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Forschungsinstitut
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Institute for the Study
of Labor

# Measurement and Analysis of Child Well-Being in Middle and High Income Countries

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*"Our historic aim will be for ours to be the first generation to end child poverty, and it will take a generation. It is a 20 year mission but I believe it can be done."*
— The Rt. Honourable PM Tony Blair M.P., The Beveridge Lecture, Toynbee Hall, March 18, 1999.

# ABSTRACT

## Measurement and Analysis of Child Well-Being in Middle and High Income Countries*

Starting from the recent UNICEF publications on child poverty in the developed countries, which received a wide audience in the political and scientific world, in this paper we further analyze the UNICEF study data base and present three composite indices that are multidimensional and quantitatively measures of child well-being. While the original UNICEF studies simply added together the ranks on different measurement scales, we present a much more sophisticated approach, with the first of our indicators being a non-parametric measure while the remaining two are parametric. In the non-parametric index of child welfare, the well-being indicators are given same weights in their aggregation to form different components from which an overall index is being constructed. Two different forms of the parametric index are estimated by using principal component analysis. The first model uses a pool of all indicators without classification of the indicators by type of well-being, while the second model estimates first the sub-components separately and then uses the share of variance explained by each principal component to compute the weighted average of each component and their aggregation into an index of overall child well-being. The indices indicate which countries have the best system of child welfare and show how child well-being varies across countries and regions. The indices are composed of six well-being components: material, health and safety, educational well-being, family and peer relationships, behaviours and risks and subjective well-being. Each of the components is generated from a number of well-being sub-indicators.

JEL Classification: D31, I10, I20, I30, J13

Keywords: child well-being, multidimensional index, principal component, child poverty, child outcomes, OECD

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## 1. INTRODUCTION

There is a growing literature on the well-being of children. It is a result of our growing ability and productivity in the use of resources and generation of economic growth. In addition to the formation of a higher wealth, part of the growth is redistributed and invested in education, technology, productivity, management and welfare programs. Institutions are also built up which have enhanced and regulated the interest, needs and rights of children. As a result of improved welfare and better allocation of resources, significant progress is made in a number of areas such as: child conventions which regulate the rights and needs of children. Other areas subject to intensive development are education and learning techniques, compulsory schooling, measures to reduce child labour, physical, psychological and sexual abuse of children, and measures to increase the society's responsibility for the safety and well-being of children. However, development has not been homogenous, but yet a certain degree of homogeneity in form of provision of basic needs and rights among the OECD countries can be found. In particular, it is easy to establish the presence of a positive association between economic development and child well-being.

In political terms, the issues of the rankings of child poverty in industrialized nations, which are under debate in this study, are very contentious, and call for a more thorough analysis. Is the UK best practice in terms of child welfare in Europe, as the current Labour Government often maintains, or is it worst practice, as the UNICEF studies claim? Are the neo-liberal policies of "New Labour" an engine of poverty reduction, or is the opposite true? And are "continental European" or "European social model" policies much better adapted to reduce child poverty in rich nations?

Let us take two very contradictory quotations. In his famous speech as the incoming President of the Council of the European Union before the European Parliament on June 23, 2005, the British Prime Minister Tony Blair said: "*And since this is a day for demolishing caricatures, let me demolish one other: the idea that Britain is in the grip of some extreme Anglo-Saxon market philosophy that tramples on the poor and disadvantaged. The present British Government has introduced the new deal for the unemployed, the largest jobs programme in Europe that has seen long-term youth unemployment virtually abolished. It has increased investment in our public services more than any other European country in the past five years. We needed to, it is true, but we did it. We have introduced Britain's first minimum wage. We have regenerated our cities. We have lifted almost one million children out of poverty and two million pensioners out of acute hardship and are embarked on the most radical expansion of childcare, maternity and paternity rights in our country's history. It is just that we have done it on the basis of and not at the expense of a strong economy." (http://www.number10.gov.uk/output/Page7714.asp)*

*UN puts UK at the bottom of 21 advanced nations. Children growing up in the United Kingdom suffer greater deprivation, worse relationships with their parents and are exposed to more risks from alcohol, drugs and unsafe sex than those in any other wealthy country in the world, according to a study from the United Nations. The UK is at the bottom of the league of 21 economically advanced countries according to a "report card" put together by UNICEF on the wellbeing of children and adolescents, trailing the United States which comes second to last. Today's findings will be a blow to the government, which has set*

*great record by lifting children out of poverty and improving their education and prospects. Al Aynsley Green, the children's commissioner for England, acknowledges that the UN has accurately highlighted the troubled lives of children. "There is a crisis at the heart of our society and we must not continue to ignore the impact of our attitudes towards children and young people and the effect that this has on their wellbeing," he says in a response today. "I hope this report will prompt us all to look beyond the statistics and to the underlying causes of our failure to nurture happy and healthy children in the UK. These children represent the future of our country and from the findings of this report they are in poor health, unable to maintain loving and successful relationships, feel unsafe and insecure, have low aspirations and put themselves at risk. (…) The Unicef team assessed the treatment of children in six different areas - material wellbeing; health and safety; educational wellbeing, family and peer relationships, behaviours and risks; and the young people's own perceptions of their wellbeing. The Netherlands tops the league, followed by Sweden, Denmark, Finland and Spain. The bottom five are Portugal, Austria, Hungary, the US and the UK. Nine countries, all of them in the northern Europe, have brought child poverty down below 10%, the report shows. But it remains at 15% in the three southern European countries - Portugal, Spain and Italy - and in the UK, Ireland and the US. Child poverty is a relative measure that shows how far the standard of living has fallen below the national average. The UNICEF report adds: "The evidence from many countries persistently shows that children who grow up in poverty are more vulnerable: specifically, they are more likely to be in poor health, to have learning and behavioural difficulties, to underachieve at school, to become pregnant at too early an age, to have lower skills and aspirations, to be low paid, unemployed and welfare-dependent". The Conservatives seized on the report, claiming that it endorsed their attack on the way in which Gordon Brown had addressed the issue of child poverty, and the prime minister had demonised the role of children in his drive against antisocial behaviour. The shadow chancellor, George Osborne, said: "This report tells the truth about Brown's Britain. After 10 years of his welfare and education policies, our children today have the lowest wellbeing in the developed world." Labour said it had taken 700,000 people out of child poverty and was mounting an unprecedented investment programme in a network of children's centres. A government spokesman argued that in many cases the data used in the report was several years old and "does not reflect more recent improvements in the UK such as the continuing fall in the teenage pregnancy rate or in the proportion of children living in workless households".*

*( http://www.guardian.co.uk/society/2007/feb/14/childrensservices.politics)*

Following intensified research, numerous approaches to the conceptualization and quantitative measurement of the well-being of children is developed. These approaches differ depending on the nature of the study and research objectives. The main differences are attributed to whether one is interested in monitoring child well-being for the purpose of evaluation of outcomes and effects of policies or identification and measurement of impacts of various factors on the outcomes. Understanding the mechanism and underlying factors contributing to child well-being and their causal and interrelationships between different components forming the well-being are essential. In this regard, Hanafin and Brooks (2005) referred to the fact that different frameworks reflect differences in underlying perception of children. For instance, the issues emphasized may include children's rights, needs,

development, outcomes, effects, and resilience. In general still, there is no clear consensus about frameworks and definitions used, but they suggest multidimensionality and complexity of the children's live situations and well-being. In the next section we provide a review of the concepts and their development in the OECD countries.

The development process of monitoring and measurement of children's well-being from a cross country perspective and convergence in human development has been rapid. Ben Arieh (1997, 1999), Ben-Arieh and Wintersberger (1997) and Ben-Arieh et al. (2001), results from a collaborative effort of experts in the field covering a wide range of disciplines and countries, was path breaking pieces of work. The team work in a number of stages aimed at: conceptualizing child's well-being dimensionality and to identify appropriate well-being indicators as well as development of scientific protocols for data collection and its utilization and validation by networks of researchers. Agreements are made on indicators, their formation in components and sub-components. Despite common features, certain differences are found in the national and international characteristics of the projects and their objectives. All together, they shed light on the concepts, measurement and practiced implementation of a better child well-being.

There are several surveys that are collected on a regular basis.[1] For instance, in the CIVED survey, the focus is on the children's civic life, in the German surveys, the focus is on the children's and their families life and economic situation, while in the American survey, the focus is on the measuring trends in child well-being and its temporal changes. In the German surveys, the components include: safety, physical status, personal life, civic life, economic resources, contributions and activities. The American surveys refer to: material well-being, health, safety, production educational and community activities, social relationships and emotional well-beings (see Land 2005, 2006, 2007a and 2007b).[2] In general the information in the surveys covers: economic situation, health, behaviour, education, social relationships, emotional, spiritual well-being, poverty perspective and social exclusion. The poverty perspective is related to Sens's (1985) limitation of capabilities or outcomes of physical, cognitive, behavioural and subjective/mental well-being. In the UK survey, the aim is different where the government focuses on the

[1] See Sturgis (2004) and WHO/Europe (2006) for complex survey data issues.

[2] The foundation for child development, child and youth well-being index (CWI) project issues an annual human development measure of how children are faring in the USA. The index provides trends in well-being between 1975 and 2005 and it is based on 28 indicators of well-being grouped into 7 quality of life domains. These are economic well-being, health, safety, educational attainment, and participation in schooling, economic and political institutions. The non-parametric composite index which is an equally weighted average of the 7 domains is indexed by the base year of 1975 which gives an overall direction of changes in well-being. There is a negative trend in well-being from 1979 to 1995, followed by an increasing trend until 2002. The major trends suggest that: progress in children's quality of life has since 2002 stalled, children's health continues to decline, children are safer and engage less in risky behaviour than ever, progress in narrowing racial and ethnic disparities has stalled since 2002, the peak in quality of life in 2002 was a temporary reaction to 9/11, the economic recession and slow growth in 2001-2002 negatively impacted the family's economic well-being. In sum there is no strong link between economic progress and children's quality of life in USA. The report suggests proactive steps at the policy and community levels to be taken to improve children's life.

outcomes to monitor the public service providers in provision of the rights like achievement in: health, safety, contribution and economic well-being, and also expectations in forms of educational outcome and positive behaviours.

Among important comparative researches are Bradshaw et al. (1993), a comparative study of child support in 13 European countries, Norway and USA. It is a report on a study of child support package consisting of all social security benefits, child support arrangements and benefits for lone parents and other benefits reducing the costs of housing, health care, schooling and child care. For a number of evaluations along the lines listed above see Bradshaw (2001, 2002), Bradshaw and Mayhew (2005), Hanafin and Brooks (2005) and Aber et al. (2002). Land (2007b) is a special focus on international comparison where a simple foundation of child well-being index (CWI) is used to compare well-being of children in USA and four English speaking countries namely Australia, Canada, New Zealand and UK. The comparison is based on 19 international indicators of child and youth well-being. They cover the same 7 domains of well-being as in the original CWI: family economic well-being, social relationships, health, safety/behavioural concerns, educational attainments, community connectedness, and emotional well-being. The result shows variations in countries performance in individual indicators and domains.

In this study, we present three composite indices that are multidimensional and quantitatively measure child well-being. The first is non-parametric while the remaining two are parametric. In the non-parametric index, in similarity with the CWI, the well-being indicators are given same weights in their aggregation, while in the parametric approach the weights are estimated. The first parametric model uses a pool of all indicators without classification of the indicators by type of well-being, while the second model estimates separately the sub-components first, and then computes the weighted aggregate child well-being index. The indices show how the child well-being varies across countries and regions. The indices are composed of six domains or components: material, health and safety, educational well-being, family and peer relationships, behaviours and risks and subjective well-being. Each of the well-being components is generated from a number of indicators. A breakdown of the index into major components provides possibilities to identify sources of well-being and associate it with social, economic and redistribution policy measures. The empirical results show that in general the aggregated child well-being is positively associated with economic development. However, in disaggregated form there is no systematic link between level of development and well-being of children.

The main contributions of this paper are as follows. First, we utilize data that is collected and used by professional networks in evaluation of child well-being with both national and cross country emphasis. Second, we extend previous work using the same data but by focusing on the measurement of composite indices. Third, we produce single non-parametric and parametric multidimensional well-being indices in which one accounts for various dimensions of well-being and weight them together to form a single index used to rank the sample countries in one single way. Fourth, based on the computed index and its underlying components, we compute efficiency level for individual countries in child well-being policy and compare it to the countries with best practiced well-being policy. Fifth, given the gained experience from this study and elsewhere, we suggest improvement to the

data collection, processing and computation. Finally, by identification of the strength and weakness of different welfare systems, we suggest policy measures to enhance child well-being in countries experiencing disparity in this area.

The rest of the paper is organized as follows. In Chapter 2 we outline the concept of child well-being from the perspectives of rights, needs, development, outcomes and effects. In Chapter 3 we review the literature by looking at different approaches to well-being and in particular the emphasis is made on the capability approach. The data and variable definitions are described in Chapter 4. Chapter 5 discusses the literature on the parametric and non-parametric index methodology. Various indices used in the measurement of child well-being are reviewed and their properties, benefits and limitations discussed. Analysis of the results is outlined in Chapter 6 which is followed by policy implication of the results in Chapter 7. Finally, Chapter 8 provides a summary and concludes this study.

## 2. CHILD WELL-BEING

Numerous approaches to conceptualization and quantitative measurement of the well-being of children have been developed. These approaches differ by the study's nature and objectives. The main differences are attributed to whether one is interested in monitoring the child well-being for the purpose of evaluation of outcomes and effects of economic and social policies or identification and measurement of impacts of different factors on the outcomes. An understanding of the mechanism and factors contributing to child well-being and interrelationships between different well-being components are considered essential. Thus, as Hanafin and Brooks (2005) indicate, the differences in frameworks may reflect differences in underlying perception, multidimensionality and complexity of the children's live situations and well-being. The development process of monitoring and measurement has been rapid (Ben-Arieh and Wintersberger, 1997; Ben-Arieh et al., 2001). In this study, the main focus is on the rights-based approach, capability approach, and children outcomes.

The framework for the analysis of child well-being is described in Bradshaw, Hoelscher and Richardson (2006). The different approaches include: a rights-based approach, creating well-being, children's interactions with their environment, dimensions of child well-being, conditions for child well-being, and child outcomes. The rights-based approach uses the UN convention on the rights of the child as a partial reference. It offers a normative framework for the understanding of children's well-being. Its four general principles include: non-discrimination, best interest of the child, survival and development, and respect for the views of the child. These are found fitting well to the conceptualization of child well-being. Bradshaw et al. (2006) point out that some children in some countries face structural disadvantages due to their belonging to ethnic minorities, having disabilities, living in institutions or temporary housing and being refugees. Many of these children tend not to be included in child surveys. The non-discrimination thus points to the need to both capture the life situations and well-being of both categories of children, and to analyze the distribution of data by various child characteristics. The children have a double role as citizens with their own right and as dependent on their families, schools, communities,

societies and the state. From the latter perspective, child well-being is understood in terms of focusing on their education, capability and future employability.

Well-being is a realization of the children's rights and the fulfilment of the objectives to provide them with abilities, potential and skills through effective protection and provision of assistance by the families and their institutional environment. Thus, well-being is the positive outcome while the opposite or deprivation is a result of neglect of their rights. The outcome depends on individual characteristics and dynamic process. It is a result of changing resource inputs and risk factors affecting both well-being and health conditions. The main factor in this relation is what is called the sense of coherence which describes a person's overall orientation and capacity to make the best use of the resources available to them. It consists of three key elements: comprehensibility, manageability and meaningfulness (Lindström and Eriksson, 2005). The degree of dependency of children on environment and resource assistance is found to be negatively related to their age.

Children's capability to develop their potential is a result of their development and well-being is a dynamic process that is influenced by a multitude of environmental factors. Children interact with their environment and play an active role in creating their well-being by making use of available resources. The bio-ecological model of human development (Bronfenbrenner, 1979; Bronfenbrenner and Morris, 1998) conceptualizes child development on the basis of four environmental influences. The strongest direct influence is from interaction with family, other people and the system labelled as microsystem. Connections between the different structures within the microsystem are described as the second level and are labelled as mesosystem. The third level, the exosystem stands for the societal context in which families live and it affects the child mainly indirectly by influencing the microsystem. The fourth level of macrosystem points to the wider societal context like economic conditions and global developments. The different systems are dynamic and interdependent, influencing each other and also changing over time (Stevens et al., 2005; Kolar and Soriano, 2000; Lippman, 2004). In their interaction with the different systems, children encounter both barriers and facilitators. Match or mismatch between an individual with their development infrastructure may lead to inclusion or exclusion processes.

The child outcomes in child well-being literature (see Innocenti, 2006; Ackerman et al., 2003; Attree, 2004; and European Commission, 2003) include: child poverty, social exclusion, child abuse and neglect, unsatisfactory child development, poor school performance and deaths by accident or injuries. Social exclusion is a multidimensional concept involving economic, social, political, cultural and social aspects of disadvantage and deprivation. It is a process by which individuals and groups are are closed out from participation in the society as a consequence of for instance low income or education. The detailed list of child outcomes include other outcomes such as: children living in families receiving welfare benefits, suicide, alcohol and drug abuse, homelessness, minorities, immigrant children, children of divorced parents, children in lone parent families, bullying and victimization, low birth rate and births outside marriage. In the next section on review of the literature, further details on the issues discussed above are provided.

## 3. REVIEW OF THE LITERATURE

The child well-being dimensionality conceptualized and appropriate well-being indicators identified along with standardized protocols for data collections and its utilization and validation has been created. In general there are agreements made on indicators, their formation in components and sub-components, but yet certain differences are found in the national and international characteristics of the projects and their objectives. There are several surveys that are collected on a regular basis. For instance, in the CIVED survey the focus is on the children's civic life, in the German surveys the focus is on the children's and their families life and economic situation, in the American survey (Land, 2005) the focus is on the measuring trends in child well-being and its temporal changes, while in the UK survey (Bradshaw and Mayhew, 2005) the aim is to monitor the public service providers in provision of the rights of the children.

The components as a reflection of the focus differ among the surveys conducted in the OECD countries. In the German surveys the components include: safety, physical status, personal life, civic life, economic resources, contributions and activities. The American surveys refer to: material well-being, health, safety, production educational and community activities, social relationships and emotional well-beings. In UK survey the government focuses on the outcomes to monitor the provision of the rights like achievement in: health, safety, contribution and economic well-being, and also expectations in forms of educational outcome and positive behaviours. In general, the information in the surveys covers: economic situation, health, behaviour, education, social relationships, emotional, spiritual well-being, poverty perspective and social exclusion.

The research in the area has led to the development of different approaches to understanding and measurement of children's well-being. It highlights the complexity of children's life situations. The degree of complexity is positively associated with the difficulties to capture child well-being within a simple index based on a limited number of indicators. Several aspects such as the dynamics of the process and interrelationships between different sub-components and regional factors are not measured. Despite these limitations, a set of carefully selected indicators covering different dimensions of well-being sheds light on the state of the well-being and realization of children's rights in different countries. Following the UNICEF (2007) report, we analyze children's well-being in six dimensions containing 18 components based on 40 indicators.[3] The six dimensions are: material well-being, health and safety, education, peer and family relationships, subjective well-being, and behaviour and risk. It should be noted that all dimensions focus mainly on children's microsystem, i.e. on the children themselves and the different subsystems that directly impact on their life. A detailed description of the data, different dimensions, components and indicators is given below in the data section.

[3] Bradshaw, Hoelscher and Richardson (2007) introduced an index of child well-being in 25 European Union countries. The aim was to use the index in monitoring the well-being of children on the European level. The index is based on rights-based approach and is a multi-dimensional understanding of child well-being. The performance of countries on 8 clusters with 23 domains and 51 indicators is studied. The clusters are children's material situation, housing, health, subjective well-being, education, relationships, civic participation and risk and safety.

The outcomes can be classified in positive or negative terms focusing on well-being or deprivation. The positive outcome indicates capability, while the negative reflects vulnerability of children. The negative outcome as a measure of the gap in realization of the rights of children suggests a focus on deprivation to be more appropriate in international comparisons. Gabel and Kamerman (2006) and Kamerman et al. (2003) identify child outcomes in selected OECD countries. They explore child poverty and its effects on children, they identify families of concern, and social policies linked to these outcomes. Corak (2005) discusses the major issues involved in defining and measuring child poverty and outlines a set of six principles and practicalities in measuring child poverty for the rich countries. Bradshaw (2002) analyzed child poverty and child outcomes in Britain with focus on characteristics of poor children and changes in child poverty over time as well as effects of public policy to abolish child poverty. Bradbury and Jäntti (1999) while they emphasize child poverty as an important social problem, find considerable variations in both anti-poverty policies and poverty outcomes across industrialized nations. They present new estimates of child poverty using a range of alternative income poverty definitions and analyze sources of the variations in child poverty. In addition to differences in welfare state institutions and social transfer outcomes, they find variations in the families market incomes more important.

