

Master's Thesis

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# Experienced Broad Wellbeing in The Netherlands: establishing national inequalities

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Name: Heleen Kooij

Supervisor: prof. dr. Lex Meijdam

Date: 14-06-2024

SNR: 2119817

ANR: 780226

Master in economics at Tilburg University  
Tilburg School of Economics and Management

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# Abstract

This research investigates the distribution of broad wellbeing in the Netherlands, focusing on inequalities and potential policy interventions, utilizing the broad wellbeing measure created by the Central Bureau for Statistics (CBS) in 2017. This thesis analyzes data from the RaboResearch broad wellbeing survey, by conducting mean analyses and Shapley value regressions to assess the contributions of various dimensions of wellbeing across different demographic groups. The results show significant differences in broad wellbeing between categories of income, education, and age. Additionally, the research highlights the importance of neighborhood amenities, employment, and health disabilities for overall wellbeing. Lastly, policy recommendations are proposed to address these inequalities. The focus of the policy intervention is to improve the overall broad wellbeing score and decreasing inequalities between societal groups by affecting multiple dimensions of broad wellbeing. By promoting volunteer work with an income tax discount, this intervention aims to improve income and social involvement.

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# 1. Introduction

In 2017, the Central Bureau for Statistics (CBS) in the Netherlands was asked by the government to create a measure for overall wellbeing. The CBS created the measure broad wellbeing (translation of the Dutch concept ‘Brede Welvaart’). The goal of this measure is to give insight in the wellbeing of a country that goes beyond solely economic wellbeing. This measure is central to this research. This thesis will give insight in the origin of this measure, discuss existing research in this field, form new research questions, and discuss the statistical analyses performed to answer these research questions. Finally, the results will be used to discuss possible policy interventions.

For the past 5 decades economists and policy makers became more critical about focusing solely on economic growth as a determinant for the wellbeing of a country. Especially the need for a constant economic growth has been questioned and still is today (Bleys, 2012).

In 2008, President Sarkozy of the French Republic asked Joseph Stiglitz to form a commission with the intention of determining the constraints of GDP as a measure for economic performance and social progress. Sarkozy was unsatisfied with the state of measures for economic performance and wellbeing of the society and the commission, called “The Commission on the Measurement of Economic Performance and Social Progress” (CMEPSP), had to research what information was needed to produce new and more relevant measures for social and economic performance, and had to determine the feasibility of those alternative measures (Stiglitz et al., 2009).

In the final report of the Commission (CMEPSP) (Stiglitz et al., 2009) it was discussed that it is essential to redirect the attention of economists away from economic growth and welfare and towards a wider topic of human wellbeing. They recommend using additional/ supporting measures for economic progress besides GDP. These measures should aim to better describe the societal performance, the quality of life that pairs with it, and the sustainability of this performance.

Based on this final report, the Dutch House of Representatives (‘de Tweede Kamer’) asked the Central Bureau for Statistics in the Netherlands (CBS) to create a measure that focusses on the overall and general wellbeing of their citizens (Horlings, Edwin et al., 2023). The CBS developed the measure Broad Wellbeing (translation of the Dutch concept ‘Brede Welvaart’). The definition of broad wellbeing given by the CBS is as follows; “the current

quality of life and the extend on which this is at the expense of the broad wellbeing of future generations, or that of people elsewhere in the world” (Horlings, Edwin et al., 2023).

Various research is conducted with (variants of) this measure. The research institute of the Rabobank, RaboResearch, has conducted national annual survey research since 2019 in which they ask questions on 11 different dimensions of broad wellbeing. This gives them insight in the *experienced* broad wellbeing in the Netherlands. As mentioned by Raspe and Stam (2019), in previous literature broad wellbeing has been mostly used to research national levels of wealth and to determine national scores of wellbeing. This motivated Raspe et al. (2019) to conduct regional research, to determine inequalities within the country. As expected, they found significant inequalities between regions, even after controlling for strong indicators such as income.

The PON-Telos institute has also conducted research concerning broad wellbeing. They distributed a survey among citizens of Noord-Brabant (Dutch province) and therefore also focused on regional results. One of their findings was a large difference in experienced broad wellbeing between generations. Furthermore, they found significant differences in broad wellbeing between individuals living in the city versus on the countryside (Blanken & Verhoeven, 2023).

With the measure of broad wellbeing being relatively new, and the many different aspects of the inequalities in distribution of the experienced broad wellbeing found by previous literature, this research aims to answer the following research question; ‘*How is broad wellbeing distributed in the Netherlands, and how can possible inequalities be reduced through policy interventions?*’. The approach of this research question is mostly focused on mapping the distribution of broad wellbeing in the Netherlands. By analyzing different aspects of broad wellbeing, such as the distribution of broad wellbeing based on economic prospects and demographics, different inequalities could come to light. This research will use these results to discuss possible policy interventions to resolve some of these inequalities.

To answer the research question, the following sub questions will be answered:

- How is experienced broad wellbeing distributed in the Netherlands, based on income?
- What is the distribution of experienced broad wellbeing between generations in the Netherlands?
- How does level of education influence the experienced broad wellbeing in the Netherlands?

- What are the contribution levels of the 11 dimensions to the overall broad wellbeing index per generation?
- What are strong indicators for broad wellbeing?
- What policy can reduce inequalities in broad wellbeing?

It is expected to find inequalities in broad wellbeing between income categories, educational levels, and generations. The recent research by Bijkerk and Raspe (2024) has conducted similar analyses as this research aims to perform to determine the inequalities between and within certain groups of society. They found significant differences between the broad wellbeing scores of generations and income levels. These insights are needed to be able to discuss policy ideas. This research aims to add to these analyses and introduce new policy interventions to try and improve the national broad wellbeing scores while trying to reduce inequalities between societal groups.

This will be done by conducting several mean analyses, such as ANOVA's and post-hoc analyses such as Tukey's HSD, linear regression analyses, and Shapley Value regression analyses on data received from RaboResearch from their annual experienced broad wellbeing survey. From these analyses significant differences in broad wellbeing between income levels and generations are concluded. Furthermore, from the Shapley Value regressions it is found that subjective wellbeing, income, and health are three largely contributing dimensions to the overall broad wellbeing index.

These outcomes form the basis from which policy ideas will be discussed. In the policy proposal some well-known policies will be discussed as well as a possible more innovative policy idea. The aim of this chapter will be to start the conversation and discussion about creating new policy to reduce the inequalities and to improve the overall broad wellbeing in the Netherlands. More research is needed to determine the effectiveness and feasibility of these ideas.

This thesis will further discuss current literature (chapter 2) in which the results from Sander and Raspe (2024), Blanken and Verhoeven (2023), and Bijkerk and Raspe (2024) will be discussed. Furthermore, in chapter 3 the research method will be described. The results from the analyses will be discussed and explained in more detail in chapter 4, after which possible policy interventions will be discussed (chapter 5). Finally, a concluding chapter will shortly summarize and conclude the research and it will critically discuss shortcomings of this research and it will introduce ideas for additional research (chapter 6). At the end of the thesis a list of references will also be present (chapter 7).

## 2. Literature review

In this chapter the view and results of important literature on (experienced) broad wellbeing will be discussed. This will be done with a large focus on the Netherlands, since this research uses Dutch data and aims to provide policy interventions for the Netherlands. It will start with discussing the origin of broad wellbeing in the Netherlands. Then, research already conducted on broad wellbeing in the Netherlands is discussed. Furthermore, expected outcomes of this research will be mentioned.

### 2.1 Broad wellbeing

As explained earlier in chapter 1, the CBS defines broad wellbeing as “the current quality of life and the extend on which this is at the expense of the broad wellbeing of future generations, or that of people elsewhere in the world” (Horlings, Edwin et al., 2023). This definition contains three dimensions. The current broad wellbeing describes the personal characteristics of people, especially the quality of the environment in which they live. The broad wellbeing of future generations depicts the resources the next generations will need to reach the same level of wellbeing as the current generation. The broad wellbeing of the people elsewhere in the world measures the effects of choices made by Dutch people on the broad wellbeing in other countries (Horlings, Edwin et al., 2023).

The research institute of the Rabobank, RaboResearch, has expanded this new view on wellbeing by creating a survey in which they measure the *experienced* broad wellbeing. They ask questions on three topics: ecological, economic, and social wellbeing. These are specified in 11 dimensions, which are the base for the questions in the survey; subjective wellbeing, safety, personal development, housing, environment, health, income, job security, work-life balance, social contacts, and social involvement.

Broad wellbeing is becoming more important in policy discussions regarding the wealth and economic wellbeing of a country. Originally these discussions often focused on income disparities only. Income inequality is often discussed in literature as one of the main explanations for a weakened economic growth (Ostry & Berg, 2011). However, it is becoming more evident that inequalities in opportunity and wellbeing have negative effects on human development, skills agglomeration, and social and economic mobility (He et al., 2022). These will eventually negatively impact economic growth. Therefore, it has become more interesting

to research the inequalities of broad wellbeing in a society as well. However, more insight in this relatively new measure is needed, that is why recently much research has been conducted in the Netherlands regarding broad wellbeing.

## 2.3 Broad wellbeing in the Netherlands

In the Netherlands research about broad wellbeing is becoming increasingly more popular and needed. As explained earlier, among others the CBS, RaboResearch, and het PON-Telos have been doing research on this matter and have created their own broad wellbeing measure.

