Netherlands beyond GDP: A Wellbeing Index

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Abstract

Since the modern conceptualization of GDP (Kuznets, 1934), serious concerns have been raised to point out that it cannot properly represent wellbeing of a society. Despite the recent reaffirmations of these concerns (Stiglitz et al., 2009; OECD, 2011), GDP is still the dominant indicator. While dashboard approaches have their merits, we pursue to advance a composite wellbeing index as an alternative to GDP in measuring the progress of society. This approach here is documented for the Netherlands, though it can be applied to any advanced economy. Care has been taken to address methodological problems that arise from the index compilation exercise by using appropriate international goalposts from the Netherlands' peer countries. To avoid making subjective choices in choosing the relative weights of various indicators we utilize the weights reported by the users of the OECD's Better Life initiative from the Netherlands. With respect to the results of the indicator, it turns out that the recent financial crisis took a couple of years more to gradually hit the Netherlands from the various wellbeing angles, compared to GDP per capita. At the same time, in terms of our wellbeing measure, the Netherlands lost over a decade, as in 2015 the wellbeing index remains lower than in 2006.

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1 Introduction

The past years have witnessed a renewed effort to go "beyond GDP" in measuring wellbeing and the progress of societies. In this working paper we outline the data and methodological choices made in the construction of a composite indicator for the Netherlands between 2003–2015. In doing so, we hope to make a practical contribution to the debate to go beyond GDP.[1]

While there is growing agreement that measuring wellbeing involves looking at more than just GDP or income, how to do this is still a source of disagreement (Stiglitz et al., 2009; Fleurbaey, 2009). We used the following design principles to guide the construction of our indicator. The first is that we focus on wellbeing, not sustainability.[2] While sustainability is a hugely important issue, tackling wellbeing alone would prove challenging enough in itself.

The second point is that we try to create a so-called hybrid composite indicator. This means that we do not provide a "dashboard" of indicators or a correction to GDP. The dashboard approach of keeping the indicators separate has no methodological flaws, yet as an instrument of communication and measurement it falls short. A large number of indicators presented all at once cannot give an accessible and direct picture of the situation. Moreover, users of such a dashboard could choose their own story from such a dashboard, thus giving scope for miscommunication.

A third design choice was to use the Stiglitz-Sen-Fitoussi report (Stiglitz et al., 2009) and the OECD Better Life Initiative as our starting points. These two initiatives are an attempt to create some common ground for the measurement of wellbeing and we want our indicator to adhere to these as much as possible. Most importantly, we rely on the OECD for the dimensions and the relative weights between the dimensions. A fourth point is that we try to take into account the production of statistical series in the Netherlands. Ideally, the data we use should be produced at regular intervals and should be of high quality. In some cases, this provides opportunities to improve upon the data choices of the Better Life Initiative, but in other cases it imposes constraints. As we will see below, creating our index also requires us to make international comparisons, so we are also dependent on the output of international statistical agencies such as Eurostat.

A fifth design principle was that we want to create a time series with constant weights over time. We think that being able to assess developments over time is crucially important for the measurement of wellbeing. For example, if we want to go "beyond GDP", we should be able to compare developments in our new indicator to GDP and this would be difficult to do if we measure it at one point in time.

Finally, we try keep our aggregation procedure as simple as possible. This means that wherever possible we stick to linear transformations and avoid statistical modeling. However, creating a composite indicator remains a fundamentally difficult task and substantial disagreement exists about how to do this. At the core of the problem is the fact that the different indicators are measured using different units and that they change at strongly

[1]This was a joint effort by Rabobank Economic Research and Utrecht University's Institutions for Open Societies program.

[2]However, the quality of the environment is one of the dimensions of our indicator, see below.

different rates. The minimum requirement in combining the indicators is putting them on the same scale. This must be done in a way so that small changes in one indicator will not drive the entire index unless it has been explicitly weighted to do so. We have chosen to normalise our indicators on international benchmarks; that is, we scale the variables to range between 0 and 1, where 0 is the minimum and 1 is maximum value found internationally. The international comparison is made with other North-West European states. There are two advantages to this procedure. One, the international performance on each wellbeing indicator usually gives a fairly wide range of values. In turn, our composite indicator is not sensitive to small changes in any of the underlying components. Second, it gives some logical meaning to our indicator. It means that we compare Netherlands to its peers: other developed countries with large welfare states. Our argument is that this places the indicators on a range that reflects the outcomes of reasonable policies in the Netherlands.

2 Well-Being Dimensions

The dimensions selected for the composite index broadly follow the taxonomy of OECD as it is implemented in the Better Life Index initiative. This decision was taken both for reasons of the relative completeness of the dimensions in that index, as well as for the practical reason of addressing the choice of selecting the weights of each wellbeing dimension in the aggregate index. In the case of using the Better Life index dimensions, or a subset thereof, we can make use of the preferences expressed by individuals visiting the Better Life index website and create their own flavor of the index (Boarini and D'Ercole, 2013).

Specifically these dimensions are shown below, sorted by the weights from the Better Life initiative (shown in parenthesis, accessed November 9th, 2015):

1. Subjective wellbeing (0.113)
2. Health (0.103)
3. Work-Life Balance (0.096)
4. Education (0.096)
5. Housing (0.091)
6. Environment (0.091)
7. Safety (0.091)
8. Income (0.085)
9. Jobs (0.083)
10. Community (0.078)
11. Civic Engagement (0.067)

3 Data

This section provides a further overview of the data and sources used in the compilation of the composite well-being index. Table 1 below shows the variables used to operationalize these dimensions, with the corresponding data coverage and the sources. An explanatory account is offered for the selection of the specific variables included for each dimension.

Dimension	Variable	Source	Avail. Years
Subjective-wellbeing	Happiness	CBS	2003-2015
	Life satisfaction	CBS	2003-2015
Health	Life expectancy	CBS	1981-2015
Education	Educational attainment	UNESCO	2003-2014
	PISA score	OECD	2003-2014*
	Average years of education	UNESCO	2003-2014
Environment	Particulate matter (PM_{10}) emissions	CBS	2003-2015
	Living Planet Index (biodiversity)	CLO	1990-2014
Safety	Violent crime rate	CBS	2003-2013
	Homicide rate	CBS	2013-2015
Income	Standardized disposable household income (corrected for inequality)	CBS	2003-2014
Jobs	Short-term unemployment	Eurostat	2003-2015
	Long-term unemployment	Eurostat	2003-2015
	Flexible employment	Eurostat	2003-2015
Community	Social contact (family and friends)	CBS	2003-2015
Civic-engagement	Voice and Accountability	World Bank	1996-2015
	Political Stability & Absence of Violence	World Bank	1996-2015
	Government Effectiveness	World Bank	1996-2015
	Regulatory Quality	World Bank	1996-2015
	Rule of Law	World Bank	1996-2015
	Control of Corruption	World Bank	1996-2015
Work-life-balance	Hours worked	CBS	2003-2015
Housing	Housing satisfaction	WOON	2003-2015

Table 1: Sources and variables for wellbeing dimensions. Note: * 2015 data available, but not yet included

3.1 Income

The income dimension of the wellbeing index is the one most closely related to the concept of GDP or GDP per capita. Yet following – among others – the arguments of the Stiglitz Commission Report (Stiglitz et al., 2009), the income measure can depart from GDP in a number of fundamental ways. The extent of divergence depends on the various choices that can be made according to the available data. An important distinction comes at deciding among National Account Statistics and Household survey data. National Account Statistics (NAS) contain among others: GDP, total final consumption, and household final consumption. Household surveys can measure: primary income, gross income, disposable income, and standardized disposable income. The fundamental difference among the NAS and Household survey data is that the latter can provide knowledge of the underlying distribution. Generally speaking, opting for NAS metrics keeps the index blind with regard to distributional aspects.[3] Table 2 provides an overview of the attributes that are important in the selection of the most appropriate variable for this dimension.

Table 2: Overview of the various options for use in the Income & Income Inequality dimension

Variable Name	Variable's Attributes			
	Aggregate	Distribution	No Oblig.	HH Corrected
GDP	√			
Total Final Cons.	√			
Household Final Cons.	√			
Primary Inc.		√		
Disposable Inc.		√	√	
Standardized Disp. Inc.		√	√	√

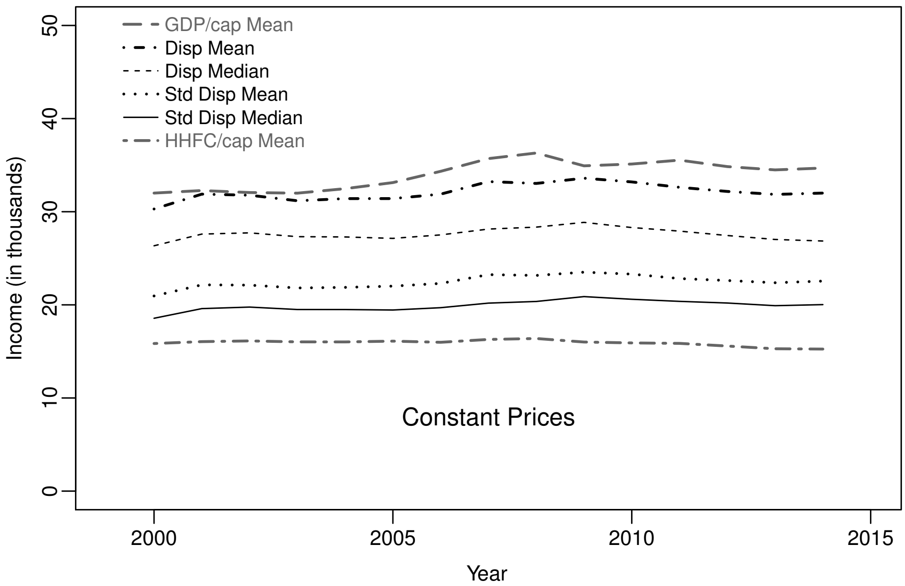
Although not explicitly stated so far at the CBS website (Centraal Bureau voor de Statistiek; Statistics Netherlands), the data on the distributional information are given in current prices. However, it is reasonable to expect that the wellbeing index accounts for the changes in the price levels. Therefore we need to convert these data in constant currency units. Regarding the deflator, since none was available for this purpose from CBS, we followed the advice of the World Bank and applied the deflators specifically constructed for incomes, made available by OECD.[4]

Figure 1 shows the evolution of NAS and survey based income variables. For the NAS components (GDP and Household Final Consumption), the average is reported, since no distributional information is linked with these variables. The survey based variables disposable and standardized disposable income, are presented with both the average and the median. Notice that the Final Household Consumption ranks at the bottom, lower than standardized disposable income. GDP per capita stands at the top of the graph, showing higher volatility in 2008, right after the 2007 financial crisis, than all other income indicators. The median of the survey based income variables, in contrast to the mean, is not influenced by the extremes of the distribution. Thus, the median is a simple way to factor in some information regarding the distributional aspects of the variable. However, the distributional content is not as rich as we would like to, as it is strictly linked to the income of the median person. Any change to the incomes of other individuals would go by unnoticed by this variable. For example, a shock depleting the incomes of the first decile, would not be captured by such a (median) variable. Since we wish to blend income and distributional information in the wellbeing index in a transparent and meaningful manner, we will investigate other options for incorporating distributional information in our income variable below.

[3] Though see the new method by Piketty et al. (2016) to produce NAS statistics with distributional information.

[4] Using the item "Deflators used for Income series" from "Regional Economy : Reference series - deflators and PPP rates". Alternatively, the implicit rates of correction among Final Household Consumption Expenditure in constant and current LCUs can be used.

Figure 1: Evolution of National Account and Household Survey based income variables in **constant prices**, 2000-2014.



The most detailed level of distributional information made available by CBS, is that of decile income shares decomposition. We can utilize this information to create an income variable that will combine inequality information from the entire distribution as well as information about the level of income. In this we will explore the other two means, namely the geometric and the harmonic. Both incorporate information from the entire distribution. If applied on the decile income shares then when multiplied with the average income they produce an income level that accounts for the income inequality throughout the income distribution. Keep in mind that the arithmetic mean is the top boundary for the geometric mean, and the geometric mean is the top boundary to the harmonic mean. The choice between the two non-arithmetic Pythagorean means can be based on their correlation with the other inequality indexes provided by CBS. In figure 2 we present the evolution of all the above indexes, and in table 3 we present the correlations of those means with the inequality indexes. On average, the correlation of the geometric mean of the deciles' income shares in terms of the standardized disposable income with the various inequality indexes is the highest at the level of -0.68. This is very close to the average correlation of the geometric mean of the non-standardized disposable income which stands at -0.66. The correlations of the harmonic means are on average lower, and in some cases very low (Theil index). With respect to the Gini and the 80/20 ratio the correlation with the geometric mean is very high; and especially in the case of standardized disposable income it is -0.84 and -0.94 respectively. In addition, do note that the geometric mean is used in the United Nations Human Development Index to account for inequality.

Table 3: Correlation of income inequality indexes with the geometric and harmonic means of deciles income shares for Disposable, and Standardized Disposable incomes in the Netherlands, 2000-2014.