In a few other studies, outcome is measured somewhat different and does not complement those above. The children outcomes in UNICEF (2005 and 2007) are measured in terms of: health, subjective well-being, education, civic participation, friendship, and risky and healthy behaviours. Ackermann et al. (2003) reviewed the literature on current approaches to the evaluation of projects on children's participation in development with focus on local level activities. The concepts, the process, the success or failure of participatory programs, their impacts, ethical concerns and evaluation of participation are discussed. Attree (2004) reviews the quantitative studies on the impacts of poverty and associated disadvantages on children's lives as children. The focus is on the children's subjective accounts of growing up in disadvantage exploring the value of social resources available to children living in poor circumstances. Asher and Paquette (2003) studied loneliness and peer relations in childhood. Berger et al. (2005) studied the effects of different welfare programs targeting parents on health of children in the US.

Health is a basic indicator of well-being and closely related to poverty and ability to cover costs for health related services. Low income and poverty are linked to risk factors that impacts on children's health and also personal problems deteriorating their health. Subjective well-being reflects how children feel about themselves and their environment. In this study, the focus is on self-defined health, personal and educational well-being. Educational achievement and aspirations are indicators for children's well-being today and in the future. They also reflect presence of inequality and social exclusion. The overall dimensions include achievement, participation and employment outcomes. The children's opportunity for civic participation at school or in their community depends on the extent of encouragement and support given by their environment. Poor children tend to participate less frequently in organized youth activities. The possibility to spend time with best friends, to have fun and share problems is of high significance in children's lives. Poverty can affect the friendship and exclusion conditions of children. Adolescence is a period in children's

development when risk behaviour is very common among young people to be accepted in their peer group. The risk behaviour includes sexual activity, tobacco and alcohol consumption and drug use, while healthy behaviour covers nutrition and physical activities. The different dimensions and indicators are described below.

The impacts of poverty on health and cognitive development are decisive and stronger among the younger children. Duncan and Brooks-Gunn (2000) find that family poverty has selected effects on child development. Deep or persistent poverty early in childhood affects adversely the ability and achievement of children. They suggest policies to prevent economic deprivation of its effects. Against this background, it is important to identify the conditions under which children are doing well and can develop their full potential. This links to Sen's concepts of capability and deprivation (Sen 1985, 1999, 2000). In this study, capabilities are related to the children's needs, opportunities and choices to make them able to have desirable current and future development (Lister, 2004).

There is an increasing interest among child welfare practitioners and policy makers towards reducing child poverty by focusing on literacy standards and exclusion from school. In particular, child poverty and social exclusion from a child's perspective (Ridge, 2002) uses child centred research methods to provide richness and context to the debate about how to tackle family poverty and social exclusion of children. It helps to understand the issues and concerns identified as important by low income families and it raises critical issues and an agenda for both policy makers and practitioners. Ridge shows that poor children are suffering from insufficient access to economic and material resources that are necessary for adequate social participation and academic parity.

## 4. THE DATA

The data used in this study were obtained from the Report Card 7 published by UNICEF INNOCENTI with the title *"Child Poverty in Perspective: An Overview of Child Well-being in Rich Countries"*. The report provides a comprehensive assessment of the lives and well-being of children and adolescents in the economically advanced nations. The data cover 33 developing and transition countries and most recent data mainly from 2001 to 2003. The children's well-being is represented by 40 well-being indicators. These are used in computation of multidimensional indices to quantify child well-being in the sample countries. Summary statistics of the data are reported in Table 1 and full description of the indicators in Appendix A and B. For additional information on the sources and background to the data, please see UNICEF (2007).

The indices are composite indices that are multidimensional and quantitatively measure child well-being (CW). The indices are composed of six well-being components: material (MW), health and safety (HS), educational (EW), peer and family relationships (PF), behaviours and risks (BR) and social (SW). Each of the well-being components is generated from a number of well-being indicators. The components are aggregated into one single index by assigning weights to each component prior to their aggregation. The weights are estimated parametrically or assigned non-parametrically on an ad hoc basis. A breakdown of the index into major components provides information about contribution of

individual indicators to each component which can be useful in design of child welfare policy of the countries.

The Material Well-being (mw) component is composed of three sub-components: child income poverty, deprivation and work. The Child income poverty (mw11) is defined as percentage of children (0-17) in households with equivalent income less than 50 percent of the median of the population of household. The deprivation is defined based on three indicators including: percentage of children reporting low family affluence, aged 11, 13 and 15 (mw21), percentage of children aged 15 reporting less than six educational possessions (mw22), and percentage of children aged 15 reporting less than ten books in the home (mw23). The work sub-component is defined as percentage of working-age households with children without an employed parent (mw31).

The Health and Safety (hs) component is also composed of three sub-components: health and birth, immunization and child mortality. The health and birth sub-component is defined by two indicators: infant mortality rate per 1,000 live births (hs11) and low birth rate defined as percentage of births less than 2,500g (hs12). The immunization sub-component is defined based on three indicators as follows: measles: percentage of children immunized aged 12-23 months (hs21), dpt3: percentage of children immunized aged 12-23 months (hs22), and polio 3: percentage of children immunized aged 12-23 months (hs23). The child mortality is based on one indicator, namely deaths from accidents and injuries per 100,000 persons aged less than 19 years, average of latest three years available (hs31).

The Educational Well-being (ew) is composed of three sub-components: achievement, participation and aspirations. Achievement is represented by three indicators namely reading literacy achievement (ew11), mathematics literacy achievement (ew12), and science literacy achievement all measured at age 15 (ew13). The participation is based on one indicator: full-time and part-time students in public and private educational institutions aged 15-19 as a percentage of the population of 15-19 year-olds (ew21). Finally, aspirations is based on 2 indicators: percentage of 15-19 year-olds not in school or employment (ew31) and percentage of pupils aged 15 years aspiring to low skilled work (ew32).

The fourth component labelled as Peer and Family relationships (pf) is obtained from five indicators divided into three sub-components: family structure, family relations and peer relations. Family structure is represented by two indicators: percentage of young people living in a single-parent family structures, (pf11) and percentage of young people living in a step-family structure, both measured at the ages 11, 13 and 15 (pf12). The family relations also is represented by two indicators defined as: percentage of students whose parents eat their main meal with them around a table several times a week (pf21) and percentage of students whose parents spend time just talking to them several times per week, both aged 15 (pf22). The peer relation is based on one single indicator: percentage of young people finding their peers 'kind and helpful' aged 11, 13 and 15 (pf31).

The component of Behaviours and Risks (br) is the most comprehensive and information intensive well-being component. It is composed of three sub-components (risk behaviour, experience of violence and health behaviour) and is based on 12 well-being indicators. The risk behaviour is based on six indicators as follows: percentage smoking cigarettes at least

once per week, aged 11, 13, and 15 (br11), percentage of young people who have been drunk two or more times, aged 11, 13, and 15 (br12), percentage of young people who have used cannabis in the last 12 months, aged 15 (br13), adolescent fertility rate, births per 1,000 women aged 15-19 (br14), percentage of young people who have had sexual intercourse, aged 15 (br15), percentage of young people who used a condom during their last sexual intercourse, aged 15 (br16). The experience of violence sub-component is based on two indicators: percentage of young people involved in physical fighting in the previous 12 months (br21), and percentage of young people who were bullied at least once in the last 2 months (br22), in both cases aged 11, 13, and 15 years. The last sub-component of health behaviour is based on four indicators: percentage of young people who eat fruit every day, aged 11, 13, and 15 years (br31), percentage of young people who eat breakfast every school day, aged 11, 13, and 15 years (br32), mean number of days when young people are physically active for one hour or more of the previous /typical week, aged 11, 13, and 15 (br33), and percentage of young people who are overweight according to body mass index (bmi), aged 13 and 15 (br34).

The sixth component labelled as Subjective Well-being (sw) is divided into three sub-components covering health, personal and school well-being, which is computed based on six indicators. The health sub-component is defined by using percentage of young people rating their health as 'fair or poor', aged 11, 13 and 15 (sw11). The personal well-being is computed by using the following four indicators: percentage of young people with scores above the middle of the life satisfaction scale, aged 11, 13 and 15 (sw21), percentage of students who agree with the statement 'I feel like an outsider or left out of things', aged 15 (sw22), percentage of students who agree with the statement 'I feel awkward and out of place', aged 15 (sw23), and percentage of students who agree with the statement 'I feel lonely', aged 15 (sw24). The school well-being is also based on: percentage of young people 'liking school a lot', aged 11, 13, 15 (31).

In addition to the above 40 indicators, two country characteristics are used to group the countries into a number of groups distinguished by location, level of development and membership in organizations. Two such characteristics that are used in reporting the results are: country group (cgroup) divided into: Scandinavia (1), North Europe (2), South Europe (3), East Europe (4), North America and others (5), Non-OECD (6). The second characteristic is a variable (oecd) indicating whether the country is an OECD members (1), or Non-OECD members (0).

## 5. THE METHODOLOGY

There is literature developed to quantitatively measure previously not measurable outcomes. The outcomes are often multidimensional and represented by several indicators with both positive and negative effects. However, the objective in this study is not to evaluate the effects of certain policy programs, rather to quantify the state of the outcome. The multidimensionality of the outcome requires creation of composite indices to have a single measure and also to aggregate the indicators. In this study, the focus is on the construction of an index of child well-being that is multidimensional and decomposable.

Such an index will be a useful tool in quantification of the state of well-being and evaluation of its impacts on development. In this section, we introduce two approached of non-parametric and parametric well-being indices frequently used in construction of such indices.

### 5.1 Non-parametric index

The non-parametric index is composite index constructed to aggregate a number of indicators of a certain process or outcome. Such indices are used for measurement of globalization (Heshmati, 2006; Heshmati and Tausch, 2007; Andersen and Herbertsson, 2003; Dreher, 2005; Kearney, 2002 and 2003; Lockwood, 2004; Lockwood and Redoano, 2005; Mahler, 2001), environment (Kang, 2002), human development (Noorbakhsh, 1998), development strategy, technology and research (Heshmati and Oh, 2007; Archibugi and Coco, 2004; Grupp and Mogee, 2004), or other types of indices. For instance, the globalization index is a simple combination of forces driving the integration of ideas, people, and economies, worldwide. It is composed of four major components: economic integration, personal contact, internet technology, and political engagement, each being generated from a number of determinant variables. This index can serve as a model for computation of a child well-being index (CWI).

In the case of child well-being, the index following UNICEF (2007) is composed of six components: material well-being, health and safety, educational well-being, peer and family relationships, behaviours and risk, and subjective well-being. The CWI is then estimated parametrically or computed non-parametrically based on the normalization of the child well-being indicators and their subsequent aggregation using an ad hoc weighting system as follows:

$$(1) \qquad CWI_t = \sum_{j=1}^{J}\sum_{m=1}^{M} \omega_{jm}\{(X_{jmi} - X_{jm}^{\min})/(X_{jm}^{\max} - X_{jm}^{\min})\}$$

where *i* indicate country; *m* and *j* are within and between component variables; $\omega_{jm}$ are the weights attached to each contributing *X*-variable within a component and weights attached to each of the six components; and *min* and *max* are minimum and maximum values of respective variables across countries in a given year. The index is similar to the commonly-used index, the Human Development Index (HDI), which is based on educational attainment, life expectancy and real GDP per capita.[4]

The index in (1) is suitable for indicators with an expected positive effect on child well-being. In cases where the indicators are expected to have a negative impact on well-being, the corresponding index is written as:

[4] For a review of the HDI, its components, criticisms, alternative measures and suggestions for some improvements of the index, see Noorbakhsh (1998).

$$(2) \qquad CWI_i = \sum_{j=1}^{J} \sum_{m=1}^{M} \omega_{jm} \{ (X_{jm}^{\max} - X_{jmi}) / (X_{jm}^{\max} - X_{jm}^{\min}) \}$$

where the two indices differ only by the numerator of the ratio. Alternatively, prior to the normalization in (1) and aggregation, the negative indicators are transformed to inverses, (*1/X*) reversing their expected impact from negative to positive.

The index component's weights in equations (1) and (2) are chosen on an ad hoc basis and are constant across countries. However, this non-parametric index can be used as a benchmark index. Lockwood (2004), in computation of a globalization index, finds the ranking of countries to be sensitive to the way the indicators are measured, normalized and weighted. In this study, we choose the weighting approach similar to the commonly used human development index, where all indicators are given equal weight (see Noorbakhsh, 1998). Ideally, the weights should differ by indicators, countries as well as over time.

### 5.2 Parametric index

The literature on index numbers is diverse and voluminous. There are at least two other alternative but parametric approaches to the non-parametric index above for computing a child well-being index; using the principal component (PC) or factor analysis (for recent applications see Heshmati, 2006; and Andersen and Herbertsson, 2003).[5] In this study we adopt the PC approach. Since the two methods in normalized form give PC scores with unit variance, we use only the PC results in the analysis of child well-being.

Principal component analysis is a multivariate technique for examining relationships within a set of interrelated quantitative variables. Given a dataset with J numeric indicators, at most P principal components can be computed; each is a linear combination of the original indicators with coefficients equal to the *eigenvector*s of the correlation of the covariance matrix. The principal components are sorted according to the descending order of the *eigenvalues*, which are equal to the variance of the components. In short, PC analysis can be viewed as a way to uncover approximate linear dependencies among variables. This method gives a least square solution to the following model:

$$(3) \qquad Y = XB + E$$

where $Y$ is a $n \times p$ matrix of the centred observed variables, $X$ is the $n \times j$ matrix of scores of the first $j$ principal components, $B$ is a $j \times p$ matrix of *eigenvector*s or factor patterns, $E$ is a $n \times p$ matrix of residuals, $n$ is the number of observations, $p$ is the number of partial variables, and $j$ the number of variables or indicators of strategy. Unlike in a traditional least squares estimation method case, where the vertical distance to the fitted line is minimized, here the sum of the squared residuals is measured as distances from the point to the first principal axis.

[5] For recent surveys on the literature on the use of composite indices in different development research context, see also Archibugi and Coco (2004) and Grupp and Mogee (2004).

PC analysis was originally developed by Pearson (1901) and further developed by Hotelling (1933). The method has been employed in many areas including the computation of an environmental index (Kang, 2002) and in computation of a simple globalization index using trade and financial openness by Agénor (2003). Heshmati and Oh (2007) used the method for computation of Lisbon Development Strategy Index.

Each of the parametric and non-parametric indices and weighted or un-weighted indices has their own advantages and disadvantages. In this study, they are used to measure the state of child well-being among the OECD countries and attribute it to the possible underlying sources of well-being. A breakdown of the index into major components provides possibilities to identify positive and negative sources of well-being. The results can be used in design of economic policy measures to bring about desirable changes in national and international child well-being policies. It is also useful in evaluation of child policy measures.

## 6. ANALYSIS OF THE RESULTS

### 6.1 Estimation of the Indices and their Components

Three child well-being indices including one non-parametric and two parametric models are estimated. The non-parametric human development type index with equal weights and the two parametric principal component models are estimated. The *eigenvalues* and *eigenvectors* of the correlation matrix of the forty well-being indicators are presented in Section A-F of Table 3. Twelve of the *eigenvalues* are bigger than 1.00 and are subsequently used in computation of the well-being index. These 12 principal components together explain 85.94 percent of the total variations. Contribution of the components to the explanation of the variance is reducing from 19.11 percent by the first component to 2.60 percent by the last component. By looking at the *eigenvector*s, it becomes evident which indicators form a component and the nature of their effects. An indicator with an *eigenvector* exceeding 0.30 is considered as a contributor to the principal component.

The *eigenvalues* and *eigenvector*s of the correlation matrix of the six sub-components indices are presented in Sections A to F of Table 3. The number of *eigenvalues* bigger than 1.00 and share of variance explained by these principal components is: material well-being (2, 0.6801), health and safety (2, 0.6530), educational well being (2, 0.7535), peers and family relationships (3, 0.8385), behaviour and risk (4, 0.6672) and subjective well-being (3, 0.8580). In each sub-component, several of the indicators are statistically significant contributors to the principal component by having an *eigenvector* exceeding 0.30.

The overall variations in the three indices and their underlying six components can be decomposed into within and between countries and regions. The rest of the analysis is based on country and regional heterogeneity in well-being. Due to the cross-sectional nature of the data, we can not discuss the temporal changes over time.

### 6.2 Country Heterogeneity in Well-Being

By using the formulae in equations (1) and (2), the three well-being indices are computed for each of the 33 sample countries. Following the human development type index approach (CWI1), all well-being factors are given identical weights. The index in disaggregate (CWI3) and aggregate (CWI2) forms are reported in Table 4. The countries are ranked by descending order of the overall index (CWI1) in Table 4. The distribution of index and its decomposition is shown in Figure 1. For matters of sensitivity analysis, this simple non-parametric index with equal weights is used as a benchmark model. The results show that Netherlands, Sweden, Denmark, Spain and Iceland are ranked as the five countries with the highest rates of child well-being, while Lithuania, New Zealand, Estonia, UK and Russian Federation have the lowest well-being.

The highest/lowest contributing components to a country rank are: material (Iceland/Lithuania), health and safety (Sweden/Austria), educational (Finland/Israel), peers and family (Italy/New Zealand), behaviour and risks (Greece/UK), and subjective well-being (Israel/Russian Federation). The countries differ in their performance in respect with different well-being components. There is no country among the top 5 that gains the highest score in more than 1 of the 6 components. For instance, Spain which is ranked in the $4^{th}$ position gain low scores in material well-being, health and safety and educational well-being, Netherlands and Denmark ranked as $1^{st}$ and $3^{rd}$ perform not well in material well-being, while Iceland in subjective well-being. Among the lowest ranked countries, we find that New Zealand is performing relatively well, but its low rank as the $30^{th}$ is caused by its poor performance in health and safety and peer and family relationships.

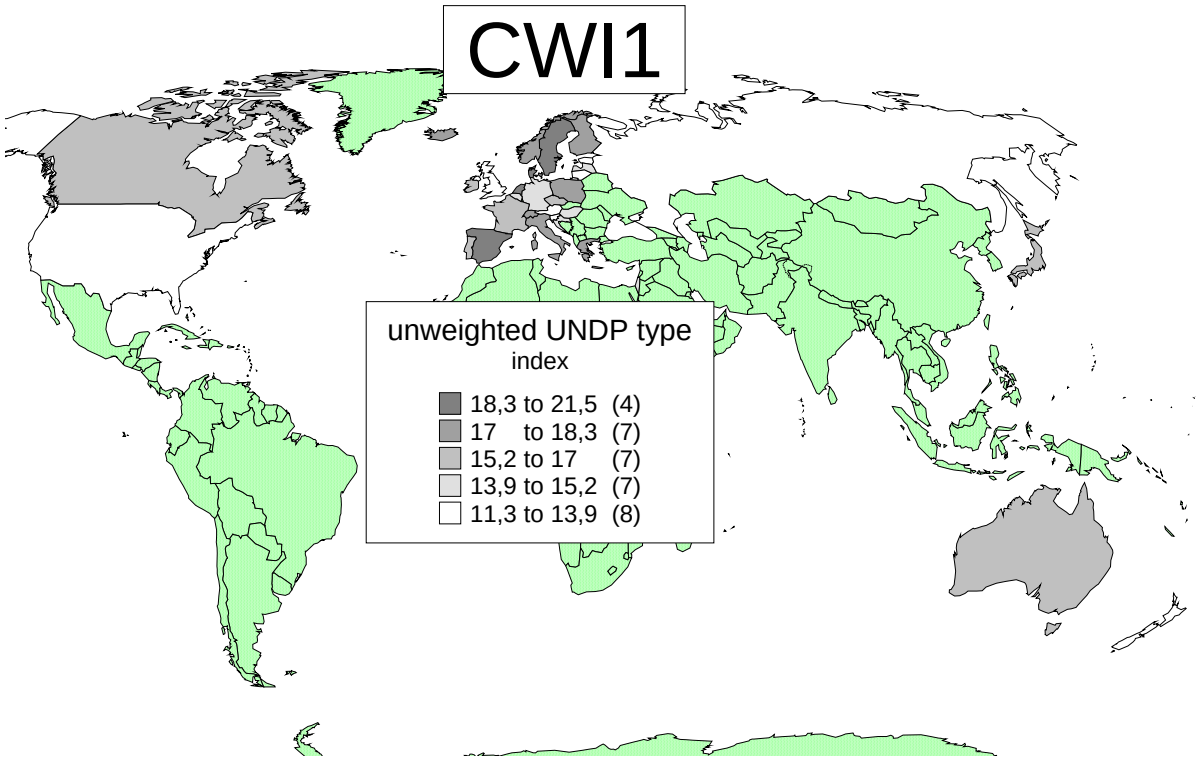
The results from the two parametric principal component analyses are reported in Table 5.A. In the first model each component is estimated separately and then aggregated into one single index (CWI3) by using the share of the variance explained by the component as weights. In the alternative index, the aggregate index (CWI2) is not decomposed. The distribution of the index and its decomposition is shown in Figure 2. The top 5 countries ranked based on the parametric approach (CWI2) are Netherlands, Sweden, Norway, Spain and Denmark. Norway and Iceland switch their position as a result of changing the method of computation of the index. Iceland lowered rank is due to peer and family, behaviour and risk and subjective well-being, while in the case of Norway the low rank is attributed to the behaviour and risk component. It should be noted that the weighted parametric (CWI3) method give similar ranking as the non-parametric approach. The low ranked countries are Latvia, UK, Lithuania, Estonia and Russian Federation.