Blanken and Verhoeven (2023), on behalf of Het PON-Telos institute, have conducted research on the experienced broad wellbeing, specifically in Noord-Brabant. In this research they used a questionnaire, developed by themselves, to collect data on the experienced broad wellbeing of the citizens of Noord-Brabant. This data was used to make a very detailed analysis about the differences and inequalities in the dimensions of experienced broad wellbeing (e.g. the difference in average experienced broad wellbeing between people living in the city and people living in the countryside).

In the survey they asked people to give their satisfaction with certain themes in broad wellbeing a grade on the scale from 1-10, with 1 being completely dissatisfied with their personal situation, and 10 being completely satisfied. These scores were then also used to form one overall grade for broad wellbeing. These grades were subsequently grouped into three categories; satisfied (grade  $\geq 7.6$ ), partially satisfied (grade 5.6 – 7.5), and dissatisfied (grade  $\leq 5.5$ ) (Blanken & Verhoeven, 2023). This contributed to discussing the results more clearly.

Some of the results from this research are very interesting. To start, they found large differences between generations and their satisfaction level of their experienced broad wellbeing. For people between 18 and 29 years only 43% of the population is satisfied with their own broad wellbeing, while for the generation of 65+ years, this is 73% of the population. When looking further into the dimensions of broad wellbeing, they found that for the younger generation they value the satisfaction with their health the highest, followed by ‘daily activities’, ‘financial situation’, and ‘social network’. For the older generation health also is the most important factor, but after that the ‘daily activities’ are most important. Based on these results, this research expects to find significant differences between the level of broad wellbeing between young and old generations, with a positive relation between generation and broad wellbeing.

Furthermore, Blanken and Verhoeven (2023) find that the scores for ‘the connection with the neighborhood’ and ‘self-reliance’ are strong indicators for experienced broad wellbeing. If people rate themselves high on these indicators, their scores on overall broad wellbeing will also be relatively high. Of the people who are self-reliant, 82% is satisfied with their broad wellbeing, whereas for people who are not self-reliant this score is only 37%. For the indicator ‘connection with the neighborhood’, of the people who indicate to have a good connection with their neighborhood 82% says to be satisfied with their broad wellbeing, whereas for the people that do not have a good connection this score is only 39%.

They have also found that ‘trust in the government’, ‘trust in the fellow man’, income, and generation are semi strong indicators. Trust in the government shows a difference of 75% satisfaction versus 53% satisfaction rate between having and not having trust in the government. For the trust in the fellow man these scores are 71% versus 46%. Blanken and Verhoeven (2023) do also discuss the possibility that all these indicators (self-reliance, connection, trust, and income) could be correlated with each other, but the data also shows that these low satisfaction scores are not limited to the people who score low on all these indicators (Blanken & Verhoeven, 2023).

A limitation to the research of Blanken and Verhoeven (2023) is that it is concentrated to Noord-Brabant and that the results cannot be compared with the scores of other provinces or the whole country. A research institute that does have data on the whole country of the Netherlands is RaboResearch. With their survey distributed to 10,000 citizens in the Netherlands per year they have created a large dataset from which the results are representative for the whole population.

In this survey the participants are asked to give a score between 1 and 7 on how applicable a situation of one of the 11 dimensions of broad wellbeing is on their lives. With 1 being ‘not at all’ and 7 being ‘perfectly’. The 11 dimensions discussed are: subjective wellbeing, safety, personal development, housing, environment, health, income, job security, work-life balance, social contacts, social involvement. The completeness of the survey is evident from the coverage of demographics and other questions on characteristics that could be determinant for an individual’s broad wellbeing, such as (and not limited to) health disabilities, living situation, zip code (creates possibilities for regional analysis), political preferences, origin of the participants parents, and level of education.

The possibility to use this data for national as well as regional research gives this data unique properties in the Netherlands. A recent example of regional research in the Netherlands is the research by Sander and Raspe (2024). They have looked at different levels of experienced

broad wellbeing in several municipalities (or combined regions) in the provinces of Friesland, Groningen, and Drenthe (North-Netherlands). In this research it is discussed which municipalities have relatively high and low levels of experienced broad wellbeing and how the broad wellbeing is distributed between regions. Their analyses also investigate the distribution of broad wellbeing within regions and between societal groups, which are also compared to the national outcomes, and they find some interesting results.

To start, they find that 16% of the residents of North-Netherlands has a lower experienced wellbeing than 0,5 (on a scale from 0-1), which is a larger percentage than the national level of 14%. This inequality, however, is even larger when looking at socioeconomic characteristics. People with an income below average, those who live in social housing, the unemployed, and people without higher education on average have lower experienced broad wellbeing than those who have an above average income, are homeowners, or have had higher education. These trends are also seen in the national results (Sander & Raspe, 2024). Other research also indicates that the region ‘het Gooi’, which is known for its wealthy citizens, has significantly higher levels of experienced broad wellbeing. They score high on health, level of education, and housing. They also have significantly higher incomes than other regions in the Netherlands (Raspe et al., 2019).

Existing literature on broad wellbeing (e.g. published by RaboResearch) focuses on mapping certain aspects of broad wellbeing for a period or region, or on giving information for the sole purpose of informing and explaining. This has created a general base of information on broad wellbeing and its effects and position in society. However, the translation to effective policy proposals and discussions has been lacking (Hardeman et al., 2023).

That makes the most recent research of Bijkerk and Raspe (2024) interesting. They discuss the importance of insights in the division of broad wellbeing for the application of effective policy. They have researched differences between generations and income categories and have also investigated the inequalities within certain categories. Bijkerk and Raspe (2024) do not go into the specifics of all 11 dimensions, but they have focused on the three overarching topics; ecological, economic, and social wellbeing. The research also gives insight in which dimensions are affectable by policy. These are important and useful when continuing working on improving broad wellbeing in the Netherlands.

For their analyses they create a normalized index of broad wellbeing by giving all questions an equal weight in the contribution to the index. As will be explained in chapter 3, this research will also create its own broad wellbeing index, but for this research it is chosen to incorporate the importance individuals experience for each dimension by creating weighted

dimension values per individual based on data retrieved from the survey. It is therefore expected to find results in line with the research of Bijkerk and Raspe (2024) but with significantly different sizes and values.

The analyses conducted by Bijkerk and Raspe (2024) resulted in the following outcomes. First, they find inequalities in the division of broad wellbeing for income as well as generations. As has been discussed in existing literature, income has a positive effect on (broad/ subjective) wellbeing (Alloush & Wu, 2023; Dirzyte et al., 2014; Killingsworth, 2021). The research of Bijkerk and Raspe (2024) has found that lower income categories also have lower broad wellbeing scores in the Netherlands. Additionally, they found a convex relation between income and broad wellbeing, meaning that an increase in income has a larger positive effect for somebody in the low-income categories than it has for an individual in the high-income categories (Bijkerk & Raspe, 2024). This is in line with the diminishing marginal return income has on wellbeing described by Stevenson and Wolfers (2013).

For the effect of generation on broad wellbeing they have given a more detailed explanation on the level of the three topics. At first, they found a positive effect of generations with ecological and social wellbeing, and the economic wellbeing seemed to have a negative relation with age. However, this could be explained by the reduced importance of the dimensions job security and personal development for the old generation. When only income was used for the economic wellbeing, it was found that this had a positive relation with age (Bijkerk & Raspe, 2024).

To make broad wellbeing research more useful for policy makers, Bijkerk and Raspe (2024) also discuss important variables that influence broad wellbeing. They discuss that especially unemployment (and not working) negatively affects economic wellbeing. For social wellbeing this negative effect is measured as largest for chronic health disabilities. Furthermore, they determine that being a homeowner increases the ecological wellbeing when compared to having a rental home. All three topics of broad wellbeing are positively affected by having enough services and amenities, such as healthcare and education institutions, within proximity.

Another important observation made by Bijkerk and Raspe (2024), is the fact that the effects of the three topics are correlated with each other. This was to be expected as the positive relation between income and health is already often discussed in literature. Having a higher income and better economic wellbeing could logically lead to better housing (possibly in a better and safer environment) and subjective wellbeing, affecting the ecological and social wellbeing of the individuals.

This correlation contributes to the observation that even though the focus of the research conducted by Bijkerk and Raspe (2024) is on broad wellbeing and the inequalities that accompany it, the main discussed factor is income, and the effect is has on the different dimensions of broad wellbeing. As explained, they also discuss strong determinants for broad wellbeing, besides the inequalities between generations and income levels, and the most discussed and explaining variables are income or health related (unemployment and chronic health disabilities). It gives rise to the question in what ways income is influencing broad wellbeing and how this could be used to form specific and effective policy.

## 2.4 Income and the other dimensions

The positive relation between income and health is not a new finding. According to Pritchett & Summers (1996) “Wealthier nations are healthier nations”. They argued that the found positive relation between income and health could be explained by the fact that with a higher income an individual could buy more health-enhancing goods. The Grossman model is the theoretical framework for this observation in which health is described as a form of capital stock in which individuals could invest for improvements (French, 2012).

However, the research of French (2012) also argues that the causational relation of health and income is not yet determined and the relation could work both ways. They compare literature supporting both theories after which they analyze panel time-series data to research the possible causation between health and income. They find that the relation indeed works both ways. It has been observed that enhanced health generally leads to higher income, while increased income has a positive impact on health (French, 2012).

