Migrants, Health, and Happiness: Evidence that Health Assessments Travel with Migrants and Predict Well-Being

Martin Ljunge

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EVIDENCE THAT HEALTH ASSESSMENTS TRAVEL WITH

MIGRANTS AND PREDICT WELL-BEING[1]

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Abstract

Health assessments correlate with health outcomes and subjective well-being. Immigrants offer an opportunity to study persistent social influences on health where the social conditions are not endogenous to individual outcomes. This approach provides a clear direction of causality from social conditions to health, and in a second stage to well-being. Natives and immigrants from across the world residing in 30 European countries are studied using survey data. The paper applies within country analysis using both linear regressions and two stage least squares. Natives' and immigrants' individual characteristics have similar predictive power for health, except Muslim immigrants who experience a sizeable health penalty. Average health reports in the immigrant's birth country have a significant association with the immigrant's current health. Almost a quarter of the birth country health variation is brought by the immigrants, while conditioning on socioeconomic characteristics. There is no evidence of the birth country predictive power declining neither as the immigrant spends more time in the residence country nor over the life course. The second stage estimates indicate that a one standard deviation improvement in health predicts higher happiness by 1.72 point or 0.82 of a standard deviation, more than four times the happiness difference of changing employment status from unemployed to employed. Studying life satisfaction yields similar results. Health improvements predict substantial increases in individual happiness.

JEL codes: F22; I12; I31; J15

Keywords: health status; self-reported health; subjective well-being (SWB); happiness; life satisfaction; immigrant health

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1   INTRODUCTION

Self-reported health is one of the strongest correlates with subjective well-being, indicating that health may be important for individual well-being (Chida & Steptoe, 2008) (Easterlin, 2003) (Graham, 2010) Subjective well-being, happiness or life satisfaction, may also be an objective of individuals and policy makers. This paper presents evidence on the relationship between health and happiness using a method that has a claim to isolate the causal direction from health to happiness. The paper extends the literature by using variation in health that plausibly is not endogenous to the individual's current well-being.

Health assessments vary widely both across individuals within a country and across countries. This paper studies immigrants in 30 European countries and compares their health and socioeconomic gradient to natives using survey data and regression analysis.[3] Focusing on immigrants allows the study of persistent social influences on self-reported health by combining two approaches in the literature, as discussed below. Moreover, the persistent influence on health allows estimating the effect of health on well-being using an instrumental variable approach.

The ultimate contribution of the paper is to estimate the influence of health on well-being using a two stage model where birth country health is used as an instrument for individual health. The paper makes three additional contributions to improve estimating the influence of health on well-being. First, the socioeconomic gradient of health, the predictive power of socioeconomic characteristics for health, is estimated for natives and immigrants. Second, one persistent influence on self-reported health, mean health assessments in their birth countries, is estimated among immigrants from across the globe. Third, it is examined if the birth country influence on health dissipates as immigrants spend more time in the residence country or as they age.

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[3] The term socioeconomic gradient is used to describe the predictive power of socioeconomic characteristics for the outcome, in this case health.

The first point on the socioeconomic gradient contributes to the literature on immigrant health which has shown a weak gradient among Mexican immigrants in the U.S. (Akresh & Frank, 2008)ʼ (Rubalcava, Teruel, Thomas, & Goldman, 2008)ʼ (Acevedo-Garcia, Soobader, & Berkman, 2007)ʼ (Buttenheim, Goldman, Pebley, Wong, & Chung, 2010)ʼ (Goldman, Kimbro, Turra, & Pebley, 2006)ʼ (Sanchez-Vaznaugh, Kawachi, Subramanian, Sanchez, & Acevedo-Garcia, 2009) Significant differences in the socioeconomic gradient of health has also been found in the Canadian context, see for example (Wang & Hu, 2013). Evidence from Germany points to small differences, see (Nesterko, Braehler, Grande, & Glaesmer, 2013). The differences between natives and immigrants have been found to dissipate with time spend in the destination country; see for example (Subedi & Rosenberg, 2014). The estimated gradient reported below is similar, on average, for natives and immigrants using data on 91 immigrant groups residing in 30 countries.

Moreover, persistent social influences on health of immigrants are studied. This combines two strands of the health literature: social influences on health and persistent influences of early environmental exposures. The literature has studied how social influences in the individual's current environment correlates with health. (Marmot & Wilkinson, 2006)ʼ (Berkman & Kawachi, 2000) Another literature has studied how exposures through the life course influence health later in life (Cohen, Janicki-Deverts, Chen, & Matthews, 2010)ʼ (Gong, Xu, Fujishiro, & Takeuchi, 2011)ʼ (Takeuchi, Hong, Gile, & Alegria)ʼ (Ben-Shlomo & Kuh, 2002) and effects of exposures in utero. (Rasmussen, 2001)ʼ (Almond & Currie, 2011) Health assessment in the individual's birth country are related to the health report in a different environment at a later stage in the life course, hence combining the perspective of social influences with past exposures, to study a novel health influence channel.

An essential part of the approach is to study social influences that are not endogenous to the outcomes of the individuals studied. Immigrants, whose current health does not determine the

mean health in their birth country, provide such a setting. The data covers natives and immigrants in 30 European countries between 2002 and 2010. Immigrants originate from 91 countries across the globe.

The ultimate part of the analysis provides evidence on how health influences happiness. The literature thus far has found strong correlations between health and happiness where the causality could be interpreted in both directions. (Chida & Steptoe, 2008) (Easterlin, 2003) (Graham, 2010) Related is also evidence on job satisfaction (Pagan, Ordóñez de Haro, & Sánchez, 2015). Building on the previous analysis of persistent social influence on health among migrants, a two stage approach is applied that can provide evidence on the causal influence of health on happiness. Birth country health is used as an instrument of individual health in estimating the influence of health on happiness. The estimates provide evidence on the causal effect of health on happiness given that the instrument is relevant (which is shown in the first part of the analysis) and the exclusion restriction holds (which can never be known with certainty). The instrumental variables approach in this paper complements other approaches to studying the causal relationships between health and well-being such as the structural equations model in (Gana, o.a., 2013) which impose different assumptions to yield stronger causal evidence than cross sectional correlation studies.

