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THE GDI AS A MEASUREMENT INSTRUMENT ON GENDER ASPECTS OF DEVELOPMENT IN THE ECE REGION

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Summary

The Human development report introduced the Gender-related development index (GDI) as a measure to assess gender inequality as an aspect of human development. In this paper the measurement quality of the GDI and the applicability of the index to countries in the ECE region is evaluated.

Keywords: measurement, indicator, development, gender, inequality

Human Development Report

Annually the United Nations Development Program (UNDP) publishes the Human Development Report (HDR). The first HDR was published in 1990 and it has been a very successful product of the UNDP[2] since its first appearance. Every year the presentation of the new HDR receives much publicity, especially by the attention of the media.

The HDR is meant to make 'a contribution to the definition, measurement and policy analysis of human development', as UNDP Administrator Draper declared in the Foreword of the first HDR. Its purpose should be to make relevant experience available to policy makers. The central message was that 'while growth in the national production (GDP) is absolutely necessary to meet all essential

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[2] The UNDP does not take itself the responsibility for the content of the HDR. The HDR's were produced by an independent team of UNDP-staff, nowadays known as the HDR-Office (HDRO).

human objectives, what is important to study how this growth translates – or fails to translate – into human development in various societies' (UNDP, 1990).

Human development is defined as a 'process of enlarging people's choices. In principle these choices can be infinite and change over time. But at all levels of development the three essential ones are for people to lead a long and healthy life, to acquire knowledge and to have access in resources needed for a decent standard of living. If these choices are not available, many other opportunities remain accessible' (UNDP, 1990). The conceptualisation reminds of the capabilities approach of Amartya Sen who himself has been associated very closely to the HDR's since the beginning. The three essential choices that are incorporated in the definition of human development, are also basic components in the measurement instruments.

The HDR does not only contain reviews of global development processes and analyses of country experiences. Since its start the HDR has also been a compilation of many statistics, brought together mainly from databases of international organisations (IMF, Word Bank, UN-organisations etc.). But the HDR team did more than compiling these data: supported by a panel of consultants they tried to assemble the available comparable data into some statistical indicators of human development. The Human Development Index (HDI) was the first development measure that was presented in the HDR1990. Since then several indicators were designed. One of the presumably unexpected consequences of the tremendous success of the HDR was that it was used very soon as an important and authoritative source of international statistics.

The HDR approach was not only uncritically applauded; sometimes it was also rather critically reviewed by statisticians and social scientists. The HDR team recognised that the report and especially the development indicators should not be seen as 'something cast in stone' but as evolving and improving (UNDP, 1993). Especially the development indicators in the HDR show that the process of revising and improving has been going on from the first until the most recent publication. The critical reviews have stimulated those revisions and thus it should be (see e.g. the response in the HDR 1993 to the comments on the HDI). However, one of the main problems of statistical analysis on a global scale will not be easy to overcome by the HDR-team: the insufficient data quality of international databases, which is often easy to explain but very difficult to handle and to improve (UNDP, 1993). The broad attention attracted by the HDR and its data, might also further the recognition of the importance to produce social statistics and to enhance their data quality.

Another critical comment that was recently expressed, needs to be mentioned here, because of the involvement of the author in the process. The discussion concerning a review document on the HDR 1999 by Ian Castles[3], former head of the Australian Bureau of Statistics, that took place in the meeting of the UN Statistical Commission, gave reason to install a small working group that should evaluate the accuracy of the statistical evidence in the HDR. The report of this group will be ready in a short term.

In this paper special attention will be given to the applicability of the development measures to the member countries of the Economic Commission for Europe (among which United States and

[3] Ian Castles had already published some critical reviews of HDR's, see e.g. Castles (1998) and Castles (2000).

Canada), abbreviated to 'ECE-countries'. Only the HDI and in particular its gender-related derivative GDI will be subjects in this paper. The statistical measures, presented in the HDR, are meant as globally applicable indicators. Notwithstanding this starting point, the mandate of the UNDP makes it understandable that the use of the indictors as an instrument to evaluate the state of development in the developing countries, was considered as a prerequisite for the choice of indicators. Neither is it self-evident that the outcomes of the discussion on the applicability of the development indicators for the ECE-region can be generalised to applicability on the global level.

HDI and GDI

Components and construction HDI

The main development indicator in the HDR is the Human Development Index (HDI). The three basic elements of development, that were already mentioned above in its definition, constitute the main dimensions of the HDI as a statistical measure. Although the components have always been the same, the HDI has undergone since its first appearance in 1990 some revisions in the choice of the variables as well as in the treatment of the variables. The components of the HDI (version 1999) are the following:

1. **Longevity** (capability of living a long and healthy life), measured by life expectancy at birth (range 25-85 years)

2. **Educational attainment** (capability of acquiring knowledge, communicating and participating in the life of the community), measured by two variables: adult literacy rate (range 0-100%) and gross combined primary, secondary and tertiary enrolment ratio (range 0-100%)

3. **Access to resources** (needed for a decent standard of living [capturing] the capability of leading a healthy life, guaranteeing physical and social mobility, communicating and participating in the life of the community, including consumption), measured by real GDP per capita (PPP$) (range $100 – $40,000)

The HDI is the unweighed mean of the indices of the three components. All component indices are computed more or less in the same way from the actual variables according to the general formula for a specific country *i*:

$$\text{Index component} = \frac{\text{Actual } x_i \text{value} - \text{minimum} x_i \text{ value}}{\text{Maximum} x_i \text{ value} - \text{minimum} x_i \text{ value}}$$

The index for educational attainment is the weighed mean of the two separate indices literacy (two-third weight) and gross enrolment ratio (one-third weight). The income index is computed using the log (real GDP per capita PPP$) as values.

In the early years of the HDR the minimum and maximum value were equal to the minimum or maximum value of the range of the actual values of the indicators. The consequence of it was that the actual value of a country was contingent on the accidentally highest or lowest value, which made

comparisons of the HDI-value across time difficult. Since 1994 the HDI is computed by fixed maximum and minimum values that could be considered as long-term goal posts. This computation method allows to compare the HDI-values across time and to assess its increase or decrease.

Construction GDI

The first HDR's made already evident that the HDR-team was trying to develop a gender version of the HDI. In HDR 1995 the final version, the Gender-related Development Index (GDI), was presented. Just as the HDI, the GDI was designed by Anand and Sen (1995). The GDI contains the same three dimensions, but the computation of the components is such that the existence of inequalities is reflected in the resulting value of the components.

The value of each component equals the ' equally distributed equivalent achievement indicator'(Anand & Sen, 1995):

$$X_{ede} = \quad (p_f X_f^{1-e} + p_m X_m^{1-e})^{\frac{1}{1-e}}$$

where p_f and p_m = female and male share in the population respectively.

X_f *and* X_m value of component for the female and male population respectively.

ε = parameter which expresses social value regarding inequality

If ε = 0, then X_{ede} equals the arithmetic mean which can be considered as expressing no concern for inequality. If ε gets higher than zero, it can be interpreted as expressing a social preference for equality (or aversion of inequality). The higher the value of ε, the larger the weight given to the value of the female population and the more X_{ede} approaches the value of X_f (assuming that $X_f \quad X_m$ and X_f, X_m >0). In the GDI a 'moderate' aversion to inequality is assumed by setting ε=2, which leads to the harmonic mean of male and female values. It is important to notice that the GDI is not constructed as an exclusive inequality measure: the absolute level of achievement should also be expressed in the GDI. In the formulation of Bardhan & Klasen (1999), the GDI is a special case of the HDI, adjusted for group disparities (like gender disparity) to 'penalise' countries for existing inter-group differences in each o f the components: the adjustments for disparities will invariably lower the GDI, relative to the HDI.

Following the described intentions almost the same measures as in the HDI are used for the computation of the GDI-components. Just as the HDI, the GDI equals the unweighed mean of the component indices

Longevity, measured also by life expectancy at birth for female and male population; there's one difference: the fixed range for women is 27.5 until 87.5 years, but for men 22.5 until 82.5 years, both resulting in a 60-years range. The use of these differing ranges is justified by the assumed biological origin of the higher female life expectancy: the higher female life expectancy should not be considered as an achievement in favour of women.

Educational attainment is just as in the HDI measured by adult literacy (2/3) and gross combined primary, secondary and tertiary enrolment (1/3) in the GDI. The equally distributed index is computed from the weighed composite indices for males and females.

Income (real GDP) is computed as the equally distributed index from the adjusted estimates of the male and female real GDP per capita (PPP$). Assuming that the shares of men and women in the total GDP (PPP$) of a country equal the shares in the total wage bill, they can be calculated from data on wage ratio and labour participation.