Income also indirectly affects health through education. Income is often associated with higher education, which on its own could also influence the dimension of personal development, but also the dimension health is affected by level of education. O'Donnell et al. (2013) argues that having higher education positively effects health because higher educated individuals are more likely to adhere to treatment regimens, and evidence shows they tend to take better care of themselves. Again, for this pathway, it must be noted that education is argued to positively affect income and vice versa (Tselios, 2014).

However, the relation between education and wellbeing is not always as clearly specified. It has not only been described as positive (Blanchflower & Oswald, 2004; Easterlin, 1974), but as negative as well (Kristoffersen, 2018). The relation as described by Kristoffersen (2018) does indicate positive effects between income and education, but the research also

describes negative effects of higher education on the satisfaction with leisure time and work, which negatively influences wellbeing.

## 2.5 Expected outcomes

As described, different research conducted in the Netherlands (regional and national) have found significant inequality of broad wellbeing between income categories, generations, and levels of education. Based on this literature, it is expected to find significant national differences in broad wellbeing between the levels of these categories. However, the relationship between education and broad wellbeing depends on multiple factors and could therefore possibly present itself as a negative or neutral relationship.

Furthermore, literature shows that income remains a large determinant for broad wellbeing, and it will therefore be expected that this will be a large contributor for the differences between generations and levels of education. This is caused by the expected correlation with age and level of education.

Additionally, the dimensions health and income are expected to be large contributors to the level of broad wellbeing. As described in this chapter, research has found significant positive relationships between these variables and (subjective) wellbeing. The direction of these relationships is still under discussion, but it is argued to be causal in both directions.

Furthermore, based on the literature of Bijkerk and Raspe (2024) it is expected that the indicators employment, being a homeowner, having a health disability, and level of amenities are strong indicators for broad wellbeing.

Lastly, income-based policy is expected to have the largest effects on the national levels of broad wellbeing. Again, this is expected based on the known influential paths of income on broad wellbeing, such as via health and education.

## 3. Methodology

In this chapter the data that will be used is discussed, as well as the categorization of this data, and finally different types of statistical analyses that will be used are discussed.

### 3.1 Data

#### 3.1.1 RaboResearch broad wellbeing Survey

As explained in chapter 2, RaboResearch conducts a survey among approximately 10,000 Dutch individuals every year in May and June. This has created a dataset including 60515 observations. In this research the data from this survey will be used to answer the research questions.

In this survey the participants are asked to value their broad wellbeing based on 11 dimensions. They are asked to value the extent to which they possess sufficient wellbeing for each of these dimensions. This is asked to be done on a scale from 1 to 7 (e.g. on a scale from 1 – 7 how safe is your living environment?) (See Appendix A for the questions of all dimensions). These answers will be used to form a broad wellbeing index. How this will be done is discussed in the next paragraph.

The data that is being used is obtained via a survey, therefore the measured broad wellbeing is called *experienced* broad wellbeing. The data is available from 2019 – 2023 but is not a panel dataset. Only part of the respondents has participated in the survey multiple times. The observations will therefore be combined and cannot be used to make statements over time.

#### 3.1.2 Broad wellbeing index (BWI)

From the survey a weighted broad wellbeing index will be formed. First, the answers to the functioning questions (e.g. ‘on a scale from 1 – 7 how happy are you?’) are normalized, giving a score between 0 and 1 for all participants per dimension. Then the same is done for the questions in which they are asked to indicate the importance of that dimension on a scale from 1 to 10, and for the relative valuation questions (“divide 110 points across the 11 dimensions based on importance”). These are now also a value between 0 and 1. Finally, these scores are multiplied by each other, creating values per individual per dimension based on their importance and personal situation. These are the weighted dimension scores.

Existing research often has used the broad wellbeing index formed with equal weights, such as the research conducted by Bijkerk and Raspe (2024). This could be useful to determine

more ‘objective’ values (it remains the *experienced* broad wellbeing). However, this research aspires to include the importance people value certain dimensions to determine the impact these dimensions have on their individual broad wellbeing. So, therefore it is decided that in this research the weighted dimensions are used in the analyses.

The sum of these individual dimension scores creates the overall (weighted) broad wellbeing index, which will be used as the dependent variable in the different analyses to be conducted. For analyzing the results and to prevent very small coefficients in the regression analyses, the index is scaled from 0-1 to 0-100, making it possible to analyze the coefficients in percentage points and to discuss the average scores on a scale from 0-100.

### 3.1.3 Data categorization

To determine whether the broad wellbeing in the Netherlands is divided unequally, it is important to create categories on which this inequality must be analyzed. In this research three categorizations have been made: income, generation, and level of education.

Income is categorized in seven categories dependent on the modal income (€44.000 gross yearly income). The participants had to categorize themselves by answering a question on income, this question had 9 answer options, the levels indicated in table 1 and ‘I do not know’ and ‘I do not want to disclose’, these answers have not been included in the categorization and analyses.

| <i>Category</i> | <i>Level of income</i>  |
|-----------------|-------------------------|
| 1.              | Minimum                 |
| 2.              | Below modal             |
| 3.              | Almost modal            |
| 4.              | Modal                   |
| 5.              | Between 1 and 2 x modal |
| 6.              | 2 x modal               |
| 7.              | > 2x modal              |

Table 1: Income categories

The participants have also been categorized on age. There are 4 generations created for this research. The age categories do not have the same bandwidth, this is because they are based on life phase. Between 18 and 30 people are starting living on their own and do not have children yet. The average age of women at the birth of their firstborn in the Netherlands is 30 years old. The next generation (lower middle) is the phase in which the children live at home

and are dependent on their parents and their income and wealth. The upper middle generation represents the households in which on average children are starting to leave the household of their parents and start living on their own. However, their parents are still of working age and have different preferences from people in the old generation. The last generation represents the citizens above retirement age.

| <i>Category</i>        | <i>Age</i> |
|------------------------|------------|
| 1. <i>Young</i>        | 18 – 30    |
| 2. <i>Lower middle</i> | 31 – 50    |
| 3. <i>Upper middle</i> | 51 – 67    |
| 4. <i>Old</i>          | 67 >       |

Table 2: Generation categories

The last categorization is done on level of education. To simplify the different levels of education in the Netherlands, these have been categorized in 3 levels.

| <i>Category</i>  | <i>Level of education</i>                                                                                             |
|------------------|-----------------------------------------------------------------------------------------------------------------------|
| 1. <i>Low</i>    | Primary school, pre-vocational secondary education (vmbo).                                                            |
| 2. <i>Middle</i> | Secondary vocational education (mbo-2, 3, 4), general secondary education (havo), and pre-university education (vwo). |
| 3. <i>High</i>   | Bachelor/ master at university (of applied sciences) (hbo and wo).                                                    |

Table 3: Level of education categories

## 3.2 Analyses

### 3.2.1 Mean analyses

For the three categorizations, income, generations, and education an ANOVA will be conducted to determine whether the differences between the levels of the categories are significant. If these results are significant post-hoc tests (Tukey's HSD) will be conducted to determine the levels of differences between the categories and their significance.

After determining whether the differences between categories are significant and what these levels are, this research will conduct more specified analyses on the generations. Expected positive effects of income and education on broad wellbeing are well documented in existing literature. The effect of age on broad wellbeing, however, is much discussed, but no consensus

has yet been reached. To add to this discussion, further analyses will be conducted on the relationship between age and broad wellbeing.

### 3.2.2 Shapley Value regression

To be able to discuss more specific policy interventions to reduce the inequality in broad wellbeing it is needed to research which dimensions of broad wellbeing have the largest impact on the overall score. This gives opportunity to determine on which dimension policy should be focused and could be most productive. This will be researched by conducting a Shapley value regression of the 11 dimensions scores on the weighted broad wellbeing index. A Shapley value regression takes multicollinearity into account and solves the problem of reliability of a linear regression. It determines the relative contribution of the independent variables to the outcome. This is done by conducting all possible combinations of regression analyses with all explanatory variables. From this the contributing levels are determined depending on the interaction of variables with each other. In this research it will help determine the level of contribution of the 11 dimensions to the different outcome values of the four generations.

The linear regression as the base for the Shapley value regression is the following.

$$(1) \quad BWI_{100} = \beta_0 + \beta_1 \text{Subj. Wellbeing} + \beta_2 \text{Safety} + \beta_3 \text{Pers. Development} + \beta_4 \text{Housing} + \beta_5 \text{Environment} + \beta_6 \text{Health} + \beta_7 \text{Income} + \beta_8 \text{Job Security} + \beta_9 \text{WorkLife Balance} + \beta_{10} \text{Social Contacts} + \beta_{11} \text{Social Involvement} + \varepsilon$$

It is to be expected that analyzing the contributing levels of the dimensions on the weighted broad wellbeing index will partially represent the weights assigned to the dimensions in the creation of the broad wellbeing index. However, these weights combined with the contribution of the dimensions is the desired outcome of the analyses to be able to determine the most important dimensions for policy intervention. Therefore, this inclusion of these weights is not viewed as a possible issue, but it is acknowledged as a possible limitation to the results.

