

Health and Social Comparison

Does Envy Make You Sick?*

Matthias Schön[†]

October 19, 2015

Abstract

This paper investigates the relationship between an individual's health and relative economic performance. Using a unique dataset with explicit information on social circles, I find robust and significant positive effects of relative performance on self-reported health and negative effects on detrimental health behavior such as smoking and obesity. People that consider themselves poorer than their circle of acquaintances are significantly less likely to report good health. I further show that this effect exhibits asymmetries, i.e., being worse off than one's circle of acquaintances has a strong negative effect, whereas being better off exhibits only a mild positive effect. Furthermore, groups with lower absolute income are more strongly affected by the relative performance effect than are groups with high absolute income. I also document that the standard approach of artificially constructing reference groups yields weaker and insignificant results.

JEL Classification: I14.

Keywords: Health Economics, Inequality, Relative Deprivation

*Part of this project was completed while visiting the economics department of the University of Pennsylvania. I am indebted to Dirk Krueger for his invitation. I benefited from conversation with Hanming Fang, Michael Haliassos, Chris Hellwig, David Jaeger, Alexander Ludwig, Chris Telmer, and seminar participants at the City University of New York, the University of Cologne and the Cologne Macroeconomic Workshop 2012.

[†]CMR, University of Cologne; Albertus-Magnus-Platz; 50923 Köln; Germany; E-mail: m.schoen@wiso.uni-koeln.de

1 Introduction

Health is highly related to economic performance. Wealthy people experience a longer and healthier life than poor people, cf. Deaton and Paxson (2001). A straightforward interpretation regards this income gradient in health as an individual-level phenomenon. The relationships of income or wealth with health operate through individuals capacities to purchase medical goods and services. Without disputing the effect of absolute economic resources on health, part of the literature argues that this gradient also possesses a social component. Individuals with greater wealth enjoy better health not only because of some process affecting the individual in isolation but also because of the individuals position in a social hierarchy, cf. Cutler et al. (2011).

This theory posits that a low relative economic position is associated with feelings of inferiority, depression, and isolation and triggers chronic stress and anxiousness. Recent medical studies, e.g., by Blackburn and Epel (2012), show that chronic stress places the body permanently in a “fight or flight” situation. It channels bodily energy to the physiological processes essential for producing rapid responses to an immediate threat and puts recreational processes on hold. Whereas this “fight or flight” behavior might be beneficial in the short run, it increases the general vulnerability of the body in the long run ,cf. McEwen (1998), Seeman et al. (2001). Finally, stress and anxiety are often linked to behaviors that are detrimental to health such as smoking, alcohol drinking and a diet that leads to obesity. Elstad (1998) provides a good overview of other mechanisms of relative deprivation on health.

Contrary to absolute measures of economic performance, relative measures necessarily require a reference point. It is crucial to carefully select this reference point. The dominant approach used in the literature to determine this socioeconomic reference group is to artificially assign it according to sorting assumptions such as demographic characteristics (e.g., gender, race, education, age) and geographic proximity (e.g., country, state, zip code). Studies employing this approach generally indicate that there is an effect, cf. Eibner et al. (2004), Kondo et al. (2008), Subramanyam et al. (2009), McLaughlin et al. (2012), Cuesta et al. (2012). Others find that the effect is, if anything, weak and not significant, cf. Jones and Wildman (2008). For a good survey of the existing literature, see Adjaye-Gbewonyo and Kawachi (2012).

Constructing artificial reference groups based on demographic characteristics does not stem from deep sociological understanding. To a large extent, such an approach is taken because links between people are hard to identify empirically, cf. Soetevent (2006). Clark and Senik (2010) show that reference groups tend to be localized and are mostly limited to family, friends, neighbors and work colleagues. Their study also reveals that the personal reference point differs based on personal characteristics.¹ As reference groups are heterogeneous and likely not solely determined by age and education, a more natural approach is to directly ask households to evaluate their own performance within their social circle.

¹Men rely less on comparisons with family members than do women. Employees in more professional occupations rely more on comparisons with their colleagues than do those in elementary occupations.

This paper follows such an approach. Specifically, I use unique information from the Dutch National Bank Household Survey (DNBHS) that includes such questions and circumvents the need for artificially constructing social circles. Respondents have to answer by referring to a self-determined circle of acquaintances explained as “*people with whom [they] associate frequently, such as friends, neighbors, acquaintances, or maybe people at work*”. This open definition does not restrict the circle of acquaintances to a specific group but, in contrast to the traditional approach, accounts for the results of Clark and Senik (2010). In addition to the unique features of households’ subjective relative economic performance, this central bank questionnaire contains rich information on absolute income and assets. This is needed to carefully distinguish between absolute and relative economic performance. As the survey provides a panel data structure over 20 years, it allows for fixed effects analysis, which is largely absent from the existing literature.

I find a robust and significant positive effect of relative performance on self-reported health and negative effects on detrimental health behavior such as smoking and obesity. These findings are based on subjective relative performance information, and I control for both demographic characteristics and absolute economic performance. People that consider themselves poorer than their circle of acquaintances are significantly less likely to report good health. I further show that this effect exhibits asymmetries, i.e., being worse off than one’s circle of acquaintances has a strong negative effect, whereas being better off exhibits only a mild positive effect. Furthermore, lower absolute income groups are more strongly affected by the relative performance effect than are high absolute income groups. I also show that exploiting the same data set but pursuing the traditional approach of using a reference group based on demographic characteristics yields weaker and insignificant results.

Related Literature There are a few papers that follow this direct approach to determining the reference group, but they are limited to either a fraction of the population or to non-developed countries. Pham-Kanter (2009) uses the National Social Life, Health, and Aging Project (NSHAP) data set that reports the income positions of people older than 55 within their self-defined social networks. She examines whether there is an association between relative position and health in the US. She finds significant results for lower rank deprivation with self-reported health and cardiovascular disease. Mangyo and Park (2011) analyze a nationally representative data set from China and find support for the relative deprivation hypothesis. They suggest that relatives and classmates are salient reference groups for urban residents and that neighbors are important for rural residents. Using a representative data set from a developed country (with universal health insurance) significantly advances this literature.

My analysis proceeds as follows. Section 2 presents the data set and highlights important features that this study exploits. Section 3 describes the results of a cross-sectional nonlinear model, whereas section 4 provides the results from a dynamic nonlinear panel model. In section 5, I compare these results with the traditional approach using an artificially constructed reference group, and in section 6, I discuss endogeneity problems. I conclude in section 7.