2 METHODS

2.1 Empirical models
The first part of the analysis applies a linear ordinary least squares (OLS) model. The main type of analysis is regressions of the following form:

$$\text{Health}_{icat} = \beta_0 + \beta'_k X_{icat} + \beta_1 \text{Mean\_Health}_a + \gamma_{ct} + \varepsilon_{icat} \qquad (1)$$

Health_{icat} captures the self-reported health in period t of individual i, residing in country c, and born in country a. X_{icat} captures individual demographic and socioeconomic controls, as

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well as parental characteristics, that may affect health. The associated vector of coefficients is denoted by β'_k. The country of residence-by-year fixed effect is denoted by γ_{ct}, and ε_{icat} is the error term. This regression is run on samples of natives and immigrants. The mean level of ancestral country health assessment, Mean_Health$_a$, is common to all individuals born in country a. This term is included when studying immigrants, and in this case a≠c. Ancestral country and birth country are used interchangeably in this paper. All standard errors are clustered by the individual's birth country to allow for arbitrary correlations of the error terms among individuals with the same birth country. (Angrist & Pischke, 2009) The results presented below are based on a linear model but the results are robust to using the ordered Logit or the ordered Probit estimator. All regression parameter estimates are unstandardized.

The inclusion of the country-by-year fixed effect γ_{ct} means that the institutional structure and all other unobserved differences which apply to all residents in country c in period t (such as the mean self-reported health and the residence country health system) are accounted for. It also means that the variation used to identify the estimate on ancestral health assessment is to compare the outcomes of immigrants within each country of residence and year relative to the values in their birth countries. For example, the comparison is if immigrants residing in France born in Denmark, a country with high health assessment, have higher health assessments than the immigrants in France born in Portugal, a country with lower health assessment. The country-by-year fixed effects account for level differences across countries (time-invariant influences on the outcome variables) and non-linear trends within each country.[4] The method and related literature are discussed further in the literature, (Fernandez, 2010)ʾ (Fernández & Fogli, 2009) and has also been applied to the study of health among children of immigrants (Ljunge, 2014).

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[4] Compared to a model with country and year fixed effects the country-by-year specification used relaxes the assumption that time trends are the same across countries. In practice, the less flexible model with country and year effects deliver similar results as the country-by-year fixed effects specification.

The second part of the analysis studies how health predicts well-being. The model is that health may influence happiness. To address reverse causality, that happiness determines health, the model is estimated in two stages. In the first stage health is modeled as determined in part by birth country health, equation (1) above. The second stage equation is:

$$\text{Happiness}_{icat} = \beta_2 + \beta'_m X_{icat} + \beta_3 \text{Health}_{icat} + \gamma'_{ct} + \varepsilon'_{icat} \qquad (2)$$

Happiness_{icat} captures the subjective well-being of an individual. Equations (1) and (2) are estimated using two stage least squares (2SLS); see for example (Angrist & Pischke, 2009) for details. Birth country health is hence used as an instrument for individual health. The relevance of the instrument is established in the first part of the analysis where estimates of (1) are presented. The exclusion restriction, that conditional on the controls birth country health has no direct effect on happiness of migrants, is examined through robustness checks. Although impossible to be certain that the exclusion restriction holds the robustness analysis makes it plausible that it could be valid.

2.2 Data
The main data set is the European Social Survey (ESS). Representative samples are drawn for each country and round. Participating countries by round are listed in Appendix Table A1. The survey includes information on the country of birth of the respondent. From this it is possible to identify immigrants and which countries they originate from. Looking at 30 European countries of residence reduces the concern that the results are driven by conditions of one country. Individuals with ancestry from 91 countries across all continents are observed. The broad range of immigrants reduces the concern that the results are particular to a small number of ancestral backgrounds. The summary statistics are presented in Table 1. The immigrants are similar to the general population on observables including their self-reported health and well-being. There are some differences with more migrants having a

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higher education (while slightly fewer have an upper secondary degree) and more Muslims relative other denominations.

The cumulative first to fourth round ESS file is amended with the fifth round. The first round was collected in 2002; second round in 2004; the third round in 2006; the fourth round in 2008; and the fifth round in 2010. The residence countries included are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and United Kingdom. Extensive documentation of the data is available at http://ess.nsd.uib.no/. A summary variable names, descriptions, and sources for all the variables are found in Appendix Table A2.

(Table 1 here)

2.2.1 Self-reported Health

Self-reported health is measured by one question in the ESS (the variable name is "health"). The interviewer asks "How is your health in general? Would you say it is ..." and reads out the categories "Very good," "Good," "Fair," "Bad," "Or, very bad." "Very good" is coded with a 5 and each following category with a lower digit.

2.2.2 Subjective Well-being

One question in the ESS is about subjective well-being (the variable name is "happy"). The interviewer asks "Taking all things together, how happy would you say you are?" The answers are given on a scale from "Extremely unhappy", coded as 0, to "Extremely happy", coded as 10.

2.2.3 Life Satisfaction

Life satisfaction is assessed by one question in the ESS (the variable name is "stlife"). The interviewer asks "All things considered, how satisfied are you with your life as a whole

nowadays?" The answers are given on a scale from "Extremely dissatisfied", coded as 0, to "Extremely satisfied", coded as 10.

