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Abstract

Background – With more than a fifth of the population being foreign citizens, Switzerland offers an ideal case to study the migrant health gap and the role of labour market status on the migrants' health.

Study Question – This paper examines the potential health gaps between Swiss nationals and different migrant groups (from the permanent foreign resident population), and how alternative types of labour market status affect health among each selected groups.

Methods – Using a sample of working-age males from the Swiss Labour Force Survey for the years 2003-2009, we estimate a model with a dichotomic dependent variable and test the potential endogeneity of labour market status. Our empirical strategy avoids inconsistencies incurred by unobserved heterogeneity and simultaneity of the choice of labour market status.

Results – We observe a health gap in terms of chronic illness between Swiss nationals and all considered migrant groups. Compared to the Swiss, nationals from former Yugoslavia and Turkey have a worse health status whereas Germans have a lower prevalence of chronic illness. Our findings show a negative influence of part-time work, unemployment, and inactivity on health for all groups under study. Labour market status and standard individual characteristics (human capital, demographic attributes, etc.) explain the health disadvantage for migrants from Italy and Portugal/Spain entirely, whereas it does not for migrants from Turkey and former Yugoslavia.

Conclusions – We provide insights on the unconditional health gap between migrants and Swiss nationals and estimate the causal effect of labour market status on chronic illness for different groups of the permanent resident population in Switzerland. The results show a negative correlation between non-employment (i.e. unemployment and inactivity) and health but this effect is reduced when taking into account the endogeneity of this variable. The same conclusion applies when labour market status is subdivided into three types: part-time work, unemployment, and inactivity.

Health Policy Implications – Policy makers may need to look for new health policies for some groups of migrants, in particular those originating from former Yugoslavia and Turkey, for which the health difference relative to the Swiss cannot be fully explained by factors such as human capital, demographic characteristics and labour market status.

Keywords: Migration, Health, Labour Market, Latent Variable Models, Simultaneous Equation, Panel Data Analysis

1 Introduction

In January 2013, the Swiss Federal Council approved a comprehensive strategy entitled "Health 2020", which consists of several measures across all areas of the health system to be implemented in the coming years. One of the objectives of the strategy is that all groups in the population should have an equal opportunity to enjoy a healthy life. As shown by Gabadinho et al. (2007), migrants in Switzerland represent a potentially vulnerable population and may need a special focus in the light of the previously mentioned objective.[1] From an economic point of view, the study of migrants' health is important given that, in case of bad health among some migrant groups, the exceeding costs will have negative financial repercussions on the health system. More importantly, migrants' health will affect their labour market adjustment, productivity and economic contribution. However, little research has been conducted to examine the role of labour market status on the migrants' health. The identification of the status or statuses that determine bad health of migrants is essential to improve their health and well-being in the host country.

In the literature on how being a migrant or the act of migrating affects health status, it is found that immigrants are in better health upon arrival in the host country compared to natives, but this health advantage erodes over time (see, e.g. Antecol and Bedard, 2006; Biddle et al., 2007; Jasso et al., 2004; Lara et al., 2005; McDonald and Kennedy, 2004; Newbold, 2005). This evidence is known as the *healthy immigrant effect*. While in general existing studies tend to show a convergence in health status between immigrants and natives with the time spent in the host country, some provide weak or no support for the healthy immigrant hypothesis (e.g. Constant et al., 2015; Norredam et al., 2014; Rubalcava et al., 2008). More worryingly, some migrant groups appear to have a poorer health status than natives, even after controlling for a set of individual characteristics that also includes socio-economic variables such as education or employment status (e.g. Frisbie et al., 2001; Moullan and Jusot, 2014; Sardadvar, 2015). Therefore, there is no clear empirical evidence on how being a migrant affects health.