Surprisingly, the UK is performing extremely poor in child well-being and the Russian Federation occupies the lowest rank in all approaches. The UK is relatively well placed in educational well-being but unable to perform well in the remaining well-being components. Regardless of the method used and the weighting system, the Russian Federation is the worst performing country in providing well-being to its children. In terms of GDP per capita, the Russian Federation is better than many other of the sample countries but yet no priority is given to allocation of resources to children's well-being.

The rank of individual countries, the disaggregated parametric components as well as the three composite indices are reported in Table 7. The performance of countries differs by components and there is no indication that for a country to be very good in one component guarantees a high performance in another component. One such example is Greece which is ranked 1st in behaviour and risk, but 30th in material well-being. However, there is indication that Scandinavian countries and Netherlands are in general good in most components. In comparison with other developed countries, the children have not benefited much from the accumulated wealth and high rate of productivity in USA and UK.

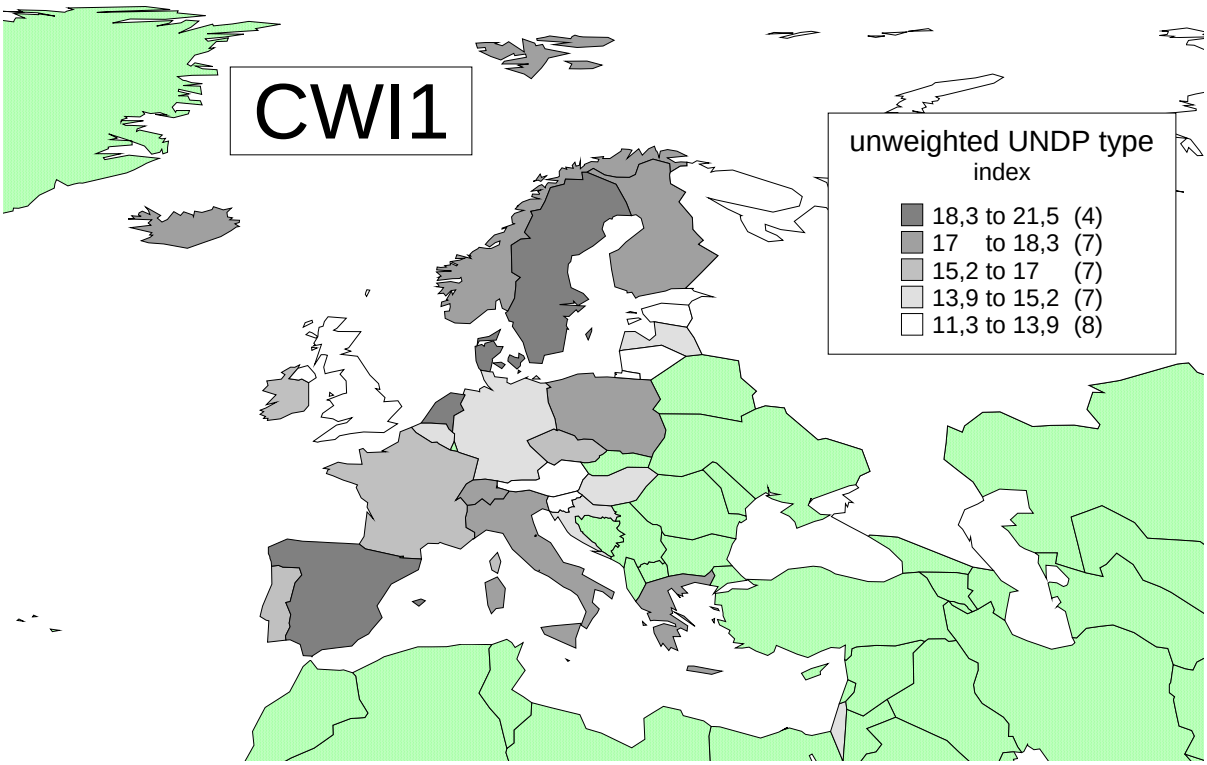
Map 1a and Map 1b shows the results for the human development type index approach (CWI1), when all well-being factors are given identical weights. Map 1a shows the results on a global scale, while Map 1b the corresponding but on a European scale. It is especially noteworthy from the Lisbon policy perspective of the European Union (see Heshmati and Tausch, 2007) to catch up with the United States by 2010 to make Europe the most competitive economy of the world in terms of child-well-being in Europe, the EU-27, with the notable exception of Austria, Estonia, Lithuania and the UK, is already on equal footing or even ahead of the United States:

**Map 1a: Child-well-being on a global scale – results from the human development type index approach (CWI1), when all well-being factors are given identical weights**




Source: Own compilations from the appendix tables

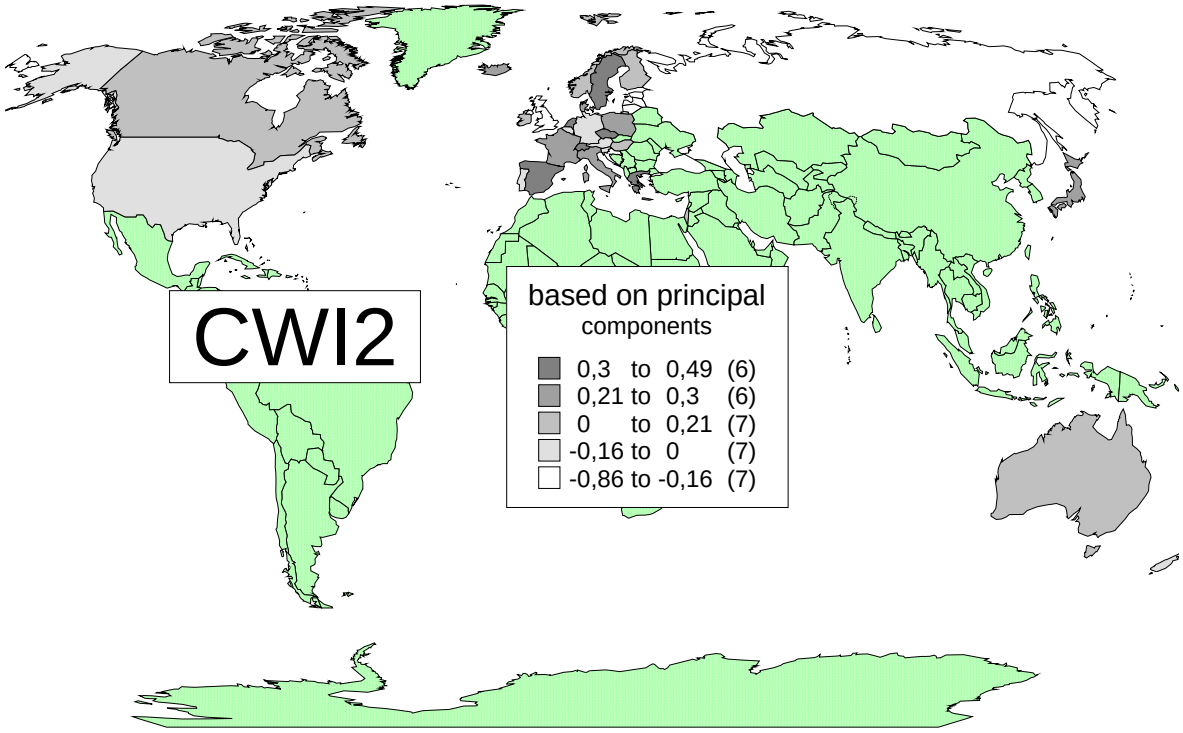
**Map 1b: Child-well-being in the European arena – results from the human development type index approach (CWI1), when all well-being factors are given identical weights**




Source: Own compilations from the appendix tables

Map 2a and Map 2b shows the results for principal component analysis based index approach (CWI2), when all well-being factors are used jointly in computing the index. Map 2a shows the results on a global scale, while Map 2b the corresponding but on a European scale. Also, the principal components data clearly show that in Lisbon policy terms, Europe must not shy away from a comparison of it's child-well being with the United States, the Lisbon process reference country number 1.

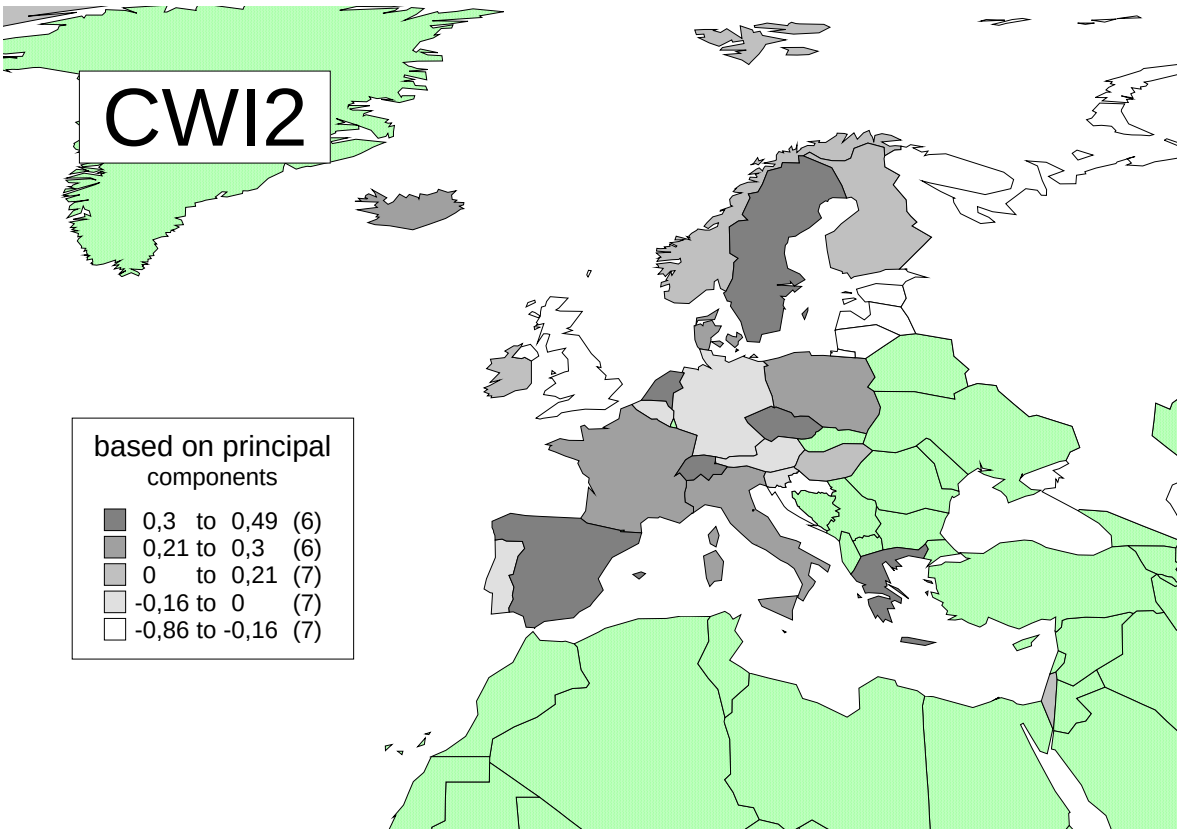
**Map 2a: Child-well-being on a global scale – results from the principal components approach**




Source: Own compilations from the appendix tables

The principal components data point to the deficiencies in child-well-being in the UK, in Croatia, the Baltic region, and Russia.

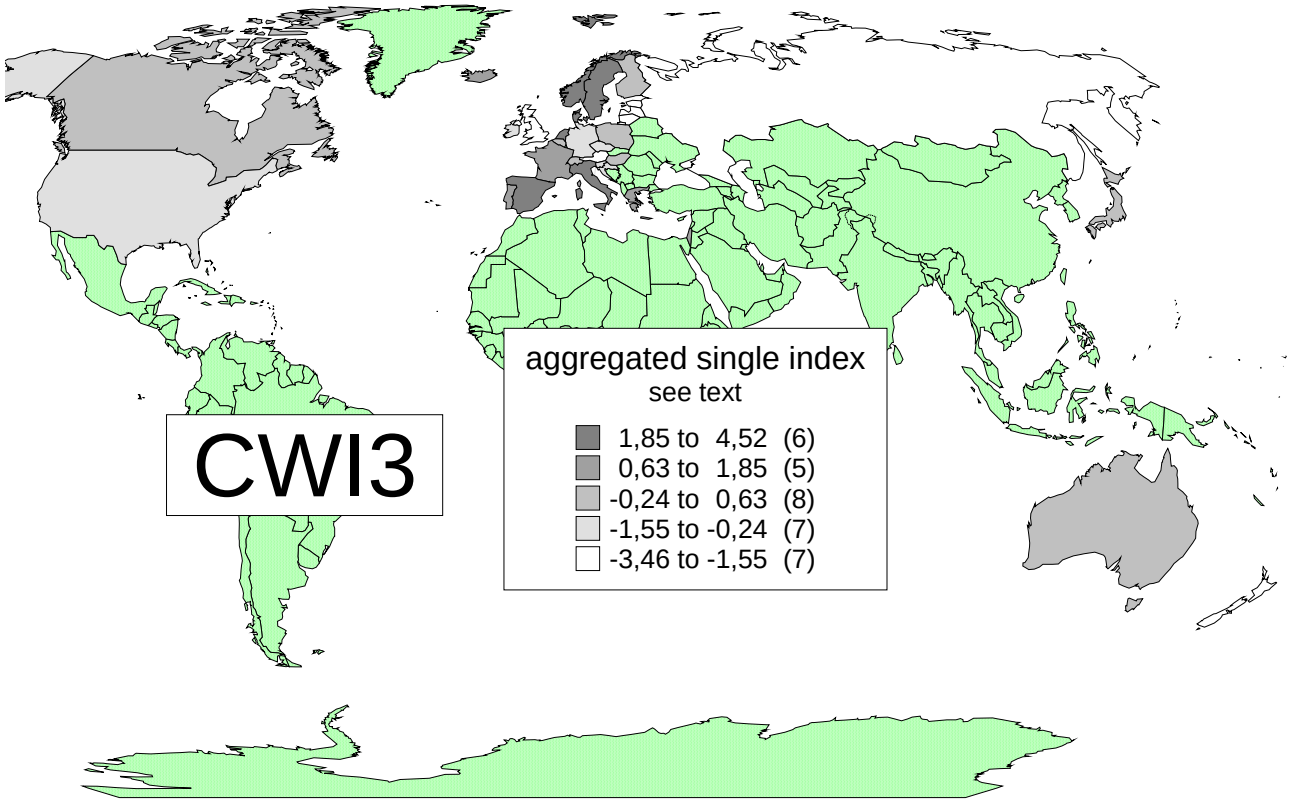
**Map 2b: Child-well-being in the European arena – results from the principal components approach**




Source: Own compilations from the appendix tables

The point, made by our maps, is also further being developed in the following paragraph, which will deal with the regional heterogeneity in well-being. Finally, the aggregate single index computed by weighing the 6 components (CWI3) yields pretty much the same results in terms of the Lisbon policy competition EU-27-USA. Map 3a shows the results on a global scale, while Map 3b the corresponding but on a European scale.

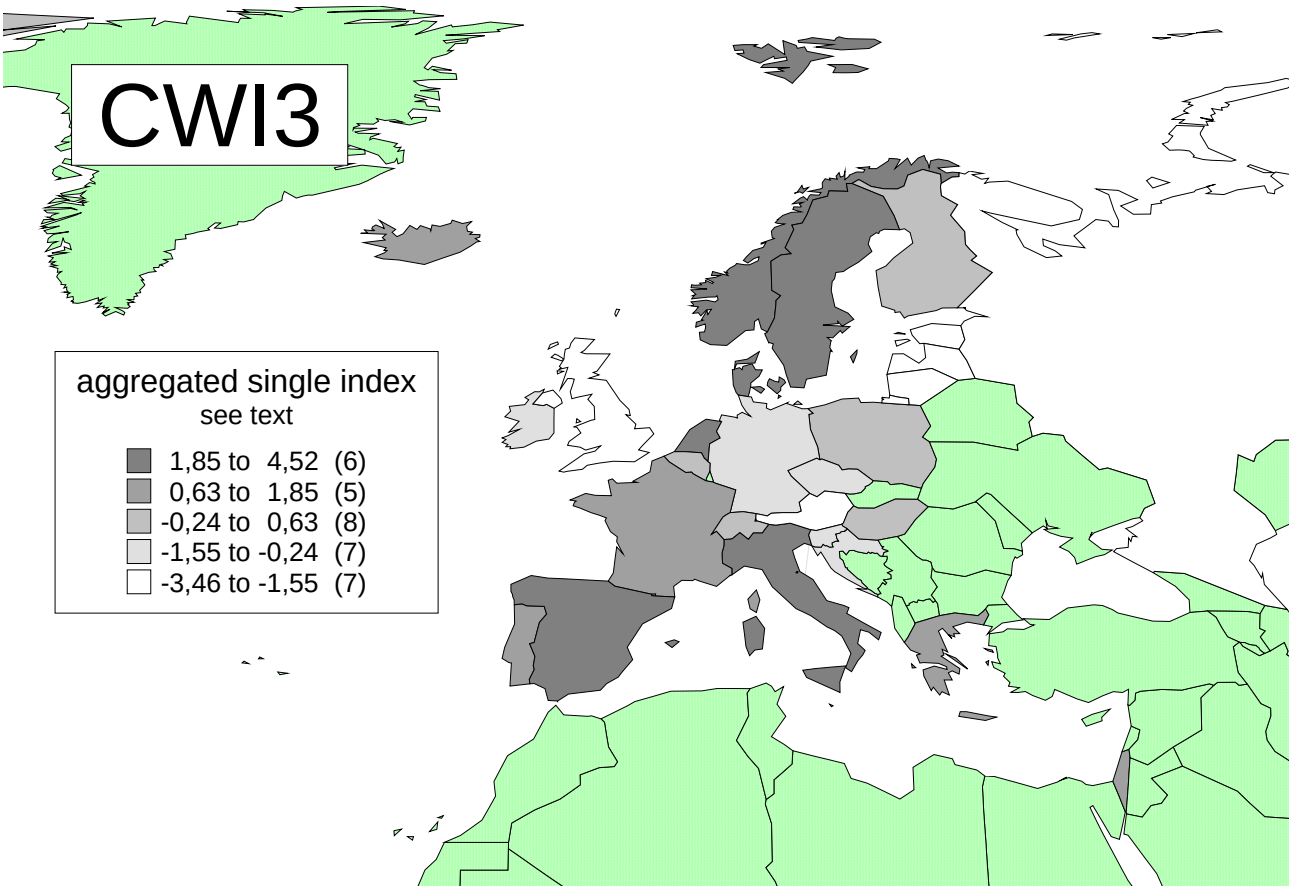
**Map 3a: Child-well-being on a global scale – results from the aggregated single index**




Source: Own compilations from the appendix tables

Again, the child welfare policy deficits in the UK, in Austria, and in the Baltic States clearly emerge:

**Map 3b: Child-well-being in the European arena – results from the aggregated single index**




Source: Own compilations from the appendix tables

### 6.3 Regional Heterogeneity in Well-Being

The countries are grouped into 6 groups by regional location and membership in the OECD. We find a clear indication of heterogeneity in child well-being across the groups of countries. This is confirmed by all the three well-being indices which give similar rankings. The Scandinavian countries are topping the list by performing best in material well-being, health and safety and educational well-being, while they are not performing well in behaviour and risk and subjective well-being.

The South European countries show exceptional performance in peer and family relationships and behaviour and risk. The East European countries as expected show their comparative advantage in health and safety and educational well-being. The North European countries are unexpectedly holding relatively a low position in provision of well-being for their children. The North American countries are also weak in respect with health

and safety, peer and family and subjective well-being. Finally, the Non-OECD countries are weakest in economics and educational well-being.

### 6.4 Correlation among Indices and Components

The correlation matrix of well-being components estimated using principal component analysis and the three indices are reported in Table 6. The between component correlation show that material well-being is positively correlated with educational well-being. Behaviour and risks is also positively correlated with subjective well-being. The remaining paired relationships between the different components are not statistically significant. The three well-being indices are highly correlated with each other (0.82-0.92) suggesting similar ranking between the countries. The highest correlation (0.9236) is found between the disaggregated parametric and non-parametric human development type well-being indices.

The three indices normalized to the Netherlands value is shown in Figure 3. The picture shows similar trend in ranking countries, but yet significant shifts in the position of countries due to the use of computation method. The main contributors to the aggregate principal component analyses (CWI2) are educational well-being, economic well being and behaviour and risks. The contributors to the non-parametric index (CWI1) are health and safety and educational well-being. Contributors to the disaggregated principal component index are economic well-being, health and risk and subjective well-being components.