2.2.4 Individual Variables

Age, gender, marital status, education, income, employment status, and religious affiliation are recorded in the ESS. Marital status is captured by two dummies for married and never married, with widowed and divorced being the excluded category.[5] Education is captured by one dummy for tertiary (university) degree and above, and one dummy for upper secondary as the highest attained degree.[6] Lower education is the excluded category. One dummy captures income in the top three deciles, High Income, and one dummy for the middle four deciles, Middle Income.[7] One dummy captures individuals who are out of the labor force (students, not employed and not looking for work, and retired) and another dummy for unemployed who look for work.[8] Those employed is the omitted category. Religion dummies for being Catholic, Protestant, or Muslim are included while other denominations are the excluded category.[9]

2.2.5 Parental Characteristics

There is information on the education and labor supply of the individual's parents (labor supply refers to labor market status being market work, either employed or self-employed). Dummies are created for both the mother and father if the parent has an upper secondary or tertiary degree. Dummies are also created for if the father or mother was working when the immigrant was age 14.[10]

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[5] Marital status indicators are derived from the variables "marital", "marlfr", "maritala", and "maritalb" that capture marital status across waves and France.
[6] These indicators are based on the variables "edulvla" and "edulvlb"..
[7] Income categories are derived from the variables "hinctnt" and "hinctnta".
[8] Employment status indicators are derived from the variable "mnactic".
[9] The religious categories are derived from the variable "rlgdnm".
[10] The parental characteristics are derived from the variables "edulvlma", "edulvlfa", "emprm14", and "emprf14".

2.2.6   Health Assessments in the Country of Birth

Average health assessment in the country of birth is computed in the integrated European Values Survey and the World Values Survey (EVS/WVS). This allows expanding the analysis of immigrants beyond those with ancestry in the countries covered by the ESS. The EVS/WVS health measure can be matched with immigrants from 91 nations across the globe. Extensive documentation is available at www.worldvaluessurvey.org.

The health assessment question has the following formulation in the EVS/WVS, "All in all, how would you describe your state of health these days? Would you say it is..." The answers are coded 1 for "Very poor," 2 "Poor," 3 "Fair," 4 "Good," and 5 "Very good." Averages are computed for all countries and across the waves (collected between 1981 and 2008) to capture persistent mean health assessments.

2.2.7   Additional Ancestral Country Characteristics

Birth country health, the variable of main interest in the analysis on persistent health influences below, is related to other ancestral country characteristics. There is a positive relationship between health and income across countries. We do not want to confound the effect of ancestry from a more developed country with the effect of a higher health country. The log of the ancestral country's gross domestic product (GDP) per capita is used to measure the effect of ancestry from a more developed nation.

Moreover, ancestral country health outcomes can influence the health of immigrants. This is accounted for by controlling for life expectancy at birth and infant mortality (per 1 000 births). Also accounted for is inequality through the ratio between the incomes of the top compared to the bottom 20%. All these measures are taken from the World Development Indicators (WDI) provided by the World Bank. For documentation see http://data.worldbank.org/data-catalog/world-development-indicators. The degree of democracy is measured by the polity2 variable from the Polity IV project. For

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documentation see http://www.systemicpeace.org/polity/polity4.htm. A data compilation is used as the source for these birth country characteristics. (Samanni, Teorell, Kumlin, & Rothstein, 2010) (The Quality of Government Institute cross-country data set)

Average subjective well-being (happiness) in the birth country is measured across the five waves of the EVS/WVS (the surveys were conducted between 1981 and 2008). The happiness question in EVS/WVS is "Taking all things together, would you say you are:" where answers are given by "Very happy", "Quite happy", "Not very happy", and "Not at all happy".

2.2.8   Missing observations

There are 16 (0.10%) missing observations of health in the immigrant estimation sample. Health report missing is not significantly associated with individual control variables, except that those who are unemployed are less likely to not report health. In the native sample there are 251 (0.12%) missing observations of health. All individual characteristics are insignificant except Protestants who are more likely to report health. For subjective well-being there are 144 (0.86%) missing observations in the immigrant estimation sample. Not reporting happiness is not significantly associated with any of the control variables. This indicates that the analysis is not biased by non-responses of the dependent variables.

3   RESULTS

3.1 Socioeconomic gradient for natives and immigrants

The first and second columns of Table 2 present the socioeconomic gradients of self-reported health for natives and immigrants, respectively. The specifications include the same individual and parental characteristics. The estimates on the individual characteristics are very similar across the two groups with one notable exception. Muslim immigrants pay a health penalty while there is no such effect for native Muslims. The health penalty for

Muslim immigrants is of similar size as having less than an secondary degree (versus having one) or being three deciles lower in the income distribution; a sizeable effect. The associations of education, income, labor force and marital status are similar across groups.

The associations of parental education and labor supply are largely similar across the groups, although the effects are less significant for the immigrants. For immigrants the estimate on the mother having a tertiary degree is close to zero and insignificant, while there is a positive and significant estimate for natives. For immigrants the estimate on the father having a tertiary degree is not significantly different from zero, but the point estimate is close to that in the native sample. The estimate of a working mom (at age 14) is close to zero in the immigrant sample, while there is a penalty in the native sample. The results indicate that parental characteristics may be less important for immigrants compared to natives. The estimates on parental characteristics are less precisely estimated than the individual characteristics so the lack of significance of parental characteristics in the immigrant sample could reflect the larger uncertainty rather than actual differences in estimates.

Comparing the estimates of the socioeconomic characteristics between natives in column 1 and immigrants in column 2 of Table 2 reveals that the socioeconomic gradient is not significantly different between natives and immigrants, with one exception.[11] Muslim immigrants express significantly worse health while there is no such effect among natives.

One implication of the similar socioeconomic gradients is that immigrants do not seem to be selected differentially compared to the native population. Immigrants hence appear representative of the native population with respect to the health determinants considered. The possible exception is Muslim immigrants.

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[11] Given that estimates are not significantly different between natives and immigrants, it may not be informative to compute quantitative differences across groups based on point estimates that could measure the same underlying parameter.

The similar socioeconomic gradients for health among natives and immigrants in the European context contrast with the healthy immigrant effect found in studies using US and Canadian data, where the socioeconomic gradient differs for natives and immigrants. The results presented here are in line with (Nesterko, Braehler, Grande, & Glaesmer, 2013) finding of only very small health differences between German natives and immigrants. Both the summary statistics in Table 1 and the analysis in Table 2 discussed point to no significant health differences among natives and immigrants in a broader European context. The results point to a difference in immigrant health determinants between Europe and North America.