HDI and GDI for ECE-countries

The values of the countries on the HDI in table 1 have been used to order the countries in the ECE-region. Comparison of the global rankings and ECE-rankings illustrates the position of the ECE-region: 17 out of the global HDI top-20 are ECE-countries[4]. In the same table 1 the values of the component variables and the three separate component indices are given. The differences between the ECE-countries on the HDI-values are smaller at the higher HDI-levels than at the lower level: the difference between the median value and the highest value is 0.099, while the lowest value is 0.167 than the median value.

In table 2 the GDI-values are given as well as the values of the corresponding component variables and indices. Comparing the values and the derived ranks of HDI- and GDI it becomes clear how strongly both development indices are correlated. The mutual differences between the countries on the GDI in the lower half are somewhat larger compared to the corresponding differences on the HDI-values: the lowest GDI value is 0,180 lower than the median value, while the mutual differences are smaller in the upper half: the highest GDI-value is 0,086 higher than the median value.

Reliability

Reliability is a quality characteristic of the measurement instrument that refers to its stability and consistency. Unreliability can be considered as the noise of the measurement: it is assumed to be the random error component associated with the attempt to measure some true score and it should be minimised. Generally the reliability is assessed by comparing the results of different observations that should have more or less the same outcome (Carmines and Zeller, 1979).

A special case of reliability is worth mentioning here because of its relevance in relation to HDI and GDI: some forms of reliability are not directly referring to measurement problems but are associated with the estimation of the value of some measure. One variant is the estimation of a population value from the corresponding sample value (mean, variance etc.). Another variant is the estimation of the value of a specific entity from the corresponding values of other entities that have at least some similarity with the entity for which the value is to be estimated. The degree of this unreliability can often be estimated: its size will depend on the assumptions of the estimation model and some data characteristics (e.g. the number of observations). The similarity of estimate reliability and

[4] The complete HDR-set of all countries consists of 174 countries.

measurement reliability (in contrast to validity) is that both will concern random errors of the variables.

Life expectancy

The estimation of life expectancy is generally dependent on decennial census data in combination with yearly data from birth and death registrations. Several countries in the ECE-region have population registers that can be used as data source. Although the efforts are sometimes rather great (e.g. to organise the census), most countries consider the relevant data sources as very important. Especially migration might be considered as one of the possible threats for the data quality of population register data. Some countries that maintain population registers use the census as a tool to assess the quality of the registers. Although registers and census will not be free of accidental errors, they are universal data sources without any sampling error. On the whole the life expectancy can be considered as a rather reliable indicator.

Education

The HDI/GDI-component on education consists of two elements: illiteracy and enrolment. In many developed countries illiteracy is not widespread. The greater part of these countries have no data available and in the HDR the default value 99.0 is given to them on the adult literacy component. Illiteracy measures are often measured in the census and yearly estimates are extrapolations from these data (Jones, 2000). It is clear that the estimates will become less and less reliable in the period between census periods.

The second element in the educational attainment component is the gross enrolment ratio. This indicator measures the ratio between the total enrolments at three educational levels and the total estimated population in the age bracket official corresponding to these levels (Jones, 2000). Unreliability originates especially from the measurement of enrolments: enrolments are not always stable during the year, double counting can not always be excluded and part time schooling appears difficult to deal with in statistics.

Income

The income component has always been the component in the HDI/GDI that received most critical comments. The GDP per capita (in PPP$) is a well-accepted economic indicator, resulting from a rather complex statistical process. To assess the reliability of the indicator is hardly possible without investigating the complete statistical process. It might be remarked that not only the reliability of the GDP-measure itself might be evaluated but also the reliability of the PPP$-conversion[5] could evoke critical comments. The gender variant has more reliability problems, because more indicators are used to compute the GDP-index in the GDI. The data on both wages and labour participation, needed for the calculation of the separate male and female GDP indices are measured by sample statistics. When no data on the wage ratio could be made available, the mean wage ratio of all

[5] The conversion factor is based on sample surveys and in many cases on only a model-based estimate from much older data. In spite of the doubts on the quality of the PPP-estimates in the International Comparison Project (see Ryten, 1998) hardly anybody advocates the use of alternative conversion factors (like e.g. exchange rates).

countries with wage data was used, i.e. 75% in the HDR1999. Other uncertainties associated with this calculation method must be characterised as validity problems and will be considered below.

Composite measure HDI/GDI

It is assumed that the components of the HDI/GDI are not measuring just one concept, such as well-being or the level of human development, but that they are all three representing important different aspects of human development. Following this claim the components can not be considered as items of a well-being scale, where the common variance can be conceived as the variance of the true score and the remaining variance can be considered as noise. It should be assumed that all components contribute to the concept to be measured by the HDI/GDI: each component has its own true score plus some unreliability. The unreliability of the HDI/GDI is completely determined by the unreliability of the equally weighed, autonomous (but strongly associated) components.

Validity

Validity is another requirement that a measuring device for an abstract concept has to meet. An indicator or measure is valid to the extent that it measures what it purports to measure (Carmines and Zeller, 1979). Invalidity of an indicator arises because of the presence of non-random error which causes that the measure represents (also) something other than the intended concept. It would go too far to discuss different types of validity and their applicability to the development indices. Content validity will be considered shortly: this concerns the theoretically relevance of the components as aspects of human development and the measures of the components. The discussion will concentrate especially on the GDI and its components. The second part of the discussion on validity will be dedicated to the construct validity: does the GDI provide any additional information than its components alone (Ivanova et.al., 1998).

GDI: content validity

The starting point for the discussion on the content validity of the GDI could be the discussion on the concept 'development' that was already an ongoing debate when the HDI-concept was introduced and has not ended either. But very soon the HDI gained the position of an important topic in this discussion because of the enthusiastic public reception and the following criticisms (Streeten,1999). The simplicity of the HDI, that was one of the reasons for its appeal, was also one of main controversial issues in comments. The concept of development is much broader than the three aspects represented in the HDI and later on the GDI. Civil and political freedom, human rights, violence or insecurity and environmental damage are examples of topics that were wrongfully neglected in the HDI, according to the critics.

Although recognising the importance of the GDI and the GEM[6] for raising attention to gender inequality in international policy debates, some critics objected to the fact that these indices are not measuring gender inequality as such, but only some combination of absolute levels of attainment

[6] Both the GDI and the Gender Empowerment Measure (GEM) were presented in the HDR 1995 as measures of gender inequality. The GEM was meant to be a measure of female economic and political power, but did also meet criticism because of its limited relevance and measurement method (Dijkstra 2000).

and relative female attainments (Dijkstra, 2000). The construction method and the choice of the variables causes that the GDI is too strongly related to absolute GDP per capita (Dijkstra & Hanmer, 1997). In an attempt to formulate and to determine the content of an international comparable measure of gender inequality, eight dimensions were identified as important aspects to define gender inequality in different cultures (Wieringa 1997, 1999). Departing from this concept, Dijkstra proposed an alternative measure for gender inequality, called the Standardised Index of Gender Equality (SIGE). But the SIGE is also very much a compromise with the reality of scarce readily available international data[7]. The unavailability of sufficient data on e.g. cultural factors or time use were serious limitations (Dijkstra, 2000)[8].

Given the choice for dimensions of the HDI and GDI as made in the HDR, various alternatives are still open to measure those dimensions. This concerns the validity of the separate components.

Life expectancy

The life expectancy at birth as an indicator has not met very much criticism. One of the reasons will be its availability and robustness. Dijkstra & Hanmer (1997) criticised the variable as too insensitive: sex specific infant and child mortality ratios are stronger related to changing conditions and will reflect better different values attached in society to the birth of a female or a male baby. Another objection by Bardhan & Klasen to the life expectancy measure is that it reports only on present conditions without measuring the cumulative impact of past and present gender inequality. They refer to the fact that gender inequality in the past has caused gender bias in mortality which becomes clear in the actual sex ratio in many developing countries (the so called 'missing women' problem). They suggest that this aspect should be reflected in the measure for the longevity component. Bardhan & Klasen remark that there may be a serious issue of 'missing men' in the eastern European regions because of heavy male losses during World War II and more recently as a consequence of alcoholism, accidents and violence among males.

The calculation method of this gender sensitive component has also raised some questions, especially on the built-in five year difference in the female and male ranges, because the biological advantage women have is presumably not independent of the degree of mortality of the environment (Bardhan & Klasen, 1999).

