	Sulphur oxides	Nitrogen oxides	Carbon dioxide
Australia	61	33	70	89	87	0	0	12
Austria	68	63	62	78	89	99	91	71
Belgium	68	77	51	65	88	82	81	50
Canada	71	3	68	100	100	48	80	72
Czech Republic	27	33	24	39	93	100	98	84
Denmark	76	48	30	62	89	76	78	49
Finland	61	26	60	65	97	93	94	58
France	67	72	77	74	90	99	78	64
Germany	59	64	50	66	91	62	81	79
Greece	33	54	50	73	84	88	73	52
Hungary	18	79	0	0	73	89	87	84
Iceland	71	33	65	86	87	17	37	21
Ireland	60	60	32	61	84	42	92	89
Italy	58	85	76	86	92	58	84	55
Japan	70	41	100	100	98	68	35	77
Korea	28	0	32	35	82	87	89	78
Mexico	0	86	4	37	0	77	91	65
Netherlands	68	100	49	76	87	97	78	6
New Zealand	46	35	51	76	84	91	100	100
Norway	100	67	58	79	94	98	88	55
Portugal	32	56	45	54	88	92	67	69
Slovak Republic	15	38	13	13	82	62	92	75
Spain	46	49	76	75	94	64	80	88
Sweden	63	55	67	94	95	68	90	77
Switzerland	84	43	75	91	89	97	87	90
United Kingdom	75	54	46	76	86	83	88	65
United States	91	44	36	60	79	36	41	0

Table A.2.3
Standardised Welfare indicators

	Economy	Leisure time	Health	Environ-ment
Australia	61	33	80	0
Austria	68	63	73	89
Belgium	68	77	64	72
Canada	71	33	77	23
Czech Republic	27	33	45	97
Denmark	76	48	54	69
Finland	61	26	70	83
France	67	72	78	82
Germany	59	64	64	75
Greece	33	54	64	72
Hungary	18	79	12	89
Iceland	71	3	88	68
Ireland	60	60	53	76
Italy	58	85	83	66
Japan	70	41	100	60
Korea	28	0	42	87
Mexico	0	86	0	79
Netherlands	68	100	66	60
New Zealand	46	35	66	100
Norway	100	67	74	82
Portugal	32	56	57	77
Slovak Republic	15	38	26	78
Spain	46	49	79	79
Sweden	63	55	83	80
Switzerland	84	43	83	94
United Kingdom	75	54	65	80
United States	91	44	52	23

Table A.2.4
Base data for the Input indicators

	Inhabitants 16-64/ Total population	Working hours per capita	Per cent of with a university education	R&D per capita	Internet users per 1000 inhabitants
Australia	0.656	850	19	405	219
Austria	0.681	731	7	561	209
Belgium	0.658	634	13	600	139
Canada	0.672	868	20	552	226
Czech Republic	0.703	917	11	203	45
Denmark	0.677	778	22	700	378
Finland	0.661	768	15	901	183
France	0.633	589	12	590	115
Germany	0.674	680	13	668	181
Greece	0.625	693	12	105	46
Hungary	0.712	668	14	142	30
Iceland	0.592	895	19	896	589
Ireland	0.667	744	14	351	156
Italy	0.712	643	10	268	143
Japan	0.708	940	19	816	189
Korea	0.696	1091	17	465	488
Mexico	0.715	730	13	36	20
Netherlands	0.782	686	21	551	249
New Zealand	0.633	837	14	250	165
Norway	0.660	685	28	590	274
Portugal	0.645	802	7	165	177
Slovak Republic	0.697	781	10	75	19
Spain	0.663	718	17	204	91
Sweden	0.662	768	17	1112	320
Switzerland	0.673	878	16	779	307
United Kingdom	0.648	793	18	499	231
United States	0.732	943	28	964	272

Table A.2.5
Standardised Input indicators

	Labour quantity Welfare	Labour quantity Economic standard	Labour quality	Research	IT	Input Welfare	Input economic standard
Australia	34	52	57	34	35	40	45
Austria	47	28	0	49	33	32	28
Belgium	35	9	29	52	21	34	28
Canada	42	56	62	48	36	47	50
Czech Republic	59	65	19	16	4	24	26
Denmark	45	38	71	62	63	60	58
Finland	36	36	38	80	29	46	46
France	22	0	24	52	17	28	23
Germany	43	18	29	59	28	40	33
Greece	17	21	24	6	5	13	14
Hungary	63	16	33	10	2	27	15
Iceland	0	61	57	80	100	59	75
Ireland	39	11	14	22	22	31	17
Italy	63	70	57	73	30	30	57
Japan	61	100	48	40	82	55	67
Korea	55	27	19	75	28	56	37
Mexico	65	28	29	0	0	23	14
Netherlands	100	19	67	48	40	64	44
New Zealand	22	49	33	20	25	25	32
Norway	36	19	100	51	45	58	54
Portugal	28	42	0	12	28	17	21
Slovak Republic	55	38	14	4	0	18	14
Spain	37	26	48	16	12	28	25
Sweden	37	36	48	100	53	59	59
Switzerland	43	58	43	69	50	51	55
United Kingdom	29	41	52	43	37	40	43
United States	74	70	100	86	44	76	75

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