2 Data Set and Estimation Methods

The Dutch National Bank Household Survey (DNBHS) is an online household survey beginning in 1993. The DNBHS covers work, pensions, housing, mortgages, income, assets, debts, health, economic and psychological concepts and other variables. It thus allows the study of the health consequences of both absolute material resources and perceptions of relative economic status. The initial survey was administered to approximately 2,790 Dutch households over-sampled from the top 10% of the income distribution and weighted to be representative of the Dutch-speaking population. Since then, households have been re-interviewed annually, with new households added each year to counteract the non-negligible attrition and maintain the representativeness of the cross-sectional sample.² The household survey underwent a major overhaul in 2001, resulting in a sample of 1,861 households.

2.1 Measures of Absolute Economic Performance

The most concerning issue in an analysis of relative economic performance is to separate the effect of relative performance from the effect resulting from naturally related effects of absolute economic performance. Absolute economic performance has both a positive association with relative economic performance and a positive impact on health. Assuming that there were be no connection between relative performance and health, a simple OLS regression omitting measures of absolute economic performance would falsely report a positive coefficient for a relative measure. Therefore, neglecting absolute measures biases the effect of relative performance upwards.

To address this problem, I include both absolute household income and absolute household net wealth as control variables. The DNBHS includes detailed questions on the sources of income that respondents may have. These sources of income serve as the basis for computing total gross income at a personal level. The DNBHS also provides rich information on personal assets and liabilities. I construct a proxy for total wealth consisting of real and financial assets and liabilities (including mortgages). Both income and assets are adjusted for inflation using OECD price deflators. Personal income, assets and liabilities are predominantly reported by males, and few households report assets for different members. To increase the number of observations, I aggregate household incomes and net assets. I further adjust for household size using the Luxembourg Income Study approach of dividing assets or income by the square root of the number of household members, (cf. Buhmann et al. (1988)) and ascribe it to each member of the household. I allow for nonlinear effects of household income and net wealth (all of which have skewed distributions) by means of a log transformation and an inverse hyperbolic sine

²The DNBHS is based on the CentERpanel, which is largely representative of the Dutch population, exceptions are under-representation of those with moderate education, single households and people living in a highly urbanized area, cf. Teppa and Vis (2012). A comparison with Netherlands Official Statistics is provided in appendix A.

(IHS) transformation, respectively.³ The advantage of this near-logarithmic IHS transformation is that it is defined for zero and negative values (see also Pence (2006)). The qualitative results of relative position are robust to alternative specifications of the aforementioned covariates (e.g., dummies denoting absolute economic performance quartiles).⁴

2.2 Measures of Relative Economic Performance

The key features of the DNBHS for this analysis are questions that the respondent has to answer by referring to a self-determined circle of acquaintances.⁵ Previous to the questions, the DNBHS defines this circle of acquaintances as “*people with whom [the respondents] associate frequently, such as friends, neighbors, acquaintances, or maybe people at work*”. This phrasing of the question allows the composition of reference groups to differ across respondents. The DNBHS also asks the respondents to report various characteristics of their acquaintances. In addition to the (perceived) average household income of their circle of acquaintances, they provide information on the age category to which most of their acquaintances belong, average education, average household size, the most prevalent type of employment (e.g., employed, self-employed or no paid work) and the average hours of work per week, distinguished by gender.

Direct Answers to Relative Performance among Acquaintances. The central variables that are used in subsequent sections are derived from direct questions on the respondents’ relative performance with respect to that of their acquaintances. To answer these questions, the respondents have to indicate the extent to which they agree or disagree with certain statements on a seven-point ordinal scale from “strongly disagree” to “strongly agree”. The exact statements of the questionnaire are provided in Table 1. The statements cover how respondents perceive their relative financial situation, their relative asset holding, or their ability to spend more than their acquaintances. The answers to these statements are correlated but not identical. Taking the average of the seven-point scale answers of *Assets*, *Spending*, and *Financial*, I construct the additional measure *Combined*.⁶

The answers to these statements are not based on objectively calculated incomes and assets of the reference group, as would be the case in the traditional approach. Rather, they reflect the respondents’ subjective perceptions of their environment. This is particularly valuable because the main mechanism connecting relative economic performance and health is assumed to operate via the perception of inferiority. Actual differences in absolute economic performance

³The functional form of the hyperbolic inverse sine is $\log[x + [x^2 + 1]^{1/2}]$, where x denotes assets.

⁴I experiment with different categories of assets, as there are many missing observations in the assets section (which leads to a decline in the total number of observations), but the results are insensitive to these variations.

⁵This unique feature is also used in other studies that investigate social effects. Georgarakos et al. (2012) find considerable effects of relative economic performance on borrowing and on indebtedness, suggesting a link to financial distress.

⁶Appendix B contains the coefficients of correlation between all three statements and *Combined*. Importantly, *Spending* is less related to the two other statements. This might be due to the reverse formulation of the statement.

Table 1: Statements of Relative Economic Performance

<i>Assets</i>	I think my household has more assets than others in my environment.
<i>Spending</i>	Other people in my environment have more money to spend than I do.
<i>Financial</i>	If I compare myself with my friends, I think in general I am financially better off.

Notes: *Spending* has an opposing formulation. In later results, I transform this variable such that the coefficients have consistent signs.

computed in the standard approach might differ from the perception and are a less accurate match for the proposed link.

A potential problem with subjective relative measures is that too many people consider themselves to be average. If the answers exhibit only little variation, regression results will be less significant. The last column of Table 2 refutes this suspicion, showing that the responses to *Financial* have a reasonable distribution. More than 31.7% of the respondents report performing below their acquaintances, while 27.3% report performing better. A second concern arises from the natural relationship between relative and absolute measures, e.g., given a constant reference point, increasing absolute income improves the relative income position. Perfect correlation between the two variables would prohibit distinguishing between the associated effects. Table 2 provides evidence that this is not an issue in this study. While 17.5% of the lowest income quintile feel themselves in a relatively better position than their milieu, 46.6% feel that they are worse off. On the opposite side of the income scale, 17.8% believe that others in their milieu do better, whereas only 44.1% of the respondents think that they are better off than other people in their environment.⁷

Indirect Answer to Relative Performance Although I argue that it is more plausible to use subjective perceptions, I compute two additional measures of relative economic performance that rely on more quantitative measures. To do so, I use responses to the following DNBHS question: “If you think of your circle of acquaintances, how much do you think is the average total net income per year of those households?”