Education

Both adult illiteracy and combined gross enrolment as measures of the educational attainment component have met critical comments. One might question if degree of literacy is an adequate device to measure development efforts: rapid expansion of educational efforts directed at younger cohorts will not become quickly visible by this measure. Besides that some serious doubts have been

[7] The following five variables 1) relative female/male access to education (primary and secondary enrolment (weighed 1/3) and literacy rates (weighed 1/3); 2) relative female/male longevity (life expectancy); 3) relative female/male labour market participation; 4) female share in administrative and management positions; 5) female share in parliament. (Dijkstra, 2000).

[8] My intention to calculate an alternative gender index for the ECE-countries by using data on time use and actual income turned out to be unachievable because of the current lack of data on both topics.(see ECE, 2000).

expressed on the measurement method of illiteracy in practice (Jones, 2000). From the data on the ECE-countries it becomes clear that illiteracy is hardly a valid measure. Recently, the OECD has done some research on functional illiteracy, as part of the OECD-project on educational indicators Educational at a glance (OECD, 1998). But these data on illiteracy are not comparable to the illiteracy data in developing countries. One might wonder if the two third weight of adult illiteracy compared to enrolment should not be reconsidered. Because of this relevance problem of the illiteracy data for many ECE-countries and the unfounded illiteracy values imputed by the HDRO, in this paper also another variant of the GDI will be used in which the educational component consists only of the gross enrolment ratio (table 3).

However, the indicator 'combined gross enrolment ratio' (GER) has also been subject to critical comments. It is questioned if this measure is sufficiently informative on the outcome of the educational process and the quality of education (Dijkstra & Hanmer, 1997). The more so because high absence of enrolled pupils and conscious over-reporting of enrolments are well-known research outcomes. Although Jones (2000) stresses the importance of emphasising gender inequalities in the access to education because of the returns of women's education for fertility, nutrition or children's health and schooling, he states also that many gender inequalities have disappeared in the younger cohorts in many parts of the world.

Soon after the introduction of the gross enrolment ratio in the HDI/GDI some developed countries would have exceeded 100% on this variable for one or both sexes. It was decided to cap this measure at 100% which prevented of course higher HDI/GDI-values for some countries. The problem is caused by the fact that the denominator of the gross enrolment ratio is defined by an age bracket of the population, while the numerator does not contain any age restrictions[9] Most countries whose combined gross enrolment ratio exceeds 100% have high percentages students who are older than the typical age in vocational and technical programmes; the share of part time enrolment in these programs appears to be rather substantial, too (OECD, 1998). When using only the gross enrolment ratio instead of the weighted combination of this variable and adult illiteracy as the educational attainment component in the construction of HDI or GDI, this will result in higher HDI- and GDI-values for especially these countries.

Income

The income measure GDP per capita (PPP$) has been the most debated component of the HDI, not so much because of the choice of the measure itself, but especially because of the adjustments or transformations of the variable (see for a review Sen,1999). The main objective in various adjustments of the GDP-variable in the HDI was to translate the view that a respectable level of human development does not require unlimited income. To reflect this the income has always been discounted in calculating the HDI. The HDR 1999 presents the rather traditional logarithmic transformation as the end result of this process (only for the time being?) while it was rejected in earlier discussions (UNDP 1993).

[9] The net enrolment ratio is the same indicator but referring to the same age bracket in both numerator and denominator. Before HDR1995 school expectancy, which is directly derived from the net enrolment ratio, was used as the second indicator of educational attainment in HDI. This indicator was dropped because of 'data problems'.

Although the income component of the HDI might be treated as a proxy measure of average consumption, this is much less self evident in the gender context. The female share of earned income does not necessarily highly correlate with the female consumption share[10] (Bardhan & Klasen, 1999; Dijkstra & Hanmer, 1997) This is recognised in the HDR where the suggestion is made that the share of income is related to the ' gap in agency'. This suggestion might justify the incorporation of the variable in indices like the GEM (see note 6), but it does not solve the interpretation problem of the income as component of the GDI. Another conceptual problem is the fact that unpaid labour and reproductive activities are excluded from the GDP-estimate[11].

Dijkstra criticises the income component as calculated in the GDI. The absolute income level weighs too heavily in the component score: it is very difficult for poor countries to outperform rich countries on gender equality as measured by GDI, no matter how equal they distribute their income (Dijkstra, 2000). This is simply the consequence of the wish to have a measure that reflects absolute levels of human development as well as gender inequality.

Especially the method to attribute the total income (GDP per capita) to males and females, gives reason to assume that the use of the GDI income component is under-estimating the gender inequality. As explained above: the GDP-estimate is attributed according estimates of the female and male share in the wage bill. For the computation of the wage bill data on the ratio of female to male non-agricultural wages (as a proxy for the wage ratio in the total economy) and the female and male shares in the economically active population are used.

The assumption that the wage-ratio in the non-agricultural sectors of activity can be generalised is doubtful. However the size of the effect will be small in most ECE-countries which are generally industrialised countries where only a minority of the employed persons is working in the agricultural sector[12]. Much greater effect will presumably result from the assumption that the wage ratio can be fully attributed to all employed persons, irrespective of employment status or working time. The share of women is rather high among especially family workers and part-time workers: neither the wage-ratio nor the number of working hours will justify to assume that their share should be equal to the share of full time employees. The female income share will be over-estimated in this way, thus the gender inequality will generally be higher than represented by the income component.

GDI: construct validity

Given the choice of the components of the GDI and the choice of the component measures, one might question the GDI as composite of the three components. Especially one might ask whether

[10] This is valid both ways: neither does high female income always translate into high female well-being and consumption level nor does a low female share in the household income need to correlate with a low share in the household consumption.

[11] Conceptually this was even more so in the earlier HDR's when the income component in the GDI was computed only from earned income shares. Technically however the HDR 1999 method does not make much difference for the gender inequality because of the fact that in 1999 the female and male share in the GDI are attributed according to the estimated earned income shares. It's only making some difference for inter-country comparisons.

[12] In this respect the ECE-countries are presumably different from many developing countries: in several ECE-countries the women/men ratio of annual earnings is even much higher in agricultural occupations than in many other occupations (ECE, 2000).

and in which the GDI provides any additional information than its components alone (Ivanova et.al., 1998).

First some results are shown on the additional information provided by the HDI above its components alone[13]. The regression of each of the elementary variables[14] on the other variables indicates their level of redundancy, (table 4a). The higher the R^2-value of the variable the higher the degree of redundancy. The regression of the income variable shows the highest proportion of explained variance (80%), but the R^2-value of life expectation is not much less (77%): these two have a high level of common variance. The proportion of explained variance in the educational attainment variables is much smaller (40-50%) and can especially be ascribed to the income variable. When all constituting variables are brought into the regression all variance of the HDI is explained: the highest proportion is contributed by the GDP-variable. These results for the HDR 1999 data of the ECE-countries are very much the same as the outcomes of the analysis of Ivanova e.o. on the global 1993 HDI data: much redundancy is present in income and life expectancy, while income contributes significantly to explaining the variation of the educational variables and life expectation does not. This conclusion comes out still much clearer when the literacy variable is abandoned (table 4b).

One complicating factor in a similar analysis of the GDI is the fact that the components are themselves constructed measures in which a specific relation of female and male values is defined. The unstandardised regression coefficients in the regression of the GDI on the component indices will only reveal (table 5) that all indices have equally contributed to the GDI by giving all three indices the same weight. The standardised coefficients show that the effect of the GDP-index is more important, which is caused by its larger variance. Another strategy is required to evaluate the information value of the GDI.

In the first strategy the quotients of the female and male values of each of the three development aspects are created as indicators of the gender inequality. Each of these quotients is regressed on the other two (table 6a, 6b). Only a small proportion of the variance of each quotient is explained by the other two: life expectancy has the highest R^2 (14%), while educational attainment has the lowest R^2-value (7%). Thus, the redundancy in the information that these variables contain is only small. Regression of GDI on these three basic indicators shows that 41% of the variation of the GDI can be explained by especially the quotients of life expectation and educational attainment that have significant impact. By the measures used in these regressions it is ignored that the GDI was meant to express also the absolute level of achievement. Because of that reason absolute level indicators were added to the GDI-regressions in two different ways (table 6a, 6b).

In one version the HDI-value is added, which appears to account for almost all GDI-variance. This can be easily explained from the construction of the GDI which was designed as an HDI-variant

[13] In order to avoid interference of their measurement scales in this analysis the basic educational variables in this analysis, they are only combined by weighing into the educational component when the scale values could be supposed to be equivalent (as they will be in the quotient variables that are constructed below). In the other regressions they will be presented as separate variables.