(Table 2 here)

3.2 Persistent predictive power on self-reported health

The health assessments of immigrants from across the world are systematically related to the average health assessments in their birth country. The pattern is illustrated in Figure 1. The horizontal axis measures the mean health assessment in the immigrant's birth country. The vertical axis captures the self-reported health difference between an immigrant group and natives, averaged across the 30 residence countries.

The positive relationship in Figure 1 implies that immigrants bring their birth country health with them to their residence country. The figure plots the 41 largest immigrant groups but it is very similar for the full sample. The analysis accounts for individual socioeconomic and birth country characteristics, yet the relationship stays firmly positive. The findings provide new evidence on how health is shaped by social forces beyond the current context.

The remaining three columns of Table 2 address if there is a persistent predictive power of health assessments in the birth country on the immigrant's current health status. In the third column self-reported health is regressed on the average health assessment in the country of birth, age, age squared, a gender dummy, and a full set of country of residence by year fixed

effects. The estimate on health in the birth country is positive and highly significant. Immigrants in a given country of residence who were born in a country with a high health assessment express relatively higher health compared to immigrants residing in the same country but who were born in a country with lower average health assessments. The significant estimate on birth country health indicates a persistent social influence on self-reported health. Persistent social influence refers to the lasting predicting power of a contextual factor in the individual's environment, where the focus in the analysis is on birth country average health assessments.

The fourth specification of Table 2 adds socio-economic characteristics of the individual to account in detail for the immigrant's current status. The predictive power of birth country health remains positive and strongly significant. Column 5 of Table 2 adds parental characteristics to the model, which slightly decrease the standard error on the persistent health estimate. The results are very similar if Muslim immigrants are excluded, indicating that the possible selection effect among Muslim immigrants do not affect the results.

A one standard deviation increase in mean birth country health corresponds to the marriage premium or being four years younger. The effect is just shy of the association of an upper secondary degree (compared to less education) and bigger than moving from the low to the middle income category. A one unit increase in the mean health of the birth country, increasing the health from Russia's level to Denmark's, parallels the effect of being twelve years younger and exceeds the effect of having a university degree (compared to having less than an upper secondary degree). The literature has argued that estimates of environmental factors on self-assessed health are a lower bound (Grafova, Freedman, Lurie, Kumar, & Rogowski, 2014).

(Table 3 here)

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3.2.1   Robustness to ancestral country factors

Conditions in the birth country other than health assessments could of course influence the immigrant later in life. Table 3 explores a number of plausible candidates. The first column accounts for GDP followed by two measures of objective health in the birth country: life expectancy and infant mortality. The estimates have the expected signs, higher development and better health measures promote health among immigrants, and are also significant. Column 4 of Table 3 accounts for the ratio between the income shares of the top and bottom 20%, a measure argued to hurt health. (Wilkinson & Pickett, 2009) There is no significant influence on the health of immigrants, although the point estimate is as hypothesized. Column 5 accounts for the level of democratization, and finds evidence that greater democracy promotes health.

Column 6 of Table 3 estimates a cumulative model with all the birth country factors. In this specification only the birth country health assessment remains significant. Its point estimate and significance is robust across specifications, indicating a persistent social influence on self-reported health. That the point estimates remain similar across specifications suggest that omitted factors might be of limited concern. The results are very similar if Muslim immigrants are excluded from the analysis.

3.2.2   Adaptation

The acculturation of the birth country factors predictive power on self-reported health has been studied by (Jasso, 2003). The last two columns of Table 3 study adaptation of health assessment in two dimensions: based on years since immigration and age. Column 7 interacts the health assessment in the birth country with an indicator for whether the immigrant has spent more than 20 years in the country of residence. About 53% of the immigrants have lived more than 20 years in the country of residence. A significant negative estimate on the interaction term would indicate that the health assessments of those who have lived more than

20 years in the country are less affected by the birth country influence. Hence, it measures if individuals adapt their health assessment when they live longer in the country of residence. The point estimate on the interaction term in column 7 of Table 3 is close to zero and insignificant. There is hence no evidence of adaptation in the birth country predictive power on health reports as immigrants spend more time in the country.

In column 8 of Table 3 the health assessment in the birth country is interacted with an indicator for whether the individual is at least 47 years old, the sample average age. The idea is to examine if there is adaptation in the birth country predictive power over the life course. There is no evidence of adaptation of health assessments over the life course.[12] The estimated coefficient on the interaction term is close to zero and insignificant.

3.3 Estimating the effect of health on subjective well-being

The previous section establishes that birth country average health significantly predicts individual health of migrants living in a different country. This result provides the basis for examining the effect of health on subjective well-being, since birth country health is plausibly not determined by the well-being of individuals living in different countries. This section presents the second stage estimates of a two stage model of (1) and (2).

The first column of Table 4 presents the second stage estimates of well-being on health where health is instrumented for by mean birth country health. Only the most exogenous individual controls, age, its square, and gender, are included. The estimate on health is positive and highly significant.

(Table 4 here)

Extensive individual controls (education, marital and labor market status, income, religion) are added in column 2 of Table 4. The addition of these controls has a negligible influence on

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[12] Similar results are found when using three groups; older than 20, older than 40, and older than 60 years of age.

the estimate on health, which remains similar in magnitude and significance. The estimates on the demographic characteristics are similar to those in the literature (married individuals are happier, those unemployed looking for work are less happy); see for example Graham (2010) and (Easterlin, 2003). The results are very similar if Muslim immigrants are excluded.

The point estimate indicates a substantial positive impact of health on subjective well-being. A one standard deviation increase in health implies a 1.72 point, or .82 of a standard deviation, increase in happiness. The estimated effect size of health is several times larger than the estimates of the biggest demographic association. The implied happiness gain of a one standard deviation increase in health is over three times the influence of being married (compared to being divorced or widowed) and over four times the happiness gain moving the employment status from unemployed looking for work to working.