This paper aims at assessing whether migrant groups are in worse or better health than Swiss nationals, and also at providing evidence on the causal effect of labour market status on health in Switzerland. Using a sample of working-age males from the the 2003-2009 Swiss Labour Force Survey (SLFS), health status is measured from the respondent's self-assessement of chronic illness. We differentiate between nine groups of migrants in order to take into account their heterogeneity. We use different categories of labour market status and explore whether they affect health among migrant groups and Swiss nationals. First, we consider the health effect of non-employment, a category in which unemployment and inactivity are grouped together. In a further step, we distinguish three indicators of labour market status: part-time employment, unemployment and inactivity. This distinction and its implication in terms of health has not been investigated fully in the existing literature. What is more, we apply an empirical strategy that avoids inconsistencies incurred by unobserved heterogeneity and simultaneity of the choice of labour market status. To address the issue of omitted variable bias, we take advantage of the panel structure of the SLFS data and estimate a correlated-random-effects

[1] In this paper, the term *migrants* is used for foreign people who have a permanent resident permit in Switzerland and thus we do not make a distinction between migrants and foreigners.

probit model (Greene, 2010; Mundlak, 1978). To deal with the simultaneous determination of health and labour market status, we follow an empirical strategy adopted by Holly et al. (1998) and consider a simultaneous pooled probit method that relates chronic illness to non-employment. Finally, to overcome both issues of simultaneity and omitted variable bias, we rely on a correlated-random-effects model and estimate a specification in which non-employment or the detailed set of labour market status types are subdivided according to whether respondents choose a particular status for health or non-health reasons, as in the spirit of Schmitz's (2011) study on the causal effect of unemployment on health.

Our results show that there is an unconditional health gap between Swiss and migrants. Migrants coming from Italy, Portugal/Spain, Turkey and former Yugoslavia are in worse health than the Swiss, whereas migrants from Germany are in better health compared to the Swiss. When we add a set of standard individual characteristics and an indicator for non-employment, the health gap is (a) reversed to the advantage of migrants from Italy and Portugal/Spain, (b) reduced but still to the disadvantage of those from Turkey and former Yugoslavia, and (c) almost unchanged for those from Germany. The health gap estimates, when derived from a correlated-random-effects probit model, are more than twofold lower in absolute value. Also the negative health effect of non-employment is considerably reduced. The latter pattern is even more pronounced when controlling for simultaneity bias, in the sense that the effect sizes associated with labour market status become smaller, and sometimes statistically insignificant for some migrant groups.

The remainder of the paper is organized as follows. Section 2 presents a literature review on the health effect of being a migrant in a host country and on the effect of socio-economic variables on health. The data, variables and the sample used are described in Section 3. Section 4 describes the methodology used, and the results are presented in Section 5. Section 6 discusses, in conclusion, our main findings and their implications in terms of health policy.

2 Review of the Literature

This paper builds on two strands of the literature. The first analyses the health gap between migrants and natives with a particular focus on the so-called healthy immigrant effect (HIE), whereas the second examines socio-economic determinants of health.

The HIE describes the stylized fact that immigrants seem to be in better health than natives upon arrival in the new country, but their health converges to the national average over time (for evidence, see, e.g. Antecol and Bedard, 2006; Biddle et al., 2007; Giuntella and Mazzonna, 2014; Jasso et al., 2004; Kennedy et al., 2015; Kwak, 2016; Lara et al., 2005; Leclere et al., 1994; McDonald and Kennedy, 2004; Newbold, 2005; Rivera et al., 2015). There are different potential explanations for the health advantage of migrants at arrival: a healthier lifestyle in the sending country, a rise in income after migration, migrant health screenings, and self-selection (Chiswick et al., 2008; Farré, 2016). Self-selection may be an important explanation, as healthy individuals may be physically or financially more likely to migrate (e.g. Farré, 2016; Kennedy et al., 2015; Martinez et al., 2015; Stillman et al.,

2009; Thomson et al., 2013). The convergence in health status between immigrants and nationals with the time spent in the host country may arise from assimilation, acculturation, common environment, cultural or language barriers to health service use, relative under-use of preventative health screening, selective re-migration, or regression to the mean (Chiswick et al., 2008; Delavari et al., 2013; Jasso et al., 2004; Leung, 2014; Lopez-Gonzalez et al., 2005). Yet, some studies report partial or no support for the HIE (e.g. Constant et al., 2015; Kobayashi and Prus, 2012; Laroche, 2000; Norredam et al., 2014; Pylypchuk and Hudson, 2009; Rubalcava et al., 2008; Villa et al., 2012). This inconclusiveness of the literature on the HIE may at least partly be due to the large variety in health outcomes, sending and receiving countries, age groups and cohorts examined.