### 6.5 Efficiency in Provision of Well-Being

In Table 8.A, we report efficiency of countries in provision of child well-being compared with the sample country with the best practiced well-being. The measure is in the interval 0 to 100, where 0 is assigned to the country with the lowest score and 100 to the country with the highest score. The measure is computed for each of the 6 components and for each of the 3 well-being composite indices. It should be noted that the efficiency measure not only shows the rank, but also the metric distance to the frontier well-being and it is easily interpretable as percentage points. Distribution of efficiency based on the non-parametric index and its decomposition is shown in Figure 4. The efficiency of countries measured by the three index methods is shown in Figure 5. In general, all the three methods show similar performance; however, in few cases we observe significant shifts in the position of countries.

The frontier country (components) are Iceland (material well-being), Sweden (health and safety), Finland (educational well-being), Italy (peer and family relationships), Greece (behaviour and risks), and Israel (subjective well-being). Concerning the composite non-parametric index and disaggregate parametric index, Netherlands is serving as reference country, while in the case of parametric aggregate index, Sweden holds the frontier position. We find a wide range of variation in the distribution of efficiency among the countries. For instance the efficiency of frontier countries ranges from 37.54 to 90.18 for Netherlands, 22.80 to 100.00 for Sweden, 12.14 to 100.00 for Italy, 25.63 to 100.00 for

Iceland, 00.00 to 100.00 for Israel, 00.00 to 100.00 for Greece, and 18.71 to 100.00 for Finland. In the case of Russian Federation which is placed at the bottom of the distribution, the rate of efficiency ranges from 00.00 to 53.28. Ideally, in addition to the mean value, one should compute the range, variance and standard deviation for each country as measure of concentration and dispersion in performance.

The mean efficiency by country groups where countries are grouped into 6 groups by geographic location is reported in Table 8.B. As expected in all three index cases, the Scandinavian countries top the list followed by the South European countries. Surprisingly, the North European countries are holding the third position as country group and the gap to the South European countries is quite large. It was previously mentioned that in the case of the non-parametric index and disaggregate parametric index, Netherlands served as reference country, while in the case of parametric aggregate index, Sweden held the frontier position. The North American and Non-OECD country groups are least efficiency country groups in provision of child well-being with less than 40 efficiency performance compared with the reference countries.

### 6.6 Guidelines to Improve the Index

There is a growing literature on the measurement of the child well-being, inequality, poverty, health, growth and labour market evaluations.[6] However, the link between child well-being and a number of indicators such as income inequality, poverty, growth, and labour market outcomes are not investigated much. With the exception of a partial view in some studies, the relationship between for instance inequalities in opportunities, child well-being and labour market outcomes, there are no attempts made to statistically estimate and test such multi-dimensional relationships. The issue of structural equation approach accounting for causal relationships between different factors is discussed in Bollen and Lennox (1991).

The well-being index in this paper is defined in three different ways: the human development type index and the two principal component based indices. In the first index case, all underlying factors are given identical weights. The assumptions of equal weights are very strong and it might have major implications for the index, its interpretation and the ranking of countries. For instance, factors like parents employment might have implications for children's school enrolment and their access to heath care in one country but not in

[6] For a selection of research see: Bradshaw (2002); Mayhew (2005) and Brooks and Hanafin (2005) on child-well-being; Bradshaw (2006) on the measurement of child poverty using income data; Cantanero et al. (2005) on effects of income inequality on population health; Förster and D'Ercole (2005) on income distribution and poverty; Coles and Richardson (2005) on education and well-being of children; Gregg et al. (2005) on the effects of mothers return to work on child development; Haveman et al. (1997) on childhood poverty, adolescent schooling and fertility; NicGabbainn and Sixsmith (2005) on children's understanding of well-being; Peters and Mullis (1997) on the role of family income on adolescent achievement; Rodgers and Pryor (1998) on the effects of divorce and separation; Santos (1999) on the human rights; European Commission, (2003) and Papadopoulos and Tsaklogou (2003) on social exclusion; and Sobolewsky and Amato (2005) on the economic hardship in childhood and its effects on well-being in adulthood.

another with guaranteed and free services to children. On way to avoid the assumption of equal weights is to assign a number of factors on an ad hoc basis extra weights.

Traditionally, in the literature, researchers using the principal component analysis methodology use the first principal component, but in this study, we use a weighted average of the several principal components with *eigenvalues* greater than 1.0. In order to make inference about the choice of index, the sensitivity of the index and ranking of the countries with respect to the choice of alternative combinations of the principal components would be desirable to be investigated. The indices above serve as a major first step to measure a proper composite index of child well-being. There exist several other indices introduced by a number of researchers. The indices in this study are superior to the above indices due to the large number of indicators used, different computation methods applied and the sensitivity analysis conducted.

Despite significant progress made in construction of a well-being index, several essential improvements are still necessary. One key improvement is that the index should take an axiomatic approach that sets out its desirable properties and provides a family of indexes that fulfil such properties. Improvement should involve the identification of other key dimensions of well-being accounting for differences in level of development and regional location. The index should fully quantify child well-being regardless of economic and geographic location of countries. In addition to the current components, it should incorporate several other country-specific relevant components.

Industrialized countries dominate the current sample, with different welfare characteristics than developing countries. The over-weighting of the advanced industrial countries in the sample results in biased level and changes in the mean well-being. The sample of countries should be expanded to include more developing and transition countries. This would enable researchers to control for unobservable country-specific effects and to model the temporal patterns of key variables. Access to panel data would also enable identification of well-being effects by performance comparison of countries over time, before and after child welfare reforms and by the use of matching techniques to construct counterfactuals. This would provide valuable information on well-being, its consequences and redistributive policies. The index should be designed in such a way that it can further be used for international, regional and within-region comparisons. These improvements will affect positively the analysis of the determinants of well-being by paying more attention to the country sample, measurement problems, data issues and data sources.

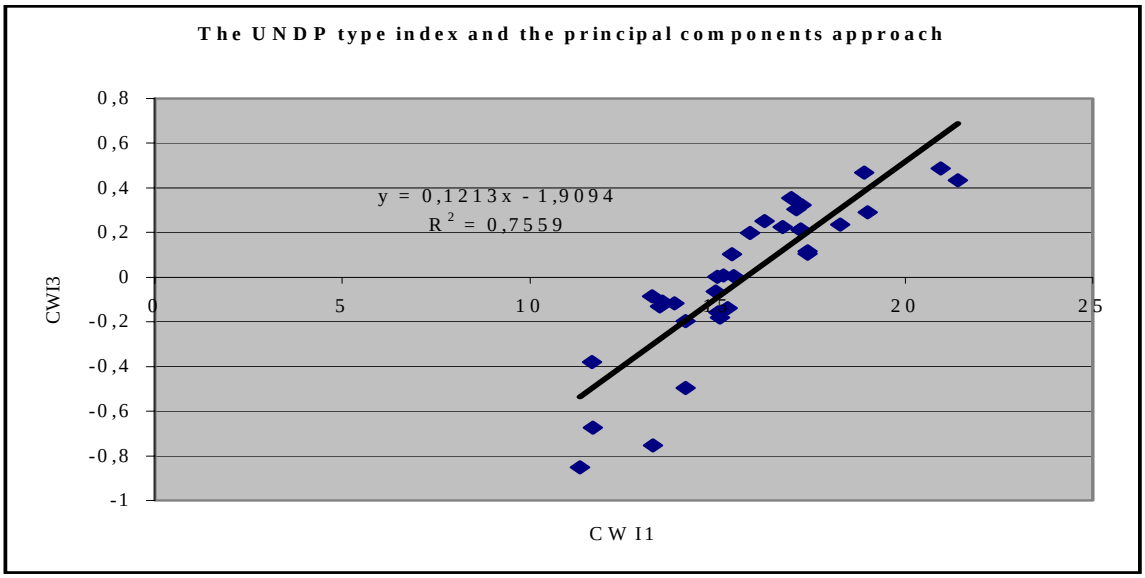
## 7. POLICY IMPLICATIONS

In this paper, based on the child welfare indices and their underlying components, we computed efficiency levels for individual countries in child well-being policy. The efficiency level was then compared to that of the countries with the best practice well-being policy. We have also suggested several improvements for the data collection, for the processing and for the computation of data. Having identified performances of sample countries and identified the strength and weakness of different welfare systems, in this

section we will further analyze implications of the UNICEF study and the conclusions one would be able to draw from our own data analysis.

For one, it is certain that whatever indicator is being constructed from the available data, there is a very close correlation between the indicators used (see Graph 1). The UNDP type index and the principal components index have a common variance of more than 75.6%:

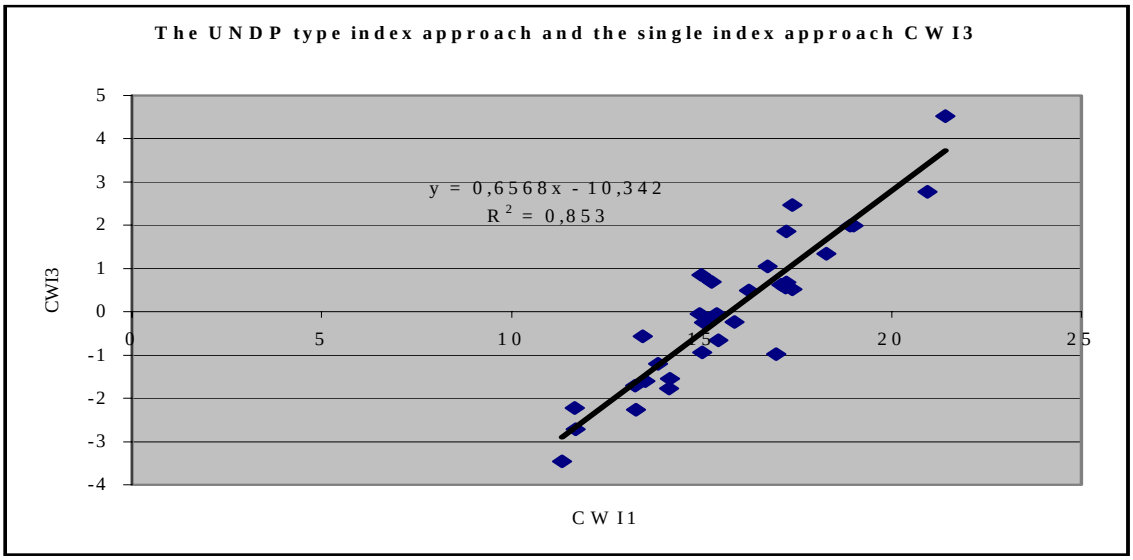
**Graph 1: The UNDP type index and the principal components approach**




Source: Own compilations from the appendix tables

The UNDP type CWI1 index and the CWI3 index are even stronger related to one another. Their joint variance is 85.3% (see Graph 2):

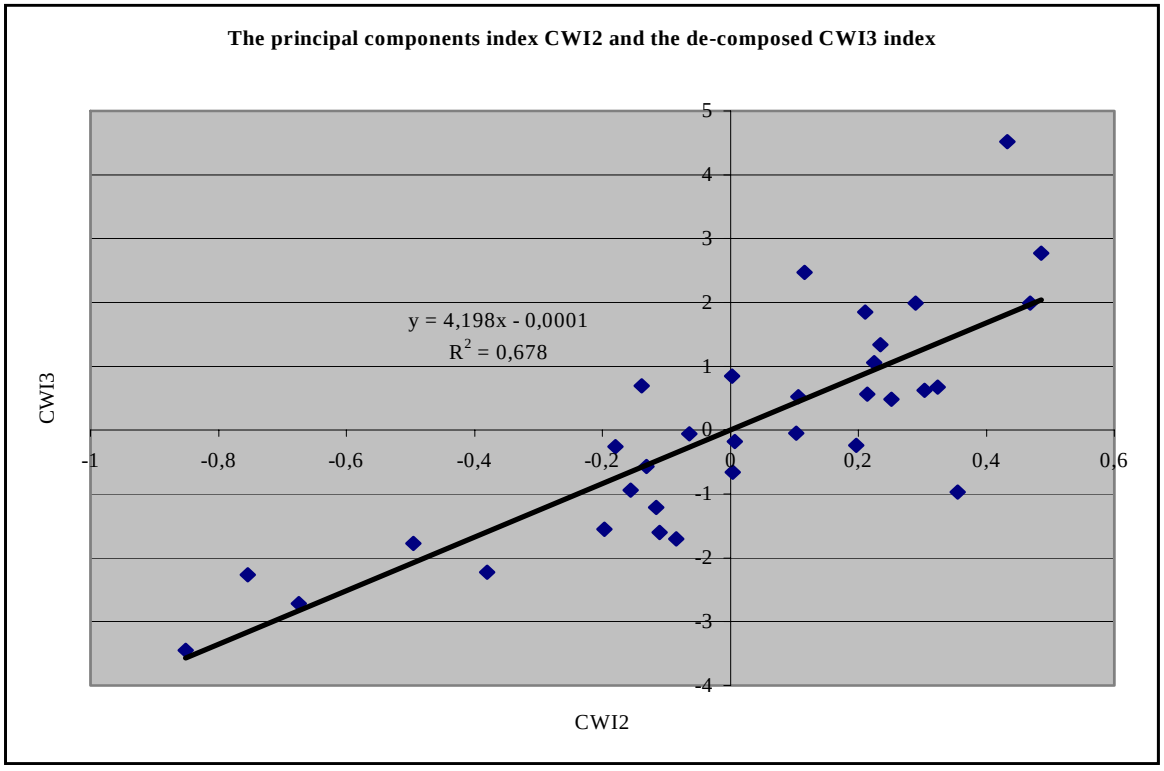
**Graph 2: The UNDP type index and the single index approach CWI3**




Source: Own compilations from the appendix tables

The principal components solution and the CWI3-index also have more than 67% of their variance in common with CWI2 (see Graph 3).

**Graph 3: The principal components index CWI2 and the de-composed CWI3 index**

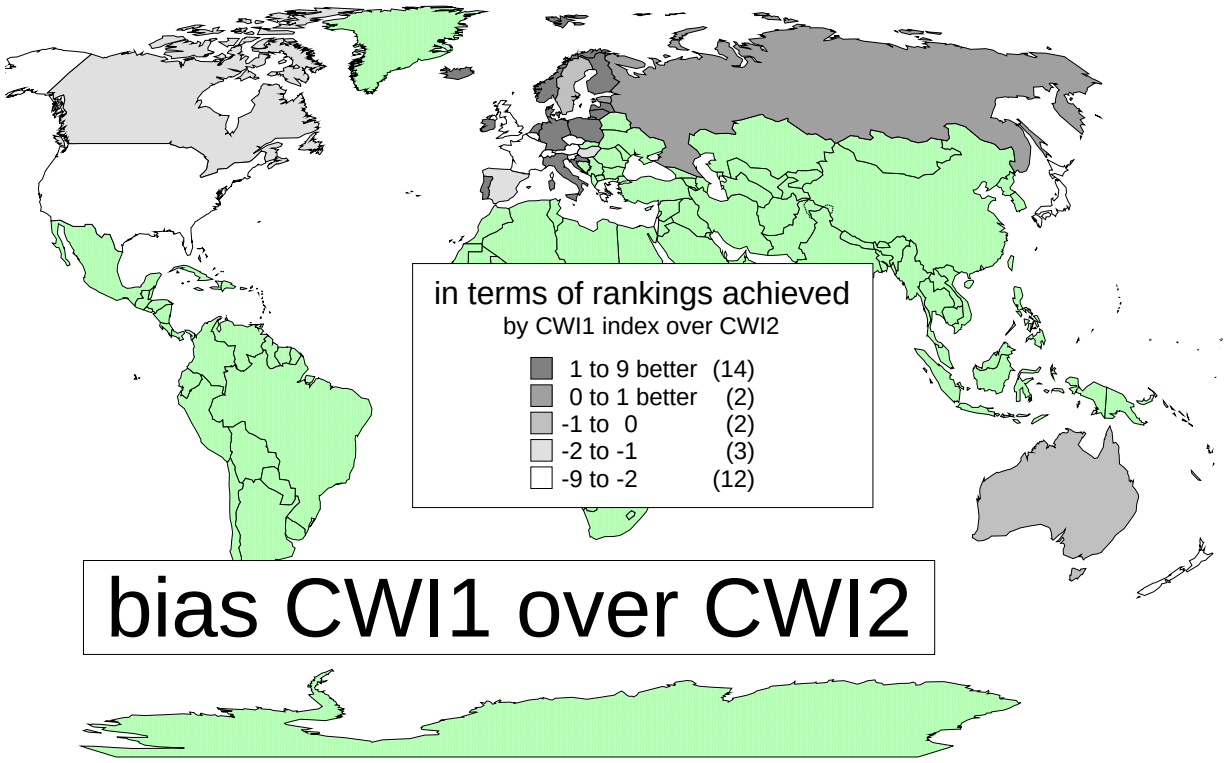



Source:Own compilations from the appendix tables

Finally, we also try to answer the question, whether or not the UNICEF (2007) ranking procedure, which was simply based on average rankings of the 6 dimensions (material well-being, health and safety, educational well-being, family and peer relationships, behaviours and risks, and subjective well-being) perhaps contributed to the very bad overall ranking, which the United Kingdom experienced in the UNICEF study.

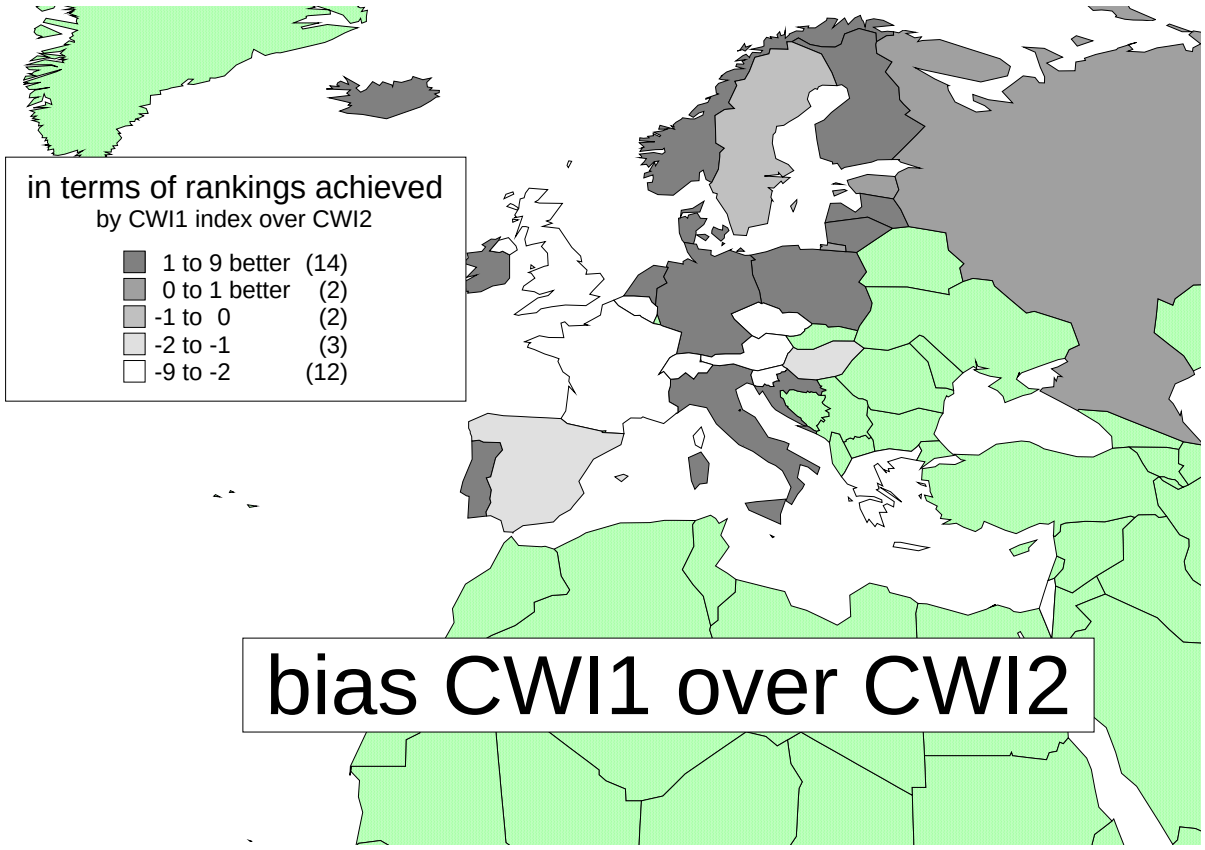
To answer this question, we compared the rankings of the CWI1 measure and the CWI2 measure as shown on Map 4a on the global scale and on Map 4b at the European level (see also Table 9 and 10):

**Map 4a: The bias of the human development index approach over the results of the principal components approach on a global scale**




Source: Own compilations from the appendix tables

**Map 4a: The bias of the human development index approach over the results of the principal components approach on a global scale**

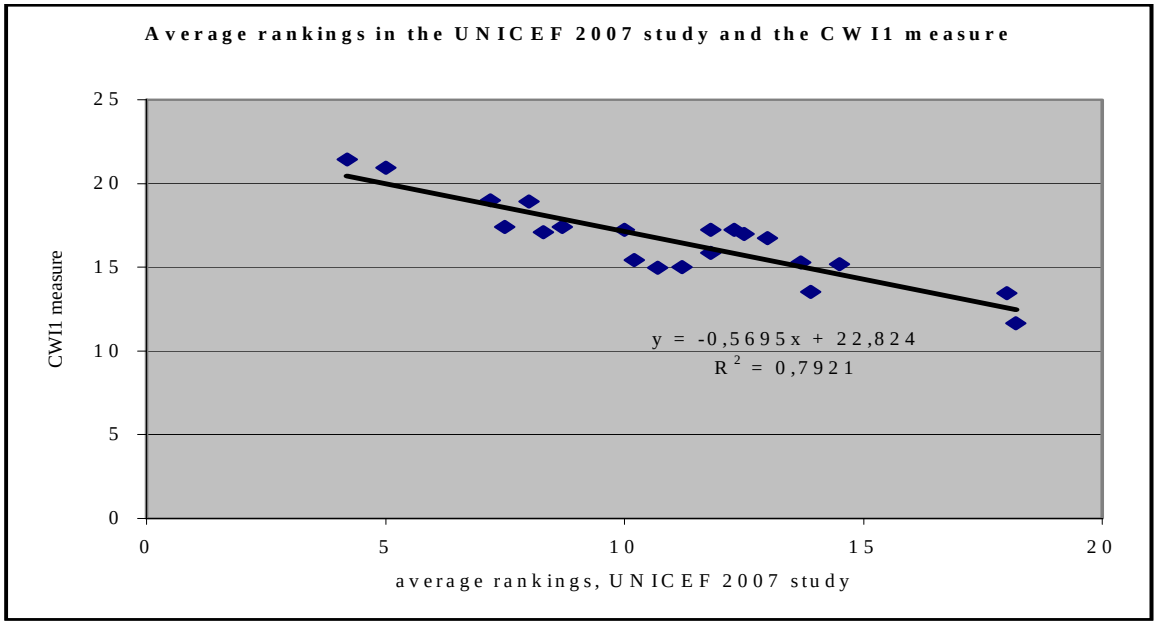



Source: Own compilations from the appendix tables

Based on this analysis, we can say that the non-parametric solution to aggregate the UNICEF data indeed presents a bias in favour of some continental European countries, the Irish Republic and Iceland *vis-à-vis* models such as Britain, the United States, and New Zealand, where for many years neo-liberal policies were dominating the political economy. However, France, Austria and several other "European social model countries" are also unfavourably treated by the application of the non-parametric approach.