The concern with the instrumental variable approach is that there are relevant omitted variables, as the relevance of the instrument was established in the section 3.2. Birth country characteristics correlated with birth country health could influence happiness. Several plausible candidates were examined in section 3.2.1. Column 3 of Table 4 adds the cumulative specification with birth country characteristics from the mentioned section (log of GDP per capita, life expectancy, infant mortality, top vs. bottom income shares, and democracy) to the two stage model. The estimate on health remains positive and significant, while all the added birth country characteristics are insignificant except life expectancy.

Since the outcome variable is happiness there may be the added concern that happiness persists from the birth country. To address this concern the fourth column of Table 4 adds the birth country mean happiness to the two stage model. The estimate on birth country happiness is close to zero and insignificant while health remains positive and significant.

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The F-statistics for exclusion of the instrument in the first stage is added at the bottom part of Table 4. The first specification with minimal individual controls comes in slightly under the common 10 threshold as an indicator of sufficiently strong instrument. Adding individual characteristics to the model the precision increases and the F-statistic for the exclusion of the instrument increase to 17, indicating a very strong first stage. Adding the five birth country characteristics in the third specification has little effect on the first stage strength. Adding birth country happiness has little effect on point estimates, and is itself insignificant, but due to covariation with birth country health the first stage is not as strong. Yet, the F-statistic comes in at the threshold value 10. The relevance of the instrument is hence established.

The exclusion restriction is not possible to test in this exactly identified model. Omitted variables correlated with the instrument and outcome is always a concern. Potential omitted variables could include productivity and human capital that correlate with birth country average health. The robustness analysis includes GDP per capita and life expectancy, factors that arguably would capture differences in productivity and human capital across birth countries. Moreover, individual controls for education, labor force attachment, and income also account for the individual's productivity and human capital. The robustness of the results to a wide range of birth country factors and individual characteristics indicate that no other major factor is likely to influence the result.

Additional evidence on how health affects subjective well-being comes from studying life satisfaction. There is a strongly significant predictive power of health on life satisfaction in column 5 of Table 4 using the same two stage estimation procedure and extensive controls as in the previous column. The result corroborates the interpretation that health improves subjective well-being by demonstrating the effect on life satisfaction, a measure distinct from

but related to happiness. The first stage results for life satisfaction are very similar to the previous specifications, both in terms of estimates and first stage strength.

4 DISCUSSION

Immigrants and natives look alike (Table 1) and have similar health gradients (columns 1-2, Table 2). These observations are consistent with the weak evidence of immigrant sorting on health (Akresh & Frank, 2008)[,] (Rubalcava, Teruel, Thomas, & Goldman, 2008) and supplements earlier studies that have found different socioeconomic gradients, in particular between U.S. natives and immigrants from Latin America. (Acevedo-Garcia, Soobader, & Berkman, 2007)[,] (Buttenheim, Goldman, Pebley, Wong, & Chung, 2010)[,] (Goldman, Kimbro, Turra, & Pebley, 2006)[,] (Sanchez-Vaznaugh, Kawachi, Subramanian, Sanchez, & Acevedo-Garcia, 2009) The similarities between immigrants and natives make it plausible that the persistent influences on health, and in the second stage well-being, estimated among immigrants could generalize to natives. If this is the case then targeted health policy interventions could benefit the general population.

Although no specific health interventions have been studied in this paper the analysis would suggest that interventions that improve health both have long lasting effects on health as well as contributes to individual happiness. The individual correlates suggest that avoiding unemployment is associated with both better health and greater happiness. Higher education is associated with better health (but does not significantly contribute to happiness when health is accounted for). This suggests that education interventions that keep people out of unemployment could have substantial returns both in health and happiness among both healthy and health impaired workers.

Birth country income inequality does not have a significant effect on immigrant health reports, indicating such effects are not persistent. The lack of persistence, if capturing a true

effect of income inequality close to zero (rather than measurement noise), suggests that policy interventions could be effective if inequality causes poor health. (Marmot & Wilkinson, 2006), (Wilkinson & Pickett, 2009) Had income inequality been found to persist it might have been more challenging for policy to overcome such persistence.

The effects of mean health in the birth country on current health are quantitatively significant. They are comparable to much studied socioeconomic influences such as education, income, marriage, and age. The effect size makes it relevant to contemplate policy interventions to improve health. Moreover, the social influence on individual health indicates spillover effects.

The predictive power of birth country health assessment on individual health could be interpreted as causal as the immigrant residing in a different country cannot plausibly affect the average value in the birth country. This causal direction is a strength of the approach studying immigrants, which is hard to achieve in samples of natives. The robustness of the estimate when accounting for individual, parental, and birth country characteristics adds power to the causal interpretation. Yet, one can never completely rule out the influence of omitted factors.

The persistent social influences on health have two implications. First, social influences on health assessments imply a potential for spillovers from improved health beyond those directly affected. Second, the persistent predictive power of birth country health on health assessment, over and above a wide range of current socioeconomic factors, implies long-lasting effects on health. Policy that promotes health assessments could have positive health effects both contemporaneously and over the individual's whole life course. Policy interventions may also benefit individuals not directly treated by the intervention through the social feedback from the treated individuals.

The two stage estimates provide evidence on the direction and magnitude of the effect of health on subjective well-being. The instrumental variables approach offers new evidence on the causal relationship of health and well-being (measured by happiness and life satisfaction) where the current literature has largely focused on individual correlations where causality could run in both directions. The results are in line with (Gana, o.a., 2013) who finds that subjective health predicts subjective well-being in a subsequent year. The causal interpretation of the two stage estimate presented in this paper is of course conditional on the identifying assumption that birth country health has no direct influence on happiness of migrants beyond the specified model. This is an untestable assumption inherent in the instrumental variable approach, yet the robustness checks of the two stage model indicate that it could be plausible that the identifying assumption holds.

The two stage estimate of health on happiness (and life satisfaction), when interpreted causally, has one essential implication. Health is a very important determinant of individual well-being, quantitatively much more important than other demographic and economic characteristics. The findings reinforce the importance for both policy makers and individuals themselves to improve health as a means to higher well-being.