Variable Name	Disposable Income		Std. Disposable Income	
	Geometric	Harmonic	Geometric	Harmonic
Gini	-0.80	-0.62	-0.84	-0.55
Theil	-0.52	-0.28	-0.36	-0.09
Polarization	-0.45	-0.52	-0.58	-0.60
Ratio 80/20	-0.88	-0.89	-0.94	-0.92

Building on the high correlation of this geometric mean with the key income inequality indexes from CBS, we can utilize now its additional property of expressing an income share average. This property can be put to work once we multiply this value with the average income from the entire distribution. The result of this is shown in figure 3, along with the mean and median of both disposable income variables expressed in constant prices. The figure demonstrates the similarity among the median standardized disposable income with its geometric version. However, in contrast to the median standardized disposable income, any changes in segments of the distribution apart from the median individual of the distribution will not be missed. This favors the geometric standard disposable income as the income inequality sensitive income variable for inclusion in the wellbeing index.

Figure 2: Evolution of the geometric and harmonic means of the income shares per decile of the income distribution in comparison to the inequality indexes in the Netherlands, 2000-2014.

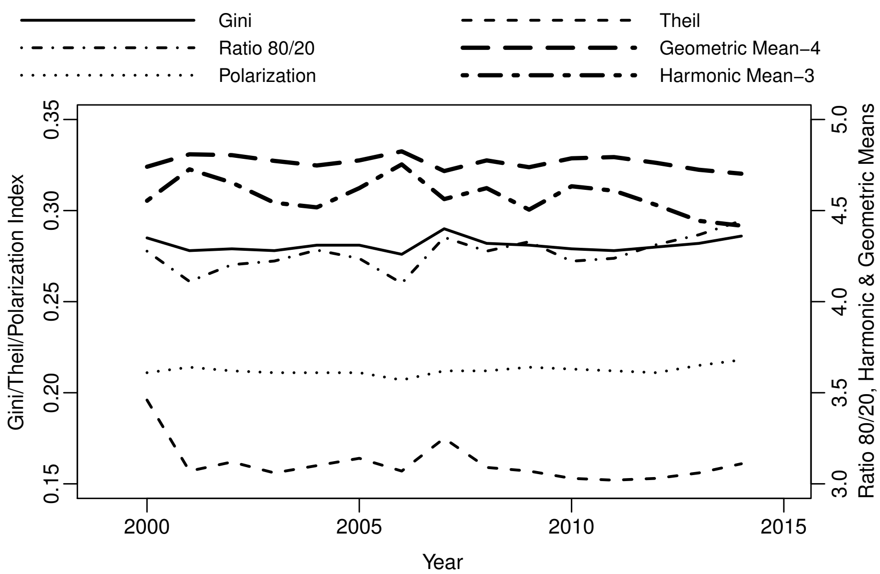
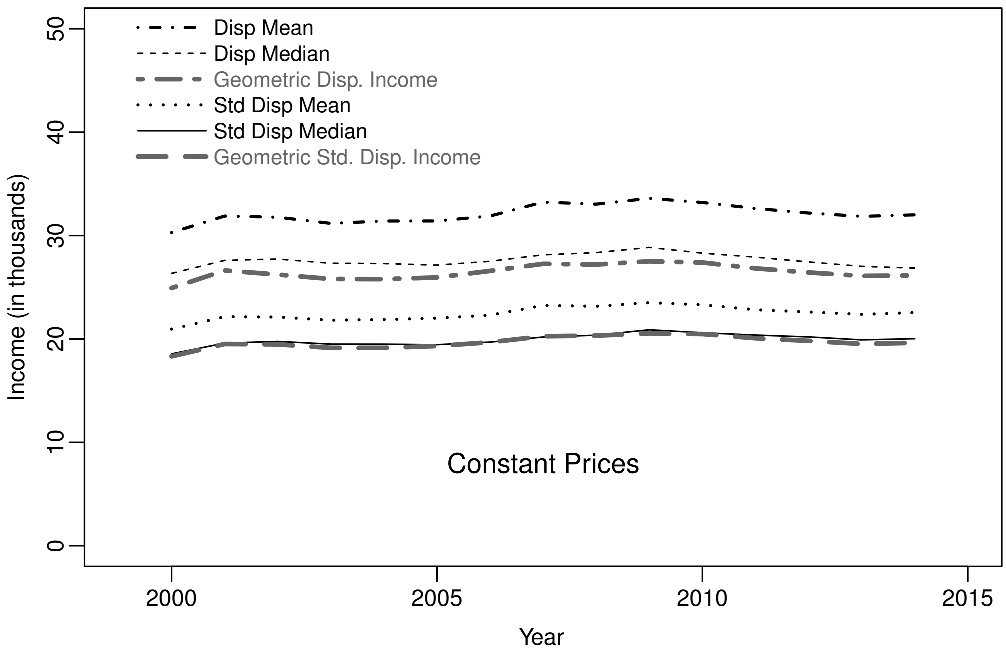


Figure 3: Evolution of the geometric standardized disposable income expressed in constant prices in the Netherlands, 2000-2014.



Ideally, to avoid double counting, we should be excluding education and health expenses from our income measure, since this is also measured in other dimensions (see section below). In a single country treatment, or in an international comparison with other countries that have the same institutional arrangements for education and health as do the Netherlands, there would not be a big problem. But once we become interested in broader international comparisons this will be a worrisome point. Especially when in some countries substantial part of educational and health expenditures are financed privately compared to countries where this is done in principle from the public purse. In the current version of the index the aim is to focus on the case of the Netherlands, thus the fact that we are unable to exclude those expenses would not be very worrisome.

3.2 Education

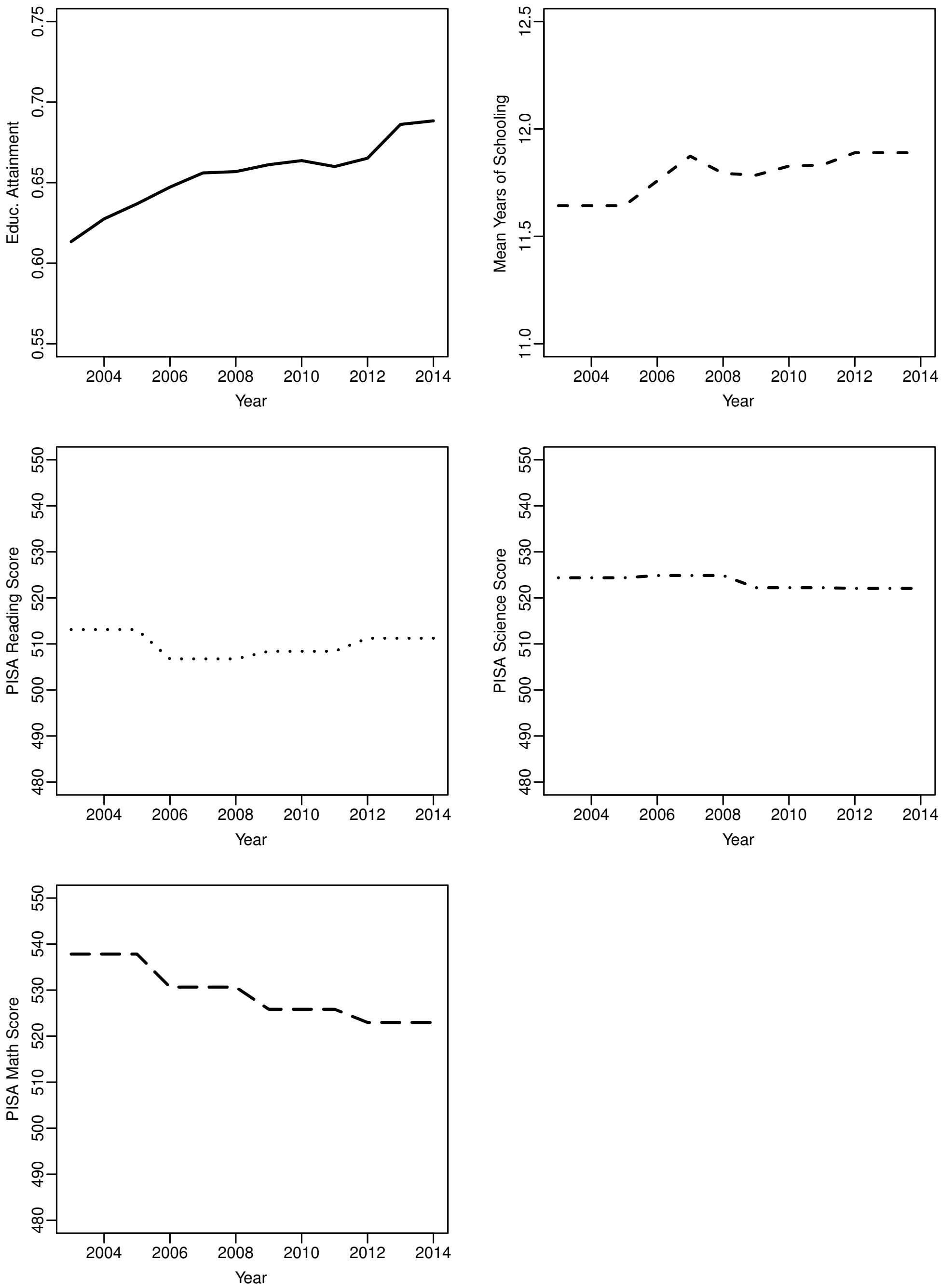
Education has been used extensively in constructing composite well-being indexes together with metrics for income and health. Examples of such indexes include the HDI index (UNDP, 1990), the OECD Better Life index (Boarini and D'Ercole, 2013), as well as long run well-being indexes in van Zanden et al. (2014) and Prados de la Escosura (2014). Perhaps the most widely used indicator for this dimension is population literacy, followed by a version of overall education attainment. Literacy tracks the share of population able to read and write, at least in very simple terms. This indicator in developed countries has reached maximum levels, rendering its inclusion in an index virtually without an impact. A still relevant educational indicator for developed countries is education attainment. It expresses the share of a population group that has reached a certain maximum codified level of education. Typically those shares are calculated for a certain large population group, e.g. of age 25 or older, rather than the entire population. Other relevant variables such as average years of schooling have been incorporated in wellbeing indexes, such as the Human Development Index of United Nations, or the Better Life index from OECD. An additional choice taken in the HDI is the average years of expected schooling. According to UN, the expected years of schooling is the "number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrollment rates persist throughout life disaggregated by sex."[5] In that sense this variable expresses a possible future trend in the national education statistics. Since in this wellbeing index we are interested in expressing the current level of wellbeing in the Netherlands, we do not include expected years of education.

The OECD Better Life Index, beyond educational attainment and average years in education, introduces direct measurements for student competencies in main educational themes as well. Those skills are captured in the PISA surveys, and are split into three basic components: Reading, Science and Mathematics. The first round of PISA surveys was conducted under the auspices of OECD in 2000. The Netherlands did not participate in that first round. Since 2000 five more survey waves have been conducted, and the Netherlands has participated in all of them. Obviously the downside for using the PISA data of educational performance is that they are only made available every 3 years. The country coverage of the PISA survey is extensive and includes 71 countries in 2015. The student coverage of the PISA 2015 survey for example is quite impressive with about 540 000 students participating coming from 18 618 schools throughout the 71 countries (or economies). Participating students are of age between 15 years and 3 months until 16 years and 2 months. The total population of this cohort in the participating countries is about 29 million.

Figure 4 contains the variables used in the education dimension, along with a composite sub-index for education in the last sub-plot. As discussed above the data include education attainment, mean years of schooling and the PISA scores for reading, science and mathematics. Education attainment here measures the share of population age 25 and above with at least an upper secondary diploma according to the ISCED classification. The data are from the UNESCO Institute of Statics. Mean years of schooling are available from the same source and describe the average years of schooling in the same population group as in the education attainment variable. And finally, PISA scores measure the performance of students in secondary education (15 year olds).

[5] The index data are available at `http://hdr.undp.org/en/content/education-index`; for details see UNESCO (2013).

Figure 4: Education attainment, mean years schooling, and PISA scores for the Netherlands, 2003-2015 (source: UNESCO/CBS/OECD).



