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Putting Subjective Well-being to Use for Ex-ante Policy Evaluation

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Putting Subjective Well-being to Use for Ex-ante Policy Evaluation*

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Abstract

Most studies using microsimulation techniques have considered the effect of potential reforms, but only regarding income distribution. However, it has become increasingly recognised, both at the academic and political level, that focusing purely on income provides a limited picture of social progress. We illustrate how ex-ante policy evaluation can be performed in terms of richer concepts of individual well-being, such as subjective life satisfaction and equivalent incomes. Our analysis makes use of EUROMOD, the EU-wide tax-benefit microsimulation model, along with 2013 EU-SILC data for Sweden, which for the first time provides information on subjective well-being. Our results show that the effect of potential reforms varies widely depending on the well-being concept used in the evaluation. We discuss the normative questions that are raised by this finding.

JEL: D60, H23, I31

Keywords: disposable income, satisfaction, equivalent income, microsimulation

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1 Introduction

Tax-benefit microsimulation models have proved to be a powerful tool for ex-ante evaluation of policy reforms. Until now most applications have considered the effect of potential reforms on income distribution only, implicitly assuming that the measure of individual well-being to focus on is income. At the same time, it has become increasingly recognised, both at the academic and political level, that focusing exclusively on income provides only a limited picture of social progress (see, e.g., the report by Stiglitz, Sen and Fitoussi, 2009). In addition to income, life dimensions such as health, employment, leisure, housing and environmental quality are also highly valued as determinants of a good life, and should be taken into account in policy evaluation. The aim of this paper is to illustrate how microsimulation can be used for the ex-ante evaluation of policy reforms within such a richer evaluative framework.

The obvious first step in such an analysis is the prediction of policy effects regarding the different dimensions of life. In this exercise, it is important to take cross-effects into account. As an example, a larger income may have an effect on health, while a better health may influence the earning capacity of individuals. From a normative point of view, predicting the effects of policies on different dimensions separately may be sufficient, e.g. to calculate multi-dimensional inequality. However, in many cases, clear-cut results will only be obtained if one manages to aggregate the different life dimensions into a single indicator of individual well-being. There is no consensus in the literature on the best measure of individual well-being.[1] We will therefore show the results for two different concepts: subjective life satisfaction and equivalent income. In section 2 we briefly sketch the normative intuitions behind these concepts and explain which empirical information is needed for their implementation.

Our empirical work is based on the SILC 2013 data for Sweden. SILC 2013 contains detailed information on income components, employment, self-assessed health, housing conditions and, for the first time, a module on subjective well-being with information on life satisfaction and emotions. We use the EU-wide tax-benefit model EUROMOD to calculate household disposable income. In section 3 we sketch a picture of the distribution of well-being in Sweden for the three welfare concepts used in this paper (disposable income, life satisfaction, equivalent income), and we show that there are significant differences between these three views. This offers the basis from which we proceed to evaluate the effects of four counterfactual tax-benefit policy reforms: an additional payment for recipients of social assistance, an increase in the basic amount of child benefit, an additional payment of housing allowance for pensioners, and an improvement in the quality of low-quality housing. In each case, budget neutrality is achieved by increasing the top rate of the government tax. We analyse the effects of these policies in section 4. Again, the choice of well-being measure has a significant impact on the evaluation results. Note that our fourth reform only results in losers if we focus exclusively on disposable income, since the gainers see the

[1] An overview of the debate and a critical discussion of the different possibilities can be found in Fleurbaey and Blanchet (2013) and Decancq et al. (2015a).

quality of their houses improved but do not receive any income transfer. Section 5 concludes.

Our paper conveys two messages. First, it highlights the feasibility of evaluating (ex-ante) the effect of policy reforms not only on income but also on other well-being indicators. Non-monetary policies have an important effect on well-being, and this effect is disregarded if policy evaluation is restricted to an assessment in terms of income. Second, it shows the importance of comparing different well-being indicators to assess the potential effect of a policy reform.

2 Measures of individual well-being

In this section we describe our three measures of individual well-being (disposable income, subjective well-being and equivalent income) and discuss how they can be implemented empirically for ex-ante policy evaluation.

2.1 Income and other life dimensions

The vast majority of studies interested in assessing the effects of tax-benefit policy reforms have opted for disposable income as a measure of individual well-being. Disposable income is a function of market income, individual and household characteristics, and the tax-benefit system. More formally, let y_i represent disposable income of individual i, ω_i market income and z_i a vector of individual and household characteristics that are relevant within the tax-benefit regulations of the country. Then disposable income is given by:

$$y_i = d\left(\omega_i, z_i, p_y\right), \tag{1}$$

where $d(.)$ represents the tax-benefit function transforming market income and individual and household characteristics into disposable income, where p_y is a set of parameters of the tax-benefit system (e.g. maximum benefit amounts, minimum thresholds for social insurance contributions, level of tax bands, etc.). Provided that detailed information about market incomes, individual and household characteristics, and the parameters (i.e. the rules) of tax-benefit policies in a country are available, tax-benefit microsimulation models can be used to calculate the disposable income of all individuals in the sample.

Nearly everybody agrees that y_i is indeed an important determinant of well-being. When we restrict ourselves to income, however, we neglect the effects of policies on other life dimensions (such as health, quality of housing, employment, etc.) that are also important determinants of well-being for most individuals. We denote these other life dimensions by l_i. Analogously with eq. (1), we can write that l_{ij}, the level of life dimension j reached by individual i, is determined by his income y_i, the quality of other life dimensions $l_{i(-j)}$, a vector of policy parameters p_{lj} and relevant individual characteristics z_i:[2]

$$l_{ij} = l(y_i, l_{i(-j)}, z_i, p_{lj}, \epsilon_{ij}) \tag{2}$$

[2]While there will be some overlap, the individual characteristics that are relevant for the different life dimensions do not coincide and are not identical with the individual characteristics

with ϵ_{ij} a disturbance term. If the necessary information is available, these eqs. (2) can be estimated. It is then also possible to simulate the effects of changes in p_{lj} on the value l_{ij}, reached by individual i. Note that eqs. (1)-(2) describe a system of equations. As an example, changes in p_y may affect the non-income life dimensions if y_i has a significant effect in (2).

2.2 Subjective well-being

In some cases, e.g. when we only want to calculate the value of multidimensional inequality or poverty (Aaberge and Brandolini, 2015), it is sufficient to collect information on the vector (y_i, l_i). However, for a full welfare evaluation it is desirable to aggregate these different dimensions into one overall measure of individual well-being. One possibility for doing this is to use a set of objective weights, the same for all individuals. Such an objective approach disregards the fact that different individuals may have very different opinions about what is important in life, i.e. that they may have very different preferences. The economic tradition takes the position that such differences in individual preferences should be respected. We will follow that tradition in this paper and restrict ourselves to measures of well-being that respect preference heterogeneity.[3]

In recent years, subjective well-being measures, such as happiness and life satisfaction measured with large representative surveys, have become increasingly popular in this regard and some authors (e.g. Layard, 2005, O'Donnell and Oswald, 2015) have advocated the use of these indicators in policy evaluation. Numerous studies have indeed shown that non-monetary life dimensions, in addition to income, are important determinants of subjective well-being. We can therefore represent life satisfaction S_i of individual i as a function

$$S_i = S_i\left(y_i, l_i\right). \tag{3}$$

Eq. (3) can be estimated. After simulating the effects of a policy measure on (y_i, l_i) (based on (1)-(2)), we can use the estimated version of eq. (3) to also simulate the effect on individual life satisfaction.

Note that eq. (3) makes explicit that the life satisfaction function $S_i(.)$ is individual-specific. This is definitely realistic, as it is a well-known fact that two individuals with identical vectors (y, l) may experience a different level of subjective satisfaction. For the normative interpretation of using life satisfaction as a measure of well-being, it is useful to distinguish between two causes of these interindividual differences. First, as mentioned before, individuals may

that play a role in the tax-benefit system. To simplify the notation, we still use the same symbol z_i in eqs. (1) and (2). One way to interpret this is to see z_i as a vector containing all individual characteristics, while keeping in mind that only a subset of these characteristics will have a significant effect on each of the separate dimensions, with the others having zero effect.

[3] Within economics the most influential "objective" approach is the capability approach, as defended by Sen (1985) and Nussbaum (2000). A critical discussion of this approach can be found in Decancq et al. (2015a) and Fleurbaey and Blanchet (2013). Decancq et al. (2016) show how preference differences can be integrated into empirical applications of the capability approach.

have different preferences, i.e. they may differ in the relative importance they attach to different life dimensions. Second, even if two individuals have identical preferences and the same bundle (y, l), they may still experience a different level of life satisfaction due to different scalings of satisfaction. In economic jargon, the former explanation leads to differences in marginal rates of substitution, the latter refers to the cardinalization of the satisfaction function.