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Figure 1 legend
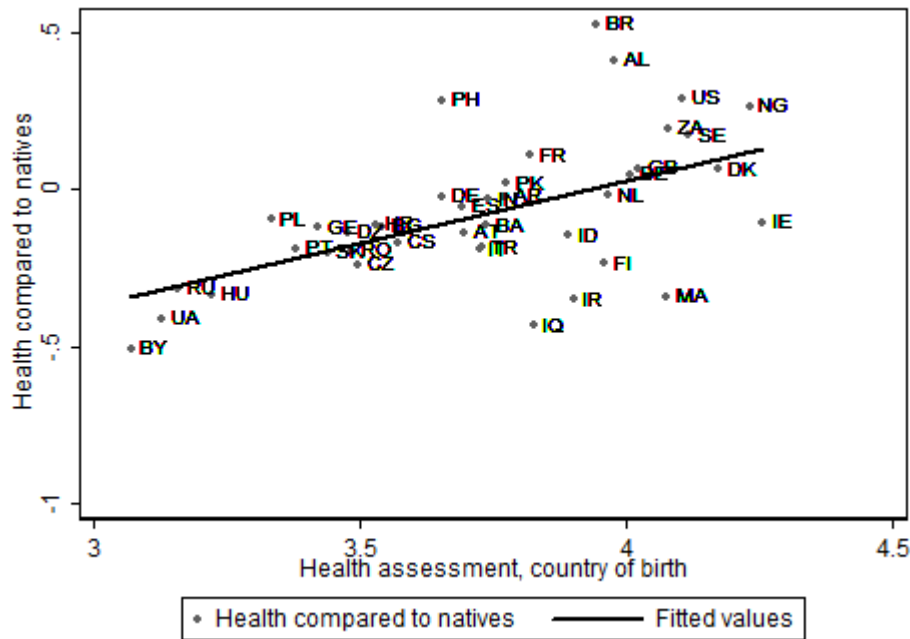
Figure 1. Health assessment in the birth country and self-reported health of immigrants compared to natives.

Notes: Health assessment is measured from 1, very bad, to 5, very good. Self-reported health deviations on the vertical axis are from the national average (across 30 nations). The sample is immigrants in 30 European countries. Country labels follow ISO-3166. Data are from the European Social Survey and the World Values Survey.

6   Tables

Table 1. Summary statistics.

Variable	Native born sample		Immigrant sample	
	Mean	Std. Dev.	Mean	Std. Dev.
Self-assessed health	3.74	.94	3.77	.98
Average health assessment, birth country			3.64	.33
Subjective well-being (happiness)	7.13	2.06	7.14	2.11
Age	47.4	18.6	47.7	17.68
Female	.538	.499	0.555	0.497
Upper secondary degree	0.444	0.497	0.410	0.492
College/university degree	0.228	0.420	0.314	0.464
Middle income	0.295	0.456	0.298	0.457
High income	0.159	0.366	0.135	0.342
Out of labor force	0.479	0.500	0.452	0.498
Unemployed	0.037	0.188	0.050	0.218
Married	0.530	0.499	0.578	0.494
Never married	0.279	0.448	0.212	0.409
Catholic	0.302	0.459	0.225	0.418
Protestant	0.128	0.334	0.072	0.259

Muslim	0.032	0.175	0.079	0.269
Upper secondary education, mother	0.181	0.385	0.146	0.353
Tertiary education, mother	0.070	0.255	0.103	0.305
Upper secondary education, father	0.212	0.409	0.159	0.366
Tertiary education, father	0.097	0.296	0.147	0.354
Working mother (at age 14)	0.528	0.499	0.480	0.500
Working father (at age 14)	0.872	0.334	0.834	0.372
Observations	207941		16656	

Notes: Data from the European Social Survey, rounds 1 through 5. The immigrant sample refers to individuals born in a country different from the country of residence (where the survey is conducted).

Table 2. Self-reported health for natives and immigrants.

Dependent variable: Self-reported health status

Sample:	Natives (1)	Immigrants (2)	Immigrants (3)	Immigrants (4)	Immigrants (5)
Average health assessment, birth country			**0.209**	**0.234**	**0.234**
			(0.071)**	(0.050)***	(0.048)***
Age	-0.035	-0.033	-0.013	-0.036	-0.035
	(0.002)***	(0.003)***	(0.002)***	(0.003)***	(0.003)***
Age squared/100	0.018	0.016	-0.007	0.018	0.018
	(0.003)***	(0.003)***	(0.002)**	(0.003)***	(0.003)***
Female	-0.049	-0.053	-0.098	-0.050	-0.051
	(0.015)**	(0.014)***	(0.013)***	(0.014)***	(0.014)***
Upper secondary degree	0.096	0.108		0.120	0.108
	(0.014)***	(0.020)***		(0.018)***	(0.018)***
College or university	0.200	0.195		0.217	0.196
	(0.016)***	(0.025)***		(0.023)***	(0.023)***
Middle income	0.067	0.075		0.077	0.074
	(0.008)***	(0.017)***		(0.018)***	(0.017)***
High income	0.134	0.176		0.171	0.165
	(0.012)***	(0.024)***		(0.025)***	(0.024)***
Out of the labor force	-0.217	-0.266		-0.272	-0.270
	(0.018)***	(0.023)***		(0.024)***	(0.024)***
Unemployed	-0.130	-0.170		-0.167	-0.167
	(0.015)***	(0.028)***		(0.028)***	(0.028)***
Married	0.103	0.090		0.090	0.090
	(0.010)***	(0.018)***		(0.018)***	(0.018)***
Never married	0.026	0.041		0.033	0.032
	(0.011)*	(0.023)		(0.023)	(0.023)
Catholic	0.036	0.018		0.027	0.027
	(0.020)	(0.019)		(0.018)	(0.018)
Protestant	0.068	0.125		0.116	0.111
	(0.015)***	(0.027)***		(0.027)***	(0.026)***
Muslim	0.013	-0.088		-0.127	-0.114
	(0.021)	(0.030)**		(0.031)***	(0.030)***
Upper secondary education, mother	0.045	0.059			0.058
	(0.011)***	(0.027)*			(0.026)*
Tertiary education, mother	0.039	0.006			0.013
	(0.010)***	(0.032)			(0.029)
Upper secondary education, father	0.032	0.043			0.045
	(0.009)**	(0.024)			(0.023)
Tertiary education, father	0.040	0.028			0.027
	(0.010)***	(0.024)			(0.024)
Working mother (at age 14)	-0.027	-0.007			0.003
	(0.010)**	(0.016)			(0.016)
Working father (at age 14)	0.083	0.050			0.046