### 3.2.3 Linear regression and Shapley value regression

To determine the relative value of indicators for broad wellbeing a linear regression is conducted. Included are generation (age category dummy variables), gender (binary variable, 1 female, 0 male), income level (income category dummy variables), level of education (education category dummy variables), being a homeowner (binary variable, yes/ no), having a

health disability (binary variable, yes/ no), being employed (binary variable, yes/ no for having an income from work/ employment) and the level of amenities in the neighborhood (dummy variables describing a scale from 1 – 7, with 1 very low and 7 very high).

Because the broad wellbeing index is a normalized value (between 0 and 1) it is expected to estimate small coefficients, to solve this issue the regression is ran with  $BWI_{100}$  as dependent variable. This is the normalized broad wellbeing index times 100. This makes analyzing the coefficients in percentage point possible. This gives the following equation.

$$(2) \quad BWI_{100} = \beta_0 + \beta_1 Female + \beta_2 Generations + \beta_3 Income + \beta_4 Education + \beta_5 Employed + \beta_6 Health Disability + \beta_7 Homeowner + \beta_8 Amenities + \varepsilon$$

For simplification in notation the category dummy variables, generations, income, education, and amenities are noted as one variable each, however, the consist of dummies accordingly to their categorization (see paragraph 3.1.3 and as described above) with their corresponding coefficients. In each of those variables the reference dummy variable is chosen based on the desired comparisons. For income the reference category is the 4<sup>th</sup> category, which represents the modal income. For education, the middle category is the reference variable, leaving room to compare the effect of having eighter higher of lower education on broad wellbeing. Lastly, for amenities the middle level of amenities in the neighborhood (category 4) is chosen as reference.

It is chosen to only include these indicators for broad wellbeing into the regression and not all the variables from the survey. This is because the main intention of this research is to determine the inequalities in broad wellbeing in the Netherlands and to discus possible policy interventions to decrease these inequalities. The research by Bijkerk and Raspe (2024) does include all variables from the survey and they find that being a homeowner, having a health disability, having paid work, and the level of amenities in the neighborhood are the strongest indicators for broad wellbeing. Therefore, it is chosen to include these variables into the regression analysis. Logically, it is expected that the (adjusted) R-squared will be low and therefore the explanatory power of the model is also lower than desired. This is because of omitted variables.

Besides a linear regression, a Shapley Value regression is conducted to determine the contributing levels of the variables and indicators while controlling for collinearity. For this analysis, the dummy variables for generation are replaced with a numerical variable “age”. This

represents the actual age of the participants. Education is represented by the variable “higher education”, a binary variable indicating whether the participant has higher education or not. Income is represented by a factor variable including all 7 income levels. This Shapley value now indicates the contributing level generally of all income levels, this reduces its explanatory value. However, this analysis is mostly done to research the explanatory value of the indicators ‘employed’, ‘having a health disability’, and ‘being a homeowner’. These variables will still be explained on the level that is desired.

This does not go for the level of amenities. This variable is included in the Shapley value regression as a single factor variable containing values of 1-7 indicating the 7 levels of amenities. With this the contributing effects of the different levels of amenities is lost, but the Shapley value can still indicate the power of the overall variable amenities and the importance it has on explaining the variance in the outcome.

## 4. Results

This chapter will discuss the results from the conducted statistical analyses in terms of values and significance. Furthermore, comparisons between results will be made to create insights needed for the translation to policy interventions. The policy interventions will be discussed in chapter 5.

### 4.1 Mean analyses

#### 4.1.1 Income

| <i>Income</i>              | <i>Mean broad wellbeing score (0-100)</i> |
|----------------------------|-------------------------------------------|
| 1. Minimum                 | 49.44                                     |
| 2. Below modal             | 52.99                                     |
| 3. Almost modal            | 58.85                                     |
| 4. Modal                   | 61.50                                     |
| 5. Between 1 and 2 x modal | 63.70                                     |
| 6. 2 x modal               | 66.41                                     |
| 7. > 2x modal              | 68.15                                     |

Table 4: Mean broad wellbeing score of income categories.

As can be already observed from table 4 the two lowest categories score below sufficient (55/100, based on the Dutch educational report mark scale) on the mean broad wellbeing. And as expected, the mean BWI score increases for the higher income categories. However, to determine if these differences are significant, the results from the ANOVA test should be considered.

|                  | <i>Df</i> | <i>Sum Sq</i> | <i>Mean Sq</i> | <i>F-value</i> | <i>Pr(&gt;F)</i> |
|------------------|-----------|---------------|----------------|----------------|------------------|
| <i>Income</i>    | 6         | 648345        | 108057         | 320.5          | <2e-16 (***)     |
| <i>Residuals</i> | 22123     | 7459895       | 337            |                |                  |

Table 5: ANOVA results for income categories.

Significance codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

From table 5 it can be concluded that there are significant differences between the categories with a confidence level of  $< 0.001$ . To determine what categories differ significant and what the value of those differences are, the post-hoc test Tukey's HSD will be analyzed.

As can be seen from table 6 all differences are statistically significant with a confidence level of  $< 0.001$ , except the difference between income category 6 and 7. This is significant on the confidence level of 0.1.

| <i>Income</i> | <i>Diff</i> | <i>Lwr</i> | <i>Upr</i> | <i>P adj</i> |
|---------------|-------------|------------|------------|--------------|
| 2 – 1         | 3.5556      | 1.9248     | 5.1863     | 0.000        |
| 3 – 1         | 9.4112      | 7.7024     | 11.1200    | 0.000        |
| 4 – 1         | 12.0684     | 10.4247    | 13.7121    | 0.000        |
| 5 – 1         | 14.2585     | 12.6720    | 15.8451    | 0.000        |
| 6 – 1         | 16.9674     | 15.0046    | 18.9302    | 0.000        |
| 7 – 1         | 18.7147     | 16.7808    | 20.6486    | 0.000        |
| 3 – 2         | 5.8557      | 4.5967     | 7.1146     | 0.000        |
| 4 – 2         | 8.5129      | 7.3437     | 9.6820     | 0.000        |
| 5 – 2         | 10.7030     | 9.6157     | 11.7904    | 0.000        |
| 6 – 2         | 13.4118     | 11.8251    | 14.9986    | 0.000        |
| 7 – 2         | 15.1591     | 13.6083    | 16.7100    | 0.000        |
| 4 – 3         | 2.6572      | 1.3814     | 3.9329     | 0.000        |
| 5 – 3         | 4.8473      | 3.6461     | 6.0486     | 0.000        |
| 6 – 3         | 7.5561      | 5.8893     | 9.2230     | 0.000        |
| 7 – 3         | 9.3035      | 7.6707     | 10.9361    | 0.000        |
| 5 – 4         | 2.1902      | 1.0834     | 3.2969     | 0.000        |
| 6 – 4         | 4.8990      | 3.2989     | 6.4990     | 0.000        |
| 7 – 4         | 6.6463      | 5.0817     | 8.2108     | 0.000        |
| 6 – 5         | 2.7088      | 1.1675     | 4.2501     | 0.000        |
| 7 – 5         | 4.4561      | 2.9517     | 5.9605     | 0.000        |
| 7 – 6         | 1.7473      | 0.1497     | 3.6443     | 0.0943       |

Table 6: Tukey's HSD outcome of income categories.

The largest difference between adjacent categories is between income category 2 and 3. The results show that people with an income of almost modal (category 3) score 5.86 higher on their mean broad wellbeing index than people who have a below modal income. The difference between people with an income of twice the modal income and people with higher than twice the modal income is the smallest measured difference (1.747) this is in line with existing literature where decreasing marginal benefits of income on wellbeing is often described.

Besides comparing the adjacent categories, it is also interesting to see what the differences between modal income and other categories is. When looking at the difference between minimum income and modal income, the difference in mean broad wellbeing is 12.07.

People who have a modal income score 12 points higher on their broad wellbeing score than people with minimum wage income. That would mean a 24.4% increase of the broad wellbeing score if people would go from a minimum income to a modal income. This is a large increase, especially considering the mean score for minimum income to be 49.44 which is, when converted to a grade from 1-10 significantly below sufficient (5.5). This large difference and the low scores that come with minimum and below modal income give room for policy discussion and interventions to try and reduce these differences.

#### 4.1.2 Education

For education, 3 categories have been analyzed. In table 7 the mean broad wellbeing scores per category have been noted.

| <i>Education</i> | <i>Mean broad wellbeing score (0-100)</i> |
|------------------|-------------------------------------------|
| 1. <i>Low</i>    | 58.53                                     |
| 2. <i>Middle</i> | 59.74                                     |
| 3. <i>High</i>   | 63.17                                     |

Table 7: Mean broad wellbeing score of education categories.

To determine whether these differences in mean broad wellbeing are significant, the results from the ANOVA test are viewed (table 8).

|                  | <i>Df</i> | <i>Sum Sq</i> | <i>Mean Sq</i> | <i>F-value</i> | <i>Pr(&gt;F)</i> |
|------------------|-----------|---------------|----------------|----------------|------------------|
| <i>Education</i> | 2         | 139968        | 69984          | 191.2          | <2e-16 (***)     |
| <i>Residuals</i> | 39406     | 14420280      | 366            |                |                  |

Table 8: ANOVA results of the education categories.