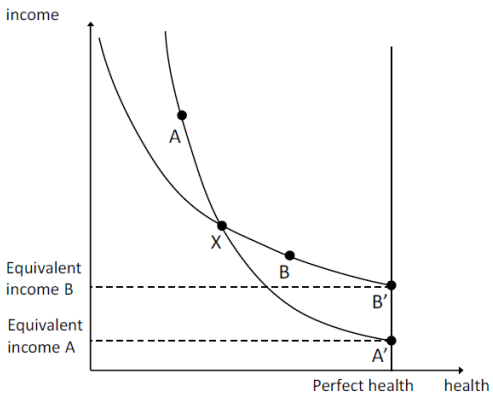
We have already argued that in a liberal society it is a natural assumption to respect differences in satisfaction that reflect differences in preferences, i.e. to consider that a person whose individual outcomes do not match his preferences is indeed worse off. Being unemployed is worse for someone who attaches a large importance to the social integration that comes with having a job. It is much less clear, however, as to whether we should also respect scaling differences. These differences mainly reflect individuals' aspirations and expectations. Let us consider two examples. Suppose that Ann and Beth are in exactly the same objective situation: they have the same income, the same health, the same job situation, etc. Ann comes from a rich family and is used to an opulent life, while Beth has poor parents and her actual situation is much better than what she had expected in her childhood. As a result, Ann has a lower level of subjective well-being than Beth. Should we then try to compensate Ann for her "misfortune" of being born into a rich family? Or, consider two individuals John and Jim, who both have a strong preference for not being disabled. Jim has an accident and loses a limb. However, after some time he adapts to his new situation: he still would prefer to be able-bodied but his satisfaction level returns to what it was before the accident. Does this imply that we should not take into account his loss of a limb in the evaluation of his well-being? In fact, does this means that society in general should not care very much about individuals losing a limb?[4] Sen (1985, p. 21) has pointed out that subjective well-being measures may suffer from what he calls "physical-condition neglect": "A person who is ill-fed, undernourished, unsheltered and ill can still be high up in the scale of happiness or desire-fulfillment if he or she has learned to have 'realistic' desires and to take pleasure in small mercies." If this is considered a problem, one must look for a measure of individual well-being that does respect differences in individual preferences but does not suffer from physical-condition neglect. One possible candidate is equivalent income (Fleurbaey and Blanchet 2013, Fleurbaey and Maniquet 2011, Decancq et al., 2015a, 2015b, Schokkaert et al. 2011).

2.3 Equivalent income

Equivalent income is defined as the hypothetical income that, if combined with the best possible value on all non-income dimensions, would place the individuals in a situation that (s)he finds equally good as his/her actual situation. Let us

[4]This example is inspired by the empirical work of Loewenstein and Ubel (2008). The literature documents many spectacular cases of adaptation. An extreme example is described in Bruno et al. (2011), who show that even patients with locked-in syndrome can recover a high degree of subjective life satisfaction.

Figure 1: Equivalent income



explain its normative intuition using Figure 1, in which we depict a situation with two life dimensions: income and health. The indifference curves through A and B represent the preferences of two individuals Ann and Beth respectively. We assume that society agrees that there is some level of health seen as "perfect".

First consider a situation where Ann and Beth are both in X: they have the same income and the same health level. If we want to respect individual preferences, it does not necessarily follow from their identical objective outcomes that they also enjoy the same level of well-being: in X the indifference curve of Ann is steeper than that of Beth, showing that she is more concerned about being (un)healthy. It is therefore natural to accept that Ann is worse off than Beth. In general, preferences do matter. There is, however, one situation for which it can be argued that preference differences should not matter, and this is when both Ann and Beth are perfectly healthy. In this situation it would be very strange to claim that either of the two has a lower well-being level because she cares less (or more?) about her health. This means that when two individuals are both in perfect health, we can compare their well-being on the basis of their incomes, irrespective of their preferences. Combining this insight with respect for individual preferences allows us to rank all possible situations. Assume that Ann is in A and Beth in B. According to their own preferences, Ann is equally well-off in A and A', and Beth is equally well-off in B and B'. Yet, in A' and B' they are both in perfect health. Given that we then can evaluate the lives A' and B' on the basis of their incomes, we can also evaluate A and B on the basis of these incomes. The well-being of Ann (Beth) in A (B) can then be measured by the equivalent income A (B) in Figure 1.

The criterion to set the reference values for the non-income dimensions is therefore that at these reference values preference differences should not matter for measuring well-being. If preferences can be assumed to be monotonic in a life dimension that has a natural upper bound (as is the case for health), this upper

bound is a natural choice for the reference value. If the non-income dimension does not have an upper bound (e.g. quality of housing), one may use a value that is close to the maximum of the observed distribution.[5]

It is clear that the equivalent income measure indeed respects individual preferences. It does not suffer from "physical-condition neglect". If two individuals hold the same preferences, the one on the higher indifference curve will always have a larger equivalent income, independent of the (possibly individual-specific) scaling of subjective well-being. The equivalent income measure therefore "corrects" for differences in aspirations. Despite the fact that it is expressed in monetary terms (which has some practical advantages when it comes to measurement), it is an encompassing measure of well-being taking into account the well-being loss that follows from not achieving the reference values for the non-income dimensions. In fact, in Figure 1 Ann in A has a larger monetary income than Beth in B, but her equivalent income is lower because her health is worse. The well-being loss is individual-specific as it does depend on the individual's own preferences. Remember that the equivalent incomes of Ann and Beth would be different if they were both in situation X.

Implementation of the equivalent income measure requires information on individual preferences. In this paper, we follow Decancq et al. (2015b) and Schokkaert et al. (2011) and retrieve information about individual preferences from subjective well-being regressions.[6] This method is explained in the following subsection.

2.4 Towards operational implementation: evaluating the effect of policy changes

As already mentioned before, we will use a tax-benefit microsimulation model for the empirical implementation of eq. (1). We furthermore must choose a specific functional form for eqs. (2) and (3). For the former we will use a simple linear specification. The latter, however, is more important since we also want to use its estimates to calculate equivalent incomes. It is therefore necessary to be able to distinguish differences in preferences from differences in aspirations and expectations. A simple way to do this is to specify the life satisfaction regression (3) as

$$S_i = \alpha + \pi ln(y_i) + (\beta + \gamma' z_i)' \, l_i + \delta' z_i + \varepsilon_i, \tag{4}$$

where l_i and z_i are again the non-income dimensions and personal characteristics (e.g. gender, age, etc.) respectively, $(\alpha, \pi, \beta, \gamma, \delta)$ are coefficients to be estimated and ε_i is a disturbance term. Eq. (4) is a natural extension of the most common

[5] With non-monotonic preferences the most natural choice is the individual-specific best value for that dimension - see Fleurbaey and Blanchet (2013) and Decancq et al. (2015b).

[6] Two other methods have been used in the literature to derive preference information for the calculation of equivalent incomes. Decoster and Haan (2014) and Bargain et al. (2013) use a revealed preferences approach to income-leisure preferences with random utility models of labour supply. Fleurbaey et al. (2013) and Schokkaert et al. (2013) use contingent valuation techniques as part of a stated preference approach.

specification in the empirical happiness literature. Differences in preferences are modelled through the interaction effects between z_i and l_i. As an example, the marginal rate of substitution of individual i between y_i and l_{ij} is given by

$$MRS_i(y_i, l_{ij}) = \frac{(\beta + \gamma' z_i) y_i}{\pi}. \tag{5}$$

The direct effects of z_i on life satisfaction, parameterised with δ, and the idiosyncratic disturbance term ε_i are interpreted as capturing aspirations and expectations. They do not affect the marginal rates of substitution, i.e. the slope of the indifference curves, but they do affect the cardinalization of subjective well-being.

Let the best possible (reference) values of the non-income dimensions be represented by $\bar{l}$, and let the equivalent income of individual i be y_i^*. The definition of equivalent income as the hypothetical income that, combined with the reference value for all non-income dimensions, would place the individuals in a situation that they find equally good as their actual situation can then be written as:

$$S_i = \alpha + \pi ln y_i + (\beta + \gamma' z_i)' l_i + \delta' z_i + \varepsilon_i = \alpha + \pi ln y_i^* + (\beta + \gamma' z_i)' \bar{l} + \delta' z_i + \varepsilon_i,$$

which immediately yields

$$y_i^* = y_i exp\left[\left(\frac{\beta + \gamma' z_i}{\pi}\right)' \left(l_i - \bar{l}\right)\right]. \tag{6}$$

The estimates of the coefficients in eq. (4) can now be used to calculate equivalent incomes. Differences in preferences are taken up in this expression through the differences in the marginal rates of substitution (compare eqs. (6) and (5)). Differences in scaling (as captured by the terms $\delta' z_i + \varepsilon_i$) do not appear in eq. (6).

We now have all the information for the ex-ante evaluation of policy reforms in terms of individual well-being. Consider for instance that we would like to evaluate the effect of changing the parameters p_y of the tax-benefit system to a set of hypothetical values p_y^C. The disposable income y_i^C of individual i under the counterfactual scenario C can be simulated with the tax-benefit microsimulation model:

$$y_i^C = d\left(\omega_i, x_i, p_y^C\right). \tag{7}$$

We then introduce y_i^C into the estimated set of equations (2) to get an estimate $\hat{l_i^C}$ of the non-income dimensions. The effect of the counterfactual policy reform C on life satisfaction can be assessed by comparing the distribution of predicted life satisfaction $\hat{S}_i$ (obtained using the estimated coefficients in eq. (4)) with the distribution of $\hat{S_i^C}$, where $\hat{S_i^C}$ represents predicted life satisfaction with disposable income y_i and non-income dimensions l_i replaced by y_i^C and $\hat{l_i^C}$, respectively. A similar method applies to equivalent incomes, where the estimated

equivalent incomes of the base situation $\hat{y_i^*}$ can be compared with the estimated equivalent incomes $\hat{y_i^{C*}}$ in the counterfactual scenario.

3 Well-being in Sweden

3.1 The data: EUROMOD and EU-SILC

In order to calculate household disposable income under different policy reform scenarios, we use EUROMOD, the EU tax-benefit microsimulation model. EUROMOD simulates cash benefit entitlements and direct personal tax and social insurance contribution liabilities on the basis of the tax-benefit rules in place in each of the 28 EU Member States.[7] The underlying micro-data used for the simulations in EUROMOD is EU-SILC, which contains detailed information on different income sources as well as household and individual characteristics.

In addition to detailed income information, our analysis requires information on subjective well-being as well as different life dimensions that individuals consider important. We use EU-SILC 2013, which for the first time incorporates information about overall life satisfaction. In fact, the 2013 EU-SILC contains a whole ad-hoc module on subjective well-being, with information about life satisfaction and satisfaction with specific life domains (income, leisure, environment, etc.) as well as information about emotions (feelings of happiness, depression, etc.), which are also used in our analysis.