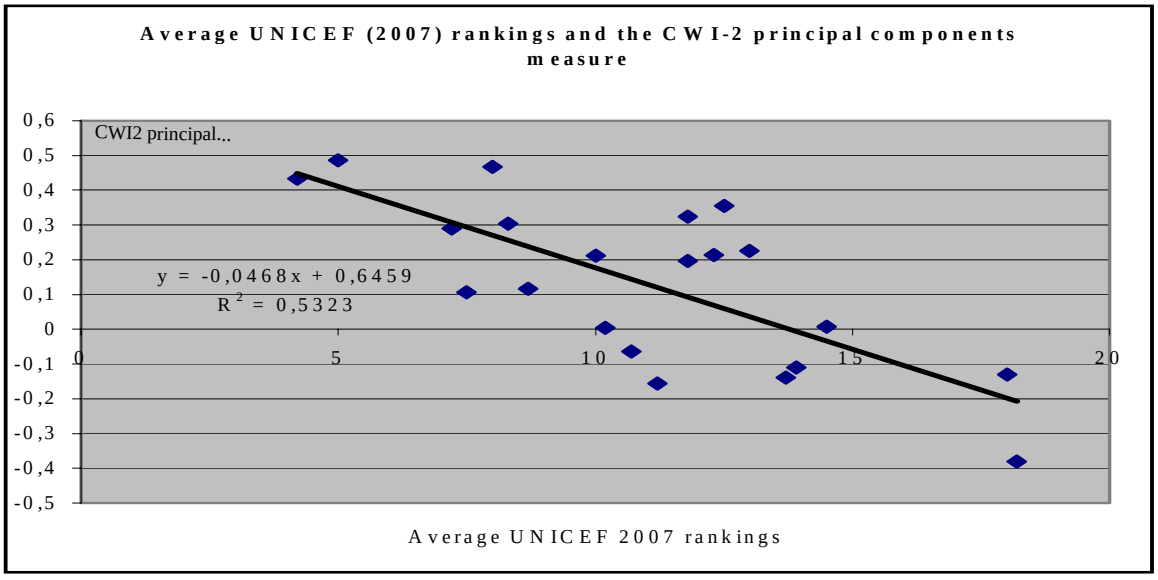
Finally, we compare the simple aggregate rankings of the UNICEF 2007 study with our own results. The results from CWI1 are shown on Graph 4 and those related to CWI on Graph 5. Apart from the fact that the UK always comes out on the bottom of the list, the results are also quite robust to the other rankings achieved:

**Graph 4: The average UNICEF (2007) rankings and the CWI1 measure (UNDP type index)**




Source: Own compilations from the appendix tables

**Graph 5: The average UNICEF (2007) rankings and the CWI2 measure (principal components)**




Source: Own compilations from the appendix tables

The consistently bad ranking of the United Kingdom in all analyses has been linked in the literature to the "*working tax credit*" system, which was the flagship of New Labour's social policies (Daguerre, 2005; Field and Cacket, 2007). According to these critics, these tax credits were badly designed:

- Despite the huge costs, only a quarter of children in poor working households receiving tax credits are taken out of poverty because of them. Over 700,000 children in poor working households are not receiving tax credits;
- A further result of the poor design of the tax credits system is that two parent households need far greater earnings than a lone parent to move past the poverty line. In 2004-05, two parents with two children had to earn £240 a week to have a net income of £295, to be above the poverty line. Contrary, a lone parent with the same number of children needed to earn just £76 a week to gain a net income of £230, £5 above the poverty line; and
- With tax credits not making allowance for the second adult in the household, two parent families needed to work far longer to achieve the same level of income (Daguerre, 2005; Field and Cacket, 2007)

## 8. SUMMARY AND CONCLUSIONS

In this study, we present a composite index that quantifies the level of child well-being to rank developing countries in their child well-being policy. The index is composed of six main components including: material well-being, health and safety, educational well-being, peer and family relationships, behaviours and risks and subjective well-being. Three indices are computed. The human development type index, which is nonparametric, is compared with the alternative parametric principal components index. The latter is estimated in two forms: aggregated index and index disaggregated into six components. In the former, weights are assigned on an ad hoc basis to each indicator and factor component, while in the latter the weights are estimated. The non-parametric index, despite its limitations, is used more frequently in practice and can serve as a benchmark index.

The computation results show that countries differ significantly in their well-being performance. We observe some degree of heterogeneity by regional location or economic region. For instance, Scandinavian countries as a region perform quite well in comparison with other regions in and outside Europe. However, we find no evidence suggesting that if a country is performing well in one component will also perform well in other components. The low rank of the countries is to some extent linked to their economic conditions and inability to address these issues effectively. However, exceptions are found, where low performance of countries like USA and UK has the highest GDP per capita. This suggests existence of little relationship between the level of development and children's well-being. The high-ranked countries share somewhat similar patterns in various index component distributions. The mean well-being by region shows that regions systematically differ in their performance.

Although the current version of the index quantifies the level of well-being well, it has certain limitations and the results should be interpreted with caution. It should be considered as a relatively simple and partial measure. We have addressed a number of extensions to overcome some of the shortcomings, which concern the axiomatic approach to set out the desirable properties of the index, identification and incorporation of more dimensions or components and the use of non-parametric and parametric estimation of the index to avoid the choice of weights attached to each index component on an ad hoc basis. An expansion of the sample to include more developing and transition countries and data collection covering several consecutive years will certainly shed light on the temporal patterns of well-being and its regional variability.

The current data is aggregate national level data with no within country regional variation or inequality in well-being within a country. A decomposition of the total variation in well-being into between and within country components is desirable. For data limitation reasons, this study focused on only the between country variation. The within country variation might explain much of the variance and, in particular, it can provide useful information about the distributional shifts within cohorts, across family types, and regions. Initial endowments and how countries develop their well-being determine the well-being distributional effects. These are important issues in understanding how well-being functions and how to use the generated information in policy formulation and development evaluations.

In view of the above discussion, it should be noted that the simpler approach adopted here was mainly due to problems of data availability. Well-being is considered a possible source and deriving force of inequality differences across countries and over time. Identification and quantification of its effects will benefit the allocation of resources by policy-makers. This research not only measures but it also gives guidelines on how empirically to link well-being to factors such as inequality, poverty and growth. Although it is in an early stage of development, the paper has identified several directions along which future advances can be made. The breakdown of the index into major components provides possibilities to identify sources of well-being and associate it with social and economic policy measures to bring about desirable changes in national, regional and international policies.

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Table 1. Summary statistics of child well-being data after imputation, n=33.

| Variable | Mean | Std Dev | Minimum | Maximum | CoeffVar | t-value |
|---|---|---|---|---|---|---|
| A. Material Well-being (MW): | | | | | | |
| mw11 | 11.056 | 4.525 | 2.400 | 21.700 | 40.929 | 14.04 |
| mw21 | 24.536 | 14.993 | 5.800 | 58.300 | 61.105 | 9.40 |
| mw22 | 31.571 | 16.340 | 8.400 | 72.700 | 51.758 | 11.10 |
| mw23 | 7.167 | 2.967 | 1.900 | 12.900 | 41.395 | 13.88 |
| mw31 | 4.961 | 2.498 | 0.400 | 11.300 | 50.340 | 11.41 |
| B. Health and Safety (HS): | | | | | | |
| hs11 | 5.336 | 2.522 | 2.400 | 16.000 | 47.268 | 12.15 |
| hs12 | 6.182 | 1.411 | 3.100 | 9.100 | 22.825 | 25.17 |
| hs21 | 91.455 | 6.974 | 75.000 | 99.000 | 7.625 | 75.34 |
| hs22 | 94.242 | 4.062 | 83.000 | 99.000 | 4.310 | 133.27 |
| hs23 | 93.364 | 5.165 | 81.000 | 99.000 | 5.532 | 103.84 |
| hs31 | 19.239 | 12.912 | 7.300 | 60.000 | 67.117 | 8.56 |
| C. Educational Well-being (EW): | | | | | | |
| ew11 | 490.798 | 23.536 | 442.000 | 543.000 | 4.796 | 119.79 |
| ew12 | 495.354 | 29.513 | 433.000 | 544.000 | 5.958 | 96.42 |
| ew13 | 493.828 | 29.567 | 402.000 | 548.000 | 5.987 | 95.95 |
| ew21 | 73.538 | 16.609 | 29.300 | 93.900 | 22.585 | 25.44 |
| ew31 | 11.357 | 8.287 | 2.700 | 25.200 | 72.971 | 7.87 |
| ew32 | 28.766 | 7.691 | 14.400 | 50.300 | 26.735 | 21.49 |
| D. Peer and Family relationships (PF): | | | | | | |
| pf11 | 13.086 | 4.048 | 4.800 | 20.800 | 30.936 | 18.57 |
| pf12 | 8.214 | 4.295 | 1.200 | 16.000 | 52.291 | 10.99 |
| pf21 | 78.656 | 9.684 | 58.300 | 93.800 | 12.311 | 46.66 |
| pf22 | 60.707 | 12.306 | 36.900 | 90.200 | 20.272 | 28.34 |
| pf31 | 292.152 | 1312.108 | 43.300 | 7601.000 | 449.119 | 1.28 |
| E. Behaviours and Risks (BR): | | | | | | |
| br11 | 10.677 | 2.491 | 6.100 | 16.400 | 23.335 | 24.62 |
| br12 | 19.564 | 15.161 | 8.000 | 79.400 | 77.492 | 7.41 |
| br13 | 19.631 | 11.086 | 4.200 | 40.400 | 56.470 | 10.17 |
| br14 | 18.583 | 11.044 | 4.000 | 46.000 | 59.432 | 9.67 |
| br15 | 23.581 | 4.693 | 15.100 | 38.100 | 19.901 | 28.87 |
| br16 | 75.292 | 5.999 | 65.300 | 89.100 | 7.968 | 72.09 |
| br21 | 39.190 | 5.375 | 25.100 | 49.000 | 13.715 | 41.89 |
| br22 | 32.336 | 9.943 | 15.000 | 64.300 | 30.750 | 18.68 |
| br31 | 32.655 | 7.521 | 20.100 | 47.800 | 23.031 | 24.94 |
| br32 | 62.817 | 11.441 | 39.200 | 80.800 | 18.213 | 31.54 |
| br33 | 3.895 | 0.383 | 3.100 | 4.500 | 9.840 | 58.38 |
| br34 | 13.108 | 5.593 | 4.400 | 25.500 | 42.672 | 13.46 |
| F. Subjective Well-being (SW): | | | | | | |
| sw11 | 16.297 | 5.772 | 9.000 | 32.400 | 35.415 | 16.22 |
| sw21 | 84.735 | 4.460 | 75.200 | 94.200 | 5.264 | 109.14 |
| sw22 | 6.194 | 1.833 | 2.300 | 9.800 | 29.598 | 19.41 |
| sw23 | 9.694 | 2.881 | 3.600 | 18.100 | 29.718 | 19.33 |
| sw24 | 7.385 | 4.421 | 2.700 | 29.800 | 59.869 | 9.60 |
| sw31 | 23.080 | 7.558 | 8.000 | 38.900 | 32.746 | 17.54 |
| G. Country Characteristics: | | | | | | |
| OECD | 0.758 | 0.435 | 0.000 | 1.000 | 57.446 | 10.00 |
| Group | 3.606 | 1.853 | 1.000 | 6.000 | 51.386 | 11.18 |

Table 2.A Pearson correlation matrix after imputation, material well-being.

| | mw11 | mw21 | mw22 | mw23 | mw31 |
|---|---|---|---|---|---|
| mw11 | 1.0000 | 0.2035 | 0.2784 | 0.3456 | 0.0954 |
| | | 0.2558 | 0.1166 | 0.0488 | 0.5973 |
| mw21 | 0.2035 | 1.0000 | 0.7605 | -0.3689 | 0.2319 |
| | 0.2558 | | 0.0001 | 0.0346 | 0.1941 |
| mw22 | 0.2784 | 0.7605 | 1.0000 | -0.2051 | -0.0245 |
| | 0.1166 | 0.0001 | | 0.2522 | 0.8919 |
| mw23 | 0.3456 | -0.3689 | -0.2051 | 1.0000 | -0.2950 |
| | 0.0488 | 0.0346 | 0.2522 | | 0.0956 |
| mw31 | 0.0954 | 0.2319 | -0.0245 | -0.2950 | 1.0000 |
| | 0.5973 | 0.1941 | 0.8919 | 0.0956 | |

Table 2.B Pearson correlation matrix after imputation, health and safety.

| | hs11 | hs12 | hs21 | hs22 | hs23 | hs31 |
|---|---|---|---|---|---|---|
| hs11 | 1.0000 | -0.0435 | 0.2415 | 0.1333 | 0.2419 | 0.7005 |
| | | 0.8099 | 0.1757 | 0.4596 | 0.1749 | 0.0001 |
| hs12 | -0.0435 | 1.0000 | -0.0658 | -0.1033 | -0.2812 | -0.0341 |
| | 0.8099 | | 0.7159 | 0.5671 | 0.1129 | 0.8506 |
| hs21 | 0.2415 | -0.0658 | 1.0000 | 0.7019 | 0.4256 | 0.3178 |
| | 0.1757 | 0.7159 | | 0.0001 | 0.0135 | 0.0714 |
| hs22 | 0.1333 | -0.1033 | 0.7019 | 1.0000 | 0.7269 | 0.1793 |
| | 0.4596 | 0.5671 | 0.0001 | | 0.0001 | 0.3179 |
| hs23 | 0.2419 | -0.2812 | 0.4256 | 0.7269 | 1.0000 | 0.1400 |
| | 0.1749 | 0.1129 | 0.0135 | 0.0001 | | 0.4371 |
| hs31 | 0.7005 | -0.0341 | 0.3178 | 0.1793 | 0.1400 | 1.0000 |
| | 0.0001 | 0.8506 | 0.0714 | 0.3179 | 0.4371 | |

Table 2.C Pearson correlation matrix after imputation, educational well-being.

| | ew11 | ew12 | ew13 | ew21 | ew31 | ew32 |
|---|---|---|---|---|---|---|
| ew11 | 1.0000 | 0.8592 | 0.6560 | 0.6325 | -0.7023 | -0.0943 |
| | | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.6017 |
| ew12 | 0.8592 | 1.0000 | 0.7019 | 0.6065 | -0.6659 | 0.2294 |
| | 0.0001 | | 0.0001 | 0.0002 | 0.0001 | 0.1990 |
| ew13 | 0.6560 | 0.7019 | 1.0000 | 0.3318 | -0.3847 | 0.1523 |
| | 0.0001 | 0.0001 | | 0.0592 | 0.0270 | 0.3975 |
| ew21 | 0.6325 | 0.6065 | 0.3318 | 1.0000 | -0.8908 | -0.0129 |
| | 0.0001 | 0.0002 | 0.0592 | | 0.0001 | 0.9430 |
| ew31 | -0.7023 | -0.6659 | -0.3847 | -0.8908 | 1.0000 | 0.1139 |
| | 0.0001 | 0.0001 | 0.0270 | 0.0001 | | 0.5276 |
| ew32 | -0.0943 | 0.2294 | 0.1523 | -0.0129 | 0.1139 | 1.0000 |
| | 0.6017 | 0.1990 | 0.3975 | 0.9430 | 0.5276 | |

Table 2.D Pearson correlation matrix after imputation, peers and family.

| | pf11 | pf12 | pf21 | pf22 | pf31 |
|---|---|---|---|---|---|
| pf11 | 1.0000 | 0.8663 | -0.1327 | 0.0007 | -0.0149 |
| | | 0.0001 | 0.4614 | 0.9965 | 0.9343 |
| pf12 | 0.8663 | 1.0000 | -0.1292 | -0.0387 | 0.0397 |
| | 0.0001 | | 0.4733 | 0.8306 | 0.8261 |
| pf21 | -0.1327 | -0.1292 | 1.0000 | 0.2069 | 0.0543 |
| | 0.4614 | 0.4733 | | 0.2480 | 0.7641 |
| pf22 | 0.0007 | -0.0387 | 0.2069 | 1.0000 | -0.2674 |
| | 0.9965 | 0.8306 | 0.2480 | | 0.1324 |
| pf31 | -0.0149 | 0.0397 | 0.0543 | -0.2674 | 1.0000 |
| | 0.9343 | 0.8261 | 0.7641 | 0.1324 | |

Table 2.E Pearson correlation matrix after imputation, behaviours and risks.