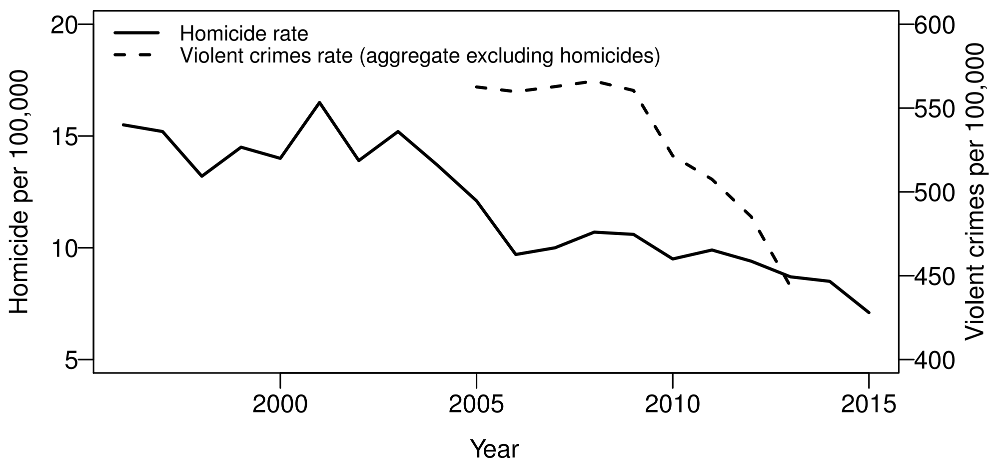
3.3 Safety

Safety in wellbeing surveys and indexes is often measured by the homicide rate, see for example OECD (2011) and van Zanden et al. (2014). The homicide rate "measures the number of police-reported intentional homicides reported each year, per 100,000 people" (UNODC). The global data source for crime related data is the United Nations Office on Drugs and Crime (UNODC). The UNODC data are based on national data collected from law enforcement, prosecutor offices, and ministries of interior and justice, as well as Interpol, Eurostat and regional crime prevention observatories (OECD/BLI). In OECD (2011) and the Better Life Index this is accompanied by the assault rate as it is measured by the Gallup World Poll surveys. In the Gallup survey the related question for capturing assault rate is whether or not a person has been assaulted or mugged during the previous 12 months.

Homicide counts for the Netherlands are available via CBS for the period 1950-2015. For reference the top left plot in figure 5 shows the evolution of the homicide rate in the period 2003-2015.[6]

Using the above sources we complement the homicide rate metrics with data on violent crimes that include total sexual violence, kidnappings, assaults and robberies. Figure 5 contains the evolution of the various violent crime rates incorporated in the safety dimension. The safety dimension is thus measured by the average of (i) homicide rates and (ii) the sum of sexual violence, kidnappings, and robberies (violent crimes).

Figure 5: Homicide and other violent crime rates per 100 000 inhabitants in the Netherlands, 2003-2015.



[6]2015 is preliminary data.

3.4 Life Satisfaction

Life satisfaction is measured here with subjective variables. We have considered three variables that would be relevant for consideration in this dimension. These are "satisfaction with daily activities", "happiness", and "satisfaction with life". However there are data limitations.

Two series of life satisfaction data are available in CBS for the time frame of interest. One is for the period 1997-2011, and the other is from 2013 onward, both via the POLS survey (*Permanent Onderzoek LeefSituatie*; permanent living conditions survey), but the data structures in the two cases are not identical. In De Jonge et al. (2015) the Reference Distribution Model is applied to create more consistent series for a variable that contains methodological breaks in the underlying surveys. We could use that approach to create a more consistent dataset for this dimension. However, the CBS has provided us with corrected series for both "happiness", and "satisfaction with life". The data are shown in table 4 and figure 6 for happiness, and for "satisfaction with life". For the "satisfaction with daily activities" variable we have found no comparable data for the period before 2013, therefore we exclude it from consideration.

Figure 6: Responses for "happiness", and "satisfaction with life" in the Netherlands, 2003-2015. Source CBS.

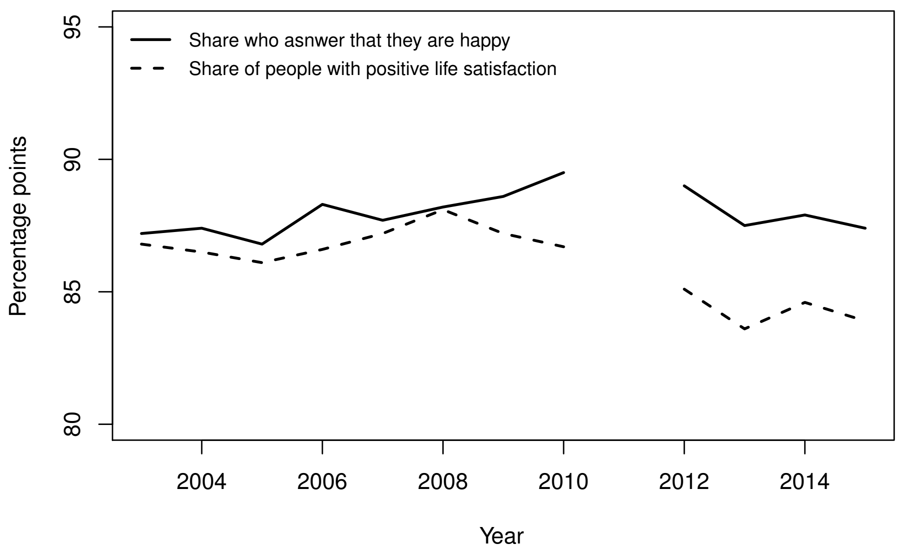


Table 4: Responses for “happiness”, and “satisfaction with life” in the Netherlands, 1997-2015

Year	Satisfied with their lives	Being happy
1997	87	90
1998	89.7	94.3
1999	87	87.9
2000	88.1	88.6
2001	88.2	88.9
2002	86.6	87.5
2003	86.8	87.2
2004	86.5	87.4
2005	86.1	86.8
2006	86.6	88.3
2007	87.2	87.7
2008	88.1	88.2
2009	87.2	88.6
2010	86.7	89.5
2011	-	-
2012	85.1	89
2013	83.6	87.5
2014	84.6	87.9
2015	83.9	87.4

3.5 Environment

Since we are developing an indicator which concerns itself with wellbeing in the present, we only include environmental indicators which affect current wellbeing. For that reason we would not include CO_2 emissions, since those emissions mainly influence future wellbeing. Eventually, however, we feel it is of great importance to develop measures of the sustainability of wellbeing.

Environmental factors that influence wellbeing include emissions, environmental amenities (like green landscapes and biodiversity) and environmental disamenities (pollution) (Stiglitz et al., 2009). Data availability is limited for some of these indicators, but we do have consistent data over a longer time period for emissions and biodiversity. These factors are relevant for environmental wellbeing now.

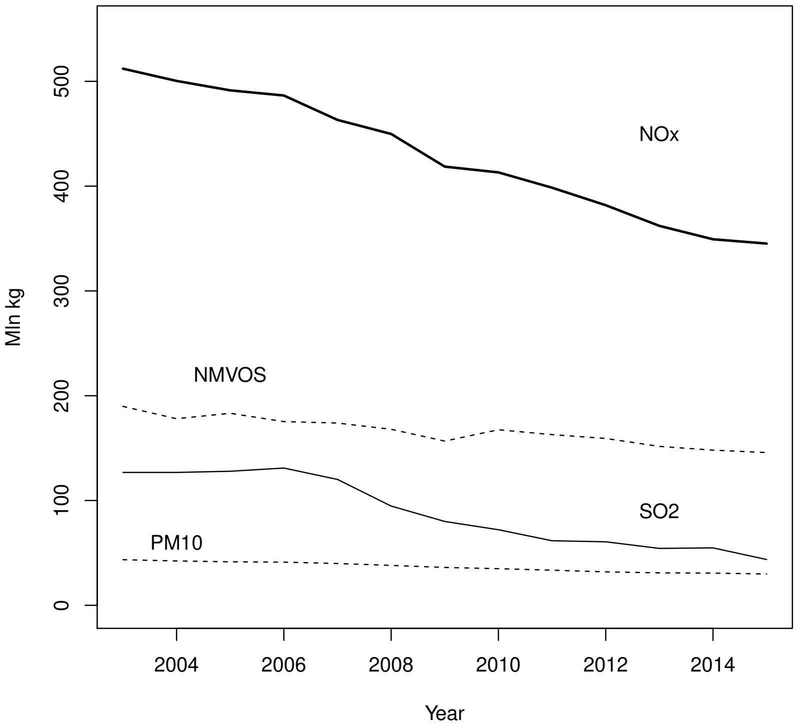
3.5.1 Emissions

One way environmental factors directly influence wellbeing is through air pollution. Certain emissions directly influence health and wellbeing. Information provided by Kees Klein Goldewijk show that from the CBS data available, the following are direct pollutants: NMVOS (non-methane volatile organic compounds, SO_2, NO_x and PM_{10}. Interestingly, all of these four emissions show a declining trend (figure 7) and are highly correlated (table 5).

Table 5: Correlation table.

	NMVOS	SO_2	NO_x	PM_{10}
NMVOS	1			
SO_2	0.94	1		
NO_x	0.98	0.97	1	
PM_{10}	0.97	0.98	0.99	1

Figure 7: Total annual emissions in mln kg.



Particular matter (PM) seems to be particularly harmful. The coarse fraction is called PM_{10}, which may reach the upper part of the airway and lungs. Smaller particles are called $PM_{2.5}$ and are more harmful because they penetrate more deeply into the lung. According to the World Health Organization WHO (2005), PM increases the risk of respiratory death in infants under 1 year, aggravates asthma and causes other respiratory symptoms such as bronchitis. $PM_{2.5}$ is especially harmful, increasing deaths from cardiovascular and respiratory diseases and lung cancer. In addition, while large amounts of PM exposure increases the negative effects, research suggests that there is no safe lower limit of PM emissions (World Health Organization, 2013).

According to the RIVM (2005) (National Institute for Public Health and the Environment), particulate matter makes the greatest contribution to the environment-related disease burden in the Netherlands. Another RIVM study 2002 states that between 1 700 and 3 000 people per year die prematurely by inhaling PM, while chronic exposure is estimated to lead to 10,000-15,000 premature deaths per year.

In addition to effects on mortality, PM_{10} and $PM_{2.5}$ emissions also influence morbidity. It aggravates symptoms of people with respiratory disease and cardiovascular disease. The Lung Fund launched a social cost-benefit analysis (CBA) which estimates the social costs of PM by health damage between €4 and 40 billion per year (Singels et al., 2005).

Because all emissions are highly correlated with each other, we could include only PM_{10} as a proxy for the other emissions as well. $PM_{2.5}$ would perhaps be better to use (is also what OECD is using in How's Life), but good data of $PM_{2.5}$ over a longer time period is difficult to come by. Ideally we would include the concentration PM_{10} emissions per cubic meter, because higher concentrations are correlated with larger health problems and concentration differs per region in the Netherlands (see figure 8). If you one multiplies the concentration per region with the population in that region you would get a good estimate of the total harm of particulate matter on the Dutch population. The exposure to particulate matter is calculated on the basis of the particulate matter concentrations in the Large-Scale Concentration Cards Netherlands [7]. The first step was the aggregation of the particulate matter measurements from 1x1 to 5x5 km to correct the resolution differences between the early and the low maps (based on advise by Guus Velders). Next, for each year in each square with particulate matter measurements of the total population from the CBS grid calculated and the total is multiplied by the average particulate matter concentration in the square.[8] The results are presented in figure 9.

[7] `http://www.rivm.nl/dsresource?objectid=rivmp:250343&type=org&disposition=inline`; Winand Smeets of the PBL informed us of these maps; some of the maps not available online themselves were kindly provided by Guus Velders of the RIVM

[8] More details can be found at `https://github.com/rijpma/fijnstof`.

Figure 8: PM_{10} concentration per region.