Our analysis is restricted to Sweden because EU-SILC 2013 is not one of the waves used as input data in EUROMOD. For this reason, the original EU-SILC 2013 data for Sweden has been updated and modified according to the requirements for EUROMOD.[8] EU-SILC 2013 contains 15,143 observations for Sweden. Life satisfaction information is available for individuals aged 16 years or older and is measured on an 11-point scale ranging from 0 ("not satisfied at all") to 10 ("fully satisfied"). Four life dimensions are considered in the estimation: income, health, being unemployed and housing quality. In our estimations, income is defined as the logarithm of household disposable income, equivalised with the modified OECD scales. Health is measured by self-assessed health, which is a categorical variable measured on a 5-point scale ranging from 1 ("poor health") to 5 ("excellent health"). The unemployment dummy takes on the value of 1 if the person is unemployed according to his/her current reported

[7] See Sutherland and Figari (2013) for more information on EUROMOD.

[8] It is important to bear in mind that income information in EU-SILC 2013 refers to incomes in 2012, while subjective well-being, household characteristics, and labour market information refer to 2013. For this reason, EUROMOD is used in a first instance to simulate disposable income in 2013, which is then used in the subjective well-being regressions and to calculate equivalent incomes. Additionally, in order to account for the fact that people might have changed labour market status between the income reference period and the survey reference period, we exclude people for whom the current labour market information does not match the specific information about months in work, unemployment, or other labour market status in the income reference period. The results are not affected if 2012 disposable income is used in the subjective well-being regressions, neither are they affected when the whole sample is used rather than excluding people with inconsistent labour market information.

labour market status. Housing quality is derived from a hedonic price equation, where imputed rent is regressed on a series of housing characteristics, such as dwelling type, number of rooms in the dwelling, availability of bath, toilet and telephone, and the presence of problems such as darkness, heat, noise, pollution and crime. Housing quality is the predicted value of this hedonic regression after correcting for household size and regional price differences.[9] Our analysis uses the observations for which all necessary variables have non-missing information. This leaves us with a sample of 5,336 observations. Descriptive statistics are presented in table 5 in the Appendix.

3.2 Life satisfaction in Sweden

The estimation results for the life satisfaction equation (4) are given in Table 1. We take disposable income, health, being unemployed and housing quality as relevant life dimensions (y_i and l_i). As discussed above, we introduce interaction terms between life dimensions l_i and personal characteristics z_i into the life satisfaction equation to model intergroup differences in preferences. The non-monetary life dimensions, health, unemployment status and housing quality, are interacted with dummies for being male, having a higher education degree and being aged 40 or more. We will also introduce into the policy analysis the indirect effects of policy changes through their effects on health. Estimates of eq. (2) for health are shown in Table 2.

Two methodological points should be noted. First, because we are only able to use a single cross-section of EU-SILC, we cannot implement panel methods to account for unobserved individual heterogeneity in the life satisfaction and health regressions. Failure to control for individual-specific time-invariant characteristics might result in a bias in the estimated coefficients (Ferrer-i-Carbonell and Frijters, 2004). A second best solution, in the case of a lack of panel data, is to use information on personality traits. Unfortunately, EU-SILC does not contain this information either. Therefore, we use information about self-rated affects or emotions available in EU-SILC 2013, as a sort of third best solution to control for individual-specific time-invariant characteristics. More specifically, we include four self-rated affects: being very nervous, feeling down in the dumps, feeling calm and peaceful, and feeling downhearted or depressed. The respondent indicates to what extent she has felt this way over the past four weeks, and the response is recorded as a categorical variable measured on a 5-point scale ranging from 1 ("All of the time") to 5 ("None of the time"). We have reversed the values of these variables so that higher values reflect that the respondent has felt these emotions more frequently.[10]

Secondly, there is an issue of potential endogeneity of self-assessed health in the life satisfaction equation, and even more so due to the fact that these are

[9] The method is similar to that used by Decancq et al. (2015b). The results are available upon request from the authors.

[10] Based on data from the British Household Panel Survey, personality traits appear to be significant predictors of emotions and feelings for the same variables used as controls in our estimation.

both self-reported subjective variables. Table 1 therefore shows the results of 2SLS-regressions. Table 2 and tables 7-9 in the Appendix present results for the first stage estimation of health-related variables.[11]

The estimation results for the life satisfaction equation (4) are are in line with previous findings in the literature. The left column (Model 1) shows the results for when emotions are not included as regressors while the right column (Model 2) includes the four emotion variables as controls. Income, defined as the logarithm of equivalised household disposable income, has a positive and significant effect on life satisfaction. The three other life dimensions considered in our analysis, self-assessed health, unemployment status and housing quality, also produce the expected effects on life satisfaction, although housing quality is not significant in model 2. Note that the magnitude of the coefficients of income and other life dimensions decreases under model 2 with the introduction of the emotion variables. This is in line with the idea that not accounting for factors related to personality traits might bias the estimates of the life satisfaction regressions. However, since the estimates of all coefficients go down, the effect on the marginal rates of substitution is smaller than the effect on life satisfaction itself. Other patterns in line with the literature include the U-shaped relationship between age and life satisfaction as well as the positive effect of being married. Most interaction terms are not significant but present the expected signs. Under model 2, health is more important for males, while unemployment seems to affect them less. The ex-ante evaluation of policies in the next section will be based on the results of Model 2.

The estimates of the health regression (Table 2) are also according to expectations. Health indicators such as chronic illness and limitation in activities have a negative effect on self-assessed health, and the same is true for the variables "unmet need". Important for our purposes is the strongly significant effect of income on health, even when we control for education. We will take up this effect in our evaluation of changes in the tax-benefit system in the next section.

3.3 Equivalent incomes and life satisfaction

We can now calculate the equivalent incomes. Following the normative reasoning in the previous section, "perfect health" is chosen as the reference value for health and "not being unemployed" as the reference for employment status. Since there is no upper boundary for housing quality, we take the 90th percentile in the sample as the reference value. Based on these reference values, the observations for the relevant life dimensions and the estimated coefficients in Table 1, equivalent incomes can be computed as in equation (6).

The three measures of individual well-being used in this paper (disposable income, life satisfaction and equivalent income) lead to very different results, reflecting their different normative assumptions. This is sharply illustrated by the results in Table 3, where we concentrate on the characteristics of the most

[11] Table 6 in the Appendix shows that the 2SLS-estimates are broadly consistent with those that are obtained with OLS or ordered logit models. The estimated effect of health on life satisfaction is smaller with 2SLS.

Table 1: Life Satisfaction Regressions (2SLS)

	Model 1	Model 2
Disposable Income (log)	0.142*** (0.044)	0.081** (0.039)
Self-reported health	0.669*** (0.085)	0.247*** (0.082)
Unemployed	-0.870*** (0.189)	-0.621*** (0.170)
Housing (in 1000SEK)	0.129*** (0.048)	0.036 (0.043)
Health x Male	0.114 (0.085)	0.143* (0.077)
Health x High. Education	0.018 (0.104)	0.095 (0.093)
Health x Age over 40	0.145** (0.067)	0.041 (0.059)
Unempl. x Male	0.337* (0.203)	0.326* (0.182)
Unempl. x High. Education	-0.504* (0.282)	-0.328 (0.253)
Unempl. x Age over 40	0.117 (0.202)	0.196 (0.181)
Housing x Male	0.012 (0.028)	0.021 (0.025)
Housing x High. Education	-0.037 (0.030)	-0.018 (0.027)
Housing x Age over 40	-0.112* (0.059)	-0.015 (0.052)
Male	-0.602* (0.364)	-0.908*** (0.327)
Age	-0.055*** (0.011)	-0.053*** (0.010)
Age squared/100	0.060*** (0.009)	0.049*** (0.008)
Married	0.465*** (0.055)	0.433*** (0.050)
Separated	-0.397** (0.183)	-0.117 (0.165)
Divorced	-0.031 (0.075)	-0.009 (0.067)
Widow	0.178* (0.104)	0.214** (0.093)
Children 0-15	0.147*** (0.051)	0.152*** (0.046)
Non-Swede	-0.083 (0.100)	0.042 (0.089)
Higher Education	-0.120 (0.444)	-0.471 (0.398)
South Sweden	0.110** (0.043)	0.096** (0.038)
North Sweden	0.236*** (0.057)	0.175*** (0.051)
Down in the dumps		-0.195*** (0.032)
Calm		0.341*** (0.028)
Nervous		-0.130*** (0.025)
Downhearted		-0.345*** (0.029)
_cons	4.153*** (0.572)	6.808*** (0.566)
N	5336	5336
R^2	0.203	0.361

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 2: First stage of 2SLS: health

	Model 1	Model 2
Chronic Illness	-0.360*** (0.021)	-0.327*** (0.019)
Limitation in activities	-0.523*** (0.018)	-0.448*** (0.017)
Unmet need for treatment	-0.243*** (0.028)	-0.163*** (0.027)
Unmet need for dental treatment	-0.251*** (0.033)	-0.164*** (0.031)
Disposable Income (log)	0.101*** (0.020)	0.064*** (0.019)
Unemployed	-0.162*** (0.048)	-0.032 (0.046)
Housing (in 1000SEK)	0.019** (0.007)	0.010 (0.007)
Male	0.021 (0.018)	-0.031* (0.018)
Age	-0.004 (0.003)	-0.005* (0.003)
Age squared/100	-0.004 (0.003)	-0.004 (0.003)
Married	0.067*** (0.026)	0.051** (0.024)
Separated	-0.007 (0.086)	0.084 (0.082)
Divorced	0.007 (0.035)	0.012 (0.033)
Widow	0.004 (0.048)	0.020 (0.045)
Children 0-15	-0.001 (0.023)	-0.005 (0.022)
Non-Swede	-0.009 (0.046)	0.033 (0.044)
Higher Education	0.094*** (0.020)	0.099*** (0.019)
South Sweden	0.043** (0.020)	0.032* (0.019)
North Sweden	0.008 (0.027)	-0.015 (0.025)
Down in the dumps		-0.099*** (0.015)
Calm		0.098*** (0.014)
Nervous		-0.065*** (0.012)
Downhearted		-0.075*** (0.014)
_cons	4.130*** (0.193)	4.506*** (0.199)
N	5336	5336
R^2	0.353	0.419

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Portrait of the deprived

	Income	Satisfaction	Eq. Income
Income poor	1.00	.	.
Satisfaction poor	0.16	1.00	.
Eq. income poor	0.18	0.32	1.00
Income (SEK/month)	7,692	16,396	16,336
Satisfaction	7.55	4.25	6.59
Health	4.06	3.26	2.66
Unemployment	0.16	0.13	0.23
Housing (1,000 SEK)	4.17	4.61	4.17
Male	0.49	0.44	0.73
Age	37.68	50.65	54.41
Married	0.20	0.28	0.43
Divorced	0.10	0.19	0.16
Widow	0.07	0.07	0.07
Child 0-15	0.28	0.19	0.15
Non-Swede	0.12	0.06	0.06
Higher Education	0.21	0.25	0.28
East Sweden	0.37	0.42	0.37
South Sweden	0.46	0.42	0.41
North Sweden	0.17	0.16	0.22

deprived individuals according to each measure.[12] Here, those considered as the most deprived in terms of subjective well-being are those individuals who report a level of life satisfaction equal to 5 or less in the 0 to 10 scale. This sample contains 383 individuals. The second column of table 2 presents the characteristics of this group of individuals. The first column presents the same information for the 383 individuals with the lowest equivalised household disposable income. Column 3 shows the information for the 383 individuals with the lowest equivalent income, calculated on the basis of the 2SLS estimations.