[14] Because of the transformation of income in the HDI the logarithmically transformed income is treated here as elementary variable

with a built-in inequality penalty. The significant coefficient of the income inequality gives reason to presume that this aspect accounts for an important contribution to the inequality penalty. The second version of the regression of the GDI shows that the size of the contribution of all components to the GDI is more or less equal to their contribution to the HDI and that all component inequalities appear to contribute to the inequality penalty.

Bardhan & Klasen (1999) have drawn attention to the relevance of the inequality penalty for the interpretation of the GDI. The total penalty gap, as they call the difference between GDI- and HDI-indices, can be factorised in contributions for each component. In figure 1 the penalty gaps in each of the three components are presented. It is clear that the contribution of the income component is dominant. Only a few countries have a larger contribution from another component, generally educational attainment. In this respect these findings on the HDR 1999 data on the ECE-countries correspond to the results of the analysis of global HDR 1995 data by Bardhan and Klasen[15] . The explanation of this large contribution of the income component in spite of the equal weights of all three components in the computation of the GDI must be found in the actually measured gap in relation to the maximum possible gap (Bardhan & Klasen, 1999). In the data on the ECE-countries the difference on life expectation between females and males varies between –1.0 and 7.2 years out of a (theoretically) possible maximum gap of 60 years, which is equivalent to 12% at the most. For the literacy variable the difference varies between –1.2 and 18.5[16], while the maximum gap equals 100; the differences for the other educational variable gross enrolment ratio lie between –13.0 and 6.0 out of maximally 100. The income variable shows differences in the female and male shares ranging from 10 to 57%, which is clearly a much wider range in comparison to the maximum possible gap than the other components. One of the main purposes of the construction of HDI and GDI, e.g. the availability of a measure in which weight is also given to non-monetary aspects of development (and gender inequality) is thus undermined by the used calculation method. Or more accurately, by the revision of the calculation method which was undertaken to make comparisons across time possible: choosing fixed goal posts and thereby delimiting wide maximum ranges of values. The conclusion must be now that this method caused an implicit weighting of the inequality components.

Some other authors criticised the GDI-construction because of the fact that the harmonic mean approach accounts for all gender inequality, weighting all differences between female and male population, irrespective of the disadvantaged gender. Thus, 'the methodology of the harmonic mean punishes for inequality no matter whether female scores are lower or higher than male. As a result, a country where women do better with respect to longevity and education has a lower score (all other things being equal) than a country where women and men have equal scores on these two variables' (Dijkstra, 2000). In the same way, an advantageous position of women in a country on one dimension can not compensate for deprivation on another dimension. These comments are related to considerations about the degree in which the absolute level should weigh compared to gender inequality. One step further is asking the question if the absolute level should have any weight at

[15] The dominance of the income component is less dominant which can presumably partly explained by the different treatment of the income variable in HDR 1999 compared to HDR 1995, presumably partly inspired by the improvements that Bardhan and Klasen suggested.

[16] Beside, the highest difference on this variable is clearly an outlier among the ECE-countries; the second highest difference is only 4.5.

all? Both questions lead back to the content validity of the GDI-measure: is it meant to measure (gendered) inequality or female 'deprivation'?

Alternatives for the GDI

Several alternatives have been suggested and tried by Bardhan and Klasen to solve the described de facto unequal weighting of the inequality components. The first alternative that suggests itself from the nature of the problem is to limit the maximum and minimum values of the components in such a way that the relation between the range of actual and maximum value is more equal for all three components. One of the rather obvious methods to achieve this is to return to the pre-HDR 1994 method: use the actual minimum and maximum values as extremes of the ranges. However, this implies also to get back the objectionable incomparability across time that was solved more or less by the fixed goal posts.

Another method to reduce the differences in the ranges, suggested by Bardhan and Klasen, is to raise the aversion factor ε for the components with the smaller ranges which would imply that the weights for longevity and educational attainment are explicitly raised. But this creates a new problem: which value should be chosen for the aversion factor. Several answers are imaginable, but justification will always be questionable.

A third suggestion Bardhan and Klasen give to solve the weighting problems caused by the income variable is to drop the income variable altogether. It's not very attractive to drop one of the components because it comes near to give up one of the basic principles of the development index. The consequences of the use of this alternative two-components GDI for the ECE-countries can be seen in their rankings according to this measure (table 3).

One last alternative to prevent unintended overweighing (Dijkstra 2000) could be to calculate the GDI from the standardised component scores. Across time comparisons would still be possible: by expressing the component values as the number of standard deviation from the mean (z-scores) the actual range of values is accounted for, while the incidental extreme values of isolated countries are less disturbing than in the early HDR method. The equal weighting of the components is achieved by force, but yet there is a price to be paid: the interpretation of the values is more difficult because the index has lost its intuitive meaning; besides that, it is not possible anymore to calculate the penalty gap as the difference between the overall value and the gendered values. The only possibility is to look at the rank values in order to evaluate the consequences (see table 7). The changes in ranks are very much the same as the changes following the use of the two-component GDI from which income was dropped, but less extreme: this can be explained from the fact that the main effect of the use of the standardised score is reduction of the implicit weight of the income component.

Other authors who went one step further in their criticism on the GDI by stressing the inequality aspect, have proposed alternative GDI-variants by dropping the absolute level component in the inequality measure altogether. Such alternatives are e.g. the GEQ (Whyte 1997) defined as the ratio of GDI and HDI or the GI (Forsythe et.al. 1998) defined as (HDI-GDI)/HDI. By using the HDI as the denominator the effect of the absolute level component was completely removed. Figure 2

shows the GI-values of the countries that were sorted according to their GDI-values. One can see how radically the rank order changed as a result of using the GI-measure. It is clear that the GI-measure indicates something completely different from the development indicators. Nothing is left of the original objective of the GDI: to design a variant of the human development indicator that should include gender equity sensitivity. The development component is lost in the GI- or GEQ-measure. These measures do not in any degree indicate whether well-being or misery is unequally distributed.

Conclusion

Just as its parent indicator HDI, the GDI is a composite indicator that is designed to summarise the state of affairs in a combination of various dimensions of human development. Although the GDI is developed as a global measure to be used in the presentation of development policies, the indicator appears also rather useful as an indicator in the ECE-region itself. The components in the GDI as well as those in the HDI are applicable for the ECE-countries, too, except the illiteracy variable as part of the educational attainment component.

The common problem of all composites is the weighing problem of dimensions in relation to their interchangeability. In the GDI the weighing problem plays a role on two levels. On the highest level the weight of inequality compared to the absolute level has to be decided on. Although criticised by several authors, the presence of both dimensions in the GDI deserves to be evaluated as a positive characteristic of the measure. The combination of both dimensions as a variant of the HDI, adjusted for group disparities by the use of the preference or aversion function is very attractive. One of the reasons is that in social development policy generally some degree of interchangeability is indeed existing between raising the general absolute level and diminishing distributional inequalities. However, the size of the aversion needs to be reconsidered.

When some revision might take place, it should not be forgotten that the higher level weights are intrinsically connected to the weights on the lowest level, because of the implicit, unintended weighing of the component inequalities. As Bardhan & Klasen made clear, the ratio between the variance of the components and the maximum value range of the components has some unintended effects on the nature of the inequality sensitivity of the GDI. The resulting implicit weights of the component inequalities might be corrected by a well-chosen specification of the aversion factor. More research is needed to answer the question if the specification of the aversion parameter might be related intrinsically to the variation of the components in relation to the fixed goal posts.