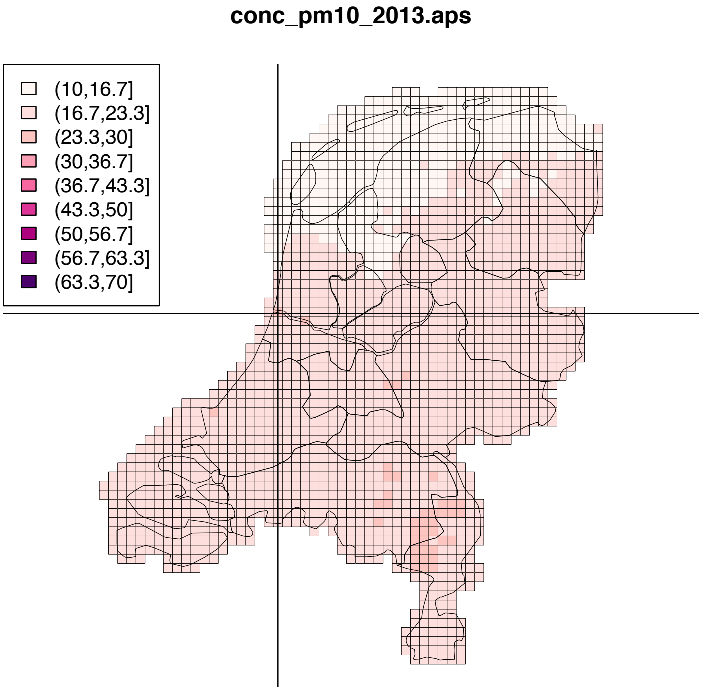
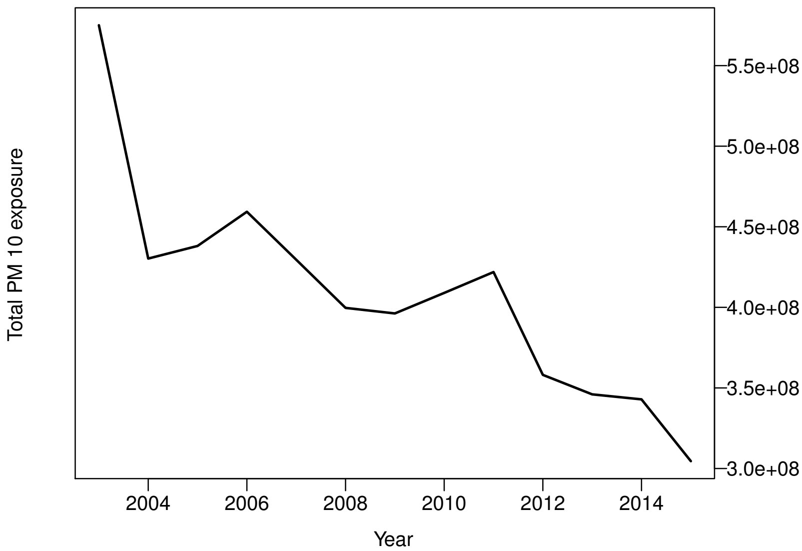


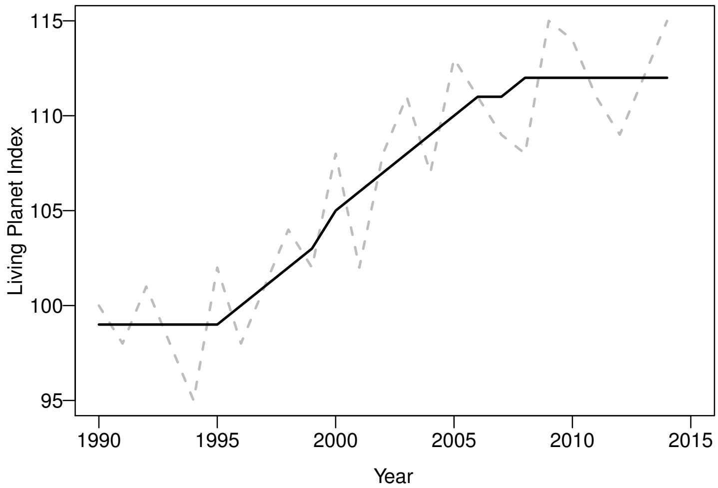
Figure 9: persons * average exposure PM_{10} (ug/m^3).



3.5.2 Biodiversity

A consistent and well-known measure of biodiversity (an indicator of environmental amenities) is the Living Planet Index, which gives the average trend of 421 kind of species. Because the series is fairly volatile, we use the smoothed series provided by the WWF. Data for the Netherlands is available from 1990 through 2014. Biodiversity seems to have an upward trend since the 1990s, although in the last couple of years biodiversity remained constant.

Figure 10: Living Planet Index, Netherlands 1990-2014.



3.6 Jobs

In the literature there is a clear consensus that unemployment negatively affects wellbeing. Most studies on happiness and life satisfactions show that unemployment has a significant and robust effect on these measures of wellbeing, even when controlling for other factors (Frey and Stutzer, 2002; Di Tella et al., 2001; Wolfers, 2003). Job loss and unemployment do not only seem to reduce wellbeing due to a loss in income, but cause a host of secondary stress factors such as worry, uncertainty, financial, family and marital difficulties (Price et al., 1998). In addition, the negative wellbeing effects seem to increase with the duration of unemployment.

Aside from becoming unemployment, the financial and social insecurity associated with the uncertain prospect of losing your job also affects wellbeing (see Stiglitz et al. (2009)). This is closely associated with financial insecurity. Burgoon and Dekker (2010) conclude that flexible employment increases individual's subjective economic security, reducing wellbeing. The literature shows a clear connection between (perceived) job insecurity individual psychological and physical health as well as psychological well-being (Witte, 1999).

Based on the above literature we decided to include both short and long-term unemployment as well as flexible employment as percentage of the labour force. Apart from their relevance to wellbeing, and advantage of including these three variables is that they all can be expressed as a percentage of the labour force. This makes both the weighing as well as presentation easier as well as more transparent. Data on short-term unemployment and long-term unemployment for 2003–2014 come from the CBS. Data on flexible employment come from Eurostat.

What is clear from the data presented below is that there seems to be a structural increase of the number of people with flexible employment as a percentage of the labour supply (see figure 11). Short and long term unemployment has increased strongly since the start of the financial crisis in 2008. Long term unemployment is still increasing even though the economic recovery has set in, which could point to more structural factors (De Graaf et al., 2015 and Rabobank).

Figure 11: Development unemployment and flexibility as % labour force, 2003-2015.

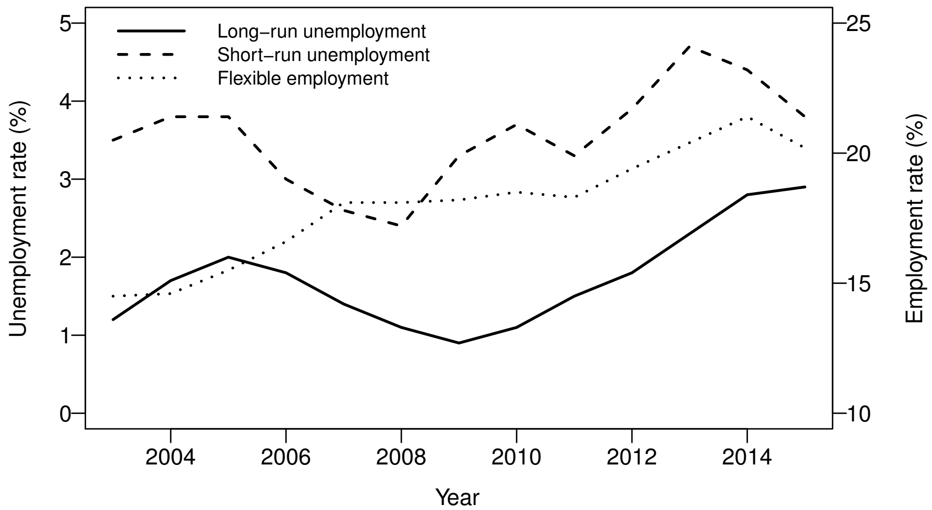
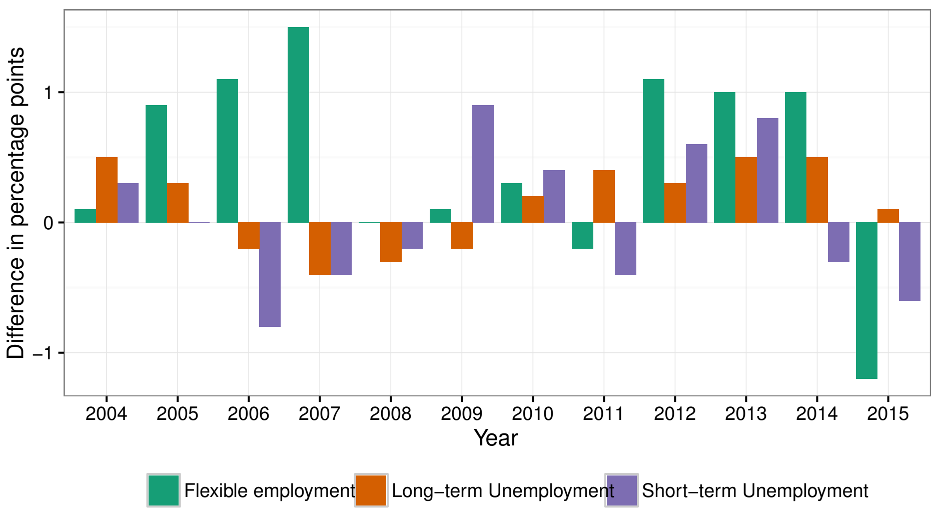


Figure 12: y-o-y differences in the variables for jobs, 2005-2015.



The remaining point is the weighing of the three variables. It seems clear that long-term unemployment is worse than short-term unemployment, which in turn is worse than flexible unemployment. An exact weighing based om income or relative wellbeing based on regressions seems unfeasible for the time being. As an example we have made a back-of-the-envelope weighing roughly based on the relative loss of wellbeing based on the literature. While weights based on relative income are a possibility, we found the rationale as well as the preliminary results unsatisfactory. Therefore, we have used equal weights for this version of the index.

3.7 Social connections and social trust

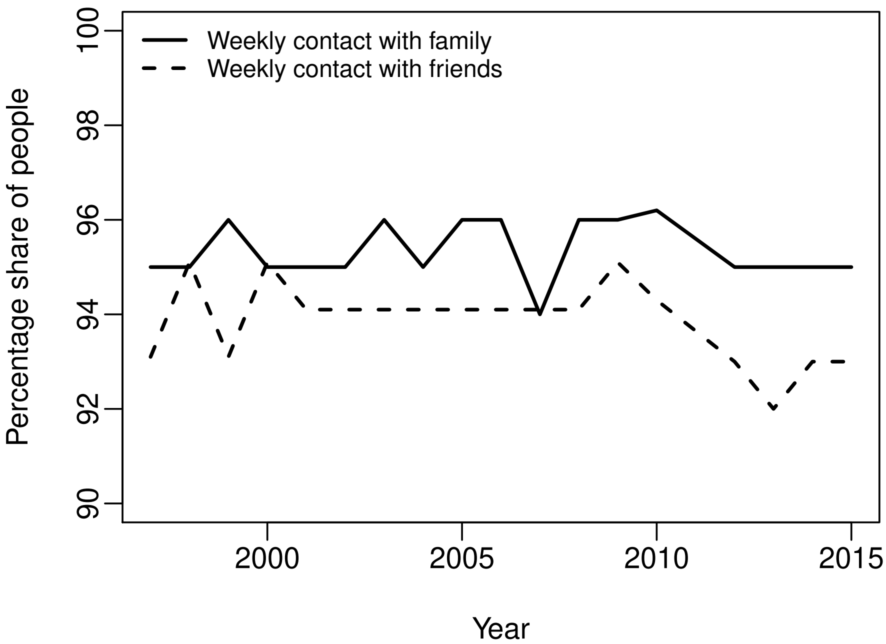
Research suggest that social connections are robust predictors of subjective measures of life satisfaction Stiglitz et al. (2009). Social connections include both the frequency of contact with friends and family as well as general trust in other people. Both data are available from the COB (Continu Onderzoek Burgerperspectieven, a Dutch public opinion survey) from 1997-2015.

From Stiglitz et al. (2009, p.185):

> *Lack of contacts with other people in normal daily is both a symptom and a cause of social distress, and it can lead to a downward spiral affecting morale and reducing social and economic opportunities. Social isolation can be measured through questions asking people about the frequency of their contacts with others [...] Research has highlighted strong associations between the degree of social isolation of each person and measures of their wellbeing, self-assurance ability and power of action, and activity*

We have data available for the share of people that have weekly contacts with friends, family and neighbors (figure 13). The figure below shows that contacts with family and friends are highly correlated and rising until 2005/6, after which they began to decline.

Figure 13: Weekly contact family and friends. Source: Statistics Netherlands



3.8 Health

In the existing literature health is another commonly used dimension for measuring wellbeing. That comes as no surprise since, as Stiglitz et al. (2009) put it, "without life, no other component has any value". In general a distinction can be made between mortality and morbidity. Mortality is easier to measure and more objective than morbidity. One of the most common measures related mortality is life expectancy, be it at birth or standardized.

Morbidity, or non-fatal health condition, is generally more subjective but also important for wellbeing. Good health is universally perceived to be important for wellbeing. The Better Life Index also argues that health brings other benefits as well, such as improved access to education and employment, increase in productivity, reduction of health care costs, good social relations, and longer life (OECD, 2011).

Because of availability of data we have also chosen to use life expectancy as a measure of health. Total life expectancy is an indicator of mortality, while the other variables measure morbidity in some degree. The following data is available (including a breakdown by gender and age):

- Life expectancy: 1981-2015
- Life expectancy in good experienced health: 1981-2014
- Life expectancy without moderate or severe physical limitations: 1983-2014
- Life expectancy without chronic diseases excluding high blood pressure: 2001-2014

- Life expectancy in good mental health: 2001-2014

There are changes in the methodology for calculating some of the life expectancy measures that make the inclusion of most these series problematic. In 2010 there was a redesign of the health survey and measurement of healthy life expectancy. Because of these changes the outcomes of 2010 relative to 2009 should be interpreted with some caution. In 2014 there was another redesign of the health survey. Changes in life expectancy without physical limitations of the outcomes of 2014 relative to 2013 should therefore also be interpreted with some caution. Finally, life expectancy without chronic diseases has also had a change in methodology. One of these changes is that until 2013 in the health survey people were asked about having asthma or COPD in one question, and from 2014 onwards this is done in two separate questions.

At first sight, for experienced health the changes in methodology do not seem to be a problem (for more information see paper). However it also states: "even when there is no change in methodology found for a particular subject, it is not sure whether the redesign of the survey has not influenced the outcome: a real change in the figures may be offset by the redesign. Finally it cannot be ruled out that a rapture in fact relates to a real change of the figures."