Significance codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Again, this ANOVA indicates that the differences between categories are significant on the confidence level of <0.001.

| <i>Education</i> | <i>Diff</i> | <i>Lwr</i> | <i>Upr</i> | <i>P adj</i> |
|------------------|-------------|------------|------------|--------------|
| 2 – 1            | 1.2165      | 0.5503     | 1.8827     | 5.56e-05     |
| 3 – 1            | 4.6395      | 3.9669     | 5.3121     | 0.000        |
| 3 – 2            | 3.4231      | 2.9311     | 3.9150     | 0.000        |

Table 9: Tukey's HSD outcome of education categories

As can be seen in table 9, all three differences between the levels of education are significant on the confidence level of  $<0.001$ . What can be seen is that the mean difference between low and middle level of education is significantly lower than the difference between middle and high level of education. However, the differences do indicate the expected positive effect of education on broad wellbeing. The difference between the size of this effect between the categories could present to be useful in policy discussions. The results show that increasing the level of education from low to middle has significantly lower positive effects than increasing from middle to high. This difference indicates that the ongoing discussions about making higher education more accessible are important for the improvement of the national broad wellbeing.

#### 4.1.2 Generations

From the data collected with the broad wellbeing survey, the following mean broad wellbeing scores on a scale from 0 – 100 have been found for the four generations.

| <i>Generation</i>    | <i>Mean broad wellbeing score (0 – 100)</i> |
|----------------------|---------------------------------------------|
| 1: 18 – 30 years old | 59.06                                       |
| 2: 31 – 50 years old | 59.87                                       |
| 3: 51 – 67 years old | 61.30                                       |
| 4: 68 – 99 years old | 64.18                                       |

Table 10: Mean broad wellbeing score of generation categories

Table 10 shows that the youngest generation has the lowest broad wellbeing score (59.06). The highest score is found for the oldest generation, as was expected based on existing literature (Bijkerk & Raspe, 2024; Blanken & Verhoeven, 2023). To determine what the differences are and whether these are significant an ANOVA test and a post-hoc Tukey's HSD test have been conducted.

The ANOVA test shows that the differences between the generations are significant (p-value  $<0.001$ ), as can be seen in table 11.

|                    | <i>Df</i> | <i>Sum Sq</i> | <i>Mean Sq</i> | <i>F-value</i> | <i>Pr(&gt;F)</i> |
|--------------------|-----------|---------------|----------------|----------------|------------------|
| <i>Generations</i> | 3         | 109241        | 36414          | 99.66          | $<2e-16$ (***)   |
| <i>Residuals</i>   | 41476     | 15155101      | 365            |                |                  |

Table 11: ANOVA results from generation categories

Significance codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

As can be seen in table 12, the difference of 0.8017 between generation 1 and 2 is not significant, because the adjusted p-value is 0.1537, which is larger than the minimum significance level of 0.10, especially when the preferred significance level for this research is 0.001. The other differences do seem to be significant.

| <i>Generations</i> | <i>Diff</i> | <i>Lwr</i> | <i>Upr</i> | <i>P adj</i> |
|--------------------|-------------|------------|------------|--------------|
| 2 – 1              | 0.8017      | -0.1800    | 1.7833     | 0.1537       |
| 3 – 1              | 2.2302      | 1.2914     | 3.1689     | 0.000        |
| 4 – 1              | 5.1102      | 4.0924     | 6.1279     | 0.000        |
| 3 – 2              | 1.4285      | 0.8425     | 2.0145     | 0.000        |
| 4 – 2              | 4.3085      | 3.6028     | 5.0142     | 0.000        |
| 4 – 3              | 2.8800      | 2.2354     | 3.5246     | 0.000        |

Table 12: Tukey's HSD outcome of generation categories

The differences in the mean outcomes become increasingly larger when comparing older generations to each other. The largest difference is between the third (upper middle) and fourth (old) generation. This difference is 2.88. This difference could be explained by the increase in leisure time caused by retirement, and the improvement of work-life balance. However, to determine these relations, the Shapley value regression results must be discussed.

## 4.2 Shapley value regression

Table 13 presents the Shapley values from the Shapley value regression for the general population. These values describe the contribution power of the dimensions on the broad wellbeing index for the general population. To determine what dimensions of broad wellbeing contribute the most to these differences in broad wellbeing, the Shapley Value regression has been conducted for all generations. These values have been noted table 14.

| <i>Dimension</i>            | <i>Std. Shapley value</i> |
|-----------------------------|---------------------------|
| <i>Subj. wellbeing</i>      | 0.1648                    |
| <i>Safety</i>               | 0.1079                    |
| <i>Personal development</i> | 0.0268                    |
| <i>Housing</i>              | 0.1140                    |
| <i>Environment</i>          | 0.0619                    |
| <i>Health</i>               | 0.1275                    |
| <i>Income</i>               | 0.1324                    |
| <i>Job security</i>         | 0.0388                    |
| <i>Work-life balance</i>    | 0.0723                    |
| <i>Social contacts</i>      | 0.1032                    |
| <i>Social involvement</i>   | 0.0507                    |

Table 13: Standardized Shapley Values for the general population

As can be seen from the general population Shapley values, the most contributing dimensions are subjective wellbeing, income, and health. Housing, social contacts, and safety are also largely contributing dimensions. Expected is to see similar trends in the Shapley values for the generations (table 14).

| <i>Dimension</i>            | <i>Young</i> | <i>Lower middle</i> | <i>Upper middle</i> | <i>Old gen</i> |
|-----------------------------|--------------|---------------------|---------------------|----------------|
| <i>Subj. wellbeing</i>      | 0.1720       | 0.1560              | 0.1570              | 0.1650         |
| <i>Safety</i>               | 0.1049       | 0.1113              | 0.0971              | 0.1236         |
| <i>Personal development</i> | 0.0425       | 0.0344              | 0.0306              | 0.0206         |
| <i>Housing</i>              | 0.0867       | 0.1048              | 0.1139              | 0.1293         |
| <i>Environment</i>          | 0.0486       | 0.0579              | 0.0612              | 0.0673         |
| <i>Health</i>               | 0.1267       | 0.1204              | 0.1264              | 0.1300         |
| <i>Income</i>               | 0.1083       | 0.1131              | 0.1320              | 0.1340         |
| <i>Job security</i>         | 0.0925       | 0.0791              | 0.0525              | 0.0160         |
| <i>Work-life balance</i>    | 0.0763       | 0.0846              | 0.0821              | 0.0416         |
| <i>Social contacts</i>      | 0.1010       | 0.0863              | 0.0971              | 0.1219         |
| <i>Social involvement</i>   | 0.0405       | 0.0519              | 0.0504              | 0.0484         |

Table 14: Standardized Shapley Values per generation and general society

#### 4.2.1 Generation 1: 18 – 30 years old (young)

Table 14 shows that for the youngest generation subjective wellbeing is the most heavily contributing broad wellbeing dimension to the overall broad wellbeing indicator. The second most contributing is health and after that it is income. Also, safety and social contacts have relatively higher scores. Personal development and social involvement contribute the least to the broad wellbeing indicator.

It is remarkable that dimensions such as housing, environment, and work-life balance are not in the highest levels of contribution. In current popular information sources, such as the Dutch national news and papers, the matter of the younger generation caring for the environment more than older generations is often discussed. As well as the pressing affordable housing shortage for first-time buyers and the increased pressure at work.

However, it must be noted that for housing this discussion often refers to the lower half of the lower middle generation instead of the young generation. 18-year-old individuals are (generally) not looking to buy a house, therefore, the issues with the housing market will have a lower effect on the lower half of the first generation. This could explain the relatively low contributing factor of housing in this generation compared to the image created by the Dutch media.

#### 4.2.2 Generation 2: 31 – 50 years old (lower middle)

For the lower middle generation, the Shapley values are distributed relatively comparable with the values of the young generation. Again, subjective wellbeing, health, and income have the highest scores. However, job security has become less contributing. Furthermore, the increase in importance of housing is expected. Having a suitable house for an individual's situation becomes more important when not only your own preferences must be considered. In this generation people on average start with having children, making a good and suitable home more important for individuals. This shows that the expectation about a high contributing factor of housing for younger generations does become more present in this generation.

#### 4.2.3 Generation 3: 51 – 67 years old (upper middle)

The Shapley values for the third generation also show that subjective wellbeing, income, and health are the most contributing dimensions. Also, housing is now highly contributing. It is interesting to see is that job security and personal development is decreasing in its contributing

levels for older generations. This could be expected as individuals are becoming more set in their habits and interests, which also complies to their work interests. For older generations it is becoming less interesting to retrain to a different field or occupation, as the time they must spend in that new occupation is getting significantly smaller. The ‘investment’ in their personal development is becoming less of a priority.

#### 4.2.4 Generation 4: 67 – 99 years old (old)

For the oldest generation of this research some interesting results were found. The three most contributing dimensions are still subjective wellbeing, health, and income, as is expected. However, housing is now the fourth most contributing dimension. This is a relatively large difference from the contributing factor of housing in the young generation. From the data it can be observed that when becoming older, housing is becoming more contributing for respondents in the determination of their broad wellbeing.

Another interesting observation is the decreasing contribution of job security. Logically, for the oldest generation, which starts at the age of the Dutch retirement age, this is the lowest of all generations. They are not dependent on their job for income anymore. However, we can also see a decreasing importance with getting older when comparing the first three generations with each other.

Also, social contacts have become more contributing. In the first three generations this value is relatively comparable. The Shapley value for safety is also largest for the old generation when compared to the other generations.