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ANNEX

Table 1.
HDI and its components for ECE-countries, sorted by HDI

Global HDI-rank	ECE HDI-rank	Country	Adult literacy rate, 1997 (%)	Combined first-, second- and third-level gross enrol ment ratio, 1997 (%)	Life expectancy at birth, 1997 (years)	Real GDP per capita , 1997 (PPP$)	Education Index	Life expectancy index	GDP index	Human development index (HDI), 1997
1	1	Canada	99.0	99.0	79.0	22480	0.99	0.90	0.90	0.932
2	2	Norway	99.0	95.0	78.1	24450	0.98	0.89	0.92	0.927
3	3	United States	99.0	94.0	76.7	29010	0.97	0.86	0.95	0.927
5	4	Belgium	99.0	100.0	77.2	22750	0.99	0.87	0.91	0.923
6	5	Sweden	99.0	100.0	78.5	19790	0.99	0.89	0.88	0.923
8	6	Netherlands	99.0	98.0	77.9	21110	0.99	0.88	0.89	0.921
9	7	Iceland	99.0	87.0	79.0	22497	0.95	0.90	0.90	0.919
10	8	United Kingdom	99.0	100.0	77.2	20730	0.99	0.87	0.89	0.918
11	9	France	99.0	92.0	78.1	22030	0.97	0.89	0.90	0.918
12	10	Switzerland	99.0	79.0	78.6	25240	0.92	0.89	0.92	0.914
13	11	Finland	99.0	99.0	76.8	20150	0.99	0.86	0.89	0.913
14	12	Germany	99.0	88.0	77.2	21260	0.95	0.87	0.89	0.906
15	13	Denmark	99.0	89.0	75.7	23690	0.96	0.84	0.91	0.905
16	14	Austria	99.0	86.0	77.0	22070	0.95	0.87	0.90	0.904
17	15	Luxembourg	99.0	69.0	76.7	30863	0.89	0.86	0.96	0.902
19	16	Italy	98.3	82.0	78.2	20290	0.93	0.89	0.89	0.900
20	17	Ireland	99.0	88.0	76.3	20710	0.95	0.86	0.89	0.900
21	18	Spain	97.2	92.0	78.0	15930	0.95	0.88	0.85	0.894
23	19	Israel	95.4	80.0	77.8	18150	0.90	0.88	0.87	0.883
26	20	Cyprus	95.9	79.0	77.8	14201	0.90	0.88	0.83	0.870
27	21	Greece	96.6	79.0	78.1	12769	0.91	0.89	0.81	0.867
28	22	Portugal	90.8	91.0	75.3	14270	0.91	0.84	0.83	0.858
32	23	Malta	91.1	78.0	77.2	13180	0.87	0.87	0.81	0.850
33	24	Slovenia	99.0	76.0	74.4	11800	0.91	0.82	0.80	0.845
36	25	Czech Republic	99.0	74.0	73.9	10510	0.91	0.81	0.78	0.833
42	26	Slovakia	99.0	75.0	73.0	7910	0.91	0.80	0.73	0.813

44	27	Poland	99.0	77.0	72.5	6520	0.92	0.79	0.70	0.802
47	28	Hungary	99.0	74.0	70.9	7200	0.91	0.76	0.71	0.795
54	29	Estonia	99.0	81.0	68.7	5240	0.93	0.73	0.66	0.773
55	30	Croatia	97.7	67.0	72.6	4895	0.88	0.79	0.65	0.773
60	31	Belarus	99.0	80.0	68.0	4850	0.93	0.72	0.65	0.763
62	32	Lithuania	99.0	75.0	69.9	4220	0.91	0.75	0.62	0.761
63	33	Bulgaria	98.2	70.0	71.1	4010	0.89	0.77	0.62	0.758
68	34	Romania	97.8	68.0	69.9	4310	0.88	0.75	0.63	0.752
71	35	Russian Federation	99.0	77.0	66.6	4370	0.92	0.69	0.63	0.747
73	36	Macedonia, TFYR	94.0	70.0	73.1	3210	0.86	0.80	0.58	0.746
74	37	Latvia	99.0	71.0	68.4	3940	0.90	0.72	0.61	0.744
76	38	Kazakhstan	99.0	76.0	67.6	3560	0.91	0.71	0.60	0.740
85	39	Georgia	99.0	71.0	72.7	1960	0.90	0.80	0.50	0.729
86	40	Turkey	83.2	61.0	69.0	6350	0.76	0.73	0.69	0.728
87	41	Armenia	98.8	72.0	70.5	2360	0.90	0.76	0.53	0.728
91	42	Ukraine	99.0	77.0	68.8	2190	0.92	0.73	0.52	0.721
92	43	Uzbekistan	99.0	76.0	67.5	2529	0.91	0.71	0.54	0.720
96	44	Turkmenistan	98.0	90.0	65.4	2109	0.95	0.67	0.51	0.712
97	45	Kyrgyzstan	97.0	69.0	67.6	2250	0.88	0.71	0.52	0.702
100	46	Albania	85.0	68.0	72.8	2120	0.79	0.80	0.51	0.699
103	47	Azerbaijan	96.3	71.0	69.9	1550	0.88	0.75	0.46	0.695
104	48	Moldova, Rep. Of	98.3	70.0	67.5	1500	0.89	0.71	0.45	0.683
108	49	Tajikistan	98.9	69.0	67.2	1126	0.89	0.70	0.40	0.665

Table 2.
GDI and its components for ECE-countries, sorted by GDI

HDI-rank	GDI-rank	Country	Adult literacy rate, 1997 (%)		Combined first-, second- and third-level gross enrolment ratio, 1997 (%)		Life expectancy at birth, 1997 (years)		Real GDP per capita , 1997 (PPP$)		Equally distributed education attainment Index	Equally distributed life expectancy index	Equally distributed income index	Gender-related development index (GDI), 1997
			Female	Male	Female	Male	Female	Male	Female	Male				
1	1	Canada	99.0	99.0	100.0	96.0	81.8	76.1	17254	27806	0.987	0.899	0.897	0.928
2	2	Norway	99.0	99.0	98.0	93.0	81.1	75.2	20872	28095	0.978	0.886	0.915	0.927
3	3	United States	99.0	99.0	97.0	91.0	80.1	73.4	23540	34639	0.973	0.862	0.942	0.926
5	4	Sweden	99.0	99.0	100.0	95.0	80.8	76.3	17829	21789	0.985	0.892	0.881	0.919
4	5	Belgium	99.0	99.0	100.0	100.0	80.6	73.8	15249	30565	0.993	0.870	0.892	0.918
7	6	Iceland	99.0	99.0	89.0	86.0	81.3	76.8	19183	25777	0.952	0.901	0.901	0.918
6	7	Netherlands	99.0	99.0	97.0	100.0	80.7	75.0	14483	27877	0.988	0.881	0.881	0.916
9	8	France	99.0	99.0	94.0	91.0	82.0	74.2	17176	27134	0.968	0.885	0.894	0.916
8	9	United Kingdom	99.0	99.0	100.0	99.0	79.8	74.5	15736	25917	0.992	0.869	0.883	0.915
10	10	Switzerland	99.0	99.0	76.0	83.0	81.8	75.4	16802	33878	0.925	0.893	0.909	0.909
11	11	Finland	99.0	99.0	100.0	94.0	80.6	73.0	15045	25522	0.983	0.863	0.878	0.908
13	12	Denmark	99.0	99.0	91.0	87.0	78.3	73.0	19733	27741	0.957	0.844	0.909	0.904
12	13	Germany	99.0	99.0	87.0	89.0	80.2	73.9	16780	25962	0.953	0.868	0.889	0.904
14	14	Austria	99.0	99.0	85.0	86.0	80.2	73.7	14099	30337	0.945	0.866	0.884	0.898
16	15	Italy	97.8	98.8	83.0	80.0	81.2	75.0	12634	28405	0.927	0.885	0.868	0.894
15	16	Luxembourg	99.0	99.0	69.0	69.0	79.9	73.3	17326	44955	0.890	0.860	0.932	0.894
17	17	Ireland	99.0	99.0	90.0	86.0	79.2	73.6	11585	29973	0.953	0.857	0.865	0.892
18	18	Spain	96.2	98.4	94.0	89.0	81.5	74.5	9568	22569	0.954	0.883	0.825	0.888
19	19	Israel	93.4	97.5	81.0	79.0	79.7	75.7	12387	24007	0.903	0.878	0.856	0.879
21	20	Greece	94.9	98.3	79.0	79.0	80.7	75.6	8248	17429	0.907	0.886	0.793	0.861
22	21	Portugal	88.3	93.7	93.0	88.0	78.8	71.8	9445	19469	0.908	0.839	0.813	0.853
24	22	Slovenia	99.0	99.0	78.0	74.0	78.2	70.6	9137	14619	0.913	0.823	0.790	0.842
23	23	Malta	91.7	90.5	77.0	78.0	79.3	74.9	5733	20772	0.866	0.868	0.767	0.834
25	24	Czech Republic	99.0	99.0	74.0	74.0	77.4	70.3	7952	13205	0.907	0.814	0.769	0.830
26	25	Slovakia	99.0	99.0	76.0	74.0	76.7	69.2	6366	9532	0.910	0.799	0.725	0.811
27	26	Poland	99.0	99.0	78.0	77.0	76.9	68.2	5061	8060	0.918	0.792	0.691	0.800