In Switzerland, most evidence on health differences not only between indigenous and migrant populations but also within the migrant population has been drawn from the health monitoring of the migrant population (GMM I in 2004 and GMM II in 2010).[2] The results from the first GMM survey suggest that immigrants from neighbouring countries have a similar health status as the Swiss, whereas migrants from Turkey and the former Yugoslavian Republic countries are found to be in worse health (Gabadinho et al., 2007). The results from the second GMM survey show that the health status of older migrants, who have been in Switzerland for a long time, is generally worse than that of Swiss people of the same age. Furthermore, the migrant population exhibits larger gender differences in terms of health, which are less pronounced for the indigenous population (Guggisberg et al., 2010; Moussa and Pecoraro, 2013).

In the literature examining the socio-economic determinants of health, it is generally found that higher socio-economic status (SES) proxied by education and other labour market outcomes leads to better health outcomes (see, e.g. Bardasi and Francesconi, 2004; Bender and Habermalz, 2008; Cottini, 2012a;b; Cottini and Lucifora, 2013; Fletcher and Sindelar, 2009; Llena-Nozal, 2009; Mackenbach et al., 2008; Pirani and Salvini, 2015; Rodriguez, 2002; Schmitz, 2011; Shields and Price, 2005).[3] It should be noted that, in these studies, the measurement of health often involves subjective evaluation due to the nature of the data used (i.e. survey data in general). In many instances, the focus is on chronic conditions such as mental illness rather than self-rated general health. From a health care expenditure perspective, this is more relevant because of the large potential costs associated with the necessary prolonged care use due to chronic health problems (Tsiachristas et al., 2016).

There may be different pathways through which labour market participation variables, used as SES indicators, affects health. Rodriguez (2002) and Bardasi and Francesconi (2004) show that part-time employment does not seem to lead to adverse self-reported health outcomes.[4] On the other hand, they do not find the same pattern of results for temporary contracts: whereas Bardasi and Francesconi detect no association with self-reported mental health, Rodriguez indicates a negative association with self-reported general health status for full-time workers. More generally, the negative relationship between temporary employment and health has been confirmed by Virtanen et al. (2005)

[2] GMM stands for *Gesundheitsmonitoring der Migrationsbevölkerung.*

[3] There are a few exceptions (see, for instance, Bardasi and Francesconi, 2004; Schmitz, 2011).

[4] While Bardasi and Francesconi refer to all British workers in part-time employment, Rodriguez shows that the health status of part-time workers with permanent contracts in Germany and Britain is not significantly different from those employed full-time. Rodriguez also shows that, in Britain, only part-time work with no contract is associated with poor health but the difference is not statistically significant.

in a meta-analysis of 27 studies and also, more recently, in a study by Pirani and Salvini (2015) focusing on the Italian case. Using data from 15 European countries, Cottini and Lucifora (2013) and Cottini (2012a;b) show that unfavourable working conditions such as shift work, restricted autonomy, complex and intensive tasks lead to a higher probability of self-reported physical and mental problems. In a related vein, occupational accidents and disability pensions seem to be more frequent among migrants employed in low-skilled work (Bolliger et al., 2010; Claussen et al., 2009; 2012; Egger et al., 1990; Gany et al., 2014; Lehmann et al., 1990). Along the same line, Fletcher and Sindelar (2009) finds that blue collar positions have worse self-reported health outcomes in the US.

Other SES indicators, such as non-employment or unemployment, may lead to economic deterioration, social isolation, uncertainty, disorder, no goal or purpose in life, loss of social recognition, and low self-esteem, which in turn is particularly detrimental in terms of chronic mental health (Shields and Price, 2005). Among the few studies in this area, there is some evidence of a negative association between unemployment and health (Bender and Habermalz, 2008; Schmitz, 2011). Job loss is associated with an increased consumption of antidepressants, and non-employment in general goes hand in hand with poor psychological well-being (Kuhn et al., 2009; Shields and Price, 2005). Using panel data from New Zealand in order to consider changes in SES indicators and mental health, Mckenzie et al. (2014) find that non-employment leads to an increase in depression scores. However, when taking into account the selection effects of ill individuals into unemployment, Schmitz (2011) finds that unemployment has no effect on bad health, the latter being proxied by health satisfaction, mental health, and hospital visits in Germany.