	(0.010)***	(0.017)**			(0.017)**
Country-by-year fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.299	0.319	0.284	0.321	0.322
Observations	207941	16656	16656	16656	16656

Notes: The dependent variable is self-assessed health, which ranges from 1, 'very bad' to 5 'very good.' Column (1) estimates the association socio-economic gradient for the native population (born in the country of residence). Column (2) restricts the sample to immigrants (not born in the country of residence). Column (3) studies immigrants and estimates the effect of health assessments in the country of birth on the immigrant's self-reported health, while only accounting for the most exogenous individual characteristics. Column (4) adds socioeconomic characteristics of the individual, and column (5) adds parental characteristics. High income is a dummy for the top three deciles. Middle income is a dummy for the middle four deciles. Country of residence-by-year fixed effects included in all specifications. Data is from the first to fifth waves of the European Social Survey. Standard errors in parenthesis. Standard errors allow for clustering on the individual's birth country. Models estimated with ordinary least squares. Significance stars, * significant at 5% level, ** significant at 1% level, *** significant at 0.1% level.
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Table 3. Additional birth country influences and adaptation of health reports.

Dependent variable: Self-reported health status

Sample: Immigrants

Alternative specification:	Birth country	Birth country	Birth country	Birth country	Birth country democracy	Birth country cumulative	Adaptation:	Adaptation:
	GDP	life expectancy	infant mortality	income inequality		model	years in country	life course
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Average health assessment,	**0.207**	**0.214**	**0.237**	**0.235**	**0.240**	**0.249**	**0.238**	**0.233**
birth country	(0.046)***	(0.052)***	(0.049)***	(0.053)***	(0.047)***	(0.059)***	(0.051)***	(0.050)***
log of GDP per capita,	0.043					0.040		
birth country	(0.012)***					(0.029)		
Life expectancy at birth,		0.003				-0.005		
birth country		(0.001)*				(0.004)		
Infant mortality per 1000 live births			-0.001			-0.000		
birth country			(0.000)**			(0.002)		
Top 20% vs bottom 20% income				-0.002		-0.002		
shares, birth country				(0.002)		(0.002)		
Democracy (polity2),					0.006	0.004		
birth country					(0.002)**	(0.003)		
Average health assessment,							-0.004	
birth country interacted with							(0.005)	
dummy for living over 20 years								
in the country of residence								
Average health assessment,								0.002
birth country interacted with								(0.008)
dummy for age 47 years								
or older								
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-by-year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.323	0.322	0.322	0.321	0.324	0.324	0.321	0.321
Observations	15571	15802	15802	15398	15258	14888	16656	16656

Notes: The dependent variable is self-assessed health, which ranges from 1, 'very bad' to 5 'very good.' All specifications study immigrants and estimate the effect of health assessment in the country of birth on self-reported health. Individual controls include age, age squared, gender, education, labor force attachment, income, and religious denomination as in Table 2. Country of residence-by-year fixed effects are included in all specifications. Data is from the first to fifth waves of the European Social Survey. Standard errors in parenthesis, which allow for clustering on the birth country. Significance stars, * significant at 5% level, ** significant at 1% level, *** significant at 0.1% level.

Table 4. Estimates of the influences of health on subjective well-being (2SLS).

	Happiness (subjective well-being)				Life satisfaction
Dependent variable: Sample: Immigrants Model presented: Second stage					
Specification:	Demographic controls	Extended controls	Birth country controls	Birth country controls and happiness	Birth country controls and happiness
	(1)	(2)	(3)	(4)	(5)
Health (individual's own, instrumented with birth country average health)	**1.788**	**1.753**	**1.481**	**1.414**	**1.600**
	(0.393)***	(0.324)***	(0.420)***	(0.485)**	(0.510)**
Birth country controls:					
log of GDP per capita, birth country			-0.057	-0.057	-0.063
			(0.056)	(0.056)	(0.064)
Life expectancy at birth, birth country			0.025	0.025	0.029
			(0.008)***	(0.009)**	(0.009)**
Infant mortality, (per 1000 live births), birth country			0.004	0.004	0.003
			(0.003)	(0.003)	(0.004)
Top 20% vs bottom 20% income shares, birth country			0.000	-0.000	0.002
			(0.005)	(0.005)	(0.006)
Democracy (polity2), birth country			0.012	0.012	0.008
			(0.007)	(0.007)	(0.005)
Happiness, birth country				0.038	-0.187
				(0.143)	(0.169)
Individual controls:					
Age, age sq., gender	Yes	Yes	Yes	Yes	Yes
Education, labor force and marital status, income, religion		Yes	Yes	Yes	Yes
Country-by-year fixed effects	Yes	Yes	Yes	Yes	Yes
F-statistic for exclusion of instrument (first stage)	8.62	22.09	17.46	10	10.1
R-squared	0.025	0.0564	0.1401	0.1553	0.1633
Observations	16512	16512	14760	14760	14783

Notes: The dependent variable in columns 1 through 4 is happiness, which ranges from 0, 'extremely dissatisfied' to 10 'extremely happy.' The dependent variable in column 5 is life satisfaction, which ranges from 0, 'extremely unhappy' to 10 'extremely satisfied.' All specifications study immigrants and estimate the effect of health assessment on happiness, where health is instrumented for with birth country mean health assessment. The table presents the second stage estimates of the two stage least squares model. First stage estimates presented in appendix Table A3. Individual controls include age, age squared, gender, education, labor force attachment, income, and religious denomination as in Table 2. Country of residence-by-year fixed effects are included in all specifications. Data is from the first to fifth waves of the European Social Survey. Standard errors in parenthesis, which allow for clustering on birth country. Significance stars, * significant at 5% level, ** significant at 1% level, *** significant at 0.1% level.