The first indirect measure of relative economic performance is a binary variable denoting whether a household has a higher income than its acquaintances. The second indirect measure is the difference between the natural logarithms of household income and the reported income

⁷Appendix C contains a cross-tabulation of wealth and the perception of relative position that shows similar results. The results also hold for different classifications of absolute economic performance and for other measures of relative economic performance.

Table 2: Absolute Income vs. Relative Perception

Compared to Other I'm Financially Better Off	Absolute Income Quintiles					
	1st	2nd	3rd	4th	5th	Total
Totally Disagree	11.63	7.17	4.64	3.71	2.45	5.92
2	15.26	11.64	8.50	7.50	4.59	9.50
3	19.80	18.91	18.34	13.91	10.78	16.35
4	35.85	42.49	43.81	43.80	38.01	40.79
5	10.44	12.27	16.45	18.48	23.55	16.24
6	4.89	5.96	6.79	10.15	16.38	8.83
Totally Agree	2.12	1.57	1.46	2.45	4.24	2.37
Total	100.0	100.0	100.0	100.0	100.0	100.0

Notes: Cross tabulation of absolute adjusted household income quintiles and perception of relative performance among circle of acquaintances. Entries are in percentages.

of its acquaintances.⁸

$$Ind_IncDist_i = \begin{cases} 1 & \text{if } Inc_i > IncAcq_i \\ 0 & \text{if } Inc_i < IncAcq_i \end{cases} \quad (1)$$

$$Log_IncDist_i = \log(Inc_i) - \log(IncAcq_i) \quad (2)$$

As the DNBHS provides no information on the asset holdings of the circle of acquaintances, these measures are restricted to household income only.

2.3 Measures of Health and Health Behavior

In the DNBHS, the respondents report the standard survey measure of self-reported health (SRH) on a five-point ordinal scale (“excellent”, “good”, “fair”, “not so good”, “poor”). In the benchmark case, I collapse this multidimensional answer to a binary variable, either being in good health (“excellent”, “good”) or in poor health (“fair”, “not so good”, “poor”). In addition to capturing an individual’s subjective well-being, poor self-reported health has been shown to be a robust predictor of mortality and correlates highly with other objective health indicators, especially in the context of the working age population and developed countries, cf. Miilunpalo et al. (1997), Idler and Benyamini (1997).

In addition to self-reported health, this study investigates the relationship between relative economic performance and various behaviors that are related to health. This proxies for the mechanism connecting relative position with health explained above. People with low relative

⁸The answer to the question concerning the net income of the circle of acquaintances is reported in brackets. To avoid the difficulty of comparing income brackets to continuous household income, I use a question that directly asks the respondents to classify own income in the same brackets. I use the midpoints of these brackets as household income and adjust it using reported average household size.

standing may compensate for the resulting unhappiness with short-term pleasant but unhealthy activities. Smoking is often considered to reduce acute stress symptoms, heavy and permanent alcohol consumption may be employed to drown one’s frustrations, and eating for comfort mitigates bad mood, cf. Wilkinson (2000). Given these considerations, relative economic performance has negative long-term effects on health. The DNBHS contains information on three health-related behaviors. Smoking is reported in various intensities. I assume smoking to be harmful when the respondent reports smoking every day. Drinking alcohol is reported only in terms of whether one drinks more than four alcoholic drinks alcohol per day. The survey also includes information on a respondent’s height and weight, which allows me to compute the body mass index (BMI).⁹ I classify someone as obese when the BMI exceeds 30, following the criteria used by the World Health Organization.

2.4 Data Selection

Not all of the observations in the DNBHS are applicable to the following analysis. First, as I am interested in a respondent’s economic performance, I focus only on adults and drop all observations of respondents younger than 18. Second, all observations that have at least one non-response among health or control variables are excluded. Third, as with many surveys that include questions on financial status, the greatest constraints on sample size are the response rates for the income and asset questions. The response rate in the DNBHS for the questions on absolute income, absolute assets and questions regarding the circle of acquaintances is 61%, leading to a final sample size of 19,811 observations.¹⁰

If the non-responding households differ from the responding households in a relevant characteristic, this could bias the results. Table 3 presents the summary statistics for the complete DNBHS, the sample excluding non-responses to health and control variables and the final sample excluding also non-respondents to absolute economic performance and questions concerning relative economic performance. The sample that answered the control and health questions and the sample that also answered the income, asset and relative performance questions are quite similar in terms of demographic characteristics. The final sample includes more males and is slightly older. This is also reflected in the fact that the final sample includes fewer students and more retirees. Fortunately, there are only small differences between the two samples with respect to economic characteristics. Respondents who do not answer one of the economic questions are on average only a somewhat less wealthy and have a lower income. The average evaluation of one’s relative position does not differ between the two samples. The summary statistics for the health variables also signal that there is no systematic bias from non-responders. In both samples, approximately 80% report good health and 20% poor health. Health behavior is not affected.

⁹The BMI is computed as $BMI = weight[kg]/(height[m])^2$.

¹⁰Unfortunately, many of the questions central to relative economic performance, which are key variables for this paper, are not included in the 1993, 1994, 2008, 2010, and 2012 waves.

Table 3: Descriptive Statistics of Complete DNBHS and Final Sample

Sample	Complete Sample	Responded to Health & Control	Final Sample
Variable	Mean or Proportion		
Age	45.9	48.0	49.6
% Male	50.5	54.0	55.7
Household Size	2.8	2.7	2.6
% Urban	60.7	60.9	60.4
% Less than High School	15.3	14.5	11.6
% High School	39.1	37.0	37.0
% College	43.8	46.7	49.9
% Employed	54.7	53.6	56.8
% Unemployed	1.8	1.8	1.7
% Retired	13.4	15.7	17.5
% Students	7.0	4.3	1.5
% Others	23.1	24.6	22.6
Net Assets	199,350 (686,468)	200,683 (723,604)	202,602 (293,218)
Gross Income	30,287 (35,849)	30,300 (36,441)	33,226 (39,734)
% Fin. Better Off than Others	26.3	26.5	27.4
% Fin. Worse Off than Others	33.1	32.9	31.8
Self-Reported Health			
% Excellent		17.4	16.6
% Good		62.2	63.7
% Fair		16.4	15.8
% Not so Good		3.4	3.3
% Poor		0.6	0.6
% Smoking (Every Day)		22.0	20.7
% Alcohol (Drinks/Day>4)		7.2	7.5
Body Mass Index (BMI)		25.2 (4.3)	25.3 (4.2)
% Obese (BMI>30)		10.0	10.0
Observations	57,656	32,486	19,766

Notes: Summary statistics of the pooled 15 waves of DNBHS 1995-2007/2009/2011 and only respondents with age \geq 18. The base year for the deflation of assets and income is 2010. Standard deviation in parentheses

2.5 Model Estimation

Estimating the association between relative economic performance and health requires addressing the problem of omitted variables. I have already discussed this for the most obvious case of absolute economic performance, but there are other variables that might bias my results. To address biases from omitted variables, two general strategies can be applied: (a) introduce the omitted measure explicitly into the analysis and estimate the adjusted degree of association between relative position and health, and (b) estimate “fixed effects” models. Fixed effect models difference out effects of persistent characteristics (both measurable and not) of households, cf. Daly et al. (1998). In this section, I follow both strategies and in the first part incorporate several control variables in a cross-sectional estimation of a reduced-form nonlinear model. In second part, I exploit the DNBHS panel structure and use a nonlinear dynamic model with fixed effects. For both approaches, I use data from 15 waves of the DNBHS, i.e., 1995-2007/2009/2011.