The first three rows of the table show the overlap between the three well-being concepts. Only around 16% of those considered poor according to life satisfaction and 18% of those considered poor according to equivalent income are among the income poor. In the following rows, we sketch the portrait of the most deprived individuals according to each of the well-being concepts. These portraits differ substantially. The income-poor attain a reasonably high level of life satisfaction and health. They are on average much younger than the two other groups. By construction, the satisfaction poor and the equivalent income poor have a larger income. The most deprived according to life satisfaction have higher income, better health and better housing than those with

[12]Similar results were shown in Decancq et al. (2015b) with data for Russia.

the lowest values of equivalent income. The least satisfied are also less likely to be unemployed compared to the equivalent income deprived. The importance of the scaling variables (including the idiosyncratic disturbance term) for life satisfaction is well illustrated by a comparison of the income-poor and the satisfaction-poor: the latter do better on all dimensions of life, except health.

4 Evaluation of counterfactual policy scenarios

In order to assess the effect of policy reforms on each of our well-being concepts, we simulate four hypothetical policy reforms. As described before, we use EUROMOD to simulate disposable incomes and eqs. (2)-(6) to derive the effects on life satisfaction and equivalent incomes. In all counterfactual scenarios, budget neutrality is achieved by an increase in the top tax rate of government income tax, which is 25% in Sweden.[13] The different scenarios are described in detail in subsection 4.1. The following subsections describe the size of the gains for the gainers, the distribution of gains and losses, the resulting inequality in well-being and the effects on social welfare. In the case of life satisfaction and equivalent incomes, we discuss the results with and without taking into account the indirect effect of income and housing quality on health. All results are based on the estimates of Model 2 in Table 1.

4.1 Description of policy scenarios

Counterfactual A: Additional Social Assistance Payment

Social assistance in Sweden is a means-tested benefit aimed at low income families. The benefit unit is the nuclear family, including cohabiting partners and children up to 18 years old, or aged under 20 and receiving the basic child benefit. To be eligible for social assistance, the conditions stipulate that the family does not have any wealth and the family members are willing to work. The benefit amount is calculated as the difference between family needs plus housing costs and family means. Family needs depend on household size, marital status of the parents and the age of the children. The benefit is not taxable. Our first counterfactual scenario (reform A) simulates an additional payment of 4,000 SEK per month (around 400 euros) for those families who are recipients of social assistance.

Counterfactual B: Increase in Child Benefit Amount

Child benefit in Sweden is a universal benefit for families with children aged 0 to 15 years or less than 20 years if in upper secondary education. The child benefit's basic monthly amount was equal to 1,050 SEK (around 105 euros)

[13] Personal income tax in Sweden is divided into four parts: government tax, country council tax, municipality tax and funeral tax. Government income tax in Sweden is assessed individually and it is made up of three bands. The first band is exempted of payment, the rate of the second band is set at 20%, and the rate of the top band is set at 25%.

in 2013. Children aged 0 to 15 years receive the benefit every month, while children aged 16-20 years receive the basic amount for 10 months out of the year. Additional amounts are paid depending on the number of children in the family. The benefit is not taxable. In our second counterfactual scenario (reform B), we simulate an increase in the basic amount of child benefit from 1,050 SEK to 2,000 SEK per month for children aged 0-15 years.

Counterfactual C: Additional Payment of Housing Allowance for Pensioners

Housing allowance for pensioners is a means-tested benefit targeted at old age pensioners and persons with a disability pension. The assessment unit is the nuclear family, including cohabiting partners and children up to 18 years old, or aged under 20 and receiving the basic child benefit. Individuals aged 65 and above are entitled to the age allowance, while individuals younger than 65 are entitled to the disability allowance. The allowance decreases with income over certain income thresholds, which are dependent on the marital status of the recipients. The benefit is not taxable. In our third counterfactual scenario (reform C), we simulate an additional payment of 2,000 SEK per month (around 200 euros) for the recipients of the housing allowance for pensioners.

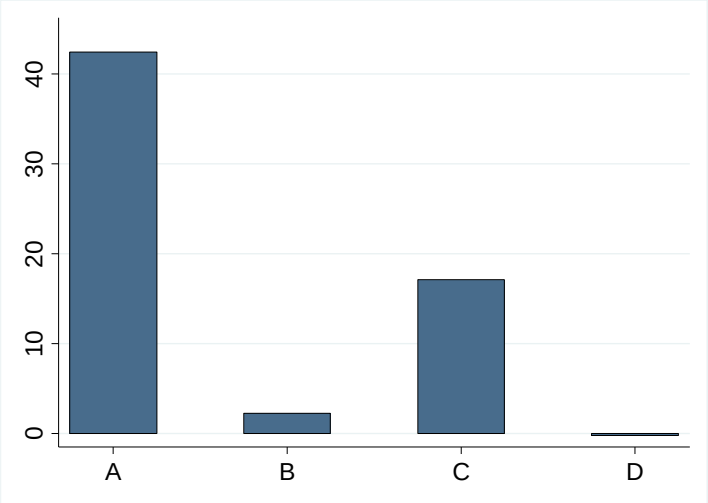
Counterfactual D: Improvement in Housing Quality

Finally, we simulate a policy reform, which does not involve a monetary transfer and therefore has no positive effect on disposable income. In particular, we simulate an improvement in housing quality of half a standard deviation for the 4% of individuals in our sample who report low housing quality.

The cost differences between the counterfactual reforms are reflected in the increases in the top government tax rate, which are necessary to achieve budget neutrality. The top tax rate would need to increase from 25% to 34.8% under reform A; to 45.6% under reform B; and to 33.6% under reform C. Assessing the cost of reform D is less straightforward since we need information on the likely costs of housing improvements. In our analysis, we assume that the simulated improvement in housing under reform D would require half a month's work for a person employed in construction, plumbing, building finishing and related trades. In 2013, the average salary of a person employed in this sector was 26,900 SEK per month.[14] Under this assumption, the cost of improving housing quality would be 13,450 SEK per household for the 4% of our sample that would benefit from such reform. Budget neutrality is then achieved by an increase in the top government tax rate from 25% to 49.8%.

[14]See Statistics Sweden: http://www.scb.se/en_/Finding-statistics/Statistics-by-subject-area/Labour-market/Wages-salaries-and-labour-costs/Salary-structures-whole-economy/

Figure 2: Percentage change in disposable income, all reforms: gainers



4.2 The effects on the gainers

A first step to assess the effect of the hypothetical reforms on our measures of individual well-being is to compare the effects on the gainers, i.e. the recipients of the additional payments or the beneficiaries of the housing improvement. The numerical results are given in Table 10 in the Appendix. Figures 2-5 summarise the main findings for the different well-being measures. Note that the proportion of gainers varies across the scenarios. Under reform A, around 2.89% of individuals in our sample would benefit from an increase in social assistance. The proportion of beneficiaries under reform B would be substantially larger, with around 13.31% of our sample receiving increased payments from child benefit. Under reform C, 6.1% of our sample would benefit from an increase in housing benefit for pensioners, while by construction, 4% of our sample would benefit from an improvement in housing quality under reform D. Since all four reform scenarios are assumed to be financed by an increase in government tax, the proportion of people losing (those paying higher taxes) as a result of the reforms equals 4.36% of our sample in all four cases.

When we consider equivalised household disposable income, reform A (an increase in social assistance) results in the highest average increase for the gainers, followed by reform C (an increase in housing benefit for pensioners) and reform B (an increase in child benefit). The improvement of housing quality (reform D) has a slightly negative effect on average disposable income because the "gainers" do not receive any additional income from the housing reform, while a few of them must pay additional taxes.

In the case of life satisfaction, Figure 3 presents two sets of results. The left-hand chart presents the percentage increase in average predicted life satis-

faction for gainers when the indirect effects of income and housing quality on health are not taken into account (S1) and the right-hand chart presents the results when these indirect effects are accounted for (S2). Similar results are shown in Figure 4 for equivalent incomes, where the panels EI1 and EI2 show the gains with and without the positive feedback effects through health and housing, respectively. Unsurprisingly, the gains of the different policy reforms are larger when the indirect effects are taken into account. This finding must be interpreted cautiously. Raising the income of a person will not immediately improve his/her health. Yet, the presence of a positive effect in the longer run is extensively documented in the literature, and neglecting it would certainly lead to an underestimation of the well-being gains for the concerned groups.