28	27	Hungary	99.0	99.0	75.0	73.0	74.9	66.8	5372	9194	0.907	0.764	0.705	0.792
29	28	Estonia	99.0	99.0	83.0	80.0	74.5	63.0	4236	6372	0.932	0.728	0.656	0.772
30	29	Croatia	96.4	99.0	68.0	67.0	76.5	68.8	3557	6325	0.876	0.794	0.639	0.769
31	30	Belarus	98.5	99.0	82.0	78.0	73.9	62.2	3909	5912	0.925	0.717	0.642	0.761
32	31	Lithuania	99.0	99.0	77.0	73.0	75.6	64.3	3323	5221	0.910	0.748	0.618	0.759
33	32	Bulgaria	97.6	98.8	73.0	68.0	74.7	67.6	3256	4801	0.890	0.769	0.611	0.757
34	33	Romania	96.7	98.9	68.0	68.0	73.9	66.2	3221	5435	0.878	0.751	0.619	0.750
35	34	Russian Federation	98.8	99.0	80.0	74.0	72.8	60.6	3503	5356	0.917	0.694	0.625	0.745
37	35	Latvia	99.0	99.0	72.0	69.0	74.4	62.5	3330	4664	0.895	0.725	0.610	0.743
36	36	Macedonia, TFYR	94.0	94.0	70.0	70.0	75.3	70.9	2257	4163	0.860	0.802	0.567	0.742
38	37	Kazakhstan	99.0	99.0	79.0	74.0	72.5	62.8	2804	4358	0.915	0.710	0.590	0.738
41	38	Armenia	98.8	98.8	68.0	75.0	73.6	67.2	1928	2816	0.897	0.757	0.523	0.726
40	39	Turkey	73.9	92.4	54.0	67.0	71.7	66.5	4681	7982	0.748	0.735	0.684	0.722
46	40	Albania	85.0	85.0	68.0	67.0	75.9	69.9	1501	2711	0.792	0.798	0.498	0.696
47	41	Azerbaijan	96.3	96.3	73.0	69.0	74.1	65.5	1164	1952	0.879	0.746	0.448	0.691
48	42	Moldova, Rep. Of	97.4	99.0	71.0	69.0	71.5	63.5	1221	1805	0.888	0.709	0.446	0.681
49	43	Tajikistan	98.3	99.0	65.0	73.0	70.2	64.2	850	1404	0.887	0.703	0.395	0.662
20	x	Cyprus	93.5	98.4	NA	NA	80.0	75.5	8095	20329	NA	0.879	0.803	NA
39	x	Georgia	NA	NA!	71.0	70.0	76.8	68.5	1521	2440	NA	0.794	0.489	NA
45	x	Kyrgyzstan	NA	NA	71.0	68.0	71.9	63.3	1798	2720	NA	0.709	0.514	NA
44	x	Turkmenistan	NA	NA	NA	NA	68.9	61.9	1642	2586	NA	0.673	0.502	NA
42	x	Ukraine	NA	NA	80.0	74.0	73.7	63.8	1691	2763	NA	0.730	0.507	NA
43	x	Uzbekistan	NA	NA	74.0	78.0	70.7	64.3	2019	3047	NA	0.708	0.533	NA

Table 3.

Various variants of GDI for ECE-countries, sorted by GDI

HDI-rank	GDI-rank	HDI-ger-rank	GDI-ger -rank	Two components GDI-ger-rank	GI-rank	Country	Human development index (HDI), 1997	Gender-related development index (GDI), 1997	Human development index (literacy excluded) (HDI-ger), 1997 1)	Gender-related development index (literacy excluded (GDIger), 1997 1)	Two component-GDI, 1997 2)	Two component-GDI-ger, 1997 1)2)	Gender inequality index (GI), 1997 3)
1	1	1	1	1	23	Canada	0.932	0.928	0.930	0.925	0.943	0.939	0.00379
2	2	4	3	6	1	Norway	0.927	0.927	0.920	0.919	0.932	0.920	0.00025
3	3	6	7	9	5	United States	0.927	0.926	0.917	0.915	0.918	0.901	0.00107
5	4	3	4	3	24	Sweden	0.923	0.919	0.923	0.916	0.939	0.934	0.00408
4	5	2	2	2	33	Belgium	0.923	0.918	0.927	0.921	0.932	0.935	0.00556
7	6	10	10	11	2	Iceland	0.919	0.918	0.890	0.892	0.926	0.888	0.00059
6	7	7	6	4	31	Netherlands	0.921	0.916	0.917	0.916	0.935	0.933	0.00526
9	8	9	9	8	6	France	0.918	0.916	0.903	0.902	0.927	0.905	0.00167
8	9	5	5	5	19	United Kingdom	0.918	0.915	0.920	0.916	0.930	0.932	0.00301
10	10	16	16	18	32	Switzerland	0.914	0.909	0.867	0.865	0.909	0.843	0.00536
11	11	8	8	7	29	Finland	0.913	0.908	0.913	0.904	0.923	0.917	0.00519
13	12	12	11	15	3	Denmark	0.905	0.904	0.880	0.881	0.900	0.867	0.00063
12	13	13	12	12	10	Germany	0.906	0.904	0.880	0.879	0.910	0.874	0.00233
14	14	14	14	16	38	Austria	0.904	0.898	0.877	0.868	0.905	0.860	0.00713
16	15	17	17	17	37	Italy	0.900	0.894	0.867	0.856	0.906	0.850	0.00697
15	16	20	20	25	42	Luxembourg	0.902	0.894	0.837	0.827	0.875	0.775	0.00937
17	17	15	15	14	41	Ireland	0.900	0.892	0.877	0.867	0.905	0.868	0.00869
18	18	11	13	10	39	Spain	0.894	0.888	0.883	0.874	0.919	0.899	0.00726
19	19	19	19	19	27	Israel	0.883	0.879	0.850	0.845	0.890	0.839	0.00503
21	20	22	21	20	36	Greece	0.867	0.861	0.830	0.823	0.896	0.838	0.00668
22	21	18	18	13	34	Portugal	0.858	0.853	0.860	0.852	0.873	0.872	0.00562
24	22	24	23	22	18	Slovenia	0.845	0.842	0.793	0.791	0.868	0.792	0.00298
23	23	23	22	21	43	Malta	0.850	0.834	0.820	0.804	0.867	0.822	0.01895
25	24	25	24	24	21	Czech Republic	0.833	0.830	0.777	0.775	0.860	0.777	0.00312
26	25	26	25	26	9	Slovakia	0.813	0.811	0.760	0.758	0.855	0.775	0.00202
27	26	27	26	23	15	Poland	0.802	0.800	0.753	0.753	0.855	0.784	0.00267
28	27	28	27	29	22	Hungary	0.795	0.792	0.737	0.737	0.836	0.752	0.00367
29	28	29	28	27	7	Estonia	0.773	0.772	0.733	0.733	0.830	0.772	0.00186
30	29	32	31	37	28	Croatia	0.773	0.769	0.703	0.703	0.835	0.735	0.00517
31	30	30	29	28	17	Belarus	0.763	0.761	0.723	0.720	0.821	0.759	0.00290

32	31	31	30	33	12	Lithuania	0.761	0.759	0.707	0.706	0.829	0.749	0.00255
33	32	33	33	35	4	Bulgaria	0.758	0.757	0.697	0.695	0.829	0.737	0.00078
34	33	38	36	42	13	Romania	0.752	0.750	0.687	0.683	0.815	0.715	0.00255
35	34	34	32	40	16	Russian Federation	0.747	0.745	0.697	0.696	0.805	0.732	0.00273
37	35	39	37	43	8	Latvia	0.744	0.743	0.680	0.680	0.810	0.715	0.00199
36	36	35	34	30	35	Macedonia, TFYR	0.746	0.742	0.693	0.689	0.831	0.751	0.00583
38	37	37	35	34	20	Kazakhstan	0.740	0.738	0.690	0.688	0.812	0.737	0.00305
41	38	42	41	38	11	Armenia	0.728	0.726	0.670	0.664	0.827	0.735	0.00244
40	39	40	38	47	40	Turkey	0.728	0.722	0.677	0.673	0.741	0.667	0.00798
46	40	45	43	36	25	Albania	0.699	0.696	0.663	0.657	0.795	0.736	0.00467
47	41	46	45	41	30	Azerbaijan	0.695	0.691	0.640	0.635	0.812	0.728	0.00525
48	42	48	46	44	14	Moldova, Rep. Of	0.683	0.681	0.620	0.618	0.798	0.704	0.00265
49	43	49	47	46	26	Tajikistan	0.665	0.662	0.597	0.595	0.795	0.695	0.00482
20	x	21	x	x	x	Cyprus	0.870	NA	0.833	NA	NA	NA	NA
39	x	43	42	32	x	Georgia	0.729	NA	0.670	0.663	NA	0.750	NA
45	x	47	44	45	x	Kyrgyzstan	0.702	NA	0.640	0.639	NA	0.702	NA
44	x	36	x	x	x	Turkmenistan	0.712	NA	0.693	NA	NA	NA	NA
42	x	41	39	31	x	Ukraine	0.721	NA	0.673	0.669	NA	0.750	NA
43	x	44	40	39	x	Uzbekistan	0.720	NA	0.670	0.667	NA	0.734	NA