Cross-Sectional Model In the first approach, I consider the observations of all 15 waves as one huge cross-sectional data set. The cross-sectional results are estimated by a nonlinear probit model with following regression equation

$$Pr[Health_i = H] = \Phi\{\alpha + \beta RP_i + X_i\theta + \epsilon_i\} \quad (3)$$

where $Health_i$ is a binary health variable of respondent i , i.e., being in good or poor health, smoking or not smoking, and RP_i is a relative economic performance measure (either direct or indirect). X_i represents a set of explanatory variables that may affect health, including the natural logarithm of adjusted household income, the inverse hyperbolic sine of adjusted net household assets and other control variables. These control variables are age, age², gender, educational attainment, degree of urbanity, labor market status dummies and general variables such as year dummies. The β and the vector θ are parameters to be estimated. The error term ϵ_i is individual specific, is assumed to be uncorrelated with X_i and across individuals and is assumed to be drawn from a distribution with mean zero and constant variance. I cluster standard errors at the individual level to account for correlations of individual health over time.

In my models, I do not control for possible reverse causality running from health to absolute and relative economic performance, and hence I may overestimate the impact of income. I interpret the models in reduced form.

Panel Models In the second approach, I exploit the panel structure of the DNBHS. I estimate two dynamic logit models, one with fixed effects and one without a fixed effect.

$$Pr[Health_{i,t} = H] = \Phi\{\alpha + \beta RP_i + X_{i,t}\theta + \epsilon_{i,t}\} \quad (4)$$

$$Pr[Health_{i,t} = H] = \Phi\{\alpha + \beta RP_i + X_{i,t}\theta + u_i + \epsilon_{i,t}\} \quad (5)$$

where $Health_{i,t}$ is health of individual i at time t . $X_{i,t}$ consists of the same control variables as above except for those that do not vary over time, as these are incorporated in the fixed effect. The u_i s represent the individual-specific and time-invariant fixed effect component.

I additionally estimate a panel ordered logit and a panel OLS with a fixed effects using the five-point ordinal scale of health condition as the dependent variable.

3 Cross-sectional Estimation

3.1 Self-reported Health

First, I run separate probit regressions of equation (3) for all direct variables *Assets*, *Spending*, *Financial* and the constructed measure *Combined*. As my interest lies in the role of absolute and relative economic performance, I focus solely on these results.¹¹ The main result of the cross-sectional estimation are shown in Table 4. The first two rows of Table 4 show the standard result that absolute economic performance (household income and household net wealth) is positively associated with self-reported health. All regression coefficients are positive and highly significant. The probit estimates in the last four rows show that all relative performance measures are also positively associated with self-reported health. The regression coefficients of *Assets*, *Spending*, *Financial* and *Combined* are all positive and highly significant, with the strongest association being observed for the combined measure. This is clear evidence that relative economic performance has a significant affect on reporting good health.¹²

Table 4: Probit Regression Coefficients for Direct Measures

Self-Reported Health	I	II	III	IV
Log Income	0.1120***	0.1077***	0.1096***	0.0980***
IHS Assets	0.0057**	0.0057**	0.0053**	0.0036
Assets	0.0537***			
Spending		0.0666***		
Financial			0.0616***	
Combined				0.1117***

Notes: *** Significant at $\alpha=0.01$, ** Significant at $\alpha=0.05$, * Significant at $\alpha=0.1$.

All regressions include age, age², gender, degree of urbanization of place of residence, education dummies, dummies for employment status and year dummies. Clustered robust standard errors.

To facilitate interpretation of the quantitative results of these nonlinear estimations, Ta-

¹¹The estimations also yield standard results, i.e., the probability of good health is decreasing in age, and education has a protective effect on health. They are omitted for clarity, but full results are available from the author upon request.

¹²In Appendix D, I provide results of an ordered probit regression. Therefore, I use the original five-point health variable instead of the collapsed binary variable as the dependent variable. This estimation produces similar results.

ble 5 presents the marginal effects of relative economic performance measures for the median respondent. The marginal effects indicate how the odds of reporting good health are changed by varying an independent variable by one degree.^{13 14} A strong perception that one is better off than one’s circle of acquaintances is highly related to the probability of reporting good or excellent health. Increasing the subjective perception of own relative performance by one degree would increase the probability of reporting good health by up to 3.07%.¹⁵

Table 5: Marginal Effects for Median Respondent

Self-Reported Health	Assets	Spending	Financial	Combined
Marginal Effect	0.0145***	0.0188***	0.0169***	0.0307***

Notes: *** Significant at $\alpha=0.01$, ** Significant at $\alpha=0.05$, * Significant at $\alpha=0.1$. Marginal effects at median of independent variables included in probit estimation.

Non-linearity of Relative Performance Effect The effect of relative performance on self-reported health seems to be highly nonlinear. I estimate equation (3) using dummies for either being below or above the relevant peer group instead of the continuous measure. The resulting estimates exhibit strong asymmetries in the impact of relative economic performance. The regression coefficient for being in a low position is -0.1891, whereas the coefficient of being in a better position is 0.0634. The absolute magnitude of the negative effect of being in a relatively poor position is higher than the absolute magnitude of the positive effect of being in a relatively high position. In terms of marginal effects, this means that feeling deprived compared with one’s circle of acquaintances reduces one’s probability of being in good health by 5.2%. Being in an economic situation that is advantageous compared with one’s acquaintances increases the likelihood of being in good health by only 1.7%. This result also holds for a finer distinction of being in the lower or upper position, but due to few observations at the boundary, the estimates are statistically insignificant.¹⁶

Gender, Age, Absolute Economic Performance Differences In the previous estimations, I control for various demographic characteristics using dummy variables. This approach does not take into account that the relationship between relative economic performance and health might differ across demographic groups. To determine whether the results are stronger

¹³The median respondent in the sample used here is a 49-year-old male who is employed, has a high school degree, an adjusted income of 30,662€, and net assets of 134,951€. He neither agrees nor disagrees with the relative economic performance questions.