| | br11 | br12 | br13 | br14 | br15 | br16 | br21 | br22 | br31 | br32 | br33 | br34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| br11 | 1.0000 | 0.1573 | -0.1545 | 0.0762 | -0.0423 | -0.0259 | 0.1311 | 0.2938 | 0.1034 | 0.2839 | -0.2805 | -0.4757 |
| | | 0.3820 | 0.3906 | 0.6733 | 0.8148 | 0.8861 | 0.4668 | 0.0970 | 0.5668 | 0.1093 | 0.1138 | 0.0051 |
| br12 | 0.1573 | 1.0000 | -0.2739 | 0.4674 | 0.2164 | -0.1425 | 0.2517 | 0.0447 | 0.0020 | -0.0006 | -0.0437 | 0.0213 |
| | 0.3820 | | 0.1229 | 0.0061 | 0.2262 | 0.4286 | 0.1575 | 0.8046 | 0.9910 | 0.9974 | 0.8090 | 0.9061 |
| br13 | -0.1545 | -0.2739 | 1.0000 | -0.1491 | 0.1722 | 0.1404 | -0.1419 | -0.0697 | 0.2064 | -0.2406 | 0.3948 | 0.4573 |
| | 0.3906 | 0.1229 | | 0.4075 | 0.3379 | 0.4357 | 0.4308 | 0.6996 | 0.2491 | 0.1773 | 0.0230 | 0.0074 |
| br14 | 0.0762 | 0.4674 | -0.1491 | 1.0000 | -0.0804 | 0.1231 | 0.4325 | 0.4046 | -0.1824 | -0.1682 | 0.1793 | 0.0663 |
| | 0.6733 | 0.0061 | 0.4075 | | 0.6563 | 0.4949 | 0.0119 | 0.0195 | 0.3096 | 0.3495 | 0.3179 | 0.7139 |
| br15 | -0.0423 | 0.2164 | 0.1722 | -0.0804 | 1.0000 | -0.5500 | -0.1504 | -0.1739 | -0.2031 | -0.0254 | 0.0397 | 0.1758 |
| | 0.8148 | 0.2262 | 0.3379 | 0.6563 | | 0.0009 | 0.4033 | 0.3330 | 0.2568 | 0.8880 | 0.8261 | 0.3278 |
| br16 | -0.0259 | -0.1425 | 0.1404 | 0.1231 | -0.5500 | 1.0000 | 0.2709 | 0.0916 | 0.2246 | -0.3174 | 0.0439 | 0.1280 |
| | 0.8861 | 0.4286 | 0.4357 | 0.4949 | 0.0009 | | 0.1272 | 0.6118 | 0.2089 | 0.0718 | 0.8083 | 0.4778 |
| br21 | 0.1311 | 0.2517 | -0.1419 | 0.4325 | -0.1504 | 0.2709 | 1.0000 | 0.1173 | -0.0304 | -0.2370 | 0.3385 | 0.0804 |
| | 0.4668 | 0.1575 | 0.4308 | 0.0119 | 0.4033 | 0.1272 | | 0.5153 | 0.8663 | 0.1840 | 0.0540 | 0.6565 |
| br22 | 0.2938 | 0.0447 | -0.0697 | 0.4046 | -0.1739 | 0.0916 | 0.1173 | 1.0000 | -0.3589 | 0.2152 | -0.1013 | -0.3061 |
| | 0.0970 | 0.8046 | 0.6996 | 0.0195 | 0.3330 | 0.6118 | 0.5153 | | 0.0402 | 0.2291 | 0.5746 | 0.0832 |
| br31 | 0.1034 | 0.0020 | 0.2064 | -0.1824 | -0.2031 | 0.2246 | -0.0304 | -0.3589 | 1.0000 | -0.1503 | 0.0434 | 0.2943 |
| | 0.5668 | 0.9910 | 0.2491 | 0.3096 | 0.2568 | 0.2089 | 0.8663 | 0.0402 | | 0.4037 | 0.8105 | 0.0964 |
| br32 | 0.2839 | -0.0006 | -0.2406 | -0.1682 | -0.0254 | -0.3174 | -0.2370 | 0.2152 | -0.1503 | 1.0000 | -0.3892 | -0.5234 |
| | 0.1093 | 0.9974 | 0.1773 | 0.3495 | 0.8880 | 0.0718 | 0.1840 | 0.2291 | 0.4037 | | 0.0251 | 0.0018 |
| br33 | -0.2805 | -0.0437 | 0.3948 | 0.1793 | 0.0397 | 0.0439 | 0.3385 | -0.1013 | 0.0434 | -0.3892 | 1.0000 | 0.3347 |
| | 0.1138 | 0.8090 | 0.0230 | 0.3179 | 0.8261 | 0.8083 | 0.0540 | 0.5746 | 0.8105 | 0.0251 | | 0.0569 |
| br34 | -0.4757 | 0.0213 | 0.4573 | 0.0663 | 0.1758 | 0.1280 | 0.0804 | -0.3061 | 0.2943 | -0.5234 | 0.3347 | 1.0000 |
| | 0.0051 | 0.9061 | 0.0074 | 0.7139 | 0.3278 | 0.4778 | 0.6565 | 0.0832 | 0.0964 | 0.0018 | 0.0569 | |

Table 2.F Pearson correlation matrix after imputation, subjective well-being.

| | sw11 | sw21 | sw22 | sw23 | sw24 | sw31 |
|---|---|---|---|---|---|---|
| sw11 | 1.0000 | -0.7511 | -0.1013 | 0.2464 | 0.1442 | 0.1180 |
| | | 0.0001 | 0.5745 | 0.1669 | 0.4233 | 0.5129 |
| sw21 | -0.7511 | 1.0000 | -0.0370 | -0.2078 | -0.1690 | 0.1496 |
| | 0.0001 | | 0.8378 | 0.2457 | 0.3470 | 0.4058 |
| sw22 | -0.1013 | -0.0370 | 1.0000 | 0.3049 | 0.1971 | -0.1651 |
| | 0.5745 | 0.8378 | | 0.0844 | 0.2714 | 0.3583 |
| sw23 | 0.2464 | -0.2078 | 0.3049 | 1.0000 | 0.6266 | -0.0245 |
| | 0.1669 | 0.2457 | 0.0844 | | 0.0001 | 0.8922 |
| sw24 | 0.1442 | -0.1690 | 0.1971 | 0.6266 | 1.0000 | -0.0417 |
| | 0.4233 | 0.3470 | 0.2714 | 0.0001 | | 0.8175 |
| sw31 | 0.1180 | 0.1496 | -0.1651 | -0.0245 | -0.0417 | 1.0000 |
| | 0.5129 | 0.4058 | 0.3583 | 0.8922 | 0.8175 | |

Table 3. The *eigenvalues* and *eigenvector*s of the correlation matrix of child well-being (CWI2) indicators.

A-E. *Eigenvalues* of the Correlation Matrix

| | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| 1 | 7.6441 | 2.4046 | 0.1911 | 0.1911 |
| 2 | 5.2394 | 1.1022 | 0.1310 | 0.3221 |
| 3 | 4.1371 | 1.0594 | 0.1034 | 0.4255 |
| 4 | 3.0777 | 0.3367 | 0.0769 | 0.5025 |
| 5 | 2.7409 | 0.3865 | 0.0685 | 0.5710 |
| 6 | 2.3543 | 0.2448 | 0.0589 | 0.6298 |
| 7 | 2.1095 | 0.3124 | 0.0527 | 0.6826 |
| 8 | 1.7970 | 0.1989 | 0.0449 | 0.7275 |
| 9 | 1.5981 | 0.2583 | 0.0400 | 0.7675 |
| 10 | 1.3397 | 0.0427 | 0.0335 | 0.8010 |
| 11 | 1.2970 | 0.2579 | 0.0324 | 0.8334 |
| 12 | 1.0390 | | 0.0260 | 0.8594 |

*Eigenvector*s

| | Prin1 | Prin2 | Prin3 | Prin4 | Prin5 | Prin6 | Prin7 | Prin8 | Prin9 | Prin10 | Prin11 | Prin12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mw11 | 0.2098 | -0.1785 | 0.2193 | -0.1032 | -0.0200 | 0.1801 | 0.0505 | -0.0859 | 0.0293 | -0.0337 | -0.1839 | 0.0251 |
| mw21 | 0.2981 | 0.0122 | -0.0021 | -0.1132 | -0.0625 | -0.0162 | -0.0963 | -0.1261 | 0.1201 | -0.0607 | 0.1526 | 0.2067 |
| mw22 | 0.2231 | 0.0117 | 0.1355 | -0.2838 | -0.0452 | -0.1340 | -0.0087 | 0.0650 | 0.0295 | 0.0615 | -0.1363 | 0.2413 |
| mw23 | -0.0399 | -0.1750 | 0.0328 | -0.0941 | 0.1430 | 0.2237 | 0.1224 | 0.4055 | -0.0545 | 0.1117 | -0.0963 | 0.3812 |
| mw31 | 0.0901 | 0.0539 | -0.1517 | 0.1881 | 0.1105 | 0.1529 | -0.4302 | -0.0304 | 0.2422 | 0.0117 | -0.1067 | -0.1646 |
| hs11 | 0.2641 | 0.0506 | 0.1496 | -0.0085 | -0.0117 | 0.1554 | -0.1522 | 0.1528 | -0.0060 | 0.0823 | -0.2556 | 0.0501 |
| hs12 | 0.0545 | -0.2546 | 0.1125 | -0.2326 | -0.0406 | 0.1407 | -0.0171 | -0.0827 | -0.1132 | 0.3641 | -0.0349 | -0.0341 |
| hs21 | -0.1083 | -0.1598 | 0.0630 | 0.0133 | 0.2225 | 0.2474 | -0.0240 | 0.2120 | 0.3644 | -0.1381 | 0.2006 | -0.0724 |
| hs22 | -0.0574 | -0.2024 | 0.2305 | 0.1791 | 0.2643 | 0.1471 | -0.0007 | 0.0329 | 0.1460 | -0.2117 | 0.0642 | -0.0189 |
| hs23 | -0.1086 | -0.2186 | 0.3098 | 0.1120 | 0.0128 | 0.0054 | 0.1654 | 0.0628 | -0.0192 | -0.1425 | 0.1231 | -0.0477 |
| hs31 | 0.1886 | 0.1020 | 0.1293 | 0.1106 | -0.1600 | 0.2248 | -0.0380 | 0.0048 | -0.3019 | -0.0787 | 0.2157 | -0.0076 |
| ew11 | 0.2824 | -0.0159 | -0.1231 | -0.0216 | 0.1074 | -0.0647 | 0.1889 | -0.0062 | -0.1169 | 0.0743 | 0.1987 | -0.1433 |
| ew12 | 0.2964 | -0.0975 | -0.1088 | 0.0766 | 0.0983 | -0.0811 | 0.0064 | 0.1190 | -0.1311 | 0.0828 | 0.1576 | -0.1090 |
| ew13 | 0.1798 | -0.0592 | -0.1762 | 0.1580 | 0.3306 | 0.0902 | 0.0056 | -0.0974 | -0.2781 | 0.1161 | 0.0980 | 0.0788 |
| ew21 | 0.2664 | 0.0526 | 0.0730 | 0.0889 | 0.0631 | -0.1740 | 0.2476 | 0.0900 | 0.0782 | 0.0785 | -0.0053 | -0.0377 |
| ew31 | 0.2485 | -0.0606 | 0.0709 | 0.0024 | -0.1252 | 0.0475 | 0.2077 | 0.0121 | 0.2633 | 0.0353 | 0.2132 | 0.1180 |
| ew32 | -0.0370 | 0.0441 | -0.1010 | 0.0671 | -0.0735 | 0.0228 | 0.4641 | -0.3413 | 0.2425 | 0.0028 | 0.0030 | -0.1115 |
| pf11 | -0.1367 | 0.2390 | 0.1755 | 0.1485 | -0.1746 | 0.1696 | 0.0059 | -0.0103 | -0.2481 | 0.0350 | -0.0041 | -0.0116 |
| pf12 | -0.1582 | 0.2632 | 0.1022 | 0.1111 | -0.1093 | 0.2438 | 0.1047 | -0.1013 | -0.0934 | 0.1819 | 0.0005 | -0.0494 |
| pf21 | 0.0595 | -0.1445 | 0.1827 | 0.3108 | -0.2267 | -0.0056 | -0.1946 | -0.0852 | 0.0481 | 0.1723 | 0.0386 | 0.1134 |
| pf22 | -0.0526 | -0.1350 | 0.0287 | 0.2758 | 0.1135 | 0.0673 | 0.0870 | -0.1128 | -0.2433 | -0.3510 | 0.0632 | 0.1388 |
| pf31 | 0.0179 | 0.0107 | 0.0268 | -0.0740 | -0.3239 | -0.1599 | -0.0101 | 0.3977 | 0.1814 | -0.1007 | 0.0379 | -0.3787 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| br11 | 0.0988 | 0.1802 | -0.1025 | -0.0815 | 0.1092 | 0.2698 | 0.0640 | -0.3333 | 0.2889 | -0.0089 | -0.0288 | -0.0332 |
| br12 | 0.0332 | 0.2311 | 0.1648 | 0.1570 | 0.1619 | -0.2310 | 0.0949 | -0.0724 | 0.2380 | 0.1321 | -0.1128 | 0.1483 |
| br13 | -0.1130 | 0.0255 | 0.1442 | -0.2333 | -0.0384 | 0.3348 | 0.0005 | -0.1875 | -0.0317 | 0.1306 | -0.0473 | -0.0365 |
| br14 | 0.2085 | 0.0412 | 0.1311 | 0.2300 | 0.0842 | 0.0479 | -0.3649 | -0.0094 | 0.0710 | 0.0932 | 0.1087 | -0.1310 |
| br15 | -0.2075 | 0.0172 | 0.0581 | 0.1297 | 0.1556 | 0.0176 | 0.1057 | 0.1322 | 0.1680 | 0.4299 | 0.1370 | 0.0791 |
| br16 | -0.1685 | 0.2505 | -0.0093 | 0.1775 | 0.1601 | -0.1357 | -0.0657 | 0.0175 | -0.0114 | 0.1916 | 0.0836 | 0.1878 |
| br21 | 0.1708 | -0.0878 | 0.2214 | 0.2017 | 0.0315 | -0.0462 | 0.0803 | -0.1453 | 0.1149 | -0.1730 | -0.1687 | 0.1341 |
| br22 | 0.1147 | 0.1423 | 0.0642 | -0.0687 | -0.1039 | 0.3679 | 0.1207 | 0.1079 | 0.0352 | -0.0063 | 0.1588 | -0.1980 |
| br31 | -0.0187 | 0.1740 | -0.0289 | 0.2831 | -0.2493 | 0.1262 | 0.1512 | 0.3084 | 0.0573 | 0.0023 | 0.0880 | 0.1251 |
| br32 | 0.0346 | -0.2575 | 0.1642 | 0.1020 | -0.1592 | -0.1095 | 0.0428 | -0.1715 | -0.0208 | 0.2676 | 0.2110 | -0.1678 |
| br33 | 0.0486 | 0.0601 | -0.3213 | -0.1168 | 0.1719 | 0.1385 | -0.0033 | 0.0988 | 0.0327 | 0.0672 | 0.3547 | 0.0339 |
| br34 | -0.1568 | -0.2696 | 0.0915 | -0.0511 | 0.0053 | -0.1003 | -0.0876 | -0.0747 | 0.0335 | 0.2928 | 0.1685 | -0.0362 |
| sw11 | 0.0967 | 0.2405 | 0.2123 | 0.0389 | 0.2073 | -0.0484 | 0.1007 | 0.1699 | 0.0089 | 0.1663 | -0.2111 | -0.1374 |
| sw21 | 0.2151 | 0.2537 | 0.1450 | -0.0178 | 0.1022 | -0.0205 | 0.0223 | 0.0074 | -0.1196 | -0.0068 | 0.0516 | -0.1100 |
| sw22 | -0.1357 | 0.1338 | 0.2616 | -0.1854 | 0.1247 | -0.0591 | -0.2524 | -0.0903 | 0.0760 | -0.0799 | 0.1546 | -0.1212 |
| sw23 | -0.0502 | 0.1468 | 0.2500 | -0.2819 | 0.2331 | 0.0289 | 0.0501 | 0.0512 | -0.0452 | -0.1034 | 0.1224 | 0.0745 |
| sw24 | -0.0333 | 0.1516 | 0.2838 | -0.1536 | 0.1058 | -0.2582 | -0.0041 | -0.0597 | -0.1109 | -0.1149 | 0.3330 | -0.0364 |
| sw31 | 0.0244 | 0.1331 | -0.0113 | -0.0733 | -0.2941 | -0.0095 | -0.1752 | -0.0657 | 0.1637 | -0.0568 | 0.3061 | 0.4798 |

Table 3. Continuous (CWI3)

A.MW *Eigenvalues* of the Correlation Matrix

| | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| 1 | 2.0471 | 0.6939 | 0.4094 | 0.4094 |
| 2 | 1.3532 | 0.5225 | 0.2706 | 0.6801 |
| 3 | 0.8307 | 0.3355 | 0.1661 | 0.8462 |
| 4 | 0.4952 | | 0.0990 | 0.9452 |

*Eigenvector*s

| | Prin1 | Prin2 | Prin3 | Prin4 |
|---|---|---|---|---|
| mw11 | 0.5392 | -0.1790 | 0.3023 | -0.7518 |
| mw21 | 0.5828 | 0.3265 | -0.0429 | 0.1860 |
| mw22 | 0.6027 | -0.0371 | -0.2485 | 0.4562 |
| mw23 | 0.0685 | -0.6748 | 0.5827 | 0.4099 |
| mw31 | -0.0395 | 0.6360 | 0.7109 | 0.1544 |

B.HS *Eigenvalues* of the Correlation Matrix

| | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| 1 | 2.3531 | 0.7884 | 0.3922 | 0.3922 |
| 2 | 1.5648 | 0.6122 | 0.2608 | 0.6530 |
| 3 | 0.9526 | 0.2545 | 0.1588 | 0.8117 |
| 4 | 0.6981 | | 0.1163 | 0.9281 |

*Eigenvector*s

| | Prin1 | Prin2 | Prin3 | Prin4 |
|---|---|---|---|---|
| hs11 | -0.1662 | 0.6621 | 0.0976 | 0.4841 |
| hs12 | 0.1570 | 0.3808 | 0.8022 | -0.3515 |
| hs21 | 0.5399 | -0.0336 | 0.0799 | 0.5530 |
| hs22 | 0.5843 | 0.1864 | -0.2138 | 0.1336 |
| hs23 | 0.5293 | 0.1349 | -0.2262 | -0.5265 |
| hs31 | -0.1859 | 0.6020 | -0.4935 | -0.2025 |

C.EW *Eigenvalues* of the Correlation Matrix

| | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| 1 | 3.2644 | 2.0077 | 0.5441 | 0.5441 |
| 2 | 1.2566 | 0.4189 | 0.2094 | 0.7535 |
| 3 | 0.8377 | 0.5442 | 0.1396 | 0.8931 |
| 4 | 0.2934 | | 0.0489 | 0.9421 |

*Eigenvector*s

| | Prin1 | Prin2 | Prin3 | Prin4 |
|---|---|---|---|---|
| ew11 | 0.5081 | -0.0415 | 0.2140 | 0.0873 |
| ew12 | 0.5065 | -0.2509 | -0.0229 | 0.1704 |
| ew13 | 0.3887 | -0.4098 | 0.4573 | 0.0205 |
| ew21 | 0.4454 | 0.2738 | -0.2886 | -0.7909 |
| ew31 | 0.3676 | 0.4614 | -0.4407 | 0.5807 |
| ew32 | 0.0229 | 0.6923 | 0.6832 | 0.0050 |

D.PF *Eigenvalues* of the Correlation Matrix

| | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| 1 | 1.8343 | 0.5375 | 0.3669 | 0.3669 |
| 2 | 1.2968 | 0.2357 | 0.2594 | 0.6263 |
| 3 | 1.0611 | 0.4274 | 0.2122 | 0.8385 |
| 4 | 0.6336 | | 0.1267 | 0.9652 |

*Eigenvector*s

| | Prin1 | Prin2 | Prin3 | Prin4 |
|---|---|---|---|---|
| pf11 | 0.6959 | -0.1099 | 0.0959 | -0.0018 |
| pf12 | 0.6946 | -0.1387 | -0.0493 | 0.0494 |

| | | | | |
|---|---|---|---|---|
| pf21 | 0.0603 | 0.3959 | 0.7846 | -0.4611 |
| pf22 | 0.1065 | 0.7290 | 0.0219 | 0.6756 |
| pf31 | -0.1347 | -0.5294 | 0.6100 | 0.5730 |

E.BR *Eigenvalues* of the Correlation Matrix

| | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| 1 | 2.5199 | 0.4337 | 0.2100 | 0.2100 |
| 2 | 2.0861 | 0.1295 | 0.1738 | 0.3838 |
| 3 | 1.9565 | 0.6331 | 0.1630 | 0.5469 |
| 4 | 1.3234 | | 0.1103 | 0.6572 |

*Eigenvector*s

| | Prin1 | Prin2 | Prin3 | Prin4 |
|---|---|---|---|---|
| br11 | 0.4220 | -0.0603 | -0.1650 | 0.4312 |
| br12 | 0.2250 | 0.1019 | 0.5352 | 0.2899 |
| br13 | -0.1100 | 0.1518 | -0.2913 | 0.6617 |
| br14 | 0.1508 | -0.3450 | 0.2764 | 0.0265 |
| br15 | -0.1198 | 0.4788 | 0.2590 | 0.0806 |
| br16 | 0.1566 | 0.5093 | 0.3213 | 0.0899 |
| br21 | 0.0106 | -0.4656 | 0.3707 | 0.1117 |
| br22 | 0.3500 | -0.1609 | -0.1797 | 0.2262 |
| br31 | 0.2601 | 0.1245 | 0.2069 | -0.3067 |
| br32 | -0.4122 | -0.2446 | 0.1635 | 0.0891 |
| br33 | 0.2691 | 0.1484 | -0.3373 | -0.3095 |
| br34 | -0.5146 | 0.1226 | -0.0378 | 0.1231 |

F.SW *Eigenvalues* of the Correlation Matrix

| | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| 1 | 2.8068 | 1.5425 | 0.4678 | 0.4678 |
| 2 | 1.2643 | 0.1874 | 0.2107 | 0.6785 |
| 3 | 1.0768 | 0.7150 | 0.1795 | 0.8580 |
| 4 | 0.3617 | | 0.0603 | 0.9183 |

*Eigenvector*s

| | Prin1 | Prin2 | Prin3 | Prin4 |
|---|---|---|---|---|
| sw11 | 0.4028 | -0.5722 | -0.0499 | 0.0377 |
| sw21 | 0.3823 | -0.5278 | 0.3726 | -0.0937 |
| sw22 | 0.4451 | 0.4473 | -0.1288 | -0.4152 |
| sw23 | 0.4759 | 0.2131 | -0.2552 | 0.7984 |
| sw24 | 0.5147 | 0.2298 | 0.0349 | -0.3583 |
| sw31 | 0.0436 | 0.3089 | 0.8807 | 0.2266 |