1) Educational attainment consists only of gross enrolment ratio
2) The indices are the unweighed mean of only life expectancy and educational attainment
3) The index is defined as (HDI-GDI)/HDI

Table 4a.
Results regression HDI and components

Dependent					
	LE	LIT	GER	GDP	HDI
Independent	standardised.B				
LE		-0.399	0.146	0.752**	0.272**
LIT	-0.102		0.240*	0.047	0.088**
GER	0.066	0.424*		0.206*	0.137**
log(GDP)	0.850**	0.209	0.517*		0.636**
R-square	0.783	0.150	0.519	0.808	1.000

** p<.01 and * p <.05

Legenda: LE=life expectancy
LIT=adult literacy
GER=combined gross enrolment ratio
log(GDP)= logarithmised GDP per capita (PPP$)

Table 4b.
Results regression HDI-ger and components

Dependent				
Independent	LE	GER	GDP	HDI-ger
	Standardised.B			
LE		0.056	0.740**	0.235**
GER	0.024		0.228*	0.344**
log(GDP)	0.864**	0.632**		0.519**
R-square	0.774	0.464	0.806	1.000

See legenda Table 4a

Table 5
Results regression GDI and components

Dependent / Independent	LE	EDU	GDP	GDI	
	standardised B				unstandardised.B
constant					0.000
LE-index		-0.073	0.736 **	0,267**	0.333
EDU-index	-0.030		0.246 **	0,202**	0.333
GDP-index	0.889**	0.708**		0,618**	0.333
R-square	0.756	0.418	0.798	1.000	

See legenda Table 4a.

Table 6a
Results regression GDI and components (extended version)

Dependent / Independent	f/m LE	f/m EDU	f/m GDP	GDI	GDI	GDI
	Stand.B					
f/m LE		0.223	0.292	-0.610**	0.004	-0.079**
f/m EDU	0.207		0.081	0.383**	0.001	-0.047**
f/m GDP	0.281	0.084		-0.037	0.028**	-0.059**
HDI					1.007**	
femLE						0.212**
femLIT						0.121**
femGER						0.154**
log(femGDP)						0.612**
R-square	0.139	0.069	0.104	0.413	1.000	1.000

Legenda (see also Table 4a):
f/m-variables consist of quotient of female and male values on the respective variables
fem-variables consist of values for females on the respective variables

Table 6b
Results regression GDI-ger and components (extended version)

Dependent / Independent	LE	GER	GDP	GDI-ger	GDI-ger	GDI-ger
	stand.B					
f/m LE		0.322*	0.290	-0.671**	0.009	-0.061**
f/m GER	0.299*		0.082	0.421**	-0.006	-0.059**
f/m GDP	0.264	0.081		-0.051	0.024**	-0.046**
HDI					1.0011**	
femLE						0.182**
femGER						0.365**
log(femGDP)						0.508**
R-square	0.188	0.127	0.107	0.447	0.999	1.000

See for legenda Table 6a

Table 7.

GDI and its components for ECE-countries (z-scores), sorted by GDI

HDI-rank	GDI-rank	GDI-ger-rank	ZHDI-rank	ZHDI-ger-rank	ZGDI-rank	ZGDI-ger-rank	Country	Education Index (z-scores)	GDP-index (z-scores)	Life expectancy index (z-scores)	Equally distributed income index (z-scores)	Equally distributed education attainment Index (z-scores)	Equally distributed life expectancy index (z-scores)	ZHDI (Human development index z-scores)	ZHDI-ger (HuMan development index, literacy excluded, z-scores)	ZGDI (Gender-related development index, z-scores)	ZGDI-ger (Gender-related development index, literacy excluded, z-scores)
1	1	1	1	1	1	1	Canada	1.50	1.01	1.29	1.07	1.33	1.28	1.26	1.34	1.23	1.34
2	2	3	2	5	3	5	Norway	1.29	1.13	1.14	1.18	1.17	1.10	1.19	1.21	1.15	1.23
3	3	7	9	8	7	7	United States	1.08	1.31	0.72	1.34	1.07	0.77	1.04	1.10	1.06	1.13
5	4	4	3	2	2	2	Sweden	1.50	0.89	1.14	0.97	1.30	1.19	1.18	1.28	1.15	1.26
4	5	2	5	3	4	3	Belgium	1.50	1.07	0.86	1.03	1.46	0.87	1.14	1.25	1.12	1.25
7	6	10	10	10	9	10	Iceland	0.65	1.01	1.29	1.09	0.64	1.31	0.98	0.96	1.01	1.02
6	7	6	4	6	5	4	Netherlands	1.50	0.95	1.00	0.97	1.36	1.03	1.15	1.19	1.12	1.23
9	8	9	7	9	8	9	France	1.08	1.01	1.14	1.05	0.97	1.08	1.08	1.07	1.03	1.09
8	9	5	6	4	6	6	United Kingdom	1.50	0.95	0.86	0.98	1.43	0.86	1.10	1.21	1.09	1.22
10	10	16	17	17	12	16	Switzerland	0.02	1.13	1.14	1.14	0.11	1.20	0.76	0.71	0.82	0.75
11	11	8	8	7	10	8	Finland	1.50	0.95	0.72	0.94	1.27	0.78	1.06	1.13	1.00	1.10
13	12	11	13	15	13	13	Denmark	0.87	1.07	0.44	1.14	0.74	0.51	0.79	0.77	0.80	0.82
12	13	12	12	12	11	12	Germany	0.65	0.95	0.86	1.02	0.67	0.84	0.82	0.84	0.84	0.86
14	14	14	11	13	15	14	Austria	0.65	1.01	0.86	0.99	0.51	0.81	0.84	0.79	0.77	0.76
16	15	17	16	16	17	17	Italy	0.23	0.95	1.14	0.89	0.15	1.09	0.77	0.74	0.71	0.70
15	16	20	18	23	19	21	Luxembourg	-0.62	1.37	0.72	1.28	-0.58	0.73	0.49	0.34	0.48	0.32
17	17	15	15	14	16	15	Ireland	0.65	0.95	0.72	0.87	0.67	0.68	0.77	0.79	0.74	0.76
18	18	13	14	11	14	11	Spain	0.65	0.70	1.00	0.62	0.68	1.06	0.79	0.93	0.79	0.91
19	19	19	19	19	18	19	Israel	-0.41	0.82	1.00	0.81	-0.33	0.99	0.47	0.59	0.49	0.59
21	20	21	20	20	20	20	Greece	-0.19	0.46	1.14	0.43	-0.24	1.10	0.47	0.48	0.43	0.47
22	21	18	22	18	21	18	Portugal	-0.19	0.58	0.44	0.55	-0.23	0.43	0.28	0.67	0.25	0.65
24	22	23	23	24	22	23	Slovenia	-0.19	0.40	0.16	0.40	-0.12	0.21	0.12	0.04	0.17	0.07
23	23	22	24	22	24	22	Malta	-1.04	0.46	0.86	0.27	-1.06	0.85	0.09	0.36	0.02	0.28
25	24	24	25	25	23	24	Czech Republic	-0.19	0.28	0.02	0.28	-0.25	0.08	0.04	-0.11	0.04	-0.08
26	25	25	26	26	25	25	Slovakia	-0.19	-0.03	-0.12	0.00	-0.18	-0.13	-0.11	-0.22	-0.10	-0.21
27	26	26	27	27	26	26	Poland	0.02	-0.21	-0.26	-0.21	-0.02	-0.23	-0.15	-0.27	-0.15	-0.23
28	27	27	28	28	27	27	Hungary	-0.19	-0.15	-0.68	-0.12	-0.25	-0.62	-0.34	-0.48	-0.33	-0.44
29	28	28	29	29	28	28	Estonia	0.23	-0.45	-1.10	-0.42	0.25	-1.13	-0.44	-0.50	-0.43	-0.48
30	29	31	31	32	29	30	Croatia	-0.83	-0.51	-0.26	-0.52	-0.86	-0.20	-0.53	-0.68	-0.53	-0.64
31	30	29	30	30	31	29	Belarus	0.23	-0.51	-1.24	-0.50	0.12	-1.30	-0.51	-0.60	-0.56	-0.61