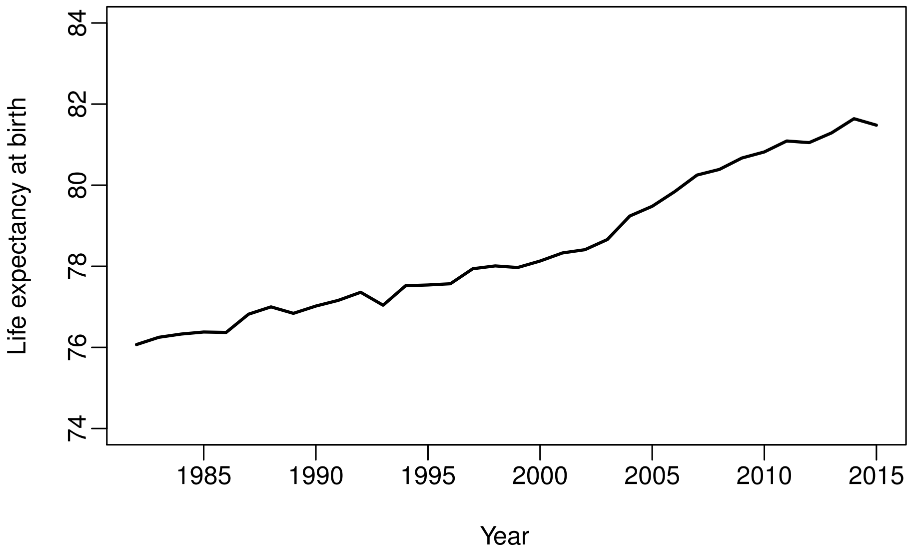
However, in our case it is not necessarily a problem that these variables cannot be aggregated since there is a high correlation between these variables and life expectancy, as the table below shows. The one exception is "life expectancy without chronic diseases excluding high blood pressure" which shows a negative and low correlation.

Correlations of life expectancy with the other variables:

- Life expectancy in good experienced health: 0.883
- Life expectancy without moderate or severe physical limitations: 0.925
- Life expectancy without chronic diseases excluding high blood pressure: -0.238
- Life expectancy in good mental health: 0.771

We therefore concentrate on total life expectancy at age zero for the dimension health. It has the advantage of being clear and easy to communicate. In addition, we do not have the problem of data breaks, and the correlation between life expectancy and most other health variables is high which is why it could be a proxy for other morbidity measures.

Figure 14: Life expectancy at birth in the Netherlands

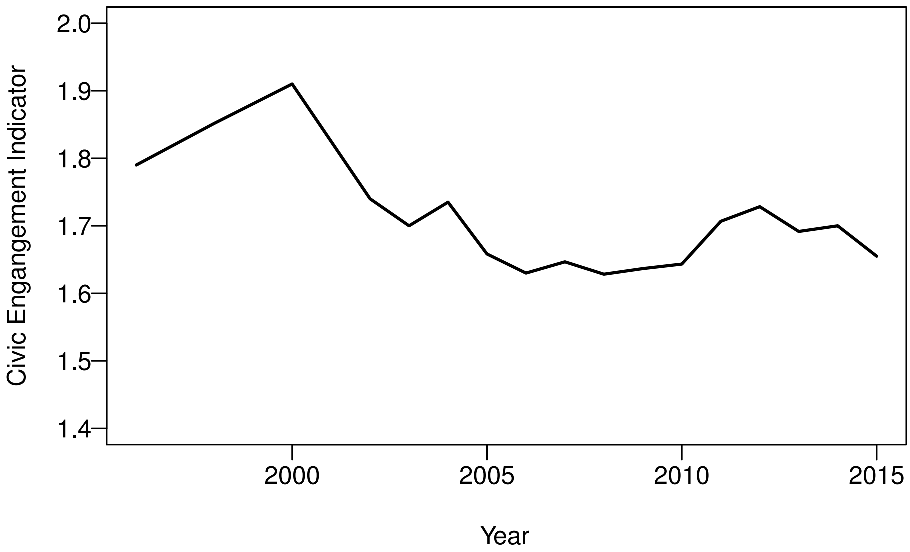


3.9 Civic Engagement (Political voice and governance)

According to Stiglitz et al. (2009), political voice and governance are an integral dimension concerning the quality of life, having both intrinsic as well as instrumental worth. Intrinsically, the ability to participate as a citizen is an essential freedom and capability. Instrumentally, strong political voice and good governance can improve public policy as well as promote public discussion, which can help citizens make more informed choices about their lives.

Regarding data availability, the World Bank governance indicators are a reliable source for data. It provides yearly data from 2003-2015 on six different indicators: control of corruption, rule of law, regulatory quality, government effectiveness, political stability and absence of violence, and voice and accountability. These indicators are measured using a host of underlying variables from different sources, and are estimated on a scale between -2.5 (weak) and 2.5 (strong). It seems logical to include all six indicators, since they are all relevant for political voice and governance.

Figure 15: Governance indicator



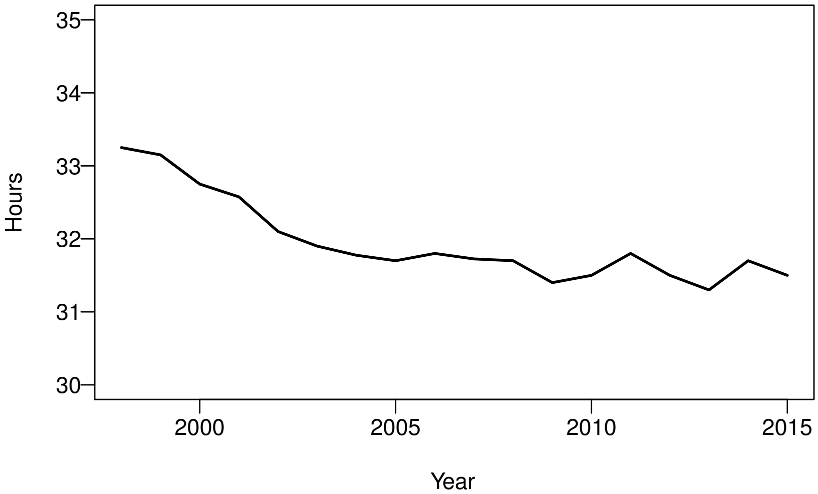
3.10 Work-life balance

A healthy work-life balance allows people to spend time on activities they value. Because we prefer to use objective measures, work-life balance is measured by using hours worked. The annual data come from Eurostat and have been corrected for a break in the series in 2008. While this includes the hours spent at work, it unfortunately does not include time spent commuting or on household chores. We are thus only able to capture the time spent not-at-work, rather than pure free time.

This series has connections with two other dimensions. Fewer hours worked might mean that people can work less and earn the income measured in the material wellbeing dimension. At the same time, some unemployment that we aim to measure in the jobs dimension may be hiding in part-time employment, which means we would be valuing underemployment positively in the work-life balance. This could be alleviated by looking only at hours worked in full-time employment, but this would neglect that part-time work could be an important driver of hours worked in the Netherlands. For this reason we look at hours worked of all employed persons.

The trend in average hours worked for the Netherlands displayed a decrease of nearly two hours in the period 1998–2014, but most of the decline occurred before 2003. The period covered by our broader wellbeing indicator showed only a very slight decrease. In 2010 and 2011, shortly after the crisis there was an increase of almost half an hour.

Figure 16: Average hours worked in the Netherlands, 1998–2015.

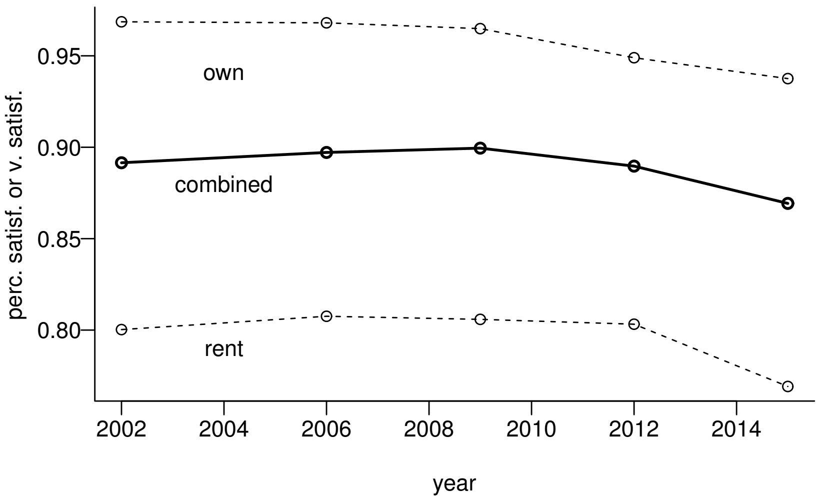


3.11 Housing

As the place where a high proportion of free time is spent, housing can be very important for wellbeing. Three aspects are relevant: (i) the objective quality of housing, including for instance living space, location, amenities, utilities, and building quality; (ii) housing satisfaction, whether people are satisfied with their house; and (iii) affordability, how much of their income people need to spend on housing. Because our goalposting approach (see next section) for the index requires that we have internationally comparable data for at North-West Europe and very little internationally comparable data is available, we are limited to the housing satisfaction variable. To an extent, subjective satisfaction with housing should also capture part of the objective housing quality and its affordability.

We rely on the Planbureau voor de Leefomgeving's (PBL; Netherlands Environmental Assessment Agency) quadrennial survey reporting the satisfaction of renters and owners combined with their house. Eurostat provides similar international information on this indicator for 2013. Satisfaction is typically very high, with nearly 90 percent reporting to be satisfied. Compared to other European countries, the Netherlands had the highest satisfaction in 2013.

Figure 17: Housing satisfaction in the Netherlands, 2002–2012.



4 Creating the composite wellbeing index for the Netherlands

Aggregating the various dimensions into one index at a minimum involves the following four issues: imputations, scaling, functional form, and weighting. Each of these issues is briefly discussed below.

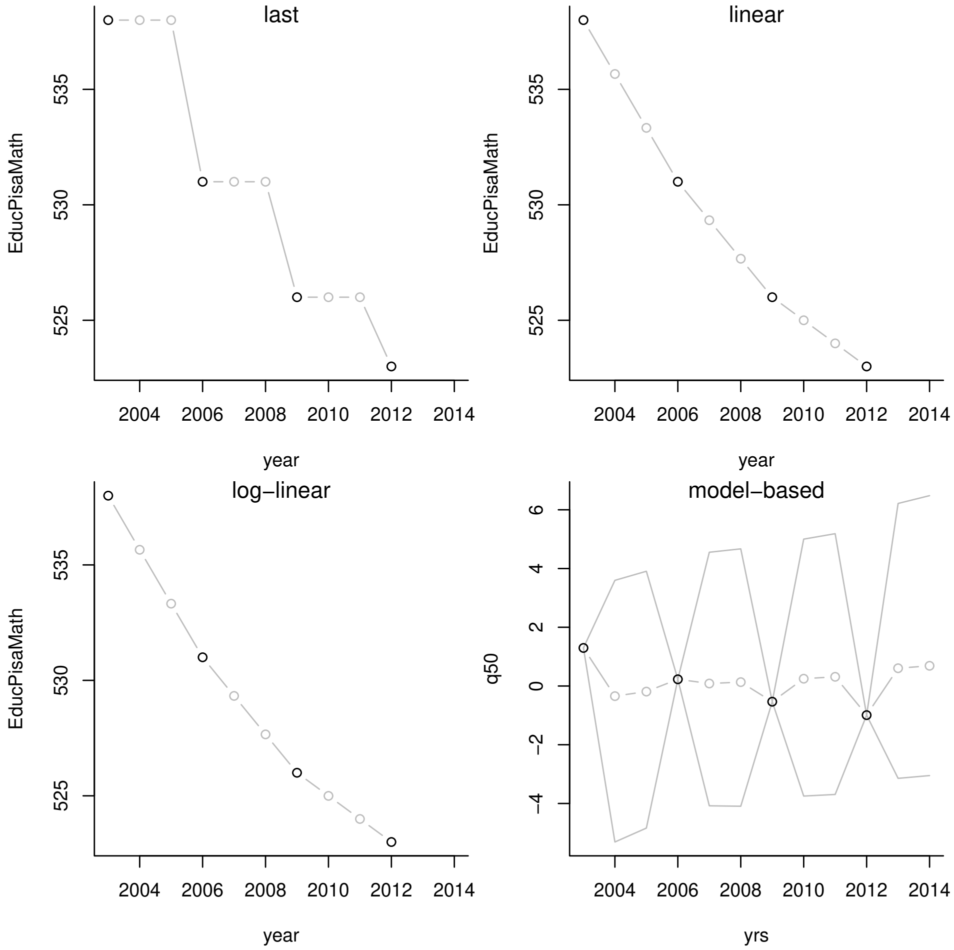
4.1 Imputations

To calculate the composite index in a given year, it is necessary to have observations for all indicators. For a country with excellent statistical agencies like the Netherlands, this should not be problematic. Nonetheless, due to changes in methodology and the fact that some data becomes available at a later point in time than other data, there is the occasional gap or shorter series. We have considered four ways of dealing with this:

- Last value imputation fills the gaps with the latest available observation. The disadvantage is that you can end up with large jumps in the series if the period for which data is missing was characterised by a growth process.
- Linear interpolation fills the gaps in proportional steps; this requires the development of the indicator to be approximately linear.
- Log-linear interpolation fills in the gaps in exponential steps); this requires the the process to be characterised by a constant growth rate.
- Model-based imputations fill in the gaps with a statistical model. How it performs depends on the suitability of the model for the data-generating process. It is possible

to get confidence intervals which is a useful feature when working with imputations. The option presented here uses the trends in all the variables in the dimension as well as the lag of the variable to be imputed.