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Table 4. Summary of unweighted human development type child well-being index (CWI1) by country.

| Obs | country | matwel | helsaf | eduwel | peefam | behris | subwel | CWI1 |
|---|---|---|---|---|---|---|---|---|
| 1 | Netherlands | 1.209 | 4.308 | 4.075 | 1.944 | 5.896 | 3.985 | 21.417 |
| 2 | Sweden | 2.045 | 4.947 | 3.902 | 1.099 | 6.105 | 2.852 | 20.950 |
| 3 | Denmark | 1.778 | 4.128 | 3.991 | 1.510 | 5.275 | 2.321 | 19.002 |
| 4 | Spain | 0.875 | 3.798 | 2.889 | 1.883 | 5.890 | 3.578 | 18.913 |
| 5 | Iceland | 2.732 | 4.634 | 3.497 | 1.164 | 4.324 | 1.927 | 18.278 |
| 6 | Finland | 1.615 | 4.416 | 4.404 | 0.996 | 3.445 | 2.517 | 17.393 |
| 7 | Norway | 2.658 | 3.028 | 3.837 | 1.437 | 3.936 | 2.494 | 17.391 |
| 8 | Greece | 0.503 | 2.126 | 2.678 | 2.250 | 6.416 | 3.260 | 17.234 |
| 9 | Italy | 0.590 | 3.431 | 2.531 | 3.045 | 5.149 | 2.479 | 17.225 |
| 10 | Poland | 0.294 | 3.684 | 4.203 | 1.580 | 5.906 | 1.554 | 17.220 |
| 11 | Switzerland | 1.167 | 2.988 | 3.369 | 1.426 | 5.377 | 2.777 | 17.104 |
| 12 | Czech Rep | 1.532 | 3.876 | 3.497 | 1.261 | 4.801 | 2.001 | 16.967 |
| 13 | France | 0.880 | 3.547 | 3.065 | 1.732 | 5.384 | 2.128 | 16.736 |
| 14 | Japan | 1.597 | 3.088 | 3.492 | 1.278 | 5.256 | 1.536 | 16.247 |
| 15 | Canada | 1.146 | 2.841 | 4.097 | 0.741 | 4.979 | 2.061 | 15.864 |
| 16 | Ireland | 0.489 | 1.652 | 3.806 | 1.599 | 5.134 | 2.758 | 15.438 |
| 17 | Australia | 1.276 | 3.083 | 4.045 | 0.668 | 4.291 | 2.031 | 15.395 |
| 18 | Portugal | 0.518 | 3.556 | 2.663 | 1.902 | 4.548 | 2.087 | 15.275 |
| 19 | Hungary | 0.593 | 3.612 | 3.020 | 1.735 | 4.012 | 2.195 | 15.166 |
| 20 | Malta | 0.493 | 3.808 | 1.181 | 2.647 | 4.538 | 2.404 | 15.071 |
| 21 | Germany | 0.975 | 3.013 | 2.754 | 2.006 | 3.878 | 2.396 | 15.022 |
| 22 | Israel | 0.953 | 2.834 | 1.052 | 0.625 | 4.378 | 5.161 | 15.003 |
| 23 | Belgium | 0.955 | 2.314 | 4.202 | 1.687 | 3.773 | 2.028 | 14.960 |
| 24 | Croatia | 0.491 | 3.253 | 1.479 | 1.891 | 5.432 | 1.612 | 14.159 |
| 25 | Latvia | 0.694 | 3.402 | 2.270 | 1.296 | 4.934 | 1.546 | 14.143 |
| 26 | Slovenia | 0.658 | 3.035 | 1.479 | 1.643 | 4.173 | 2.863 | 13.851 |
| 27 | Austria | 1.017 | 1.234 | 2.880 | 0.766 | 4.802 | 2.827 | 13.526 |
| 28 | USA | 0.797 | 2.467 | 3.610 | 0.791 | 4.283 | 1.513 | 13.461 |
| 29 | Lithuania | 0.465 | 3.556 | 1.479 | 1.234 | 5.030 | 1.516 | 13.280 |
| 30 | New Zealand | 1.009 | 1.713 | 3.746 | 0.525 | 4.307 | 1.951 | 13.250 |
| 31 | Estonia | 0.504 | 3.560 | 1.479 | 1.082 | 3.612 | 1.446 | 11.683 |
| 32 | UK | 0.775 | 2.573 | 3.207 | 0.757 | 2.534 | 1.813 | 11.659 |
| 33 | Russian Fed | 0.488 | 2.853 | 1.470 | 1.868 | 3.839 | 0.813 | 11.330 |

Table 5.A Summary of weighted principal component indices by country.

| Obs | country | prinmw | prinhs | prinew | prinpf | prinbr | prinsw | CWI2 | CWI1 | CWI3 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Netherlands | 0.820 | 0.833 | 0.719 | 0.593 | -0.058 | 1.610 | 0.433 | 21.417 | 4.518 |
| 2 | Sweden | 0.879 | 1.284 | 0.735 | -0.274 | -0.159 | 0.309 | 0.486 | 20.950 | 2.774 |
| 3 | Norway | 1.792 | -0.234 | 0.865 | 0.087 | -0.481 | 0.439 | 0.116 | 17.391 | 2.468 |
| 4 | Spain | -0.417 | 0.430 | -0.038 | 0.451 | 0.872 | 0.693 | 0.468 | 18.913 | 1.991 |
| 5 | Denmark | 0.718 | 0.755 | 0.955 | 0.157 | -0.532 | -0.064 | 0.290 | 19.002 | 1.988 |
| 6 | Italy | -0.192 | 0.134 | -0.304 | 1.652 | 0.617 | -0.055 | 0.211 | 17.225 | 1.852 |
| 7 | Iceland | 1.160 | 1.067 | 0.414 | -0.181 | -0.585 | -0.533 | 0.235 | 18.278 | 1.342 |
| 8 | France | 0.117 | 0.314 | -0.066 | 0.399 | 0.617 | -0.330 | 0.225 | 16.736 | 1.052 |
| 9 | Israel | 0.161 | -0.139 | -1.298 | -0.921 | 0.799 | 2.247 | 0.003 | 15.003 | 0.850 |
| 10 | Portugal | -0.129 | 0.368 | -0.132 | 0.531 | -0.116 | 0.170 | -0.139 | 15.275 | 0.692 |
| 11 | Greece | -0.462 | -1.045 | -0.092 | 0.611 | 1.367 | 0.296 | 0.324 | 17.234 | 0.675 |
| 12 | Switzerland | 0.568 | -0.170 | 0.155 | 0.063 | 0.220 | -0.208 | 0.304 | 17.104 | 0.627 |
| 13 | Poland | -0.632 | 0.515 | 1.098 | 0.091 | 0.158 | -0.665 | 0.214 | 17.220 | 0.565 |
| 14 | Finland | 0.332 | 1.009 | 0.831 | -0.480 | -0.814 | -0.353 | 0.106 | 17.393 | 0.523 |
| 15 | Japan | 1.158 | -0.225 | 0.098 | -0.080 | 0.244 | -0.707 | 0.252 | 16.247 | 0.488 |
| 16 | Australia | 0.242 | -0.143 | 0.687 | -0.771 | 0.136 | -0.198 | 0.103 | 15.395 | -0.047 |
| 17 | Belgium | 0.297 | -0.738 | 0.884 | 0.341 | -0.355 | -0.482 | -0.064 | 14.960 | -0.054 |
| 18 | Hungary | -0.892 | 0.421 | 0.011 | 0.324 | 0.100 | -0.145 | 0.007 | 15.166 | -0.182 |
| 19 | Canada | 0.372 | -0.398 | 0.717 | -0.696 | 0.163 | -0.396 | 0.197 | 15.864 | -0.238 |
| 20 | Malta | -0.726 | 0.313 | -1.481 | 1.130 | 0.069 | 0.441 | -0.180 | 15.071 | -0.255 |
| 21 | USA | 0.314 | -0.558 | 0.545 | -0.656 | 0.353 | -0.566 | -0.131 | 13.461 | -0.567 |
| 22 | Ireland | -0.216 | -1.411 | 0.647 | 0.147 | -0.104 | 0.274 | 0.004 | 15.438 | -0.663 |
| 23 | Germany | 0.106 | -0.302 | 0.187 | -0.601 | -0.433 | 0.099 | -0.156 | 15.022 | -0.944 |
| 24 | Czech Rep | -1.260 | 0.606 | 0.289 | -0.148 | 0.116 | -0.576 | 0.355 | 16.967 | -0.972 |
| 25 | Slovenia | -0.459 | -0.151 | -1.196 | 0.200 | -0.008 | 0.408 | -0.116 | 13.851 | -1.207 |
| 26 | Croatia | -0.728 | 0.072 | -1.196 | 0.425 | 0.252 | -0.374 | -0.197 | 14.159 | -1.550 |
| 27 | Austria | 0.354 | -1.821 | -0.137 | -0.699 | 0.256 | 0.448 | -0.110 | 13.526 | -1.599 |
| 28 | New Zealand | 0.154 | -1.239 | 0.425 | -0.941 | 0.165 | -0.265 | -0.085 | 13.250 | -1.702 |
| 29 | Latvia | -1.096 | 0.341 | -0.667 | -0.083 | -0.146 | -0.119 | -0.495 | 14.143 | -1.770 |
| 30 | UK | 0.114 | -0.686 | 0.028 | -0.688 | -0.828 | -0.164 | -0.380 | 11.659 | -2.225 |
| 31 | Lithuania | -0.772 | 0.406 | -1.196 | -0.180 | -0.524 | 0.005 | -0.754 | 13.280 | -2.261 |
| 32 | Estonia | -0.708 | 0.486 | -1.196 | -0.327 | -0.496 | -0.476 | -0.674 | 11.683 | -2.718 |
| 33 | Russian Fed | -0.968 | -0.094 | -1.293 | 0.527 | -0.863 | -0.760 | -0.851 | 11.330 | -3.451 |

Table 5.B Summary of weighted principal component indices by country group.

| Obs | cgroupx | prinmw | prinhs | prinew | prinpf | prinbr | prinsw | CWI2 | CWI1 | CWI3 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Scandinavia | 0.976 | 0.776 | 0.760 | -0.138 | -0.514 | -0.041 | 0.246 | 18.603 | 1.819 |
| 2 | SouthEurope | -0.217 | 0.040 | -0.126 | 0.729 | 0.671 | 0.155 | 0.218 | 17.077 | 1.252 |
| 3 | EastEurope | -0.928 | 0.514 | 0.466 | 0.089 | 0.125 | -0.462 | 0.192 | 16.451 | -0.196 |
| 4 | NorthEurope | 0.292 | -0.614 | 0.355 | -0.121 | -0.186 | 0.225 | 0.004 | 15.589 | -0.048 |
| 5 | NorthAmothe | 0.448 | -0.513 | 0.494 | -0.629 | 0.212 | -0.427 | 0.067 | 14.844 | -0.413 |
| 6 | Non-OECD | -0.662 | 0.154 | -1.190 | 0.096 | -0.115 | 0.172 | -0.408 | 13.565 | -1.545 |

Table 6. Pearson's correlation matrix of weighted average indexes, n=33.

| | prinmw | prinhs | prinew | prinpf | prinbr | prinsw | CWI2 | CWI1 | CWI3 |
|---|---|---|---|---|---|---|---|---|---|
| prinmw | 1.0000 | -0.0263 | 0.5717 | -0.2497 | -0.1343 | 0.1585 | 0.4744 | 0.4599 | 0.5962 |
| | | 0.8842 | 0.0005 | 0.1611 | 0.4561 | 0.3782 | 0.0053 | 0.0071 | 0.0003 |
| prinhs | -0.0263 | 1.0000 | 0.0022 | 0.2427 | -0.2572 | -0.0240 | 0.1944 | 0.5036 | 0.4049 |
| | 0.8842 | | 0.9900 | 0.1735 | 0.1484 | 0.8944 | 0.2783 | 0.0028 | 0.0194 |
| prinew | 0.5717 | 0.0022 | 1.0000 | -0.2232 | -0.0903 | -0.1880 | 0.6294 | 0.5561 | 0.5179 |
| | 0.0005 | 0.9900 | | 0.2118 | 0.6172 | 0.2947 | 0.0001 | 0.0008 | 0.0020 |
| prinpf | -0.2497 | 0.2427 | -0.2232 | 1.0000 | 0.2070 | 0.0273 | 0.1282 | 0.2826 | 0.3100 |
| | 0.1611 | 0.1735 | 0.2118 | | 0.2477 | 0.8801 | 0.4768 | 0.1110 | 0.0791 |
| prinbr | -0.1343 | -0.2572 | -0.0903 | 0.2070 | 1.0000 | 0.3160 | 0.4756 | 0.2292 | 0.2781 |
| | 0.4561 | 0.1484 | 0.6172 | 0.2477 | | 0.0732 | 0.0051 | 0.1993 | 0.1170 |
| prinsw | 0.1585 | -0.0240 | -0.1880 | 0.0273 | 0.3160 | 1.0000 | 0.2092 | 0.2922 | 0.4400 |
| | 0.3782 | 0.8944 | 0.2947 | 0.8801 | 0.0732 | | 0.2425 | 0.0988 | 0.0104 |
| CWI2 | 0.4744 | 0.1944 | 0.6294 | 0.1282 | 0.4756 | 0.2092 | 1.0000 | 0.8693 | 0.8234 |
| | 0.0053 | 0.2783 | 0.0001 | 0.4768 | 0.0051 | 0.2425 | | 0.0001 | 0.0001 |
| CWI1 | 0.4599 | 0.5036 | 0.5561 | 0.2826 | 0.2292 | 0.2922 | 0.8693 | 1.0000 | 0.9236 |
| | 0.0071 | 0.0028 | 0.0008 | 0.1110 | 0.1993 | 0.0988 | 0.0001 | | 0.0001 |
| CWI3 | 0.5962 | 0.4049 | 0.5179 | 0.3100 | 0.2781 | 0.4400 | 0.8234 | 0.9236 | 1.0000 |
| | 0.0003 | 0.0194 | 0.0020 | 0.0791 | 0.1170 | 0.0104 | 0.0001 | 0.0001 | |

Table 7. Rank of countries by weighted principal component indices.

| Obs | country | CWI2 | matwel | helsaf | eduwel | peefam | behris | socwel | CWI1 | CWI3 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Australia | 16 | 13 | 20 | 9 | 31 | 14 | 19 | 17 | 16 |
| 2 | Austria | 22 | 9 | 33 | 24 | 30 | 7 | 4 | 27 | 27 |
| 3 | Belgium | 20 | 12 | 29 | 3 | 10 | 24 | 27 | 23 | 17 |
| 4 | Canada | 13 | 8 | 26 | 8 | 29 | 12 | 25 | 15 | 19 |
| 5 | Croatia | 28 | 28 | 17 | 27 | 8 | 8 | 24 | 24 | 26 |
| 6 | Czech Rep | 4 | 33 | 6 | 14 | 20 | 15 | 30 | 12 | 24 |
| 7 | Denmark | 7 | 6 | 5 | 2 | 13 | 29 | 15 | 3 | 5 |
| 8 | Estonia | 31 | 26 | 8 | 28 | 24 | 27 | 26 | 31 | 32 |
| 9 | Finland | 15 | 10 | 3 | 5 | 25 | 31 | 23 | 6 | 14 |
| 10 | France | 10 | 16 | 14 | 21 | 9 | 5 | 22 | 13 | 8 |
| 11 | Germany | 26 | 18 | 25 | 15 | 26 | 25 | 12 | 21 | 23 |
| 12 | Greece | 5 | 24 | 30 | 22 | 3 | 1 | 9 | 8 | 11 |
| 13 | Hungary | 17 | 30 | 10 | 19 | 11 | 16 | 17 | 19 | 18 |
| 14 | Iceland | 9 | 2 | 2 | 13 | 22 | 30 | 28 | 5 | 7 |
| 15 | Ireland | 18 | 21 | 32 | 10 | 14 | 20 | 10 | 16 | 22 |
| 16 | Israel | 19 | 14 | 19 | 32 | 32 | 3 | 1 | 22 | 9 |
| 17 | Italy | 12 | 20 | 16 | 25 | 1 | 4 | 14 | 9 | 6 |
| 18 | Japan | 8 | 3 | 23 | 17 | 18 | 9 | 32 | 14 | 15 |
| 19 | Lativa | 30 | 32 | 13 | 26 | 19 | 22 | 16 | 25 | 29 |
| 20 | Lithuania | 32 | 29 | 11 | 29 | 21 | 28 | 13 | 29 | 31 |
| 21 | Malta | 27 | 27 | 15 | 33 | 2 | 17 | 5 | 20 | 20 |
| 22 | Netherlands | 3 | 5 | 4 | 7 | 4 | 19 | 2 | 1 | 1 |
| 23 | New Zealand | 21 | 15 | 31 | 12 | 33 | 11 | 21 | 30 | 28 |
| 24 | Norway | 14 | 1 | 24 | 4 | 16 | 26 | 6 | 7 | 3 |
| 25 | Poland | 11 | 25 | 7 | 1 | 15 | 13 | 31 | 10 | 13 |
| 26 | Portugal | 25 | 19 | 12 | 23 | 5 | 21 | 11 | 18 | 10 |
| 27 | Russian Fed | 33 | 31 | 18 | 31 | 6 | 33 | 33 | 33 | 33 |
| 28 | Slovenia | 23 | 23 | 21 | 30 | 12 | 18 | 7 | 26 | 25 |
| 29 | Spain | 2 | 22 | 9 | 20 | 7 | 2 | 3 | 4 | 4 |
| 30 | Sweden | 1 | 4 | 1 | 6 | 23 | 23 | 8 | 2 | 2 |
| 31 | Switzerland | 6 | 7 | 22 | 16 | 17 | 10 | 20 | 11 | 12 |
| 32 | UK | 29 | 17 | 28 | 18 | 28 | 32 | 18 | 32 | 30 |
| 33 | USA | 24 | 11 | 27 | 11 | 27 | 6 | 29 | 28 | 21 |

Table 8.A Efficiency of countries compared to best practice country.

| Obs | country | matwel | helsaf | eduwel | peefam | behris | subwel | CWI2 | CWI1 | CWI3 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Nethterlands | 37.54 | 82.79 | 90.18 | 56.31 | 86.59 | 72.96 | 96.06 | 100.00 | 100.00 |
| 2 | Sweden | 71.83 | 100.00 | 85.01 | 22.80 | 91.99 | 46.89 | 100.00 | 95.38 | 78.12 |
| 3 | Norway | 96.95 | 48.32 | 83.09 | 36.21 | 36.12 | 38.67 | 72.37 | 60.09 | 74.28 |
| 4 | Spain | 23.84 | 69.05 | 54.80 | 53.90 | 86.44 | 63.59 | 98.66 | 75.18 | 68.30 |
| 5 | Denmark | 60.87 | 77.94 | 87.66 | 39.08 | 70.60 | 34.69 | 85.36 | 76.06 | 68.25 |
| 6 | Italy | 12.14 | 59.17 | 44.11 | 100.00 | 67.36 | 38.32 | 79.50 | 58.44 | 66.54 |
| 7 | Iceland | 100.00 | 91.56 | 72.95 | 25.35 | 46.12 | 25.63 | 81.26 | 68.88 | 60.15 |
| 8 | France | 24.06 | 62.31 | 60.04 | 47.90 | 73.40 | 30.25 | 80.54 | 53.60 | 56.51 |
| 9 | Israel | 27.03 | 43.10 | 0.00 | 3.99 | 47.49 | 100.00 | 63.88 | 36.42 | 53.97 |
| 10 | Portugal | 9.18 | 62.53 | 48.05 | 54.66 | 51.89 | 29.31 | 53.28 | 39.11 | 51.99 |
| 11 | Greece | 8.58 | 24.02 | 48.50 | 68.46 | 100.00 | 56.29 | 87.88 | 58.53 | 51.78 |
| 12 | Switzerland | 35.80 | 47.24 | 69.13 | 35.78 | 73.23 | 45.16 | 86.39 | 57.24 | 51.18 |
| 13 | Poland | 0.00 | 65.98 | 93.98 | 41.86 | 86.86 | 17.04 | 79.67 | 58.39 | 50.40 |
| 14 | Finland | 54.16 | 85.69 | 100.00 | 18.71 | 23.47 | 39.20 | 71.58 | 60.10 | 49.87 |
| 15 | Japan | 53.46 | 49.93 | 72.78 | 29.87 | 70.11 | 16.64 | 82.51 | 48.74 | 49.43 |
| 16 | Australia | 40.30 | 49.81 | 89.29 | 5.70 | 45.26 | 28.01 | 71.40 | 40.30 | 42.72 |
| 17 | Belgium | 27.13 | 29.08 | 93.98 | 46.11 | 31.91 | 27.95 | 58.92 | 35.98 | 42.63 |
| 18 | Hungary | 12.27 | 64.04 | 58.69 | 48.01 | 38.08 | 31.78 | 64.21 | 38.03 | 41.03 |
| 19 | Canada | 34.93 | 43.28 | 90.83 | 8.56 | 62.98 | 28.70 | 78.44 | 44.95 | 40.31 |
| 20 | Malta | 8.16 | 69.33 | 3.83 | 84.19 | 51.63 | 36.60 | 50.23 | 37.09 | 40.11 |
| 21 | USA | 20.61 | 33.21 | 76.32 | 10.58 | 45.05 | 16.10 | 53.91 | 21.13 | 36.19 |
| 22 | Ireland | 7.99 | 11.26 | 82.15 | 42.62 | 66.96 | 44.74 | 63.96 | 40.73 | 34.99 |
| 23 | Germany | 27.94 | 47.92 | 50.77 | 58.77 | 34.62 | 36.40 | 51.99 | 36.60 | 31.46 |
| 24 | Czech Rep | 50.78 | 71.15 | 72.93 | 29.20 | 58.40 | 27.33 | 90.24 | 55.89 | 31.11 |
| 25 | Slovenia | 14.91 | 48.51 | 12.72 | 44.37 | 42.22 | 47.16 | 55.02 | 24.99 | 28.16 |
| 26 | Croatia | 8.10 | 54.38 | 12.72 | 54.20 | 74.65 | 18.39 | 48.98 | 28.04 | 23.86 |
| 27 | Austria | 29.66 | 0.00 | 54.54 | 9.57 | 58.43 | 46.31 | 55.42 | 21.77 | 23.24 |
| 28 | New Zealand | 29.31 | 12.89 | 80.38 | 0.00 | 45.66 | 26.18 | 57.31 | 19.04 | 21.95 |
| 29 | Latvia | 16.40 | 58.40 | 36.33 | 30.59 | 61.83 | 16.87 | 26.66 | 27.88 | 21.10 |
| 30 | UK | 19.72 | 36.06 | 64.29 | 9.22 | 0.00 | 23.01 | 35.24 | 3.26 | 15.39 |
| 31 | Lithuania | 7.00 | 62.54 | 12.72 | 28.16 | 64.30 | 16.16 | 7.25 | 19.33 | 14.93 |
| 32 | Estonia | 8.61 | 62.66 | 12.72 | 22.12 | 27.76 | 14.57 | 13.23 | 3.50 | 9.19 |
| 33 | Russian Fed | 7.97 | 43.60 | 12.45 | 53.28 | 33.62 | 0.00 | 0.00 | 0.00 | 0.00 |