#### 4.2.5 Translation to policy

The information retrieved from the Shapley value regressions is important for the application of policy. The level of contribution to the broad wellbeing score gives insight in which dimensions have the largest impact when adjusted by policy. The mean broad wellbeing scores per dimension per generation (Appendix B) are important as well when discussing policy. For example, safety is a highly contributing dimension in all four generations, an improvement in safety would therefore be a highly contributing improvement. However, safety is the highest scoring dimension for all four generations, so improvement could be unnecessary.

Besides the Shapely values and the mean broad wellbeing scores, the average weight assigned to the dimensions (Appendix C) needs to be considered. This sheds light on the important dimensions for the respondents and society.

### 4.3 Linear regression

Table 15 shows the results from the linear regression as described in chapter 3 (equation 2).

The regression results suggest that several predictors significantly affect the dependent variable. The relatively low value of 0.2647 for the Adjusted R-squared means that this model explains approximately 26.47% of the variance in the dependent variable. This indicates that while the independent variables are statistically significant, there is still a large portion of the variance in the dependent variable that is not explained by the model, suggesting the potential influence of other unmeasured factors. This is also explained in the research of Bijkerk and Raspe (2024), they find that a little more than half of the differences in experienced broad wellbeing cannot be explained by the variables in the survey from RaboResearch. This is a significant smaller number than the 73% of our regression. This is caused by not including all variables from the survey into the regression analysis as explained in chapter 3.

| <i>BWI_100</i>                 | <i>Coefficient</i> | <i>Std. Error</i> | <i>T-value</i> | <i>Pr(&gt; t )</i> | <i>Sign.</i> |
|--------------------------------|--------------------|-------------------|----------------|--------------------|--------------|
| <i>Intercept</i>               | 34.93896           | 0.98998           | 35.292         | < 2e-16            | ***          |
| <i>Female</i>                  | 3.03766            | 0.29862           | 10.172         | < 2e-16            | ***          |
| <i>Age</i>                     | 0.22063            | 0.01202           | 18.361         | < 2e-16            | ***          |
| <i>Minimum income</i>          | -5.71054           | 0.73894           | -7.728         | 1.17e-14           | ***          |
| <i>Below modal</i>             | -4.01781           | 0.45739           | -8.784         | < 2e-16            | ***          |
| <i>Almost modal</i>            | -0.69555           | 0.49224           | -1.413         | 0.15767            |              |
| <i>Between 1x and 2x modal</i> | 1.64252            | 0.39268           | 4.183          | 2.90e-05           | ***          |
| <i>2x modal</i>                | 2.53722            | 0.64561           | 3.930          | 8.54e-05           | ***          |
| <i>&gt; 2x modal</i>           | 4.34249            | 0.62470           | 6.951          | 3.78e-12           | ***          |
| <i>Low education</i>           | 1.23202            | 0.42715           | 2.884          | 0.00393            | **           |
| <i>High education</i>          | 0.07192            | 0.31383           | 0.229          | 0.81875            |              |
| <i>Employed</i>                | 4.43090            | 0.34373           | 12.891         | < 2e-16            | ***          |
| <i>Health disability</i>       | -7.44275           | 0.29493           | -25.236        | < 2e-16            | ***          |
| <i>Homeowner</i>               | 4.66151            | 0.32940           | 14.151         | < 2e-16            | ***          |
| <i>No amenities</i>            | -2.78320           | 2.06252           | -1.349         | 0.17723            |              |
| <i>Little amenities</i>        | -1.76735           | 1.61710           | -1.093         | 0.27445            |              |
| <i>Some amenities</i>          | -4.96695           | 1.06252           | -4.657         | 2.97e-06           | ***          |
| <i>Above average amenities</i> | 6.46918            | 0.56666           | 11.416         | < 2e-16            | ***          |
| <i>High amenities</i>          | 13.91983           | 0.54430           | 25.574         | < 2e-16            | ***          |
| <i>Very high amenities</i>     | 21.75026           | 0.61007           | 35.652         | < 2e-16            | ***          |

Table 15: linear regression (equation 2)

Significance codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#### 4.3.1 Age

As was expected, there is a significant positive relationship between age and broad wellbeing. The coefficient of 0.22063 indicates that an increase in age by 1 year, the broad wellbeing index increases 0.22 percentage point. This is a very small increase, but when taking this effect for a whole generation, the shift from one generation to another is expected to have a larger effect.

#### 4.3.2 Income

For income, the regression indicates a significant positive effect, as was expected, between income and broad wellbeing. All categories are significant on the confidence level of  $<0.001$  except for the third income category (almost modal). The larger differences observed in the mean analyses of the income categories between the lower income categories (1, 2, and 3) compared to the differences between the higher income categories (5, 6, and 7) seem to have become smaller by the addition of other indicators. However, they are still present, as was expected based on existing literature, Stevenson and Wolfers (2013) describe a diminishing marginal return from income on (broad) wellbeing.

#### 4.3.3 Education

Somewhat unexpectedly, the regression shows that having a low education increases the broad wellbeing in comparison to having a middle level education. This is significant with the confidence level of 0.01. Also, having a higher education shows to have a very small positive effect on broad wellbeing, however, this is not significant. It appears that the positive effect of education is not found, and the negative effect relationship of education and wellbeing is present when increasing education from a low to a middle level. However, it must be noted that with this large sample size it is expected (and necessary) to find very significant results, the relatively low significance score for this negative relationship should therefore be considered, and the conclusions should be made with caution.

#### 4.3.4 Gender

The regression shows that being female indicates a very significant positive effect on broad wellbeing. With a coefficient of 3.038 this appears to be a relatively large positive effect.

#### 4.3.5 Employment

Being employed also indicates to be positively related to broad wellbeing. The coefficient indicates that being employed increases the broad wellbeing index with 4.43 percentage points. This effect was expected and could be explained by the effect ‘being employed’ has on the dimension income and job security. Having paid work has a direct effect on those dimensions and could even have an indirect positive effect on housing and social contacts. Housing depends on income, and for many people the workplace is a great source for social contacts. Furthermore, literature indicates a positive relationship between income and health, so it could be argued that having paid work could also positively influence one’s health.

#### 4.3.6 Health disability

Having a health disability is estimated to have a relatively large negative effect with broad wellbeing which corresponds to the results of Bijkerk and Raspe (2024). The model indicates a relatively large significant negative effect. It shows that having a health disability decreases broad wellbeing with 7.44 percentage point. Bijkerk and Raspe (2024) find a coefficient of -0.011, which is on a broad wellbeing index of 0-1. When scaling up to 0-100, this coefficient would be -1.1, which is significantly smaller than the results from this analysis. However, this could be caused by using the weighted broad wellbeing index, and not including all variables from the survey.

The relatively large size of the coefficient can be explained by its direct and indirect effects on different dimensions of broad wellbeing. It has a direct effect on the dimension health, but also affects income. It could furthermore also affect social contacts and housing. Housing represents the suitability of a home to the life of the individual, having a health disability could imply that the individual needs special resources in its house, if those needs are not (completely) met, this could negatively affect the score of the housing dimension. And lastly, it could also impact the subjective wellbeing of the individual. This dimension represents the subjective view of the individual if he or she is happy, having a chronic health disability could have a negative effect on this perception.

#### 4.3.7 Homeownership

The regression analysis shows a significant positive effect of being a homeowner on broad wellbeing. It predicts that being a homeowner increases broad wellbeing with 4.66 percentage

point. This indicator again has multiple dimensions it could affect. To start with housing and subjective wellbeing. But it also indicates a certain income and job security to be able to buy a house.

#### 4.3.8 Amenities in the neighborhood

Lastly, the effect of the level of amenities in the neighborhood is shown in table 15. For this analyses, dummy variables are used to indicate different levels of quality and presence of amenities in the neighborhood of the participants. The two lowest categories present negative effects (in reference to the average level). However, these are both not significant. The positive effect between the level of amenities and broad wellbeing as expected based on the results of Bijkerk and Raspe (2024) is present when looking at the other categories. Having a higher level of amenities in the neighborhood increases the broad wellbeing between 6 and 7.5 percentage points per increase of level, all significant on the confidence level of  $<0.001$ .

This is significantly higher than the coefficient found by Bijkerk and Raspe (2024). They have found a coefficient of 0.04 (4.0 rescaled) for amenities. However, they do not distinguish between the levels of amenities. The large coefficients also indicate that having these amenities in the neighborhood are expected to be a strong indicator for broad wellbeing, which is in line with the results of Bijkerk and Raspe (2024).

#### 4.3.9 Shapley Value regression on single indicators

From the Shapley value regression on the describes linear regression, the following outcomes are found. Table 16 shows the standardized Shapley values per variable. These values represent the contribution to the outcome on a scale from 0-1.

| <i>Variable</i>          | <i>Std. Shapley Value</i> |
|--------------------------|---------------------------|
| <i>Female</i>            | 0.0100                    |
| <i>Age</i>               | 0.0501                    |
| <i>Income</i>            | 0.1528                    |
| <i>Higher education</i>  | 0.0096                    |
| <i>Employed</i>          | 0.0406                    |
| <i>Health Disability</i> | 0.1611                    |
| <i>Homeowner</i>         | 0.0956                    |
| <i>Amenities</i>         | 0.4800                    |

Table 16: Standardized Shapley values for the linear regression

Interesting is to observe the very large contribution power of income and ‘health disability’. This is consistent with our observations from the Shapley values from the dimensions, discussed in paragraph 4.2, where the dimensions income and health are two of the largest contributing dimensions. These findings are also in line with the results from Blanken and Verhoeven (2023). They have found that income and health are two of their strongest indicators for broad wellbeing, together with connection to the neighborhood, self-reliance, and trust in the government and fellow humans. Furthermore, this result was also found by Bijkerk and Raspe (2024). They describe having a (chronic) health disability as the largest negative influence on the social aspect of broad wellbeing. Indicating it influences the dimensions subjective wellbeing, health, work-life balance, and social contacts.