Figure 18: Four interpolation options for Pisa math scores. Note: model-based imputation on standardised scale and include confidence intervals



We use various strategies depending on the data and whether we are dealing with interpolation or extrapolation. In the case of interpolation, we have chosen generally to use linear interpolation to impute missing values. In the case of violent crime rates, however, we have estimated missing values in a regression framework using a time trend and the other crime rate indicators as predictors to capture the trend that was clearly visible in the data. For extrapolation (imputation outside the range of available observations) we have used last-value imputation to prevent obtaining values outside the observed range.

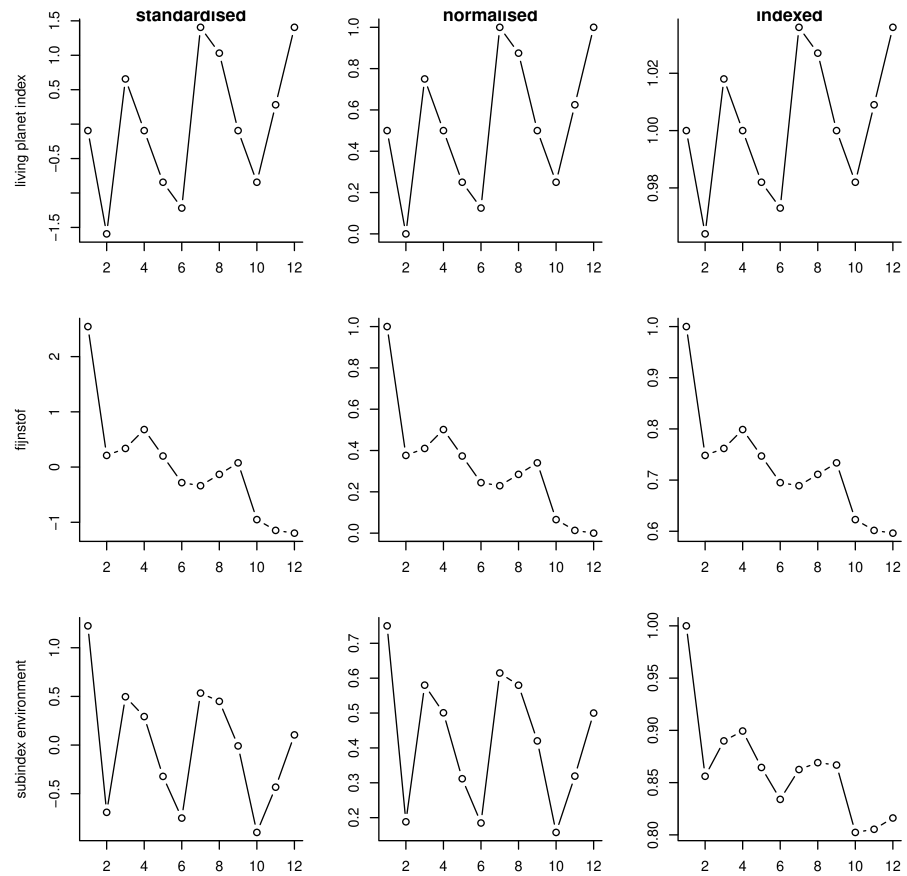
4.2 Scaling problem

Without putting the indicators on a common scale, indicators with a large data range would drive most of the index. In this sense, the choice in scaling the variables influences the relative importance of the variables, much like weighting does. The options presented here are restricted to linear transformations as this does not introduce complex tradeoffs to the index.

- normalise (set to a 0–1 range)
- standardise (set the mean to 0 and the standard deviation to 1)
- index figures (set the baseyear to 1 and express all other years as a ratio of that value)

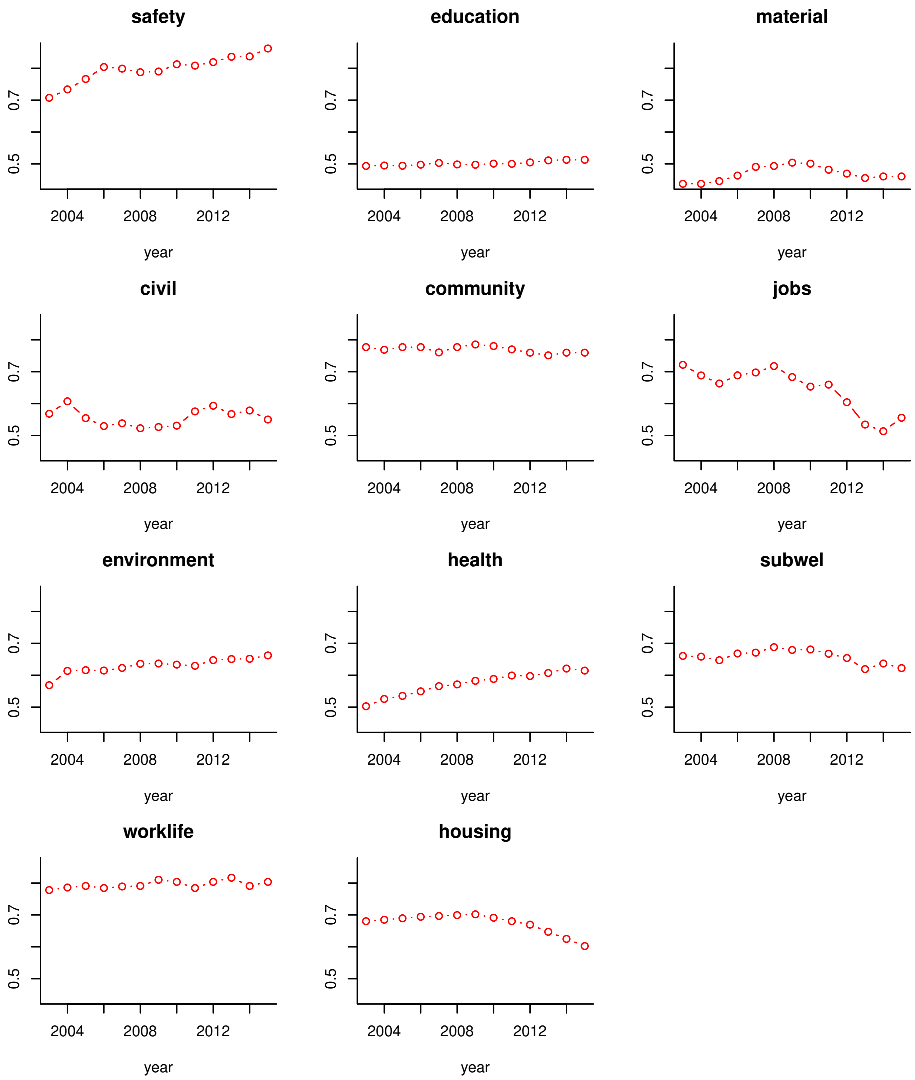
All are essentially linear transformations, so the choice does not influence the overall trend of the transformed indicators themselves (figure 19).

Figure 19: Three scaling options for environmental dimension.



However, the choice of the scaling procedure influences the relative importance of the indicators and therefore the subindices and the eventual composite indicator. This might happen when indicators are transformed on a common scale in such a way that small absolute changes translate into a large changes relative to the other indicators. Moreover, when the series is expanded (say, by adding data for 2016 or creating the index for another country), the "goalposts" (values used to scale the indicator) could change and this would in turn change the index. Indexing can especially lead to a composite indicator that is very sensitive to adding new observations because the only information used to set the index to a common scale is the first observations. If any subsequent observations are very different, this will strongly influence the final composite indicator. In contrast, standardisation is probably the least sensitive to outliers and changes in the goalpost.

Figure 20: Normalised subindices for the dimensions of the broader wellbeing index, 2003–2014.



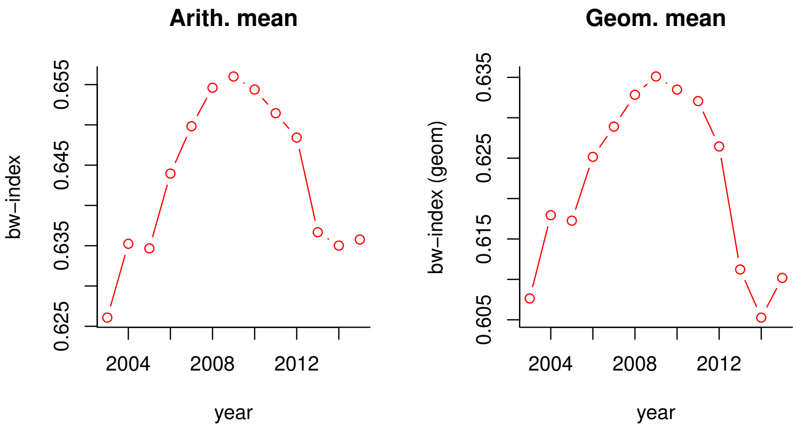
To an extent, these issues could be solved by choosing fundamental goalposts in the normalisation option. However, such goalposts do not exist for every indicator (e.g. consumption has no obvious upper bound). Our solution is to use international goalposts. This means the relative importance due to the scaling is a reflection of how the Netherlands fare internationally. As a group of reference countries we have chosen North-Western European countries, as they provide a good frame of reference for where the Netherlands, given its economy, institutions, and culture, could end up in the near future. As a test of the robustness to the choice of reference countries we have also looked at a broader group of countries: either all OECD countries or all European countries which display considerably more variation in the indicators. Table 6 in the Appendix presents the goalposts we have used for the composite indicator.[9]

Finally, to make sure that all the indicators contribute in the desired direction, we subtract the normalised indicators from one in cases where more of an indicator is not desirable. This concerns the following variables: flexible employment, short-term unemployment, long-term unemployment, particulate matter emissions, and the crime indicators.

4.3 Aggregation function

The most common options for aggregation are all means of the indicators or subindices (arithmetic, geometric, harmonic). Most statistical approaches (PCA, factor analysis, or other latent variable models) are similar in functional form to arithmetic means in the sense that they are linear combinations. Here, we have considered both a weighted arithmetic mean and a weighted geometric mean. To avoid "troubling tradeoffs" – a situation where the tradeoffs in an index depend on the level of the other variables (Ravallion, 2012) – and create a transparent index, an arithmetic mean is advisable. However, if one wants to make low (bad) values on an indicator more important, a geometric mean might be preferable. Below we present our index for both options.

Figure 21: Two aggregation functions. Arithmetic mean (left panel) and geometric mean (right panel)



[9]It was not possible to use international goalposts. In the case of life expectancy there was too little variation in the growth process in the North-West European countries and we have opted to use wider goalposts (see 6). Likewise, there was a lack of international time series for the Living Planet Index.

4.4 Weighting

Weighting tends to be a controversial topic in the construction of a composite indicator. In our case, it turned out that the choice of scaling and aggregation function was more important than choosing a weight from what we considered a reasonable range of weights (within a factor 4 of equal weights or the weights provided by the users of the OECD's Better Life Index; see figures 22 and 23). Intuitively, the weights of two (near) identical indicators do not matter for the trend in an average of these two indicators; and the more they are correlated the more this will hold. Regarding the influence of the number of indicators, consider that changing the weight of a few variables in an index consisting of a large number of variables would also not influence the average strongly.

Figure 22: Sensitivity to weights, assessed by considering distribution of composite indicator setting all possible combinations of weights to 25%. Distribution of indicator (left panel) and distribution of first differences (right panel). Dimensions aggregated using arithmetic mean.