¹⁴I also computed the average marginal effect instead of the marginal effect of the median worker, but the two sets of results are similar. For more a detailed discussion on which is the appropriate measure, see Long and Freese (2006).

¹⁵These results seem sizable, but they are not inconsistent with other studies on socioeconomic status and mortality. For instance, Marmot et al. (1991), find that British civil servants from the lowest socioeconomic class were three times more likely to die than their high-status counterparts.

¹⁶The results of this estimation are contained in appendix E.

for specific groups, I include in the probit estimation interaction terms of the relative economic performance measure and the respective sub-sample group. Table 6 presents the estimates of relative economic performance and the interaction terms.¹⁷

Column 2 reports the result of incorporating interaction terms for different age groups (young working (25-45), old working (45-65) and retired (>65)). For all three age groups, the relative economic performance effect remains positive and significant. The interaction terms are nearly zero and insignificant. There are no notable differences in the relative economic performance effect across different age groups.

The third column reports the results for differences in the effect between men and women. For each gender, relative economic performance has highly significant effects. It seems that the effect is stronger for the males than for females. This difference, however, is not statistically significant.

I further examine whether the effect is the same for different absolute economic performance groups. I divide the full sample into three different income groups (poor, medium, rich) and include interaction terms. For each income group, the estimate of relative economic performance remains positive and significant. The magnitude of this effect, however, differs remarkably across the groups. The health of the top income group is much more weakly affected by relative performance measures than is the bottom or medium income group. The coefficient of the top income group is reduced to nearly one-third of the estimate of the medium and bottom income groups. The difference between the bottom and medium income groups is not statistically significant, but the findings suggest that the effect of relative economic performance is strongest for the bottom income group.¹⁸

Table 6: Probit Regression Including Interaction Terms

Self-Reported Health	Age	Gender	Abs. Income	Abs. Wealth
Rel. Income	0.1206***	0.0963***	0.1225***	0.1111***
Rel. Income * Young	0.0082			
Rel. Income * Retired	-0.0358			
Rel. Income * Male		0.0263		
Rel. Income * Poor			0.0294	
Rel. Income * Rich			-0.0897***	
Rel. Income * Poor				0.04934
Rel. Income * Rich				-0.07401**

Notes: *** Significant at $\alpha=0.01$, ** Significant at $\alpha=0.05$, * Significant at $\alpha=0.1$.

Probit regression coefficients. Older working, female and medium income group are the omitted reference groups in the respective regressions. Clustered robust standard errors.

¹⁷I do not report the marginal effects for the sub-sample regressions. Each sub-sample has a different median respondent, and a comparison across groups cannot be reasonably made.

¹⁸This pattern in absolute economic performance is not significant when groups are constructed by placing respondents into low, medium and high net wealth categories.

Indirect Measure of Relative Income Analogous to the previous section, I run probit regressions of equation (3) for both indirect relative economic performance measures *Ind_IncDist* and *Log_IncDist*. The estimates in Table 7 generate qualitatively identical results to those obtained for the direct relative performance measures. Both *Ind_IncDist* and *Log_IncDist* are statistically not significant. Partially, this is because the sample size in this regression is much smaller (8,009 observations) than in Table 4. The income of the circle of acquaintances is reported in income bands, and to match this information to the income of the respondents, I had to use a different variable for income that has more non-respondents.

Table 7: Probit Regression Coefficient for Indirect Relative Performance Measures

Self-Reported Health	I	II
Log Income	0.1120***	0.1134***
IHS Assets	0.0055	0.0057
Ind_IncDist	0.0786**	
Log_IncDist		0.0901***

Notes: *** Significant at $\alpha=0.01$, ** Significant at $\alpha=0.05$, * Significant at $\alpha=0.1$. All regressions include age, age², gender, degree of urbanization of place of residence, education dummies, dummies for employment status and year dummies. Clustered robust standard errors.

3.2 Health-related Behavior

The results for behaviors that are considered detrimental to health are mixed. The marginal effects of this estimation for the median respondent are displayed in Table 8.

The estimates in the second column display the estimates for absolute and relative economic performance on the probability of daily smoking. They suggest that smoking and one's economic situation are linked. For both absolute economic measures, the coefficient is negative and highly significant. We can see that poor people are more likely to smoke than rich people. This result is in line with the rest of the literature, cf. Auld (2005). The estimate for relative economic performance is also negative but not significant.

Unlike smoking, the entries in the third column show inconclusive results regarding the relationship between absolute economic performance and alcohol. This relationship is negative and highly significant for net assets. However, individuals with high income seem more prone to consume alcohol. Both results can also be found in the literature, cf. Ettner (1996). The marginal effect for relative economic performance is positive and significant. Alcohol is more common among people that are financially better off than among their acquaintances.

The clearest evidence for a relationship between economic variables, absolute and relative, and health behavior is found for the probability of being obese. The estimates in the fourth column signal that income and net assets reduce the prevalence of obesity. A good relative

economic performance measure is also negatively related to the probability of reporting obesity. An improved perception of one’s relative position by one step is associated with a greater than one percent decrease in the probability of being obese.

Table 8: Marginal Effects for Health Related Behavior

Health Behavior	Smoking	Alcohol	Obesity
Log Income	-.0138**	0.0046	-0.0136**
IHS Assets	-.0056***	-0.0016***	-0.0045***
Combined	-.0072	0.0076**	-0.0092**

Notes: *** Significant at $\alpha=0.01$, ** Significant at $\alpha=0.05$, * Significant at $\alpha=0.1$.

Marginal effects for the median respondent from probit estimation. All regressions include age, age², gender, degree of urbanization of place of residence, education dummies, dummies for employment status and year dummies. Clustered standard errors.

4 Dynamic Logit Model

By exploiting the advantages of the data set’s panel structure, I can estimate a dynamic logit model with fixed effects. These fixed effects should account for possible time-invariant characteristics of the household, as a respondent’s self-esteem could affect both his self-reported health and his relative social position.