Table 8.B Mean efficiency of country groups compared to best practice country.

| Obs | cgroupx | matwel | helsaf | eduwel | peefam | behris | subwel | CWI2 | CWI1 | CWI3 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Scandinavia | 76.76 | 80.70 | 85.74 | 28.43 | 53.66 | 37.01 | 72.10 | 82.11 | 66.13 |
| 2 | SouthEurope | 15.56 | 55.42 | 51.10 | 64.98 | 75.82 | 43.55 | 56.97 | 79.97 | 59.02 |
| 3 | NorthEurope | 26.54 | 36.34 | 72.15 | 36.91 | 50.25 | 42.36 | 42.23 | 64.00 | 42.70 |
| 4 | EastEurope | 21.02 | 67.06 | 75.20 | 39.69 | 61.11 | 25.38 | 50.77 | 78.04 | 40.84 |
| 5 | NorthAmOthe | 35.72 | 37.82 | 81.92 | 10.94 | 53.81 | 23.13 | 34.83 | 68.72 | 38.12 |
| 6 | Non-OECD | 12.27 | 55.32 | 12.94 | 40.11 | 50.44 | 31.22 | 22.16 | 33.16 | 23.91 |

Table 9: The bias of the UNDP type index over the principal components analysis in terms of ranks

| | bias in favour of the UNDP measure, compared to principal components, measured by rankings |
|---|---|
| Finland | 9 |
| Norway | 7 |
| Portugal | 7 |
| Malta | 7 |
| Germany | 5 |
| Latvia | 5 |
| Denmark | 4 |
| Iceland | 4 |
| Croatia | 4 |
| Italy | 3 |
| Lithuania | 3 |
| Netherlands | 2 |
| Ireland | 2 |
| Poland | 1 |
| Estonia | 0 |
| Russia | 0 |
| Sweden | -1 |
| Australia | -1 |
| Spain | -2 |
| Canada | -2 |
| Hungary | -2 |
| Greece | -3 |
| France | -3 |
| Israel | -3 |
| Belgium | -3 |
| Slovenia | -3 |
| UK | -3 |
| USA | -4 |
| Switzerland | -5 |
| Austria | -5 |
| Japan | -6 |
| Czech R. | -8 |
| New Zealand | -9 |

Table 10: The CWI1 and CWI2 results and the UNICEF rankings (2007)

| | CWI1 | CWI2 | average ranking, UNICEF 2007 study |
|---|---|---|---|
| Netherlands | 21,417 | 0,433 | 4,2 |
| Sweden | 20,950 | 0,486 | 5,0 |
| Denmark | 19,002 | 0,290 | 7,2 |
| Finland | 17,393 | 0,106 | 7,5 |
| Spain | 18,913 | 0,468 | 8,0 |
| Switzerland | 17,104 | 0,304 | 8,3 |
| Norway | 17,391 | 0,116 | 8,7 |
| Italy | 17,225 | 0,211 | 10,0 |
| Ireland | 15,438 | 0,004 | 10,2 |
| Belgium | 14,960 | -0,064 | 10,7 |
| Germany | 15,022 | -0,156 | 11,2 |
| Greece | 17,234 | 0,324 | 11,8 |
| Canada | 15,864 | 0,197 | 11,8 |
| Poland | 17,220 | 0,214 | 12,3 |
| Czech R. | 16,967 | 0,355 | 12,5 |
| France | 16,736 | 0,225 | 13,0 |
| Portugal | 15,275 | -0,139 | 13,7 |
| Austria | 13,526 | -0,110 | 13,9 |
| Hungary | 15,166 | 0,007 | 14,5 |
| USA | 13,461 | -0,131 | 18,0 |
| UK | 11,659 | -0,380 | 18,2 |

## Appendix A. INNOCENTI (2007-07) UNICEF child well-being data, 33 observations, 42 variables and 6 dimensions.

### MW. Material Well-being

mw1. Child income poverty:

- mw11 percentage of children (0-17) in households with equivalent income less than 50 per cent of the median: most recent data.

mw2. Deprivation:

- mw21 percentage of children reporting low family affluence, aged 11, 13 and 15: 2001.
- mw22 percentage of children aged 15 reporting less than six educational possessions: 2003.
- mw23 percentage of children aged 15 reporting less than ten books in the home: 2003.

mw3.Work:

- mw31 percentage of working-age households with children without an employed parent OECD: most recent data.

### HS. Health and Safety

hs1. Health at birth:

- hs11 infant mortality rate (per 1000 live births): most recent data.
- hs12 low birth rate (% births less than 2500g): most recent data.

hs2. Immunization:

- hs21 measles: % children immunized aged 12-23 months: 2003.
- hs22 dpt3: % children immunized aged 12-23 months: 2002 (hs22).
- hs23 polio 3: % children immunized aged 12-23 months: 2002.

hs3. Child mortality:

- hs31 deaths from accidents and injuries per 100,000 under 19 years, average of latest three years available.

### EW. Educational Well-being

ew1. Achievement:

- ew11 reading literacy achievement aged 15: 2003.
- ew12 mathematics literacy achievement aged 15: 2003.
- ew13 science literacy achievement aged 15: 2003.

ew2. Participation:

- ew21 full-time and part-time students in public and private educational institutions aged 15-19 as a percentage of the population of 15-19 year-olds: 2003.

ew3. Aspirations:

- ew31 percentage of 15-19 year-olds not in education or employment: 2003.
- ew32 percentage of pupils aged 15 years aspiring to low skilled work: 2003.

### PF. Peer and Family relationships

pf1. Family structure:

- pf11 percentage of young people living in single-parent family structures, aged 11, 13 and 15: 2001.
- pf12 percentage of young people living in step family structure, aged 11, 13 and 15: 2001.

pf2. Family relations:

- pf21 percentage of students whose parents eat their main meal with them around a table several times a week, aged 15: 2000.
- pf22 percentage of students whose parents spend time just talking to them several times per week, aged 15: 2000.

pf3. Peer relations:

pf31 percentage of young people finding their peers 'kind and helpful', aged 11, 13 and 15: 2001.

## BR. Behaviours and Risks

br1. Risk behaviour:

br11 percentage smoking cigarettes at least once per week, aged 11, 13, 15: 2001.
br12 percentage of young people who have been drunk two or more times, aged 11, 13, 15: 2001.
br13 percentage of young people who have used cannabis in the last 12 months, aged 15: 2001.
br14 adolescent fertility rate, births per 1000 women aged 15-19: 2003.
br15 percentage of young people who have had sexual intercourse, aged 15: 2001.
br16 percentage of young people who used a condom during their last sexual intercourse, aged 15: 2001.

br2. Experience of violence:

br21 percentage of young people involved in physical fighting in previous 12 months, aged 11, 13, 15: 2001.
br22 percentage of young people who were bullied at least once in the last 2 months, aged 11, 13, 15: 2001.

br3. Health behaviour:

br31 percentage of young people who eat fruit every day, aged 11, 13, 15 years: 2001.
br32 percentage of young people who eat breakfast every school day, aged 11, 13, 15 years: 2001.
br33 mean number of days when young people are physically active for one hour or more of the previous /typical week, aged 11, 13, 15: 2001.
br34 percentage of young people who are overweight according to bmi, aged 13 and 15: 2001.

## SW. Subjective Well-being

sw1. Health:

sw11 percentage of young people rating their health as 'fair or poor', aged 11, 13 and 15: 2001.

sw2. Personal well-being:

sw21 percentage of young people with scores above the middle of the life satisfaction scale, aged 11, 13 and 15: 2001.
sw22 percentage of students who agree with the statement 'i feel like an outsider or left out of things', aged 15: 2003.
sw23 percentage of students who agree with the statement 'i feel awkward and out of place', aged 15: 2003.
sw24 percentage of students who agree with the statement 'i feel lonely', aged 15: 2003.

sw3. School well-being:

sw31 percentage of young people 'liking school a lot', aged 11, 13, 15: 2001.

**CC. Country Characteristics (2 indicators):**

cgroup Scandinavia (1), North Europe (2), South Europe (3), East Europe (4), North America and others (5), Non-OECD (6).
OECD OECD members (1), Non-OECD members (0).

## Appendix B. INNOCENTI UNICEF child well-being data.

**MW. material well-being (5 indicators):**

mw11
mw21, mw22, mw23
mw31

**HS. health and safely (6 indicators):**

hs11, hs12
hs21, hs22, hs23
hs31

**EW. educational well-being (6 indicators):**

ew11, ew12, ew13
ew21
ew31, ew32

**PF. peer and family relationships (5 indicators):**

pf11, pf12
pf21, pf22
pf31

**BR. behaviours and risks (12 indicators):**

br11, br12, br13, br14, br15, br16
br21, br22
rr31, br32, br33, br34

**SW. subjective well-being (6 indicators):**

sw11
sw21, sw22, sw23, sw24
sw31

**CC. Country Characteristics (2 indicators):**

cgroup
OECD

Figure 1. Non-parametric index of child well-being (chiwel) and its decomposition by sub-components.

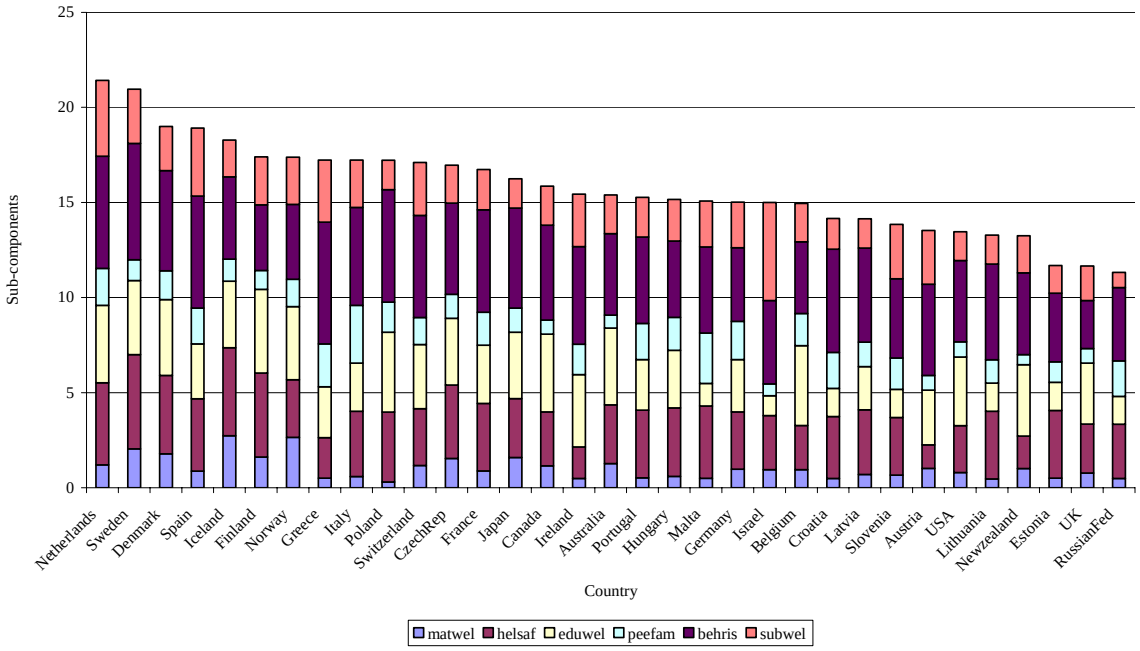


Figure 2. Parametric sub-indices of child well-being (prinallx).

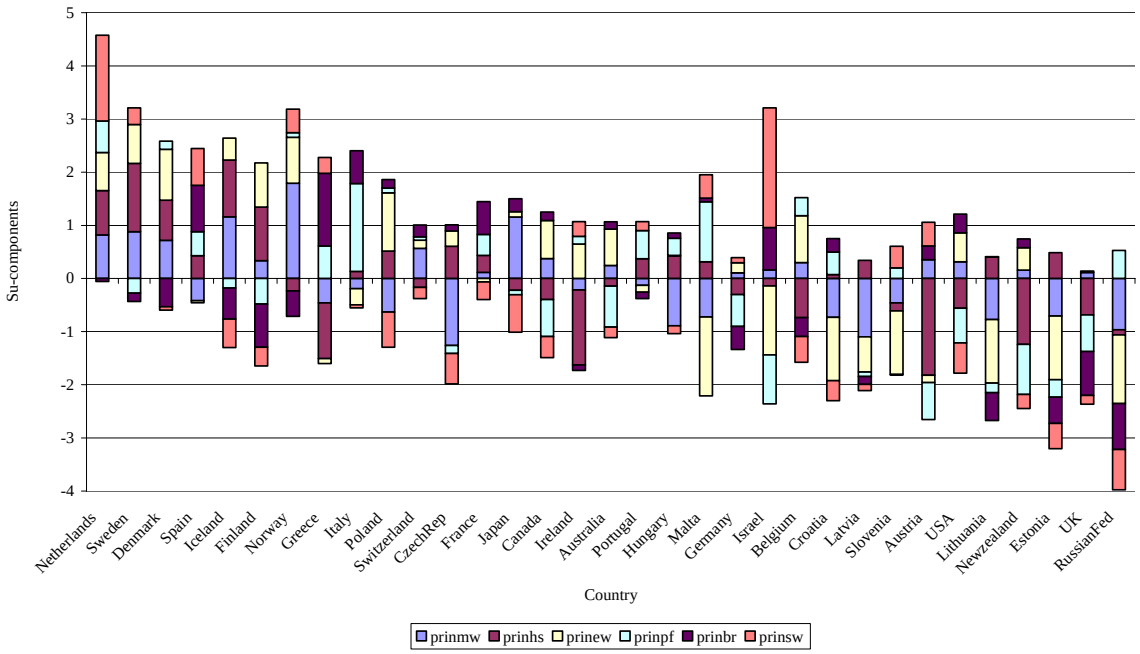

Figure 3. Normalized parametric and non-parametric child well-being Indices.

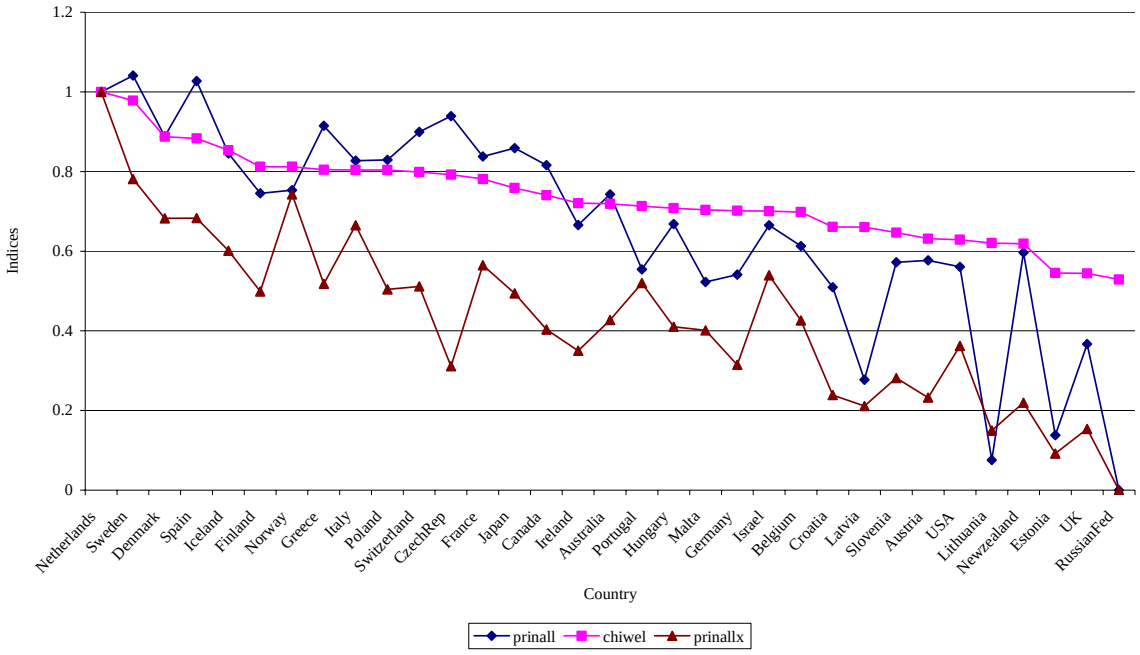


Figure 4. Efficiency based on non-parametric computation of individual well-being indices (chiwel).

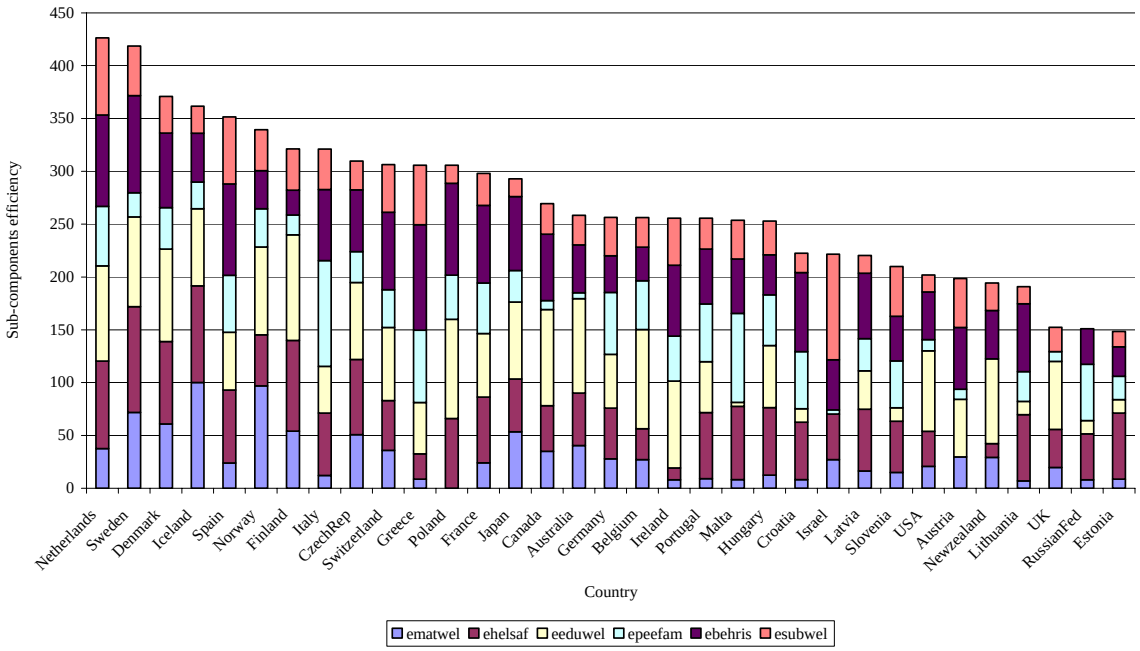

Figure 5. Efficiency based on parametric and non-parametric indices of child well-being.