The importance of feedback effects can further be illustrated for reform A. A large fraction of those who would benefit from the additional social assistance payments reported having unmet needs for medical and/or dental treatment. Given the substantial increase in social assistance that reform A represents (4,000 SEK per month), one could assume that (part of) the additional benefits would be used to cover the costs of medical and dental treatment needed. This would further increase the effect of the policy on health, and hence on well-being. Figure 5 presents the percentage increase in average equivalent income and predicted life satisfaction for gainers under reform A, when the additional effects on unmet needs for treatment through health are taken into account. S3 and EI3 represent, respectively, life satisfaction and equivalent income of gainers when unmet need for medical and dental treatment are assumed to be covered but the indirect effect of income through health is not taken into account. S4 and EI4 assume that unmet needs for medical and dental treatment are covered and the indirect effect of income through health is taken into account. Accounting for the potential effect of an increase in social assistance on treatment of unmet medical and dental needs significantly increases life satisfaction (S4) and equivalent incomes (EI4). Unmet needs of medical treatment are not only caused by lack of income; therefore, it is a very strong assumption that they would be fully covered after an income transfer. In the sequel we will not incorporate this effect into the evaluation results. Still, Figure 5 illustrates that interesting and important questions come to the fore and can in principle be tackled when one moves to a richer evaluative framework.

Returning to Figures 3 and 4, it turns out that the proportional gains in life satisfaction and equivalent income realised by the reforms are much smaller than the gains in terms of disposable income (except under reform D, as expected). This is of course to be expected given that in the broader well-being concepts, income is only one of the relevant life dimensions, and given that eq. (4) implies a decreasing marginal utility of income. On average, life satisfaction increases less than 1% under any counterfactual reform. The effects on equivalent incomes are larger, because there the (cardinal) effect of decreasing marginal utility of income does not play a role. Average equivalent income, E1, for gainers increases more than 100% under reform D, 40% under reform A, 19% under reform C and 1.4% under reform B. If indirect effects through health are taken into account, equivalent income, E2, increases by as much as 150% under reform D and 50%

under reform A. It is interesting to observe that the ranking of reforms in terms of their effect on gainers is the same for equivalent income and life satisfaction, but that it is different from the ranking obtained with disposable income. More specifically, the hypothetical non-monetary reform, D, has the largest effect on gainers in terms of life satisfaction and equivalent income, followed by reforms A, C and B.

Figure 3: Percentage change in life satisfaction, all reforms: gainers

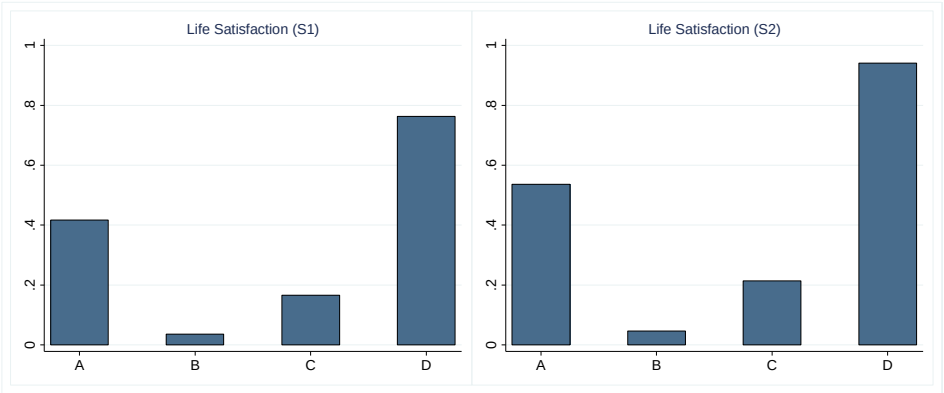


Figure 4: Percentage change in equivalent income, all reforms: gainers

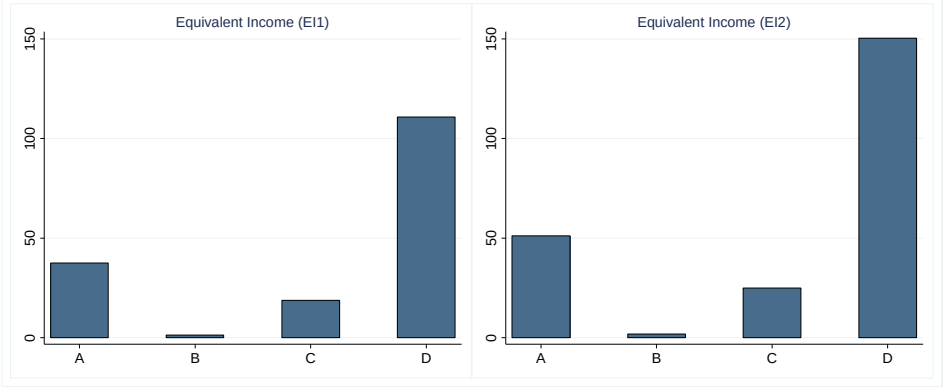
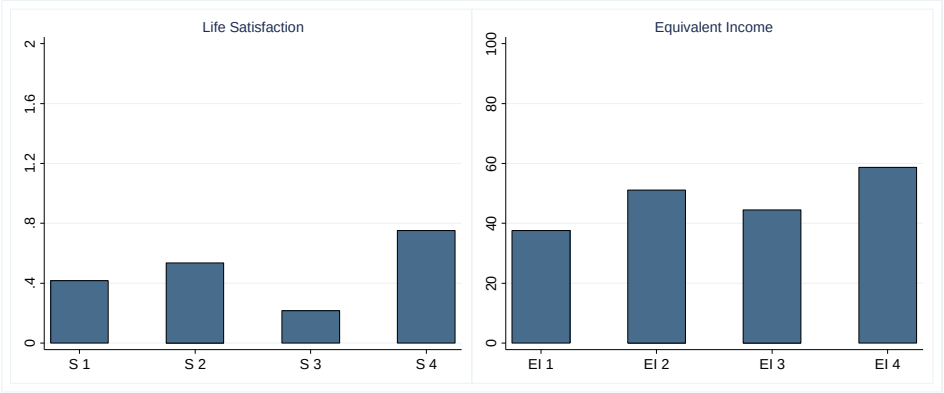


Figure 5: Percentage change in life satisfaction and equivalent income, reform A: gainers

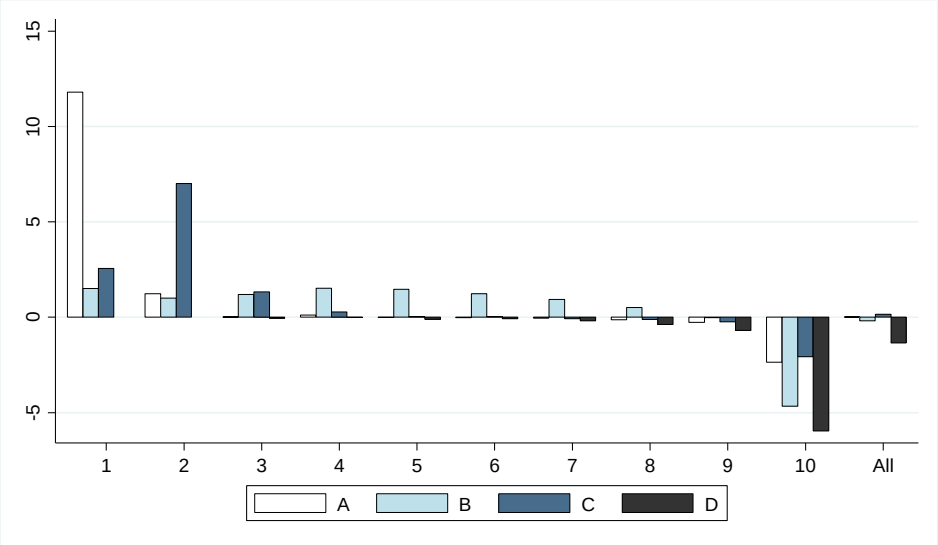


4.3 Global distribution of gains and losses

We now broaden our scope to assess the effects of our reforms over the whole population. Figures 6-8 present the gains and losses in terms of disposable income, life satisfaction and equivalent income for the different deciles of the respective distributions in the sample. Positive effects (upward pointing bars) reflect gains from the hypothetical reforms, while negative effects (downward pointing bars) are due to the increase in taxes required to achieve revenue neutrality. Table 11 in the Appendix presents the overall averages for these well-being concepts under the baseline and each of the counterfactual scenarios. Changes in these global averages are shown at the utmost right of the figures.