In Table 9, I report the baseline results estimated for the dynamic logistic model with and without fixed effects, the panel ordered logit model panel and the panel OLS with fixed effect estimation for the relative performance measure *Combined*. In all four regressions, the coefficients for relative economic performance have the expected positive sign. In all but the logit with fixed effects, the effect is statistically significant. These results support the evidence obtained in the cross-sectional estimations that the relative economic comparisons controlling for unobserved factors are associated with health. The coefficients of absolute economic performance are inconclusive. Whereas the coefficient on absolute income has a positive sign and is significant in two of four models, the coefficient on wealth is insignificant and varies in sign.

Table 9: Panel Results for Self-reported Health

Self-Reported Health	Logit - RE	Logit - FE	Ordered Logit	OLS - FE
Log Income	0.1212***	0.0244	0.1039***	0.0033
IHS Assets	0.0098	-0.0092	0.0050	-0.0015
Combined	0.2510***	0.0111	0.2140***	0.0119**

Notes: *** Significant at $\alpha=0.01$, ** Significant at $\alpha=0.05$, * Significant at $\alpha=0.1$.

All regressions include age, dummies for employment status and year dummies. Clustered robust standard errors.

5 Comparison with the Traditional Approach

In the following, I show why the results of the previous sections improve on prior studies employing artificially constructed peer groups. First, I illustrate that the self-determined peer group significantly deviates from the demographic and socioeconomic characteristics of the respondents. Second, I show that running the same regression using the economic performance relative to the artificial reference group yields weaker or even insignificant results.

5.1 Differences of Respondents from the Circle of Acquaintances

Table 10 shows the demographic and socioeconomic characteristics of respondents and the characteristics of their self-determined circle of acquaintances. Most people with no high school degree (86%) have a peer group that possess at least a high school diploma. Just over half of the people with a high school degree report that individuals in their circle of acquaintances have the same educational level. The only group for which the characteristics of the respondents and their peer group mostly coincide are college graduates.

Dependent employees are the largest group in the sample. In this group, nearly all (92%) report having a circle of acquaintances who also work as dependent employees. A more surprising observation is that in the other employment categories, only a fraction of the respondents state that their peer group has the same employment status. Only less than one-third of self-employed people report that their circle of acquaintances is mostly self-employed. Even more astonishing is that only 9% of unemployed people report that most people in their environment people are unemployed. The response options to the question regarding the employment status of the circle of acquaintances do not include retirement, but it is nevertheless remarkable that nearly two-thirds of retirees indicate that their peer group is predominantly working. Thus, similar to education, there is a mismatch between respondents and their peer group with respect to employment status.

The third important category on which most traditional approaches base their reference group is age. The last part of Table 10 shows the age of the respondents and the answers to the question of into what age bin most of their acquaintances fall. A clear pattern is that younger people are more likely to have a peer group that is older and less likely to have a group that is younger. At older ages, this pattern is reversed. On average, only 44% of the respondents indicate that their peer group falls into the same age bin as they do. More people report that their peer group is younger than people that state that their peer group is older. This difference may hint at a misperception of the true circle of acquaintances. For the research question addressed in this paper, however, only the perception of the respondent is important, as the primary mechanism for the effect of relative deprivation runs through subjective feelings and need not reflect the objective situation.

To summarize, constructing a peer group based on the demographic and socioeconomic characteristics of respondents seems not to acknowledge the fact that people have diverse peer

groups.¹⁹

5.2 Results of the Traditional Approach

As shown, the circle of acquaintances and an artificial reference group based on respondents' characteristics do not appear to coincide. Nevertheless, it is interesting to determine whether the approaches produce different results concerning the effect of one's relative income position on health. For this purpose, I generate the same two indirect measures as in Section 3 ((1) and (2)) but replace average income of acquaintances with the average income of the constructed reference group that is based on age, educational level, and sex. Additionally, I compute both indirect measures using net asset holdings of the respondents and their artificial reference group.

For all four measures, I run separate probit regressions of equation (3). The results are shown in Table 11. For both measures of absolute economic performance, the results exhibit positive and (mostly) highly significant estimates for all regressions. The results for relative economic performance reflect inconclusive and weak results. The indicator variables (1) display the same sign as in the previous section, i.e., having a higher income or wealth than one's reference group seems to increase average health. However, neither coefficient is statistically significant. Columns III and IV show the results for measure (2). Here, the extent of the difference between the absolute economic performance of the respondents and their reference group is also taken into account. Only the coefficient for relative income is statistically significant.²⁰ The relative wealth coefficient is insignificant and even exhibits a reversed sign. Using the traditional approach, I do not find a relationship between relative performance measures and self-reported health, which is contrary to my previous findings.

6 Discussion

The results shown in the previous section suggest that there is a strong relationship between relative economic performance and self-reported health status and various health-related behaviors. Some aspects of the setting, however, limit a causal interpretation of this link.

Endogeneity Problem of Circle of Acquaintances A potential challenge to the presented results is presented the fact that the self-determined circle of acquaintances is affected by the individual's health and might change over time. People aware of the negative impact of wealthier friends on their health might select their circle of acquaintances, or change their milieu, to feel more comfortable. According to this logic, everyone would select a circle of acquaintances such

¹⁹Further information on the peer group reveals that the size of the household of the respondent and the size of the circle of acquaintances is only the same in 50% of the observations.

²⁰Note that individual absolute economic performance is used to construct indirect measures (2). This results in a high correlation between the two variables and might limit a separate interpretation of the results of absolute and relative measures of economic performance.

Table 10: Comparison of Respondent with the Circle of Acquaintances

Respondents	Circle of Acquaintances		
	<i>Education</i>		
	No High School (%)	High School (%)	College (%)
No high School	14.13	44.49	41.39
High school	12.89	51.62	35.49
College	1.39	21.28	77.34
	<i>Employment Status</i>		
	Employed (%)	Self-employed (%)	No Paid Work (%)
Employed	92.44	5.73	1.82
Self-employed	66.28	29.70	4.03
Unemployed	80.56	10.80	8.64
Retired	50.97	12.35	36.68
	<i>Age</i>		
	Younger (%)	Same Age Group (%)	Older (%)
16-20	0.00	70.64	29.36
21-25	3.29	65.13	31.58
26-30	6.61	58.02	35.36
31-35	14.13	66.20	19.67
36-40	27.89	55.14	16.97
41-45	37.77	50.09	12.14
46-50	47.86	42.63	9.51
51-55	53.43	38.59	7.98
56-60	58.87	33.89	7.24
61-65	61.52	33.23	5.25
66-71	70.61	26.69	2.70
older than 71	68.87	31.13	0.00
Total	44.02	44.40	11.57

Notes: Demographic characteristics of respondents and the reported average characteristics of the circle of acquaintances.