Only a few studies combine these two strands of literature and look at the socio-economic determinants of the migrant health gap. Moullan and Jusot (2014) investigate the heterogeneity of the health gap between migrants and natives across four European countries. Their results suggest that, for immigrant men only, unemployment does not seem to be negatively associated with good health compared to employment. In contrast, Dunn and Dyck (2000) find that SES indicators in the form of income and education are more strongly associated with health for migrants than for natives. Sardadvar (2015) also investigates the socio-economic determinants of the health gap between migrants and native Austrians. He finds that SES indicators explain the entire health gap for men when controlling for potential interactions between country of origin and covariates such as education, occupation and income. He also finds that occupation has a different effect on self-reported health for migrants than for natives. In particular, blue collar workers from the EU15 and EFTA countries are more likely to report a better self-reported health status than natives. Furthermore, the unemployed from Turkey and outside the EU/EFTA countries are more likely to report a better health than natives.

Evidence from Switzerland on the migrant health gap and the role of SES indicators in explaining it is scarce. For example, Winkelmann (2002), using data from the Swiss Household Panel, shows that that migrants have more doctor visits even though some socio-economic characteristics such as education and labour market status (i.e. unemployment, part-time and full-time employment) are controlled for. Moreover, Egger et al. (1990); Lehmann et al. (1990) show that occupational accident rates and disability pension receipt are significantly higher for migrant workers than natives.

Guggisberg et al. (2010) find that the higher likelihood of receiving a disability pension among migrants (mainly from former Yugoslavia and Turkey) compared to that of the Swiss nationals can be attributed to their lower status in terms of socio-professional category and self-reported health.

While some types of labour market status such as non-employment or unemployment appear to be important determinants of health, the empirical evidence on the link between migrant (economic) assimilation and health is still mixed and inconclusive. In particular, once we take into account differences in labour market status, we may expect three possible outcomes. First, there is still a health gap between migrants and natives, migrants being in better health than natives. Then we can interpret this as "the best of both worlds" i.e. migrants enjoy both the favourable habits of their country of origin and the efficiency of the health care system in the host country (see Marmot and Syme, 1976). Second, there is no health gap between natives and migrants, differences in labour market status explaining the entire gap. Third, there is still a health gap between migrants and natives, natives being in better health than migrants. Then we can state that observed differences in labour market status cannot explain the (entire) health gap and specific policies are required to address vulnerable migrants' needs.

3 Data

In this study we use data from the Swiss Labour Force Survey (SLFS), which is representative for the permanent resident population aged 15 and older. This population contains all Swiss citizens whose main place of residence is in Switzerland and also foreign citizens with a residence permit for at least twelve months. The SLFS has been a yearly rotating panel from 1991 to 2009, including up to five waves for each individual. Since 2003, the foreign population has been over-sampled and interviews have been conducted in languages other than French, German and Italian.[5] These additional features are important to establish a reliable picture of the foreign population in the Swiss labour market. However, from 2010 onwards, not only the number of languages used in interviews were reduced to four (French, German, Italian and English) but also the panel design of the SLFS changed.[6] Therefore, only individuals interviewed over the years 2003-2009 are selected for this analysis. We restrict the sample to the working age population of men (aged from 18 to 65 years) who have no missing values in the variables of interest (see next subsection). Overall, the sample contains 53,328 individuals and 122,384 observations. Table 4 in the appendix gives an overview of the sample and the variables used in the analysis.

[5] In addition to the national languages, interviews has been carried out in English since 2003, in Albanian and Serbo-Croatian from 2003 to 2009, also in Portuguese and Turkish over the period 2005-2009.

[6] Since 2010, not only the information on the respondents' health status has been changed but also the number of interviews per person has been reduced to four at most. The second interview takes place three months after the first but does not include any health-related questions. The third interview occurs a year after the first and includes the full set of questions. The last interview is conducted three months later and, again, contains no health-related information. As a result, it is impossible to combine the new SLFS with the one set up before 2010.

3.1 Variables

Dependent Variable

As the dependent variable, we use a self-reported indicator for whether an individual suffers from a physical or psychological problem limiting him/her in daily activities and lasting for longer than a year. The response is coded as a binary variable that takes the value 0 if the respondent answered no and 1 if the respondent answered yes. Henceforth, this variable will be referred to as *chronic illness*. In spite of the popular use of self-rated health in population surveys and empirical research, its relevance has been often put into question. Because of its subjective scaling, such a measure of health may suffer from person-specific heterogeneity, so that the evaluation of health may differ across cultures or populations (Prinja et al., 2012). These potential limitations have to be carefully considered in case of cross-population comparisons, especially when comparing the indigenous and migrant populations. That being said, a large number of empirical studies investigating the health difference between these populations used related measures of subjective health (e.g. Dunn and Dyck, 2000; Moullan and Jusot, 2014).