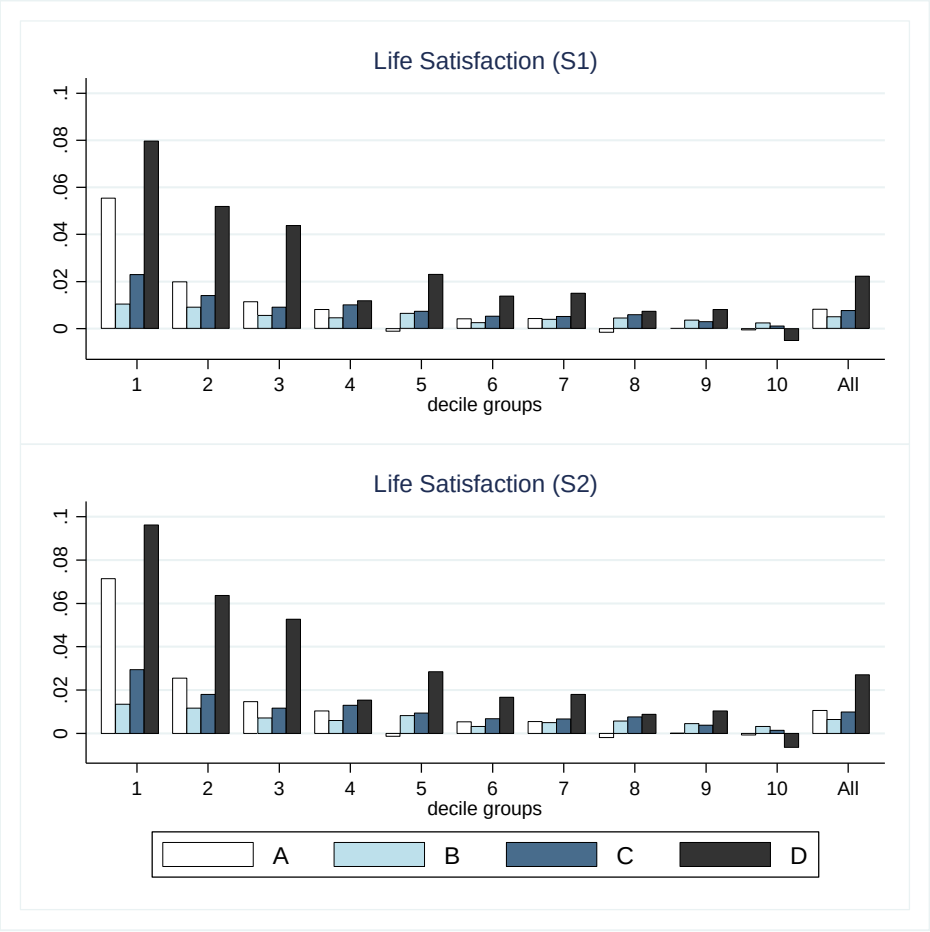
Figure 6 shows that individuals in the first and second deciles of disposable income gain the most from reforms A (increase in social assistance) and C (increase in housing benefit for pensioners), while the increase of equivalised household disposable income under reform B (increase in child benefit) is roughly the same for all decile groups except the ninth and tenth. The top income decile experiences a particularly large decrease in disposable income as a result of the increase in income taxes to finance the reforms. For the whole population, reform C results in the highest increase of average equivalised household disposable income, followed by reform A. Reform B decreases average disposable income by 0.2%, while reform D (improvement of housing quality) decreases average disposable income by around 1.3%, given the increase in taxes necessary to finance the cost of such policy.

Figure 6: Percentage change in household disposable income by income decile group: all reforms



For life satisfaction and equivalent incomes, we again show the results for both cases, one where the indirect effects of income and housing quality on health are neglected (S1 and EI1) and one where they are taken into account (S2 and EI2). Figure 7 shows that the effects of all reforms in terms of life satisfaction are small across all decile groups. The bottom deciles of the satisfaction distribution gain the most from reforms A, C and D, while the effects of reform B are roughly similar across all groups. The effect of the reforms across the distribution of equivalent incomes (figure 8) are less clear than in the case of income and life satisfaction. The bottom deciles of the equivalent income distribution (in particular the second decile) benefit the most from reforms A, C and D, but there are also relatively large gains for deciles 6 and 7, especially under reforms A and D. The top decile group experiences an important decrease in equivalent incomes as a result of the increase in tax payments.

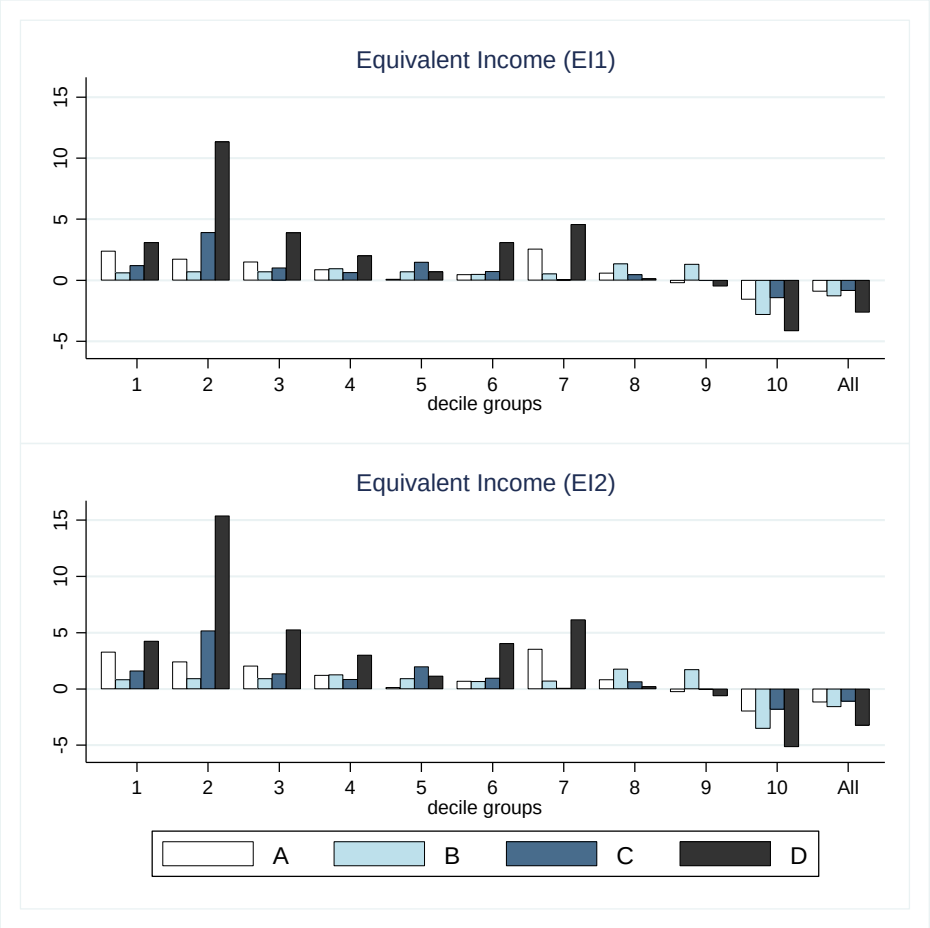
Figure 7: Percentage change in life satisfaction by satisfaction decile group: all reforms



It is interesting to compare the effects the reforms have on the global average. Average life satisfaction for the whole sample increases the most under reform D, followed by reform A, C and B. In contrast with these results, all reforms have a negative effect on the global average of equivalent incomes. Reform D decreases average equivalent income the most, followed by reforms B, A and C. In that respect, the results for equivalent incomes are more like those for disposable income (figure 6). This result is explained by the different cardinalization of the well-being measures: the equivalent income is linear in actual income (see eq. (6)), while income has a decreasing marginal effect on life satisfaction (because of the logarithmic specification of eq. (4)). Even for egalitarians, however, this is not much of a problem, since inequality aversion is a normative value that can (and should) be reflected in the social welfare function. We will return to

this issue in subsection 4.5.

Figure 8: Percentage change in equivalent income by equivalent income decile group: all reforms

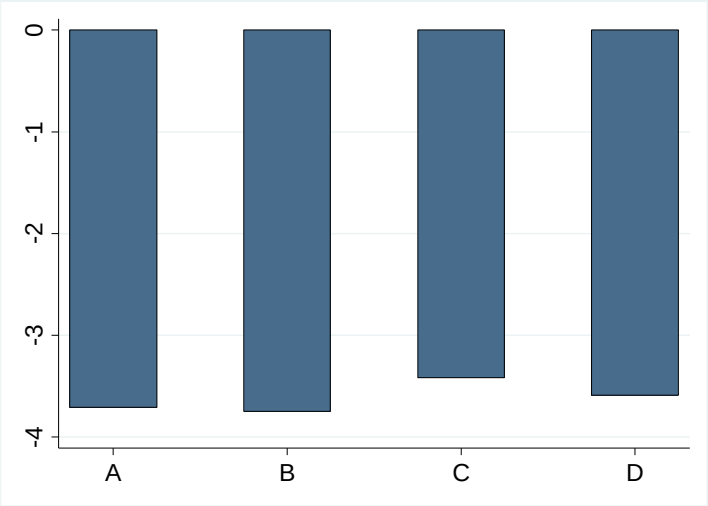


4.4 Well-being inequality

We now summarise the effects of our reforms on the Gini coefficient. Table 12 in the Appendix also presents results for a generalised Gini with parameter of inequality aversion, ρ=5, which gives more weight to individuals at the bottom of the income distribution.

Figure 9 presents the percentage change in income inequality for each of our hypothetical reform scenarios. Gini coefficients decrease by more than 3% under all reforms. Reform B decreases inequality the most, followed by reform A, D and C, but the differences are not very large. For life satisfaction (Figure 10)

Figure 9: Percentage change in income inequality (gini) all scenarios



and equivalent income (Figure 11), we again present results with and without taking into account the indirect effect of income and housing quality on health. The inequality reduction is larger in the latter case. The effect of the reforms on satisfaction inequality is very small compared to that on income inequality. Reform D decreases satisfaction inequality the most, followed by reforms A, C and B. For equivalent income, the effect of the reforms is larger than for life satisfaction but still much lower than for disposable income. Equivalent income inequality decreases the most under reform D, followed by reforms B, A and C. Not surprisingly, implementing a richer evaluative framework has huge consequences for the evaluation of the non-income policy reform.