Table 11: Probit Regression Coefficients for Artificial Reference Group

	Ind_Dist_Trade		Log_Dist_Trade	
	I	II	III	IV
Log Income	0.0436***	0.0251***	0.0158	0.0208***
IHS Assets	0.0015***	0.0018***	0.0016***	0.0167**
Relative Income	0.0119		0.0401*	
Relative Assets		0.0107		-0.0063

Notes: *** Significant at $\alpha=0.01$, ** Significant at $\alpha=0.05$, * Significant at $\alpha=0.1$.

All regressions include age, age², gender, degree of urbanization of place of residence, education dummies, dummies for employment status and year dummies. Robust standard errors clustered at the group level.

that his own performance would be equal to or better than theirs. This is clearly ruled out by the strong dispersion of perceptions shown in Table 2. Although some of one’s acquaintances are chosen endogenously, this is likely not the case for others such as sisters or work colleagues.

Relative Performance and Causality This analysis carefully attempted to ensure that the correlation between health and relative economic performance is not due to omitted variables. What is still an open question is in which direction the mechanism operates, i.e., whether health is affected by relative position or relative performance is affected by health (without directly being affected by absolute performance). In general, it is not possible to interpret the above estimates as unambiguously causal. Pham-Kanter (2009) notes that these non-causal estimates might be helpful because they suggest an upper bound for the causal effects operating through relative position. That is, we could hypothetically assume that there was no reverse causality or omitted variables and interpret the estimate as giving us the largest possible causal effect of relative position on health.²¹

7 Conclusion

Using subjective relative performance measures and controlling for demographic characteristics and absolute economic performance, this paper reports a significant positive effect of relative position on self-reported health and a negative effect on detrimental health behaviors such as smoking and obesity. It further indicates that the effect on self-reported health exhibits asymmetries, i.e., lower income groups are more strongly affected than are high income groups and that being worse off than one’s circle of acquaintances has a strong effect, whereas being better off shows only mild positive effects. In this paper, I also show that compared with the traditional approach of using a reference group constructed based on demographic characteristics, the approach based on self-reported groups generates stronger results.

²¹Although reverse causality might be at work in the overall effect, it is less clear how this reverse causality could explain the asymmetries found in the results.

My study seems to suggest that social comparisons based on economic performance are both an independent risk factor, in addition to absolute economic performance, as well as a conciliating mechanism to explain the association between income inequality and health. This result might imply that a reduction of inequality within peer groups could improve average health in the population.

References

- Adjaye-Gbewonyo, K. and I. Kawachi (2012). Use of the yitzhaki index as a test of relative deprivation for health outcomes: A review of recent literature. *Social Science & Medicine* 75(1), 129 – 137.
- Auld, M. C. (2005). Smoking, drinking, and income. *The Journal of Human Resources* 40(2), pp. 505–518.
- Blackburn, E. H. and E. S. Epel (2012). Telomeres and adversity: Too toxic to ignore. *Nature* 490, 169–171.
- Buhmann, B., L. Rainwater, G. Schmaus, and T. M. Smeeding (1988). Equivalence scales, well-being, inequality, and poverty: Sensitivity estimates across ten countries using the luxembourg income study (lis) database. *Review of Income and Wealth* 34(2), 115–42.
- Clark, A. E. and C. Senik (2010). Who compares to whom? the anatomy of income comparisons in europe. *The Economic Journal* 120(544), 573–594.
- Cuesta, M. B., E. Cottini, and A. A. Herrarte (2012, March). Socioeconomic gradient in health: How important is material deprivation? GINI Discussion Papers 39, AIAS, Amsterdam Institute for Advanced Labour Studies.
- Cutler, D. M., A. Lleras-Muney, and T. Vogl (2011). Socioeconomic status and health: Dimensions and mechanisms. In *The Oxford Handbook of Health Economics*. Oxford University Press.
- Daly, M. C., G. J. Duncan, G. A. Kaplan, and J. W. Lynch (1998). Macro-to-micro links in the relation between income inequality and mortality. *The Milbank quarterly* 76(3), 315–339.
- Deaton, A. S. and C. Paxson (2001). Mortality, education, income, and inequality among american cohorts. In *Themes in the Economics of Aging*, NBER Chapters, pp. 129–170. National Bureau of Economic Research, Inc.
- Eibner, C., R. Sturm, and C. R. Gresenz (2004). Does relative deprivation predict the need for mental health services? *The Journal of Mental Health Policy and Economics* 7(4), 167–175.
- Elstad, J. I. (1998). The psycho-social perspective on social inequalities in health. *Sociology of Health & Illness* 20(5), 598–618.
- Ettner, S. L. (1996). New evidence on the relationship between income and health. *Journal of Health Economics* 15(1), 67–85.
- Georgarakos, D., M. Haliassos, and G. Pasini (2012). Household debt and social interactions. CFS Working Paper Series 2012/05, Center for Financial Studies (CFS).

- Idler, E. L. and Y. Benyamini (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behavior* 38(1), pp. 21–37.
- Jones, A. M. and J. Wildman (2008). Health, income and relative deprivation: Evidence from the bhps. *Journal of Health Economics* 27(2), 308 – 324.
- Kondo, N., I. Kawachi, S. Subramanian, Y. Takeda, and Z. Yamagata (2008). Do social comparisons explain the association between income inequality and health?: Relative deprivation and perceived health among male and female japanese individuals. *Social Science & Medicine* 67(6), 982 – 987.
- Long, J. and J. Freese (2006). *Regression models for categorical dependent variables using Stata*. StataCorp LP.
- Mangyo, E. and A. Park (2011). Relative deprivation and health: Which reference groups matter? *Journal of Human Resources* 46(3), 459–481.
- Marmot, M., S. Stansfeld, C. Patel, F. North, J. Head, I. White, E. Brunner, A. Feeney, M. Marmot, and G. Smith (1991). Health inequalities among british civil servants: the whitehall ii study. *The Lancet* 337(8754), 1387 – 1393.
- McEwen, B. S. (1998). Protective and damaging effects of stress mediators. *New England Journal of Medicine* 338(3), 171–179.
- McLaughlin, K. A., E. J. Costello, W. Leblanc, N. A. Sampson, and R. C. Kessler (2012). Socioeconomic status and adolescent mental disorders. *American Journal of Public Health* 102(9), 1742–1750.
- Miilunpalo, S., I. Vuori, P. Oja, M. Pasanen, and H. Urponen (1997). Self-rated health status as a health measure: The predictive value of self-reported health status on the use of physician services and on mortality in the working-age population. *Journal of Clinical Epidemiology* 50(5), 517 – 528.
- Pence, K. M. (2006). The role of wealth transformations: An application to estimating the effect of tax incentives on saving. *The B.E. Journal of Economic Analysis & Policy* 5(1), 1–26.
- Pham-Kanter, G. (2009). Social comparisons and health: Can having richer friends and neighbors make you sick? *Social Science & Medicine* 69(3), 335 – 344.
- Seeman, T. E., B. S. McEwen, J. W. Rowe, and B. H. Singer (2001). Allostatic load as a marker of cumulative biological risk: Macarthur studies of successful aging. *Proceedings of the National Academy of Sciences of the United States of America* 98(8), pp. 4770–4775.
- Soetevent, A. R. (2006). Empirics of the identification of social interactions; an evaluation of the approaches and their results. *Journal of Economic Surveys* 20(2), 193–228.