Migrant Groups

In this study, permanent resident foreigners are defined as *migrants*. By construction, the nationality of an individual is fixed at the first interview (over the period 2003-2009) so that it is treated as time-invariant. Nationalities are grouped depending on the number of foreigners in the selected sample and the relative importance of their community in Switzerland. We use the Swiss as the base category, and compare them to the following groups: migrants from Italy, Germany, Portugal or Spain, France, the rest of the EU-15/AELE, the new members of the EU, Turkey, former Yugoslavia, and the rest of the world.[7]

Labour Market Status

We use a binary and a categorical indicator for labour market status, thereby expanding the analysis of Sardadvar (2015). In a first step, we group the unemployed and the out-of-the-labour-force together and label this category as *non-employment* (employment is then the base category). In a second step, we differentiate between working full-time (base category), working part-time, unemployment, and inactivity (i.e. out of the labour force). The latter categories are based on the definition of the International Labour Organization (ILO).[8] When dealing with the problem of bidirectional causality,

[7] The new member states of the EU include Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Czech Republic, Slovakia, Bulgaria and Romania. It should be noted that Slovenia is part of the former Yugoslavia as Serbia, Montenegro, Croatia, Bosnia & Herzegovina, Macedonia and Kosovo.

[8] The employment category includes either workers or apprentices. The unemployment category contains those who are not working at the present time but actively searched for a job during the last month and who might start working in the next two weeks. The inactive group incorporates those who do not belong to any of the other categories (i.e. out of the labour force). The distinction between working full-time or part-time is based on the percentage of average time spent on work in a week. This percentage for full-time work corresponds to at least 90%

we further split our categorical indicator into six subcategories, e.g. working part-time for health reasons and working part-time for other reasons, and similarly for the unemployment and inactivity categories. As a matter of fact, the SLFS contains questions on whether part-time workers, unemployed or inactive individuals are in these categories because of invalidity, illness or other health reasons.

Control Variables

We control for various individual characteristics in the regression analysis. Education has been shown to be an important determinant of health, but potentially endogenous (Gany et al., 2014; Mackenbach et al., 2008; Sardadvar, 2015; Shields and Price, 2005; Virtanen et al., 2005). The identification of its causal effect being complicated in the set up of this study, we add it as an exogenous control to avoid an omitted variable bias. Education consists of four categories (primary, secondary vocational, secondary general and tertiary). Other control variables relevant to the migration status are being foreign born, years since migration and its square. The duration of residence in the host country is an important determinant of migrants' health according to the healthy immigrant effect literature (e.g. Antecol and Bedard, 2006; Chiswick et al., 2008). The residence permit is not included as a control since it is collinear with the nationality and years-since-migration indicators.[9] Demographic controls include an indicator for being married or in a registered partnership, age and its square. Furthermore, we control for 7 broad regions, consisting of Lake Geneva (Vaud, Valais, Geneva), Middleland (Bern, Fribourg, Solothurn, Neuchâtel, Jura), North-west Switzerland (Basel-Stadt, Basel-Landschaft, Aargau), Zurich, East Switzerland (Glarus, Schaffhausen, Appenzell Ausserrhoden, Appenzell Innerrhoden, St.Gallen, Graubünden, Thurgau), Central Switzerland (Lucerne, Uri, Schwyz, Obwalden, Nidwalden, Zug), and Ticino. Finally, survey years and interview waves are controlled for by means of dummy variables.

4 Methodology

4.1 Baseline Specification

We propose a model that attempts to estimate the probability of suffering from a chronic illness, denoted by the latent variable y^*_{it}, as a function of dummy variables for each migrant group, an indicator for labour market status and other exogenous controls:

$$(1) \quad y^*_{it} = \beta_0 + \beta_1 nat_i + \beta_2 nonemp_{it} + \gamma X_{it} + e_{it},$$

where β_1 is a vector of coefficients related to the vector of nationalities nat_i. These coefficients can be interpreted as the difference in probability of having a chronic illness between the respective migrant groups and the Swiss. We also add a dummy variable for the non-employment status ($nonemp_{it}$). The vector X_{it} includes a set of exogenous controls capturing human capital (education), demographic cha-

and less than 90% for part-time work.