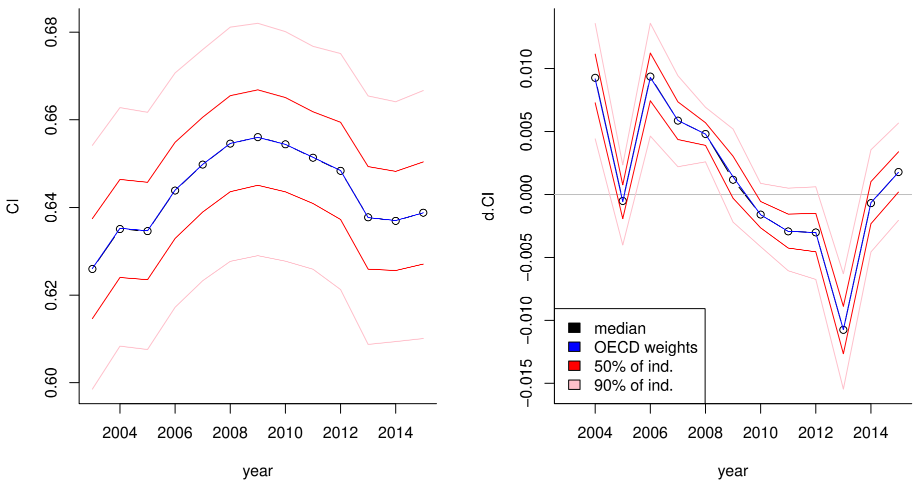
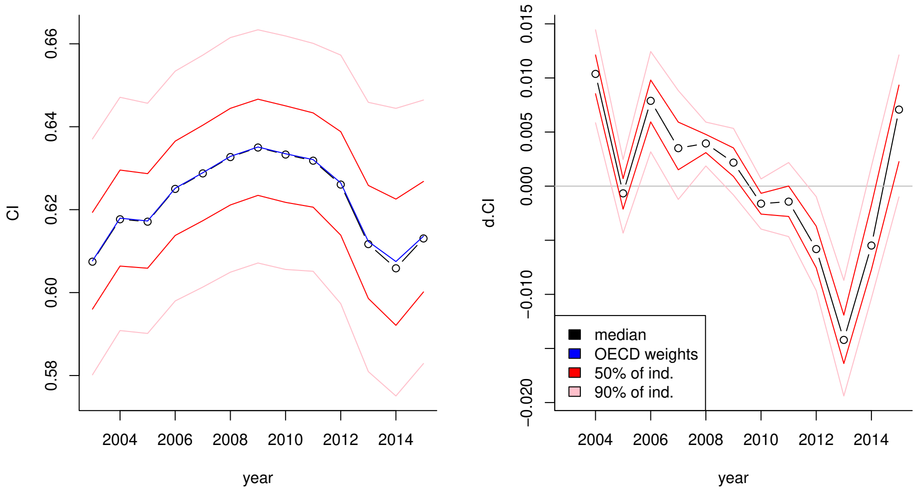
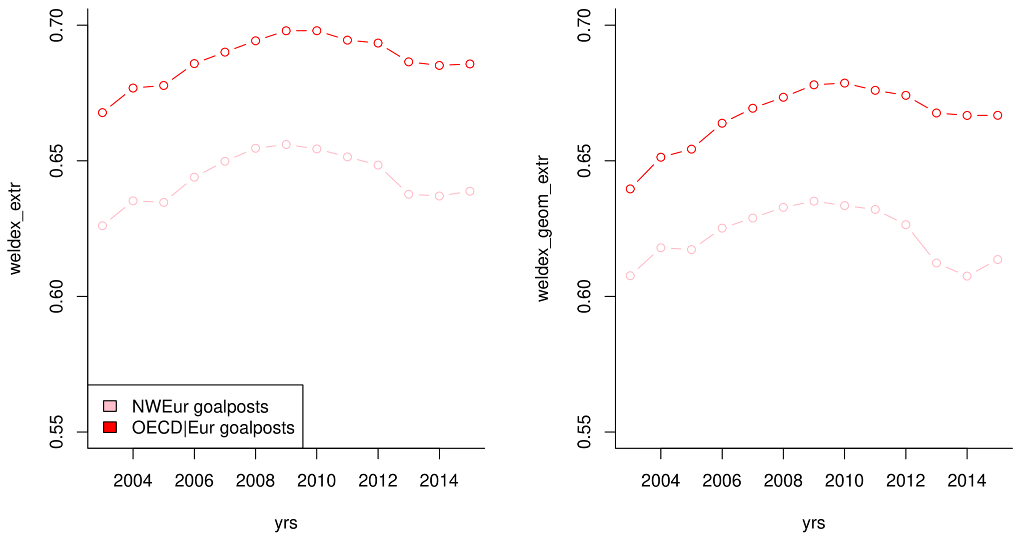


Figure 23: Sensitivity to weights, assessed by considering distribution of composite indicator setting all possible combinations of weights to 25%. Distribution of indicator (left panel) and distribution of first differences (right panel). Dimensions aggregated using geometric mean.



Finally, figure 24 below shows the weighing of the various dimensions using different normalization goalposts for scaling. For each variable a different, wider goalpost is applied depending on availability of international broadly comparable data. Table 6 in the appendix shows the goalpost values used for each variable. While changing the goalposts substantially does influence the level of the indicator, the trends remain by and large unchanged.

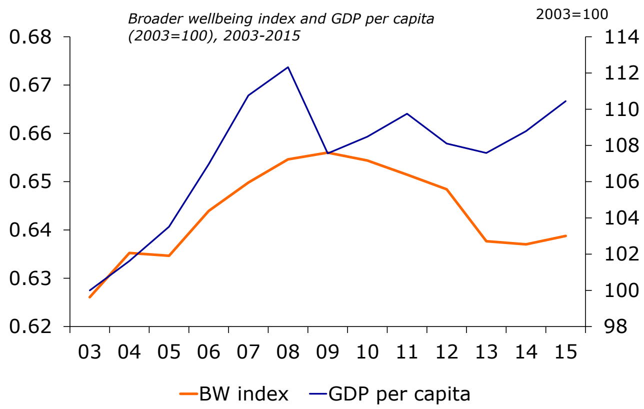
Figure 24: Sensitivity to goalposts: North-Western European countries (lower, lightline) and OECD or European countries; arithmetic (left panel) and geometric mean (right panel).



5 Results

Figure 25 presents the BW indicator and compares it to GDP per capita since 2003. In the period up to the financial crisis of 2008, economic growth and GDP per capita move in the same direction. From 2009 onwards, however, there are clear differences. In 2009 there is a strong decline in GDP per capita, but the BW indicator still increases slightly. Only in 2013 does the BW indicator decrease strongly. While GDP per capita already shows a strong recovery in 2015, the BW indicator remains virtually unchanged.

Figure 25: Composite indicator of wellbeing compared with GDP per capita (index: 2003 = 100)

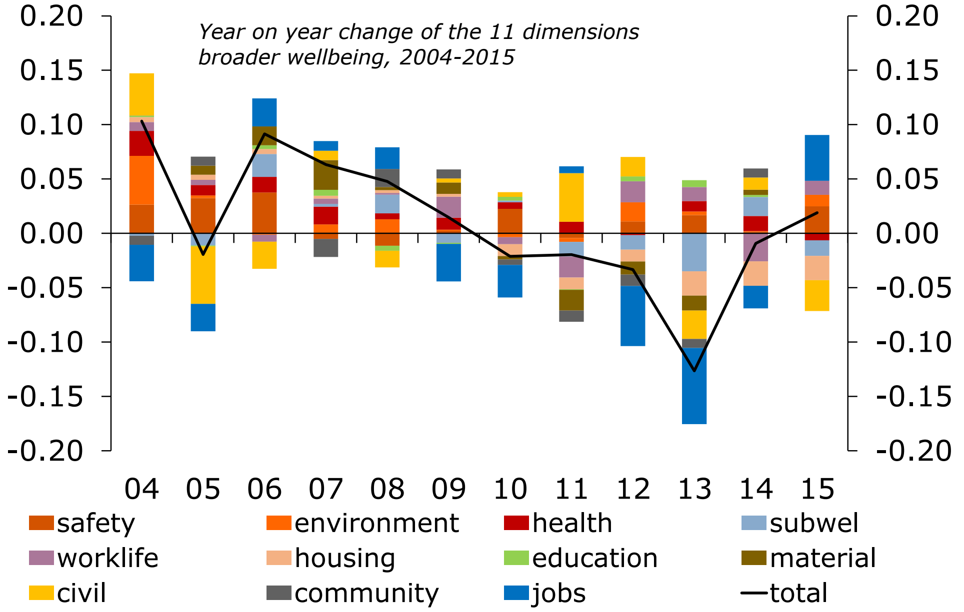


To explain these differences, we look at the 11 dimensions of the BW indicator over time. Figure 26 shows the year-on-year contribution of the 11 dimensions to the BW indicator. Until 2009 the BW indicator increases, with most of the dimensions showing an improvement. The dimension safety shows the strongest improvement, due to the drop in the number of murders and the violent crime rates. In addition, the dimension health had a consistent positive contribution to the BW indicator: every year life expectancy increased. The dimension environment also positively contributed to the indicator: biodiversity increases and the emission of particular matter decreased strongly. The dimension material wellbeing improved because the disposable income of households increased until the crisis.

While GDP per capita dropped strongly in 2009, the BW indicator remained relatively unchanged for another number of years. A lot of companies held on to their employees and wages kept rising, which explained why the dimensions jobs and material wellbeing only decreased slightly. Only in 2013 did the BW indicator decline strongly, mainly because unemployment increased markedly. At the same time, subjective wellbeing of households dropped, mainly because people reported lower life satisfaction. Possibly the drop in subjective wellbeing is linked to the effects of the crisis and the resulting uncertainty. In addition, the dimension housing decreased faster from 2013 onwards: both tenants and home owners were less satisfied with their housing situation. For homeowner this might have to do with the decreasing housing prices, while for tenants higher rents might have played a role.

With a 1.5% increase, GDP per capita in 2015 saw the strongest increase since 2008. At the same time however the BW indicator barely increased. The increased economic growth did lead to extra jobs, but people were less satisfied with their housing situation and less satisfied with their lives. This means the BW indicator still did not recover in 2015.

Figure 26: Decomposition of the year-over-year contributions to the composite indicator

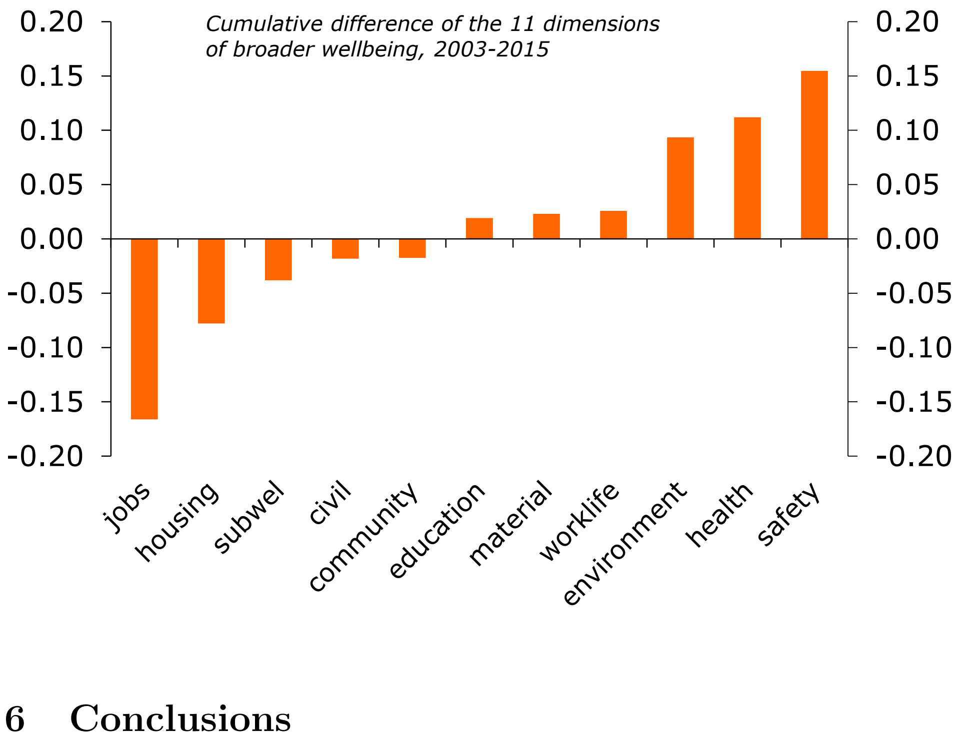


The cumulative developments of the 11 dimensions in the period 2003-2015 differ widely (figure 27). There are three dimension which have shown a strong positive development: Environment, health and safety. The dimension environment has developed positivity for two reasons. First of all, the emission of particular matter (PM_{10}), which is very detrimental to health, has been strongly reduced. Also biodiversity measured by the WWF has increased. The dimension health increased because of constant improvements to life expectancy throughout the period, while safety improved because of lower homicides per 100 000 inhabitants and a lower violent crime rate.

One of the dimensions that remained virtually unchanged over the past twelve years is material wellbeing, because the disposable income of households barely increased. Government and corporations were the primary beneficiaries of economic growth (Badir et al., 2016). Wage growth lagged behind productivity growth, which led to larger corporate profits. In addition the sector government became larger because of the increased costs of health care.

Two dimensions have decreases strongly over the past twelve year: housing and jobs. The dimension housing decreased because people reported to be less satisfied with their homes, especially in the years after the crisis. The dimension jobs contributed most negatively to the BW indicator. Unemployment increased from 4.8% in 2003 to 6.9% in 2015. Another reason the dimension jobs decreased is that employment in increasingly flexible. This negatively affects wellbeing because it increases uncertainty.