32	31	30	32	31	30	31	Lithuania	-0.19	-0.70	-0.82	-0.65	-0.18	-0.85	-0.57	-0.68	-0.56	-0.66
33	32	33	33	34	32	33	Bulgaria	-0.62	-0.70	-0.54	-0.69	-0.59	-0.55	-0.62	-0.74	-0.61	-0.72
34	33	36	36	39	34	37	Romania	-0.83	-0.64	-0.82	-0.64	-0.81	-0.82	-0.76	-0.88	-0.76	-0.87
35	34	32	35	38	35	34	Russian Fed.	0.02	-0.64	-1.66	-0.61	-0.06	-1.62	-0.76	-0.88	-0.76	-0.84
37	35	37	41	43	37	40	Latvia	-0.41	-0.76	-1.24	-0.70	-0.47	-1.18	-0.80	-0.97	-0.79	-0.93
36	36	34	37	33	33	32	Macedonia, TFYR	-1.25	-0.94	-0.12	-0.97	-1.17	-0.09	-0.77	-0.68	-0.74	-0.68
38	37	35	40	37	36	36	Kazakhstan	-0.19	-0.82	-1.38	-0.82	-0.08	-1.39	-0.80	-0.88	-0.77	-0.86
41	38	41	38	41	38	41	Armenia	-0.41	-1.24	-0.68	-1.24	-0.45	-0.73	-0.78	-0.91	-0.81	-0.94
40	39	38	49	45	43	43	Turkey	-3.38	-0.27	-1.10	-0.25	-3.39	-1.04	-1.58	-1.07	-1.56	-1.07
46	40	43	48	40	41	38	Albania	-2.74	-1.37	-0.12	-1.39	-2.53	-0.15	-1.41	-0.89	-1.35	-0.91
47	41	45	44	46	39	44	Azerbaijan	-0.83	-1.67	-0.82	-1.70	-0.80	-0.88	-1.11	-1.13	-1.13	-1.15
48	42	46	46	48	40	46	Moldova, Rep. Of	-0.62	-1.73	-1.38	-1.71	-0.62	-1.41	-1.24	-1.37	-1.25	-1.36
49	43	47	47	49	42	47	Tajikistan	-0.62	-2.04	-1.52	-2.03	-0.63	-1.49	-1.39	-1.55	-1.38	-1.53
20	44	x	21	21	x	x	Cyprus	-0.41	0.58	1.00	0.48	NA	1.00	0.39	0.48	NA	NA
39	45	42	34	36	x	35	Georgia	-0.41	-1.43	-0.12	-1.45	NA	-0.20	-0.65	-0.81	NA	-0.85
45	46	44	45	47	x	45	Kyrgyzstan	-0.83	-1.31	-1.38	-1.29	NA	-1.40	-1.17	-1.26	NA	-1.24
44	47	x	42	35	x	x	Turkmenistan	0.65	-1.37	-1.94	-1.37	NA	-1.91	-0.88	-0.81	NA	NA
42	48	39	39	42	x	39	Ukraine	0.02	-1.31	-1.10	-1.33	NA	-1.11	-0.80	-0.91	NA	-0.92
43	49	40	43	44	x	42	Uzbekistan	-0.19	-1.18	-1.38	-1.17	NA	-1.41	-0.92	-1.00	NA	-1.00

GDI-RANG	Country	Penalty gap Life expectation	Penalty gap Educational attainment	Penalty gap GDP
1	Canada	8.15894E-04	0.003315198	0.006475537
2	Norway	8.39404E-04	0.001672984	0.002508428
3	United States	8.03583E-04	4.05224E-05	0.004199193
4	Sweden	7.73901E-04	0.008323868	0.001156044
5	Belgium	4.89181E-05	2.22045E-16	0.01367917
6	Iceland	8.35545E-04	0.001614617	0.002487768
7	Netherlands	8.10991E-04	0.001589113	0.012180675
8	France	2.94173E-05	0.001766389	0.005959219
9	United Kingdom	7.93130E-04	0.001637872	0.007109545
10	Switzerland	1.57216E-05	0.001382917	0.013826621
11	Finland	8.40921E-06	0.006513478	0.007986337
12	Denmark	8.11391E-04	3.18001E-05	0.00329879
13	Germany	0.002373323	9.22397E-05	0.005440219
14	Austria	7.85922E-04	0.001699986	0.016599133
15	Italy	0.001488562	0.001621154	0.018632244
16	Luxembourg	0.001605531	0	0.025114221
17	Ireland	0.001675009	3.41276E-06	0.025429744
18	Spain	4.06518E-05	9.79742E-04	0.021139342
19	Israel	0.001813132	1.31513E-04	0.012533208
20	Greece	8.45166E-04	3.13090E-04	0.016327334
21	Portugal	2.90711E-04	7.96692E-04	0.015193415
22	Slovenia	4.64226E-05	1.41079E-04	0.006519264
23	Malta	0.001743661	0.001650458	0.047259755
24	Czech Republic	7.53034E-04	0	0.007642908
25	Slovakia	8.63187E-04	6.99188E-05	0.004944558
26	Poland	4.66111E-04	0.001708659	0.006661892
27	Hungary	5.84274E-04	1.32542E-04	0.008807778
28	Estonia	5.19882E-05	0.001939546	0.005218794
29	Croatia	9.43809E-04	0.00137817	0.010423307
30	Belarus	1.43154E-04	0.001391557	0.005393387
31	Lithuania	2.78649E-05	3.16584E-04	0.006514914
32	Bulgaria	8.54280E-04	0.001749345	0.004842288
33	Romania	0.002191452	1.80421E-04	0.008715022
34	Russian Federation	3.32625E-04	1.62048E-04	0.005732471
35	Latvia	0.001183913	0.001267123	0.003636871
36	Macedonia, TFYR	3.11850E-05	0	0.012269074
37	Kazakhstan	2.67817E-04	0.001816033	0.006314728
38	Armenia	0.001531177	0.002133558	0.004881855
39	Turkey	0.001644207	0.010261921	0.00875176
40	Albania	0.00138691	0.001708741	0.012014661
41	Azerbaijan	0.002263374	8.47952E-05	0.009633308
42	Moldova, Rep. Of	2.31024E-04	7.60203E-04	0.005530754
43	Tajikistan	6.86549E-05	0.001999709	0.009596466
44	Cyprus	8.60573E-04	#NULL!	0.024393377
45	Georgia	5.58287E-04	#NULL!	0.007773957
46	Kyrgyzstan	6.82485E-04	#NULL!	0.00586342
47	Turkmenistan	2.36049E-04	#NULL!	0.007116177
48	Ukraine	2.99216E-04	#NULL!	0.008251616
49	Uzbekistan	1.01379E-04	#NULL!	0.005712376

Country	Gender-related development index (GDI), 1997	Gender inequality index (GI), 1997 3)
Canada	0.928	0.00379
Norway	0.927	0.00025
United States	0.926	0.00107
Sweden	0.919	0.00408
Belgium	0.918	0.00556
Iceland	0.918	0.00059
Netherlands	0.916	0.00526
France	0.916	0.00167
United Kingdom	0.915	0.00301
Switzerland	0.909	0.00536
Finland	0.908	0.00519
Denmark	0.904	0.00063
Germany	0.904	0.00233
Austria	0.898	0.00713
Italy	0.894	0.00697
Luxembourg	0.894	0.00937
Ireland	0.892	0.00869
Spain	0.888	0.00726
Israel	0.879	0.00503
Greece	0.861	0.00668
Portugal	0.853	0.00562
Slovenia	0.842	0.00298
Malta	0.834	0.01895
Czech Republic	0.830	0.00312
Slovakia	0.811	0.00202
Poland	0.800	0.00267
Hungary	0.792	0.00367
Estonia	0.772	0.00186
Croatia	0.769	0.00517
Belarus	0.761	0.00290
Lithuania	0.759	0.00255
Bulgaria	0.757	0.00078
Romania	0.750	0.00255
Russian Federation	0.745	0.00273
Latvia	0.743	0.00199
Macedonia, TFYR	0.742	0.00583
Kazakhstan	0.738	0.00305
Armenia	0.726	0.00244
Turkey	0.722	0.00798
Albania	0.696	0.00467
Azerbaijan	0.691	0.00525
Moldova, Rep. Of	0.681	0.00265
Tajikistan	0.662	0.00482
Cyprus	NA	NA
Georgia	NA	NA
Kyrgyzstan	NA	NA
Turkmenistan	NA	NA
Ukraine	NA	NA
Uzbekistan	NA	NA