7 Appendix tables

Table A1. Countries Participating in the ESS by Survey Round.

Country	Survey Round: 1	2	3	4	5
Austria	X	X	X		
Belgium	X	X	X	X	X
Bulgaria			X	X	X
Cyprus			X	X	X
Czech Republic	X	X		X	X
Denmark	X	X	X	X	X
Estonia		X	X	X	X
Finland	X	X	X	X	X
France	X	X	X	X	X
Germany	X	X	X	X	X
Greece	X	X		X	X
Hungary	X	X	X	X	X
Ireland	X	X	X	X	X
Israel	X			X	X
Italy	X	X			
Luxembourg	X	X			
Netherlands	X	X	X	X	X
Norway	X	X	X	X	X
Poland	X	X	X	X	X
Portugal	X	X	X	X	X
Russian Federation			X	X	X
Slovakia		X	X	X	X
Slovenia	X	X	X	X	X
Spain	X	X	X	X	X
Sweden	X	X	X	X	X
Switzerland	X	X	X	X	X
Turkey		X		X	
Ukraine		X	X	X	X
United Kingdom	X	X	X	X	X

Notes: Data from the European Social Survey, rounds 1 through 5. Edition 2.0 of ESS round 5 is used, and the cumulative file for earlier rounds. Round 1 conducted in 2002, round 2 in 2004, round 3 in 2006, round 4 in 2008, and round 5 in 2010.

Table A2. Variable descriptions and sources.

Variable name	Description	Source	Derived from variable(s)
Individual characteristics		ESS	-
health	Subjective health	ESS	-

happy	Happiness	ESS	-
stflife	Life satisfaction	ESS	-
agea	Age in years	ESS	-
female	Female (dummy variable)	ESS	gndr
uppersecondary	Upper secondary degree	ESS	edulvla, edulvlb
tertiary	College or university	ESS	edulvla, edulvlb
middleinc	Middle income	ESS	hinctnt, hinctnta
highinc	High income	ESS	hinctnt, hinctnta
outoflf	Out of the labor force	ESS	mnactic
act__uel	Unemployed	ESS	mnactic
mar__marr	Married	ESS	marital, marlfr, maritala, maritalb
mar__nevm	Never married	ESS	marital, marlfr, maritala, maritalb
catholic	Catholic	ESS	rlgdnm
protestant	Protestant	ESS	rlgdnm
muslim	Muslim	ESS	rlgdnm

Parental characteristics

uppersecondarymo	Upper secondary education, mother	ESS	edulvlma
tertiarymo	Tertiary education, mother	ESS	edulvlma
uppersecondaryfa	Upper secondary education, father	ESS	edulvlfa
tertiaryfa	Tertiary education, father	ESS	edulvlfa
workingmom	Working mother (at age 14)	ESS	emprm14
workingdad	Working father (at age 14)	ESS	emprf14

Birth country characteristics

a009_cavg	Average health assessment	WVS	a009
lwdi_gdpc	GDP per capita (log)	WDI	wdi_gdpc
wdi_lifexp	Life expectancy	WDI	
wdi_mort	Child mortality	WDI	
wdi_ishtopbot200	Top 20% divided by bottom 20% income shares	WDI	wdi_ish20/wdi_isl20
p_polity2	Democracy index	Polity IV	
happiness_cavg	Average happiness	WVS	v10

Notes: Data source abbreviations: European Social Survey (ESS), World Values Survey (WVS), and World Development Indicators (WDI). WDI and Polity IV data has been obtained from the Quality of Government Institute's standard cross country data set; http://qog.pol.gu.se/data/datadownloads/qogstandarddata.
ESS and WVS data available through the following links:
http://www.europeansocialsurvey.org/
http://www.worldvaluessurvey.org

Table A3. First stage estimates of 2SLS model in Table 4.

Dependent variable: Health (self-assessed)

Sample: Immigrants

Specification:	Demographic controls	Extended controls	Birth country controls	Birth country controls and happiness	Birth country controls and happiness
	(1)	(2)	(3)	(4)	(5)
Average health assessment,	0.211	0.236	0.248	0.222	0.224
birth country	(0.072)**	(0.050)***	(0.059)***	(0.070)**	(0.070)**
t-statistic	2.94	4.7	4.18	3.16	3.18
log of GDP per capita,			0.041	0.035	0.034
birth country			(0.028)	(0.030)	(0.030)
Life expectancy at birth,			-0.005	-0.005	-0.005
birth country			(0.004)	(0.004)	(0.004)
Infant mortality, (per 1000			-0.000	-0.001	-0.001
live births), birth country			(0.002)	(0.002)	(0.002)
Top 20% vs bottom 20% income			-0.002	-0.002	-0.002
shares, birth country			(0.002)	(0.003)	(0.003)
Democracy (polity2),			0.004	0.004	0.004
birth country			(0.003)	(0.003)	(0.003)
Happiness,				-0.060	-0.060
birth country				(0.075)	(0.076)
Individual controls:					
Age, age sq., gender	Yes	Yes	Yes	Yes	Yes
Education, labor force and		Yes	Yes	Yes	Yes
marital status, income, religion					
Country-by-year fixed effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.283	0.320	0.322	0.322	0.322
Observations	16512	16512	14760	14760	14783

Notes: The dependent variable is self-assessed health, which ranges from 1, 'very bad' to 5 'very good.' The table presents the first stage estimates of the two stage least squares model where Table 4 presents the second stage estimates. Each column corresponds to the sample in the same numbered column in Table 4. Individual controls include age, age squared, gender, education, labor force attachment, income, and religious denomination as in Table 2. Country of residence-by-year fixed effects are included in all specifications. Data is from the first to fifth waves of the European Social Survey. Standard errors in parenthesis, which allow for clustering on birth country. Significance stars, * significant at 5% level, ** significant at 1% level, *** significant at 0.1% level.