Figure 10: Percentage change in satisfaction inequality (gini) all scenarios

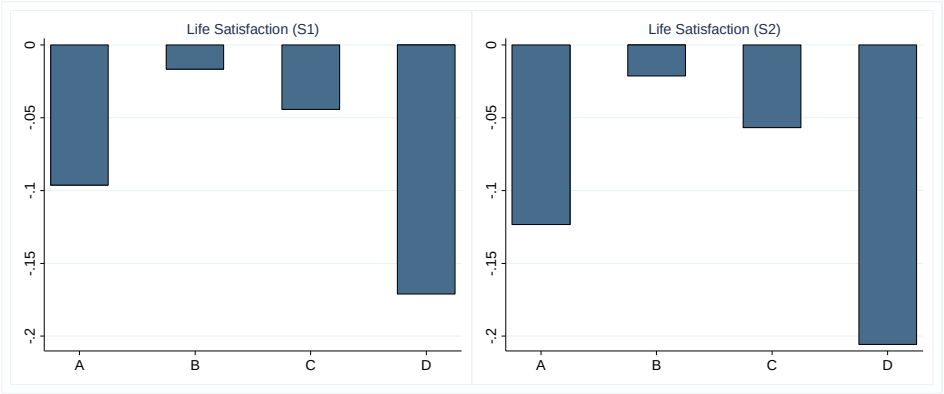
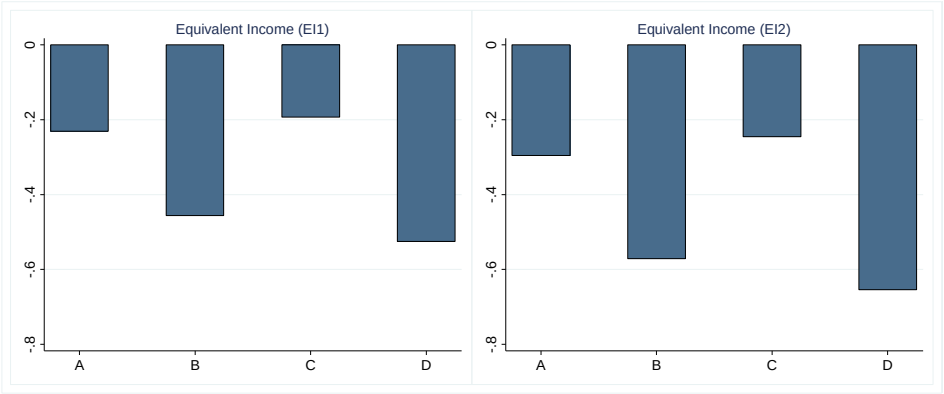


Figure 11: Percentage change in equivalent income inequality (gini) all scenarios



4.5 Social welfare

Ultimately, what we are interested in are the results on social welfare, considering both the aggregate effect and the effect on inequality. For that purpose we calculate social welfare as

$$SW\rho = A(1 - I_\rho), \tag{8}$$

where A is average well-being and I_ρ is the Generalised Gini for inequality aversion ρ. For $\rho = 0$ we get $I_\rho = 0$, and hence social welfare reduces to the (unweighed) global average of well-being that was given in Table 11 in the Appendix. Table 13 in the Appendix presents the results for (8) for all the policy scenarios and for two values of ρ. Inequality is measured by the Gini-coefficient for $\rho = 2$. A value of $\rho = 5$ implies that we give a larger weight to the well-being of persons at the bottom of the well-being distribution.

The welfare rankings of the policy reforms for the different concepts of well-being are shown in Table 4. For simplicity, we only consider the results where we take into account the effects of income and housing on health, i.e. the scenarios S2 and EI2. The results allow us to draw some important lessons.

First, the ranking of policy reforms depends crucially on two normative choices: the measure of individual well-being and the degree of inequality aversion. Focusing only on disposable income may be very misleading if society prefers a broader concept of well-being, be it life satisfaction or equivalent income.

Second, since all our policy measures reduce inequality, more policies become welfare-improving, compared to the base, if the inequality aversion in the social welfare function increases. This is most outspoken for equivalent incomes, where all policies decrease welfare for $\rho = 0$, but increase welfare for $\rho = 5$. For life satisfaction, all policies are already welfare improving for $\rho = 0$. This result can easily be explained. As mentioned before, for any individual, equivalent income is linear in disposable income. Pure income transfers may have welfare effects due to differences in preferences and the levels of the other life dimensions (see

Table 4: Ranking of policies

disposable income			life satisfaction (S2)			equivalent income (EI2)		
$\rho = 0$	$\rho = 2$	$\rho = 5$	$\rho = 0$	$\rho = 2$	$\rho = 5$	$\rho = 0$	$\rho = 2$	$\rho = 5$
C	C	A	D	D	D	base	B	D
A	A	C	A	A	A	C	A	B
base	B	B	C	C	C	A	base	A
B	base	base	B	B	B	B	C	C
D	D	D	base	base	base	D	D	base

eq. (6)), but these effects will be rather small. If one cares about well-being inequality this must be taken up in the normative inequality aversion - a positive inequality aversion will lead to the consequence of an increase in social welfare resulting from an income transfer from someone with a high level of equivalent income to someone with a low level of equivalent income. This is what we observe in Table 4: as soon as ρ starts increasing, more inequality reducing policies also become welfare improving. The situation is different if we take subjective life satisfaction as a measure of well-being. This cardinalization implies declining marginal utility of income and it is well known that if this is the case, income transfers from rich to poor are welfare-increasing, even in the (utilitarian) case $\rho = 0$.

Third, implementing a richer well-being framework makes it possible to evaluate non-income policies. A policy aiming to improve the housing quality of the poor (our reform D) can never be welfare-improving if one only considers disposable income, because in that narrow setting there are only costs and no benefits. It is preferred over all the income transfer policies, however, if we evaluate well-being in terms of life satisfaction or in terms of equivalent income with a sufficiently large degree of inequality aversion.

5 Conclusion

Microsimulation is the preferred method for the ex-ante evaluation of policy scenarios. Until now applications have mostly been restricted to the simulation of disposable incomes. This goes against the present (commendable) trend to also take into account other non-material life dimensions in the evaluation of well-being. We have shown that in principle it is easy to analyse the microsimulation results within a richer evaluative framework. This requires simulation of the effects of a policy on other life dimensions, and for many of these effects there is already substantial empirical evidence. Aggregating the different dimensions into one scalar measure of individual well-being requires making ethical choices. Yet these are genuine and important questions, and neglecting them leads to an undesirable impoverishment of the policy debate. Life satisfaction is a natural choice and the empirical evidence for its determinants is growing rapidly. It raises the issue, however, as to whether, for a distributional analysis, we should

accept that individuals are compensated when they are less satisfied due to having higher expectations - or are less compensated for misfortune if they more easily adapt to their new situation. If the response to these questions is negative, one must look for an alternative measure of individual well-being. We proposed the equivalent income measure as a possible candidate. Our empirical application for Sweden illustrates the importance of this choice. In particular, individuals with the lowest levels of life satisfaction have on average a higher income and better health, and are less likely to be unemployed than those deprived in terms of equivalent incomes.

We then simulated the effects of four hypothetical policy reforms using the three measures of well-being (disposable income, life satisfaction and equivalent income). The simulation results confirm that the choice of well-being measure is important for the welfare ranking of policies. An important aspect of this is that implementing a richer evaluative framework makes it possible to also analyse the effects of non-monetary policy reforms, and to compare the welfare effects of such reforms with those of tax-benefit policies. Moreover, feedback effects between the different life dimensions are important and can easily be taken into account. This was illustrated for the (well-known) relationship between health (care) and income.

This paper presents a simple illustration of how microsimulation techniques can be used to evaluate policy reforms in terms of individual well-being. Our empirical work has, however, some obvious shortcomings. Ideally, one would estimate a full model involving all the interactions between the relevant dimensions of life. Future research would, in particular, benefit from the availability of microsimulation models for panel data, allowing one to account for the long-term relationship between a broad range of life dimensions. Moreover, for equivalent incomes, the identification of preferences on the basis of a life satisfaction equation is only a first step (see Decancq et al., 2015b for a more extensive discussion). The identification of preferences could, for instance, be improved by the inclusion of information on stated preferences in surveys. More work is needed to correct these shortcomings. Yet, the direction this work should take is clear. Given the obvious limitations of focusing only on disposable incomes, it seems important to start walking that route.

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Appendix

Table 5: Descriptive statistics

	mean	st.dev.
Income (SEK/month)	21,309	10,707
Satisfaction	8.04	1.55
Health	4.15	0.81
Unemployment	0.04	0.19
Housing (1,000 SEK)	5.30	1.64
Male	0.49	0.50
Age	49.76	18.58
Married	0.48	0.50
Divorced	0.11	0.32
Widow	0.06	0.24
Child 0-15	0.28	0.45
Non-Swede	0.04	0.19
Higher education	0.33	0.47
East Sweden	0.39	0.49
South Sweden	0.44	0.50
North Sweden	0.17	0.38
Nervous	1.85	0.99
Down	1.34	0.74
Calm	3.99	0.81
Downhearted	1.66	0.87
Number of observations		5,336

Table 6: Life Satisfaction Regressions: OLS and ordered logit

	OLS	Ordered logit
Disposable Income (log)	0.082** (0.039)	0.139** (0.060)
Self-reported health	0.374*** (0.040)	0.551*** (0.061)
Unemployed	-0.630*** (0.169)	-0.856*** (0.268)
Housing (in 1000SEK)	-0.012 (0.029)	-0.018 (0.044)
Health x Male	0.075* (0.043)	0.119* (0.065)
Health x High. Education	0.064 (0.048)	0.099 (0.071)
Health x Age over 40	-0.041* (0.024)	-0.062* (0.035)
Unempl. x Male	0.324* (0.181)	0.412 (0.277)
Unempl. x High. Education	-0.317 (0.251)	-0.327 (0.369)
Unempl. x Age over 40	0.221 (0.179)	0.290 (0.273)
Housing x Male	0.026 (0.025)	0.032 (0.037)
Housing x High. Education	-0.013 (0.027)	0.000 (0.039)
Housing x Age over 40	0.051* (0.027)	0.079* (0.040)
Male	-0.649*** (0.197)	-1.012*** (0.300)
Age	-0.042*** (0.008)	-0.076*** (0.011)
Age squared/100	0.042*** (0.007)	0.077*** (0.010)
Married	0.427*** (0.049)	0.666*** (0.072)
Separated	-0.121 (0.164)	0.088 (0.257)
Divorced	-0.007 (0.067)	0.020 (0.100)
Widow	0.204** (0.092)	0.204 (0.139)
Children 0-15	0.155*** (0.046)	0.234*** (0.067)
Non-Swede	0.025 (0.089)	0.127 (0.131)
Higher Education	-0.378* (0.223)	-0.683** (0.330)
South Sweden	0.097** (0.038)	0.129** (0.056)
North Sweden	0.178*** (0.051)	0.214*** (0.075)
Down in the dumps	-0.188*** (0.031)	-0.204*** (0.047)
Calm	0.338*** (0.027)	0.543*** (0.043)
Nervous	-0.128*** (0.024)	-0.189*** (0.037)
Downhearted	-0.341*** (0.029)	-0.478*** (0.043)
_cons	6.183*** (0.449)	
N	5336	5336
R^2	0.363	
pseudo R^2		0.121