- Subramanyam, M., I. Kawachi, L. Berkman, and S. Subramanian (2009). Relative deprivation in income and self-rated health in the united states. *Social Science & Medicine* 69(3), 327 – 334.
- Teppa, F. and C. Vis (2012). The centerpanel and the dnb household survey: Methodological aspects. DNB Occasional Studies 1004, Netherlands Central Bank, Research Department.
- Wilkinson, R. (2000). *Mind the Gap: Hierarchies, Health and Human Evolution*. Darwinism Today. Weidenfeld & Nicolson.

Appendix A Comparison of DNBHS to the Dutch Census

Table 12 compares the DNBHS to the official census for the Netherlands taken from the Centraal Bureau voor de Statistiek (CBS). It shows that the DNBHS matches this census in important demographic characteristics such as age, gender and education and in economic data such as unemployment.

Table 12: Comparison of DNBHS to the Dutch Census

Variable	CBS	DNBHS
Average Age	39	38
% Male	49	51
% Urban	45	63
% Less high school	9	8
% Master, Doctoral	9	10
% Unemployed	5	3

Notes: Summary statistics of the pooled 15 waves of DNBHS 1995-2007/2009/2011 compared to official CBS data.

Appendix B Correlation among Direct Measures

Table 13 shows the correlation among the various direct relative performance measures. Most of the correlations are strong but not perfect. In particular, *Spending* has a weaker connection to the other variables, potentially resulting from of its reverse formulation.

Table 13: Correlation among Statements

	Assets	Spending	Financial	Combined
Assets	1			
Spending	0.19	1		
Financial	0.64	0.25	1	
Combined	0.81	0.64	0.83	1

Notes: Correlation among the several measures of relative position.

Appendix C Relative vs. Absolute Performance

Table 14 shows the distribution of the responses to *Financial* for quintiles of absolute wealth. As for income in all columns, there is a range of perceptions concerning whether the households

are better or worse off than their circles of acquaintances.

Table 14: Absolute Wealth vs. Relative Perception

Compared to others I'm financially better off	Absolute Net Wealth Quintiles					Total
	1st	2nd	3rd	4th	5th	
Totally disagree	13.07	5.43	4.01	4.12	2.98	5.92
2	17.69	10.78	7.75	6.54	4.75	9.50
3	20.64	18.25	16.25	14.95	11.66	16.35
4	32.27	42.10	43.83	43.12	42.63	40.79
5	10.37	14.66	16.50	18.96	20.70	16.24
6	4.44	6.71	9.34	9.85	13.83	8.83
Totally agree	1.51	2.07	2.32	2.47	3.46	2.37
Total	100.0	100.0	100.0	100.0	100.0	100.0

Notes: Cross tabulation of absolute adjusted household net wealth quintiles and perception of relative position among acquaintances. Entries are in percentages.

Table 15 shows the distribution of the responses to *Financial* for different income bands.

Table 15: Absolute Income vs Relative Position - Income bands

Comp. to others I'm fin. better off	Absolute Income Bands							Total
	<7	7-14	14-20	20-30	30-40	40-50	>50	
Totally disagree	8.49	15.09	8.95	5.58	4.08	2.60	2.48	5.92
2	11.37	16.77	14.62	10.09	7.39	6.70	3.84	9.50
3	20.85	18.44	19.80	18.81	15.40	12.07	10.42	16.35
4	37.98	34.79	38.84	43.49	44.02	42.70	36.63	40.79
5	11.98	8.44	11.58	14.31	17.79	20.59	24.68	16.24
6	6.29	4.61	4.76	6.31	9.05	12.44	17.34	8.83
Totally agree	3.03	1.86	1.40	2.05	2.26	2.89	4.61	2.37
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes: Cross-tabulation of absolute adjusted household income bands and perception of relative position among acquaintances. Income bands measured in 1000 €. Entries in percentages.

Appendix D Ordered Logit

In Table 16, I report the margins estimated from an ordered logit for all relative performance measures on health condition, which is an ordinal measure ranging from 1 *excellent* to 5 *poor*. The results are in line with the results of the binary probit model and indicate that an increased relative position is associated with a better self-assessed health condition including for a finer distinction of health. All results are statistically significant.

Table 16: Self-Reported Health Condition - Ordered Probit

Self-reported Health Condition	(1)	(2)	(3)	(4)
Log Income	0.0007**	0.0009***	0.0009***	0.0010***
IHS assets	0.0001**	0.0001***	0.0001***	0.0001**
Combined	0.0018***			
Assets		0.0009***		
Spending			0.0012***	
Financial				0.0011***

Notes: *** Significant at $\alpha=0.01$, ** Significant at $\alpha=0.05$, * Significant at $\alpha=0.1$.

All regressions include age, age², gender, education dummies, degree of urbanization of place of residence, and dummies for employment status. All results are from ordered probit regressions. Clustered robust standard errors.

Appendix E Asymmetric Effect

Table 17 reveals the asymmetry of the general effect for a finer distinction of the relative economic performance measure. In absolute terms, the marginal effects of being worse off than one's peer group are much stronger than the effect when one is better off than one's friends at the extreme, and this insignificance might be due to the limited number of observations for these cases.

Table 17: Self-Reported Health - Asymmetric Effect

Compared to other better off	Totally Agree	(2)	(3)	(5)	(6)	Totally disagree
Marginal Effect	-0.0539***	-0.0803***	-0.0616***	0.0252***	0.0288**	0.0013

Notes: *** Significant at $\alpha=0.01$, ** Significant at $\alpha=0.05$, * Significant at $\alpha=0.1$.

All regressions include age, age², gender, education dummies, degree of urbanization of place of residence, and dummies for employment status. Clustered robust standard errors.