However, these values do not compare to the contribution value of level of amenities. This shows to be the largest contributing indicator to the variance in broad wellbeing in this regression. A large Shapley value was expected based on Bijkerk and Raspe (2024), but it was not expected to be the largest, and with this large of a difference from the other variables. It could be caused by the fact that the variable “amenities” is a factor variable, and therefore all the different levels of amenities are captured in one Shapley value. The specific Shapley value does not explain any differences between the amenities, but it does indicate a great influence of the variable on the outcome.

Furthermore, being a homeowner also has relatively large contribution value. This is also in line with the findings of Bijkerk and Raspe (2024). They had found that being a homeowner and having a paid job were strong indicators for broad wellbeing. The Shapley value for ‘paid work’ is relatively small in comparison to the other indicators. Based on these results, it would be beneficial for policy makers to be focusing on ideas that can contribute to improving the indicators amenities, being a homeowner, and having a health disability, where for the last indicator the negative relation needs to be remembered.

Lastly, based on the research of Blanken and Verhoeven (2023), it was expected that age (generation for the research of Blanken and Verhoeven) would also be a strong indicator for broad wellbeing. However, the relatively small Shapley value indicates that the numerical variable age has a small contributing power to the outcome.

## 5. Policy

This chapter builds on the discussion of key dimensions, their impact on the broad wellbeing index, and specific indicators of broad wellbeing. These insights will be utilized to explore potential policy interventions aimed at reducing broad wellbeing inequalities in the Netherlands and enhancing the national broad wellbeing score. The primary goal of this chapter is to propose a policy framework that addresses these disparities and fosters overall improvement in wellbeing.

The differences in broad wellbeing scores between generations could potentially be addressed by implementing widely discussed policy measures such as increasing the minimum wage, making higher education more accessible to individuals of different socioeconomic levels, and decreasing income taxes (particularly in the lower tax brackets) while increasing the wealth tax. While these policies remain important topics of discussion, this paper aims to explore a more specific and innovative policy proposal.

### 5.1 Policy objectives

As discussed in chapter 4, there are significant differences in broad wellbeing between income categories as well as between generations and levels of education. These results do not stand on their own and are correlated, as was expected. For example, individuals from the young generation often have lower incomes compared to the other generations as well as individuals with lower education. With these insights and with the knowledge from existing literature, policy to decrease the inequalities between certain societal groups is often based on income. This is with good reason, as explained earlier, income has multiple paths to affect broad wellbeing and has a large contributing factor. So, also for this policy intervention, income is an important factor. But it also aims to improve other dimensions of broad wellbeing of multiple generations such as social involvement and social contacts.

According to the research by Blanken and Verhoeven (2023), "connection with the neighborhood" emerged as a significant indicator of broad wellbeing. It is assumed that enhancing the RaboResearch dimension of social involvement could yield similar positive effects to those associated with a stronger "connection with the neighborhood."

## 5.2 Policy idea and set-up

The intention of this policy is to promote volunteer work by implementing a new income tax discount when having met the requirement of a certain amount of hours of volunteer work in a year. The aim is to improve income, social involvement, and possibly social contacts, for the four generations. This could be done with several policy interventions, but it is chosen to create a new discount on the first income tax bracket to exempt part of the yearly income from being taxed when the individual has participated in volunteer work. Table 17 shows the current income taxation brackets in the Netherlands (for an individual below retirement age). This explains that for every euro of income below €75,518.- a citizen of the Netherlands pays 36.97% income tax. When the yearly income of this individual is above this cutoff, (s)he pays 49.50% income tax for every euro earned more.

| <i>Bracket</i> | <i>Taxable income</i> | <i>Percentage</i> |
|----------------|-----------------------|-------------------|
| 1              | < €75,518.-           | 36.97%            |
| 2              | ≥ €75,518.-           | 49.50%            |

Table 17: tax brackets in the Netherlands (below retirement age)

With the new tax discount, it is intended to decrease the tax paid in bracket 1. For all individuals this will be done by subtracting an amount from the taxable income in bracket 1 before taxes. The amount depends on the hours of volunteer work in a year and will always be subtracted for the income taxed in bracket 1. So, if an individual has an income of more than €75,518,- (s)he will pay the same amount of taxes in bracket 2 as (s)he would have without the discount. With this, it is intended to relatively benefit the lower income categories the most.

By offering people this discount when participating in volunteer work, their disposable income will increase. This would logically increase their income dimension, but it will also improve their social involvement dimension. Furthermore, it will give opportunity to increase their social contact dimension if they experience their volunteer work as a socially positive environment.

Additionally, this policy would not only be beneficial for low-income categories. For individuals with higher than modal income, this policy could also give opportunity to increase in different dimensions. Besides the earlier describe improvements, the individuals with yearly incomes higher than €75,518.- could also benefit from decreasing their employment hours and using that time for volunteer work.

Decreasing their working hours would decrease their gross income. This will decrease their income taxed in the higher tax bracket. This results in a net decrease in income of about 50 cents per euro. If they use their 'new free time' for volunteer work, they receive a tax discount on their lowest tax bracket. This discount is about 37 cents per euro, making their net loss only 13 cents per euro. This would mean that they could trade time from work for time for volunteering and giving back to society for only 13 cents.

Possibly, this could result in an increase in their work-life dimension, if they decrease their working hours more than they will spend on volunteer work. However, this effect could also be the other way around when the volunteer work is taking away from their leisure time. These effects could, logically, also occur in lower income categories.

Furthermore, it is expected that this could have larger positive effects on the young generation than the other three generations, because on average the young generation does not have children (yet). This could result in more free time and less financial responsibilities and would therefore create a higher likelihood for the young generation to participate in volunteer work, possibly decreasing the difference in experienced broad wellbeing between the young generation and the others. Furthermore, as discussed in chapter 2, the young generation on average has a lower income, making these benefits relatively larger for them.

Besides the direct effects on broad wellbeing and society, it is important to also consider the indirect effects this policy could have on society. The increase in volunteers would have expected positive effects on society. Firstly, it could increase the social contacts dimension for the old generation. Having more volunteers in elderly care, will create more possibilities for personal connection and attention for the elderly citizens. Secondly, this could also benefit the (mental) wellbeing of workers in these fields by decreasing their workload, since volunteers could take on tasks which do not require special knowledge and would leave only the profession-specific tasks to the professionals. These benefits could decrease burn-out and other (mental) wellbeing related costs for society and government.

### 5.3 Directions for future research

The set-up of this tax discount must be researched to assess its affectability and to determine the optimal levels of discount to determine the feasibility. There would be several options for the application of this discount, one of those could be to impose a cumulative system in which more hours of volunteer work result in a higher discount. It could also be decided to stimulate

volunteering in urgent fields by offering a higher discount for certain types of volunteer work, such as in elderly or disabled care.

Another aspect that needs to be researched is the most optimal way to execute the payout of the discount. Possible options could be to implement it as a tax return after filing the taxes, as is now already happening for other tax related situations and discounts. This would lead to a yearly 'bonus' and could pose to assist individuals in creating more financial security by acting as a way of saving. However, it could also be implemented as a direct discount on the taxes withheld per month (by the employer) which would result in a higher monthly income. This could simply result in higher income behavior and benefits. Both could be argued to have positive and negative effects, and these could also differ per income category and generation. That is why research is necessary to determine the most optimal form, set-up, and feasibility. Additionally, the expected positive and negative effects need to be researched further.

## 5.4 Limitations

For this policy to be socially beneficial, the negative social impacts may not outweigh the positive effects. There are some important negative consequences to consider. Firstly, it could motivate people to stop with activities contributing to personal development to use that time to volunteer, or it could put more strain on peoples work-life balance as discussed earlier. However, based on the average weights the respondents have assigned to the dimensions (Appendix C), a higher income will have a larger (positive) effect on the overall broad wellbeing than a worse work-life balance or less personal development will have (negative). However, it should not be easily dismissed when implementing the policy.

Secondly, the discount will decrease the (income) tax revenues of the government and the implementation and executing will be a source of costs for the government. This could result in cuts on government expenditures in other fields to reduce the budget deficit of the government. These cuts could have larger negative effects on the overall national broad wellbeing than the positive effects this policy creates. Further research must determine the feasibility and the possible negative effects of this policy to determine if the expected positive effects will reach the society.