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: First stage of 2SLS: Health x Male

	Model 1	Model 2
Chronic x male	-0.369*** (0.020)	-0.357*** (0.020)
Limited x male	-0.582*** (0.019)	-0.555*** (0.019)
Unmet treatment x male	-0.245*** (0.029)	-0.210*** (0.029)
Unmet dental treatment x male	-0.252*** (0.033)	-0.220*** (0.032)
Disposable Income (log)	0.025* (0.014)	0.008 (0.014)
Unemployed	-0.117*** (0.033)	-0.064* (0.033)
Housing (in 1000SEK)	0.015*** (0.005)	0.011** (0.005)
Male	5.066*** (0.025)	4.999*** (0.025)
Age	-0.005** (0.002)	-0.005** (0.002)
Age squared/100	0.000 (0.002)	-0.000 (0.002)
Married	0.065*** (0.018)	0.058*** (0.018)
Separated	0.068 (0.060)	0.105* (0.059)
Divorced	0.031 (0.025)	0.033 (0.024)
Widow	0.077** (0.033)	0.083** (0.033)
Children 0-15	-0.007 (0.016)	-0.010 (0.016)
Non-Swede	-0.039 (0.033)	-0.026 (0.032)
Higher Education	0.046*** (0.014)	0.046*** (0.014)
South Sweden	0.041*** (0.014)	0.037*** (0.014)
North Sweden	0.019 (0.019)	0.009 (0.018)
Down in the dumps		-0.042*** (0.011)
Calm		0.035*** (0.010)
Nervous		-0.031*** (0.009)
Downhearted		-0.021** (0.010)
_cons	-0.143 (0.133)	0.091 (0.143)
N	5336	5336
R^2	0.956	0.958

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: First stage of 2SLS: Health x Higher Education

	Model 1	Model 2
Chronic x high edu	-0.435*** (0.019)	-0.424*** (0.019)
Limited x high edu	-0.478*** (0.020)	-0.469*** (0.019)
Unmet treatment x high edu	-0.201*** (0.028)	-0.186*** (0.027)
Unmet dental treatment x high edu	-0.244*** (0.034)	-0.223*** (0.034)
Disposable Income (log)	0.036*** (0.011)	0.025** (0.011)
Unemployed	-0.039 (0.026)	-0.005 (0.026)
Housing (in 1000SEK)	0.001 (0.004)	-0.002 (0.004)
Male	0.014 (0.010)	-0.002 (0.010)
Age	0.002 (0.002)	0.002 (0.002)
Age squared/100	-0.004** (0.002)	-0.004** (0.002)
Married	0.018 (0.014)	0.013 (0.014)
Separated	-0.023 (0.048)	0.001 (0.047)
Divorced	0.009 (0.019)	0.010 (0.019)
Widow	0.048* (0.026)	0.050* (0.026)
Children 0-15	-0.006 (0.013)	-0.007 (0.013)
Non-Swede	-0.010 (0.026)	0.000 (0.025)
Higher Education	5.023*** (0.025)	5.006*** (0.025)
South Sweden	0.008 (0.011)	0.005 (0.011)
North Sweden	-0.019 (0.015)	-0.026* (0.015)
Down in the dumps		-0.010 (0.009)
Calm		0.030*** (0.008)
Nervous		-0.022*** (0.007)
Downhearted		-0.018** (0.008)
_cons	-0.361*** (0.105)	-0.250** (0.113)
N	5336	5336
R^2	0.970	0.971

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: First stage of 2SLS: Health x Over 40

	Model 1	Model 2
Chronic x over 40	-0.495*** (0.043)	-0.455*** (0.042)
Limited x over 40	0.527*** (0.033)	0.569*** (0.032)
Unmet treatment x over 40	-0.113* (0.066)	-0.035 (0.065)
Unmet dental treatment x over 40	-0.027 (0.078)	0.078 (0.077)
Disposable Income (log)	0.113*** (0.036)	0.069** (0.035)
Unemployed	0.058 (0.084)	0.200** (0.083)
Housing (in 1000SEK)	0.102*** (0.013)	0.089*** (0.013)
Male	-0.022 (0.032)	-0.078** (0.032)
Age	0.245*** (0.006)	0.238*** (0.006)
Age squared/100	-0.181*** (0.006)	-0.178*** (0.006)
Married	-0.030 (0.045)	-0.045 (0.045)
Separated	-0.172 (0.152)	-0.080 (0.149)
Divorced	-0.016 (0.062)	-0.014 (0.061)
Widow	-0.235*** (0.084)	-0.215*** (0.083)
Children 0-15	-0.257*** (0.042)	-0.255*** (0.041)
Non-Swede	-0.077 (0.082)	-0.033 (0.080)
Higher Education	-0.134*** (0.035)	-0.126*** (0.034)
South Sweden	0.083** (0.035)	0.070** (0.035)
North Sweden	0.065 (0.047)	0.037 (0.046)
Down in the dumps		-0.088*** (0.028)
Calm		0.157*** (0.025)
Nervous		-0.059*** (0.022)
Downhearted		-0.066** (0.026)
_cons	-6.048*** (0.336)	-5.645*** (0.360)
N	5336	5336
R^2	0.685	0.698

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Average values under the baseline and counterfactual scenarios for gainers

	Base A	Reform A	Base B	Reform B	Base C	Reform C	Base D	Reform D
Disposable income	8,830	12,576	19,699	20,144	11,682	13,682	13,035	13,002
Equivalent income (EI1)	570	784	4,970	5,039	305	363	133	280
Equivalent income (EI2)	570	861	4,970	5,064	305	381	133	332
Equivalent income (EI3)	570	823	-	-	-	-	-	-
Equivalent income (EI4)	570	904	-	-	-	-	-	-
Life satisfaction (S1)	6.7938	6.8221	7.9505	7.9534	7.4455	7.4579	7.4875	7.5446
Life satisfaction (S2)	6.7938	6.8302	7.9505	7.9542	7.4455	7.4614	7.4875	7.5580
Life satisfaction (S3)	6.7938	6.8085	-	-	-	-	-	-
Life satisfaction (S4)	6.7938	6.8449	-	-	-	-	-	-

Table 11: Average values under the baseline and counterfactual scenarios

	Base	Reform A	Reform B	Reform C	Reform D
Disposable income	20,184	20,186	20,145	20,215	19,909
Equivalent income (EI1)	4,515	4,473	4,457	4,476	4,397
Equivalent income (EI2)	4,515	4,463	4,444	4,466	4,368
Equivalent income (EI3)	4,515	4,475	-	-	-
Equivalent income (EI4)	4,515	4,465	-	-	-
Life satisfaction (S1)	7.9428	7.9434	7.9432	7.9434	7.9445
Life satisfaction (S2)	7.9428	7.9436	7.9433	7.9436	7.9449
Life satisfaction (S3)	7.9428	7.9432	-	-	-
Life satisfaction (S4)	7.9428	7.9441	-	-	-

Table 12: Inequality under the baseline and counterfactual scenarios

	S-Gini (ρ=2)					S-Gini (ρ=5)				
	Base	Reform A	Reform B	Reform C	Reform D	Base	Reform A	Reform B	Reform C	Reform D
Disposable income	0.24472	0.23564	0.23554	0.23635	0.23593	0.44680	0.42901	0.43925	0.43416	0.43938
Equivalent income (EI1)	0.81593	0.81404	0.81220	0.81435	0.81164	0.99403	0.99393	0.99390	0.99394	0.99378
Equivalent income (EI2)	0.81593	0.81351	0.81126	0.81392	0.81058	0.99403	0.99390	0.99387	0.99392	0.99372
Equivalent income (EI3)	0.81593	0.81390	-	-	-	0.99403	0.99391	-	-	-
Equivalent income (EI4)	0.81593	0.81337	-	-	-	0.99403	0.99389	-	-	-
Life satisfaction (S1)	0.06438	0.06432	0.06437	0.06435	0.06427	0.15205	0.15187	0.15202	0.15198	0.15179
Life satisfaction (S2)	0.06438	0.06430	0.06437	0.06434	0.06425	0.15205	0.15182	0.15201	0.15196	0.15174
Life satisfaction (S3)	0.06438	0.06434	-	-	-	0.15205	0.15191	-	-	-
Life satisfaction (S4)	0.06438	0.06426	-	-	-	0.15205	0.15169	-	-	-

Table 13: Social welfare under the baseline and counterfactual scenarios

	SW (ρ=2)					SW (ρ=5)				
	Base	Reform A	Reform B	Reform C	Reform D	Base	Reform A	Reform B	Reform C	Reform D
Disposable income	15,244.7	15,429.7	15,400.3	15,437.2	15,211.8	11,165.8	11,526.2	11,296.5	11,438.4	11,161.3
Equivalent income (EI1)	831.1	831.9	837.0	831.0	828.2	26.96	27.15	27.19	27.11	27.34
Equivalent income (EI2)	831.1	832.3	838.7	831.0	827.3	26.96	27.22	27.26	27.16	27.44
Equivalent income (EI3)	831.1	832.8	-	-	-	26.96	27.23	-	-	-
Equivalent income (EI4)	831.1	833.2	-	-	-	26.96	27.30	-	-	-
Life satisfaction (S1)	7.4314	7.4325	7.4319	7.4322	7.4340	6.7351	6.7371	6.7357	6.7362	6.7387
Life satisfaction (S2)	7.4314	7.4328	7.4320	7.4324	7.4345	6.7351	6.7376	6.7358	6.7365	6.7394
Life satisfaction (S3)	7.4314	7.4322	-	-	-	6.7351	6.7366	-	-	-
Life satisfaction (S4)	7.4314	7.4336	-	-	-	6.7351	6.7390	-	-	-