Figure 27: Cumulative development of the 11 dimensions, 2003–2015



6 Conclusions

In this report we have presented a composite indicator of wellbeing for the Netherlands for the period 2003–2015, covering 11 dimensions (subjective wellbeing, health, work-life balance, education, housing, environment, safety, income, jobs, community, civic engagement).

Although creating such an indicator is not without methodological issues, we have used a straightforward approach, consisting almost exclusively of linear transformations. Moreover, robustness checks indicate that the results would hold with different aggregation schemes.

The trends in the composite indicator in the period 2003–2015 are at once positive and negative. On the plus side we can note that there have been consistent, long-term improvements in health, safety and the environment. When the crisis struck the Netherlands in 2008–9, these steady increases were one of the reasons the crisis did not immediately result in a strong decline in the composite indicator. However, a more pessimistic conclusion is that wellbeing has not benefited from the economic recovery of the past years. While GDP per capita is again approaching its pre-crisis peak, the composite wellbeing indicator is hardly above its 2003 level.

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8 Appendix: goalposts

Table 6: Goalpost values for normalization scaling.

dmn	vrb	min	plus	note1
safety	HomicideRate	0.174	3.39	theoretical minimum
safety	violentcrimerate	49.81	3567.83	theoretical minimum
education	EducAttainment	0.459	0.95	min/plus = refCountries
education	EducPisaMath	405.455	603.2	min/plus = refCountries
education	EducPisaSci	402.727	619.65	min/plus = refCountries
education	EducPisaRead	400.909	601.56	min/plus = refCountries
education	EducPisaMath	381.882	667.69	min/plus=low of lvl 2/high of lvl 4
education	EducPisaSci	372.309	696.66	min/plus=low of lvl 2/high of lvl 4
education	EducPisaRead	370.427	688.17	min/plus=low of lvl 2/high of lvl 4
education	EducMeanYearsSchooling	9.407	14.8	min/plus = refCountries
material	InequalityIncomePerCapita	9857.582	31056.41	min/plus = equivalised HH only
civil	ctr_corrup	1.126	2.84	minmin = min - 2*stderr
civil	ruleoflaw	1.075	2.33	minmin = min - 2*stderr
civil	regularorqlty	0.734	2.28	minmin = min - 2*stderr
civil	goveffect	1.208	2.59	minmin = min - 2*stderr
civil	polstab	0.086	1.83	minmin = min - 2*stderr
civil	voice	0.99	2.01	minmin = min - 2*stderr
community	fam	48.273	108.46	min/plus is nwcountries from ess, corrected for combination of categories
community	friends	48.273	108.46	min/plus is nwcountries from ess
jobs	flex_empl	0.025	0.18	plus/min from eurostat
jobs	short_unempl	0.02	0.09	plus/min nw-countries from eurostat
jobs	long_unempl	0.006	0.1	plus/min nw-countries from eurostat
environment	livingplanet	59.545	167.97	80%range change in 12 years from living planet index broken down by income group
environment	fijnstof	17133681.82	1820280000	min/plus = lowest/highest observed annual average in refCountries times nld pop
health	lifexp	66	91.19	minmin=oecd high income since 1980, plusplus is oeppen projection
subj_welb	gelukkig	52.182	105.38	min/plus = nw countries from ess reporting 7+
subj_welb	tevreden	62.81	99	min/plus from eurobarometer
worklife	nhours	28.455	43.97	min/plus nw countries from eurostat
housing	total	0.686	0.99	min/plus nw countries from eurostat corrected to match pbl

9 Appendix: tradeoffs

The tradeoffs in the composite indicator, shown in tables 7 & 8 express how much of one indicator should be exchanged for another indicator while keeping the index constant. This tradeoffs for two variables x and y is defined as $\frac{\partial CI/\partial x}{\partial CI/\partial y}$. Our composite indicator is calculated using $W\frac{X-min}{max-min}$, where min and max refer to the international goalposts. This means that the tradeoff between two variables x and y is calculated as follows: $(w_x/(max_x - min_x)/(w_y/(max_y - min_y))$.

	HomicideRate	violentcrimerate	EducAttainment	EducPisaMath	EducPisaSci	EducPisaRead	EducMeanYearsSchooling	InequalityIncomePerCapita	ctr_corrup	ruleoflaw	regularorqlty	goveffect	polstab	voice	
HomicideRate	1.000	1092.557	0.362	145.530	159.648	147.668	3.970	3524.112	2.174	1.591	1.962	1.751	2.213	1.290	
violentcrimerate	0.001	1.000	0.000	0.133	0.146	0.135	0.004	3.226	0.002	0.001	0.002	0.002	0.002	0.001	
EducAttainment	2.766	3021.472	1.000	402.465	441.508	408.376	10.978	9745.949	6.011	4.400	5.425	4.843	6.120	3.568	
EducPisaMath	0.007	7.507	0.002	1.000	1.097	1.015	0.027	24.216	0.015	0.011	0.013	0.012	0.015	0.009	
EducPisaSci	0.006	6.844	0.002	0.912	1.000	0.925	0.025	22.074	0.014	0.010	0.012	0.011	0.014	0.008	
EducPisaRead	0.007	7.399	0.002	0.986	1.081	1.000	0.027	23.865	0.015	0.011	0.013	0.012	0.015	0.009	
EducMeanYearsSchooling	0.252	275.227	0.091	36.661	40.217	37.199	1.000	887.761	0.548	0.401	0.494	0.441	0.557	0.325	
InequalityIncomePerCapita	0.000	0.310	0.000	0.041	0.045	0.042	0.001	1.000	0.001	0.000	0.001	0.000	0.001	0.000	
ctr_corrup	0.460	502.647	0.166	66.953	73.449	67.937	1.826	1621.319	1.000	0.732	0.903	0.806	1.018	0.594	
ruleoflaw	0.629	686.694	0.227	91.469	100.342	92.812	2.495	2214.974	1.366	1.000	1.233	1.101	1.391	0.811	
regularorqlty	0.510	556.942	0.184	74.185	81.382	75.275	2.024	1796.451	1.108	0.811	1.000	0.893	1.128	0.658	
goveffect	0.571	623.917	0.206	83.107	91.169	84.327	2.267	2012.485	1.241	0.909	1.120	1.000	1.264	0.737	
polstab	0.452	493.717	0.163	65.764	72.144	66.730	1.794	1592.515	0.982	0.719	0.886	0.791	1.000	0.583	
voice	0.775	846.900	0.280	112.808	123.752	114.465	3.077	2731.728	1.685	1.233	1.521	1.357	1.715	1.000	
fam	0.046	50.101	0.017	6.674	7.321	6.772	0.182	161.604	0.100	0.073	0.090	0.080	0.101	0.059	
friends	0.046	50.101	0.017	6.674	7.321	6.772	0.182	161.604	0.100	0.073	0.090	0.080	0.101	0.059	
flex_empl	21.650	23653.810	7.829	3150.723	3456.381	3197.003	85.943	76296.862	47.059	34.446	42.471	37.912	47.910	27.930	4
short_unempl	12.475	13629.198	4.511	1815.430	1991.548	1842.096	49.520	43961.841	27.115	19.848	24.471	21.845	27.605	16.093	2
long_unempl	26.246	28675.128	9.490	3819.570	4190.114	3875.675	104.187	92493.442	57.048	41.758	51.487	45.960	58.080	33.859	5
livingplanet	0.018	19.510	0.006	2.599	2.851	2.637	0.071	62.932	0.039	0.028	0.035	0.031	0.040	0.023	
fijnstof	0.030	32.447	0.011	4.322	4.741	4.385	0.118	104.659	0.065	0.047	0.058	0.052	0.066	0.038	
lifexp	0.289	316.152	0.105	42.112	46.197	42.731	1.149	1019.769	0.629	0.460	0.568	0.507	0.640	0.373	
gelukkig	0.075	82.118	0.027	10.938	11.999	11.099	0.298	264.877	0.163	0.120	0.147	0.132	0.166	0.097	
tevreden	0.110	120.711	0.040	16.079	17.639	16.315	0.439	389.360	0.240	0.176	0.217	0.193	0.244	0.143	
nhours	0.438	478.326	0.158	63.714	69.895	64.650	1.738	1542.871	0.952	0.697	0.859	0.767	0.969	0.565	
total	21.210	23172.611	7.669	3086.627	3386.066	3131.966	84.195	74744.724	46.101	33.745	41.607	37.141	46.935	27.362	4

Table 7: Tradeoffs in the composite wellbeing indicator

voice	fam	friends	flex_empl	short_unempl	long_unempl	livingplanet	fijnstof	lifexp	gelukkig	tevreden	nhours	total	
1.290	21.807	21.807	0.080	0.038	0.046	33.672	55.998	3.456	13.305	9.051	2.284	0.047	HomicideRate
0.001	0.020	0.020	0.000	0.000	0.000	0.031	0.051	0.003	0.012	0.008	0.002	0.000	violentcrimerate
3.568	60.307	60.307	0.222	0.105	0.128	93.121	154.864	9.557	36.794	25.031	6.317	0.130	EducAttainment
0.009	0.150	0.150	0.001	0.000	0.000	0.231	0.385	0.024	0.091	0.062	0.016	0.000	EducPisaMath
0.008	0.137	0.137	0.001	0.000	0.000	0.211	0.351	0.022	0.083	0.057	0.014	0.000	EducPisaSci
0.009	0.148	0.148	0.001	0.000	0.000	0.228	0.379	0.023	0.090	0.061	0.015	0.000	EducPisaRead
0.325	5.493	5.493	0.020	0.010	0.012	8.482	14.107	0.871	3.352	2.280	0.575	0.012	EducMeanYearsSchooling
0.000	0.006	0.006	0.000	0.000	0.000	0.010	0.016	0.001	0.004	0.003	0.001	0.000	InequalityIncomePerCapita
0.594	10.033	10.033	0.037	0.018	0.021	15.491	25.763	1.590	6.121	4.164	1.051	0.022	ctr_corrup
0.811	13.706	13.706	0.050	0.024	0.029	21.164	35.196	2.172	8.362	5.689	1.436	0.030	ruleoflaw
0.658	11.116	11.116	0.041	0.019	0.024	17.165	28.546	1.762	6.782	4.614	1.164	0.024	regularorqlty
0.737	12.453	12.453	0.046	0.022	0.026	19.229	31.979	1.973	7.598	5.169	1.304	0.027	goveffect
0.583	9.854	9.854	0.036	0.017	0.021	15.216	25.305	1.562	6.012	4.090	1.032	0.021	polstab
1.000	16.904	16.904	0.062	0.030	0.036	26.101	43.407	2.679	10.313	7.016	1.771	0.037	voice
0.059	1.000	1.000	0.004	0.002	0.002	1.544	2.568	0.158	0.610	0.415	0.105	0.002	fam
0.059	1.000	1.000	0.004	0.002	0.002	1.544	2.568	0.158	0.610	0.415	0.105	0.002	friends
7.930	472.122	472.122	1.736	0.825	1.000	729.004	1212.365	74.818	288.046	195.954	49.451	1.021	flex_empl
6.093	272.034	272.034	1.000	0.475	0.576	420.048	698.558	43.110	165.971	112.908	28.494	0.588	short_unempl
3.859	572.345	572.345	2.104	1.000	1.212	883.760	1469.730	90.700	349.194	237.552	59.949	1.237	long_unempl
0.023	0.389	0.389	0.001	0.001	0.001	0.601	1.000	0.062	0.238	0.162	0.041	0.001	livingplanet
0.038	0.648	0.648	0.002	0.001	0.001	1.000	1.663	0.103	0.395	0.269	0.068	0.001	fijnstof
0.373	6.310	6.310	0.023	0.011	0.013	9.744	16.204	1.000	3.850	2.619	0.661	0.014	lifexp
0.097	1.639	1.639	0.006	0.003	0.003	2.531	4.209	0.260	1.000	0.680	0.172	0.004	gelukkig
0.143	2.409	2.409	0.009	0.004	0.005	3.720	6.187	0.382	1.470	1.000	0.252	0.005	tevreden
0.565	9.547	9.547	0.035	0.017	0.020	14.742	24.516	1.513	5.825	3.963	1.000	0.021	nhours
7.362	462.517	462.517	1.700	0.808	0.980	714.174	1187.701	73.296	282.186	191.968	48.445	1.000	total

Table 8: Tradeoffs in the composite wellbeing indicator

10 Appendix: Final weights

The first row in table 9 shows the percent impact that a 10% increase along a dimension would have on the composite index according to the OECD weights, when each dimension has the same initial level. The second row shows the impact of that increase on the actual indicator, averaged between all years. The occasionally large differences can be attributed to the process of scaling and goalposting, thus to the difference in levels among each dimension.

Phase	safety	education	material	civil	community	jobs	environment	health	subwel	worklife	housing
OECD weights	0.92	0.97	0.86	0.67	0.78	0.84	0.92	1.04	1.14	0.97	0.92
Final weights	0.34	3.32	1.24	1.26	1.92	0.30	0.57	5.14	3.56	3.06	4.18

Table 9: Initial OECD weights, and the implicit weights in the final indicator after all rescaling and goalposting took place.