## 5.5 Income tax discount vs. wages for volunteers

Another policy option to increase income for volunteering citizens could have been to introduce government-funded wages for volunteer work. However, several factors favored the implementation of a new income tax discount. A key argument for this choice is rooted in behavioral economics, specifically the concept of loss aversion. Loss aversion refers to the tendency for humans to value loss higher than an equal gain. In the context of this policy proposal, paying income taxes is perceived as a loss. Reducing this loss is likely to have a more substantial positive effect than an equivalent wage increase. Therefore, the motivational impact of this policy is expected to be greater when the benefits are applied as a discount on income taxes rather than as wages for volunteer work.

Furthermore, assuming equal implementation costs for both policies, the reduction in tax revenue for the government is expected to be lower than the expenses of paying volunteers' wages. The discount benefits only tax-paying citizens, as it is applied through income tax reductions. In contrast, paying a wage to all volunteers would include those without taxable income, increasing the number of beneficiaries and, consequently, the overall costs.

Important to note is that with implementing this discount the absolute lowest income categories (people without taxable income) are not included in the positive effects of the policy. However, by implementing a wage for volunteer work, policy makers would be creating problems with the part of society that receives (unemployment) benefits from the government. In the Netherlands, when receiving unemployment benefits from the government, the individual must declare all other income to determine if (s)he is still entitled to those benefits. If they would receive a wage for their volunteer work, it could create issues with receiving their benefits, making them net worse off. So, it could be discussed whether they could receive a higher unemployment benefit when conducting a certain amount of volunteer work. However, this group in society would benefit most of being employed and receiving a normal wage for their work, so it could be argued that not including them in this policy could function as an extra motivation for those individuals to search for employment.

## 6. Conclusion and discussion

### 6.1 Conclusion

This study aimed to address the research question ‘*How is broad wellbeing distributed in the Netherlands, and how can possible inequalities be reduced through policy interventions?*’. With multiple mean analyses (ANOVA’s), Shapley value regressions, and a linear regression on data from the experienced broad wellbeing survey from RaboResearch, significant results have been discovered.

Firstly, there are significant inequalities in broad wellbeing in the Netherlands. These inequalities have been found between levels of income, generations, and levels of education. These inequalities shed light on a positive relation between income and broad wellbeing, age and broad wellbeing, and level of education and broad wellbeing. Existing literature had introduced these relationships already, but this research has confirmed these for the Netherlands.

Secondly, the contribution levels of the 11 dimensions of broad wellbeing have been researched with a Shapley value regression. For all four generations it was found that subjective wellbeing, health, and income are the three largest contributors. The interesting differences were found in the dimensions: personal development, housing, and job security. These could be explained by the change in importance of these dimensions during a lifetime.

Thirdly, with a linear regression and a Shapley value regression, possible strong indicators for broad wellbeing have been researched. It was found that the levels of amenities in the neighborhood, being a homeowner, having a health disability, and income, are the strongest indicators for broad wellbeing. Important to note that having a health disability is negatively related to broad wellbeing.

Lastly, a policy proposal was introduced to explore potential interventions to increase the national broad wellbeing and aim to decrease the inequality in broad wellbeing in the Netherlands. The policy discussed aims to motivate citizens to conduct volunteer work by implicating an income tax discount for citizens meeting the requirements. It has been argued that this policy would increase the dimension income, and social involvement, increasing the national broad wellbeing. Furthermore, it discussed possible indirect effects on reducing certain social costs such as (mental) healthcare costs. However, more research is needed to determine the ideal application and its feasibility.

## 6.2 Discussion

Logically there are limitations to this research. First, it is important to note that the data consists of many observations. This is mostly a good quality of the dataset, however, it does create the possibility of significant results only because of the large sample size. It is important to keep this in mind when analyzing the results and when using the results for policy purposes.

Furthermore, for the analysis of the Shapley values of the dimensions, it could be argued that the inclusion of subjective wellbeing as a dimension could result in issues with the results. Subjective wellbeing is basically what researchers try to measure with broad wellbeing, so including this into the data could cause correlation and skewed results. However, during this research a Shapley value regression without subjective wellbeing has been ran. This was to research possible differences in outcome. These outcomes are noted in Appendix D and appear not to differ significantly. All standardized Shapely values have gone up, but the already highly contributing dimensions have gone up significantly more than the lower contributing dimensions. However, the relationship between the different dimensions remains similar to the original results. It also needs to be considered that the results are standardized, meaning that the sum of all values adds up to 1, so logically all values have gone up when removing one dimension.

Additionally, to extend the applicability of this research and data to policy, it would be useful to expand this research by conducting regional analyses and research the differences within societal groups. This creates opportunity to discuss more specific policy that could possibly be more effective in decreasing the inequalities in broad wellbeing in the Netherlands.

Lastly, in this research, the inclusion of “level of amenities in the neighborhood” was decided relatively late in the process. As a result, interesting policy opportunities might have been missed. This leaves room for further research on the effect of amenities in the neighborhood and why it acts as such a strong indicator of broad wellbeing.

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# Appendix A

## Survey questions for the 11 dimensions

(translated from Dutch by author)

| <i>Dimension</i>            | <i>On a scale from 1 – 7, on what level...</i>                                             |
|-----------------------------|--------------------------------------------------------------------------------------------|
| <i>Subj. wellbeing</i>      | Are you happy?                                                                             |
| <i>Safety</i>               | Is your living situation safe (no physical or emotional violence)?                         |
| <i>Personal development</i> | Do you take a course, follow education, or partake in activities for personal development? |
| <i>Housing</i>              | Is your house suitable for your personal situation?                                        |
| <i>Environment</i>          | Is the environment in which you live clean?                                                |
| <i>Health</i>               | Are you healthy?                                                                           |
| <i>Income</i>               | Is your personal income sufficient?                                                        |
| <i>Job security</i>         | Are you assured of a job?                                                                  |
| <i>Work-life balance</i>    | Are your work and private activities balanced?                                             |
| <i>Social contacts</i>      | Are satisfied with your relations with others?                                             |
| <i>Social involvement</i>   | Do you influence what your living environment looks like?                                  |

Table A: Complete survey questions on all 11 dimensions

## Appendix B

### Mean broad wellbeing scores per dimension, per generation

| <i>Dimension</i>            | <i>Young</i> | <i>Lower middle</i> | <i>Upper middle</i> | <i>Old</i> |
|-----------------------------|--------------|---------------------|---------------------|------------|
| <i>Subj. wellbeing</i>      | 68.86        | 71.14               | 73.88               | 78.64      |
| <i>Safety</i>               | 81.89        | 81.80               | 82.39               | 84.19      |
| <i>Personal development</i> | 65.59        | 56.18               | 49.45               | 47.71      |
| <i>Housing</i>              | 69.34        | 76.76               | 80.97               | 85.00      |
| <i>Environment</i>          | 67.39        | 66.31               | 65.64               | 69.40      |
| <i>Health</i>               | 70.74        | 68.06               | 65.68               | 69.11      |
| <i>Income</i>               | 67.02        | 70.62               | 71.16               | 78.86      |
| <i>Job security</i>         | 69.95        | 70.85               | 59.82               | 39.74      |
| <i>Work-life balance</i>    | 64.63        | 65.62               | 68.14               | 70.28      |
| <i>Social contacts</i>      | 68.23        | 67.92               | 71.92               | 77.31      |
| <i>Social involvement</i>   | 60.88        | 61.76               | 60.80               | 63.98      |

*Table B: Mean scores of the 11 dimensions of broad wellbeing per generation*

## Appendix C

### Average weights per dimension

| <i>Dimension</i>            | <i>Weight factor</i> |
|-----------------------------|----------------------|
| <i>Subj. wellbeing</i>      | 0.1436               |
| <i>Safety</i>               | 0.0848               |
| <i>Personal development</i> | 0.0338               |
| <i>Housing</i>              | 0.0937               |
| <i>Environment</i>          | 0.0534               |
| <i>Health</i>               | 0.1410               |
| <i>Income</i>               | 0.1085               |
| <i>Job security</i>         | 0.0390               |
| <i>Work-life balance</i>    | 0.0454               |
| <i>Social contacts</i>      | 0.0657               |
| <i>Social involvement</i>   | 0.0264               |

*Table C: average weights per dimension*

## Appendix D

### Dimension Shapley values without subjective wellbeing

| <i>Dimension</i>            | <i>Young</i> | <i>Lower middle</i> | <i>Upper middle</i> | <i>Old gen</i> |
|-----------------------------|--------------|---------------------|---------------------|----------------|
| <i>Safety</i>               | 0.1233       | 0.1309              | 0.1150              | 0.1460         |
| <i>Personal development</i> | 0.0508       | 0.0404              | 0.0353              | 0.0236         |
| <i>Housing</i>              | 0.1029       | 0.1228              | 0.1340              | 0.1530         |
| <i>Environment</i>          | 0.0552       | 0.0648              | 0.0693              | 0.0767         |
| <i>Health</i>               | 0.1590       | 0.1470              | 0.1530              | 0.1660         |
| <i>Income</i>               | 0.1280       | 0.1298              | 0.1510              | 0.1530         |
| <i>Job security</i>         | 0.1086       | 0.0891              | 0.0584              | 0.0177         |
| <i>Work-life balance</i>    | 0.0947       | 0.1047              | 0.0988              | 0.0498         |
| <i>Social contacts</i>      | 0.1286       | 0.1095              | 0.1251              | 0.1570         |
| <i>Social involvement</i>   | 0.0490       | 0.0611              | 0.0594              | 0.0569         |

*Table D: Standardized Shapley Values per generation without subjective wellbeing*