[9] The longer a migrant stays, the more likely she or he holds a permanent residence permit. The reverse applies to a migrant who recently arrived: she or he is more likely to have an annual residence permit.

racteristics (age and its square, martial status), migration status (foreign born, years since migration and its square) and fixed effects for regions, survey years and interview waves. Equation 1 allows us to determine if non-employment, along with other independent variables, is able to explain a potential health gap between different migrants groups and the Swiss.[10] The probability of chronic illness is estimated with the pooled probit procedure. As the size of the probit coefficients cannot be directly interpreted, we report estimates of average marginal effects.

4.2 Alternative Specifications

Equation 1 may be plagued by endogeneity problems from two main sources. First, we are particularly concerned with a possible omitted variable bias because we cannot control for unobserved heterogeneity that may be correlated with non-employment. Such a correlation would bias the estimate of β_2, as non-employment would be correlated with the error term. Another potential source of endogeneity is due to the simultaneous determination of health and non-employment. Ignoring this problem of simultaneity may also lead to the wrong inference about the health effect of non-employment. Put differently, the estimator from the pooled probit will not be consistent in the presence of endogeneity.

Much of the empirical work neglects the problem of omitted variable. For instance, unobserved factors such as ability or motivation are likely to be negatively correlated with non-employment. Omitting these variables would bias downward the non-employment effect derived from the pooled probit model. The omitted variable bias may also affect our other variables of interest, i.e. the nationality coefficients. This type of endogeneity can be addressed by using the panel structure of the data and applying an individual fixed effects (FE) approach. However, we cannot apply fixed effects in the probit model because of the *incidental parameters problem* which leads to serious biases as noted in Wooldridge (2002). Random effects (RE) probit estimation may be used alternatively. But the RE method assumes that unobserved heterogeneity is uncorrelated with the regressors, which seems rather unlikely in our setting. A solution consists in using a RE probit model in which we add the individual group means of time-variant variables ($\overline{nonemp}_i$ and $\overline{X}_i$) in order to filter out the correlation between the error term and the right-hand-side variables (Greene, 2010; Mundlak, 1978):

$$(2) \quad y^*_{it} = \beta_0 + \beta_1 nat_i + \beta_2 nonemp_{it} + \gamma X_{it} + \delta_1 \overline{nonemp}_i + \delta_2 \overline{X}_i + \epsilon_{it}.$$

This approach has the advantage that it allows us to estimate the coefficients of time invariant variables such as the nationality dummies. Thus, the difference between the standard RE probit model and the RE probit model with the Mundlak correction is that the latter approximates a fixed effects model through the addition of the individual means while still allowing to estimate the coefficients of time invariant variables. As suggested by Greene (2010), a means of testing for fixed vs. random effects is to apply a test for joint significance of the individual group means in order to determine if the means add any explanatory power to the model, and thereby if Mundlak's approach significantly differs from the standard RE probit model.

[10] The base category consists in the Swiss, working full-time, single or separated, with none or primary education, from the Lake Geneva region, in 2003 and wave 1.

To tackle the simultaneity problem, we follow the estimation strategy proposed by Holly et al. (1998) in the context of how the choice of insurance plan affects the utilization of health care. Accordingly, we estimate a simultaneous two equation model which simply relates chronic illness to non-employment. More specifically, we consider a reduced form equation for $nonemp^*$ which is determined by the set of exogenous variables nat and X:

(3a) $nonemp^*_{it} = \alpha_0 + \alpha_1 nat_i + \alpha_2 X_{it} + u_{1it},$

and a structural form equation for y^* which is simultaneously determined by $nonemp$ and the set of exogenous variables nat and X_2:

(3b) $y^*_{it} = \beta_0 + \beta_1 nat_i + \beta_2 nonemp_{it} + \gamma_2 X_{2it} + u_{2it}.$

To identify equation 3b, the vector X_2 is assumed to not include all the exogenous variables in X.

It should be noted that simultaneity bias may arise from the potential reverse causality between labour market status and our health variable i.e. non-employment does not only influence health, but health may also influence non-employment. Most importantly, so far, we have not proposed an estimation strategy that deals with simultaneity and omitted variable bias. While the Mundlak adjustment method can be used to address the latter issue, we take advantage of unique information in the SLFS about the reasons for choosing non-employment to tackle the former. In the spirit of Schmitz (2011) in which plant closures are used to determine the effect of exogenous unemployment on health, we split the non-employment status into two subcategories depending on whether the choice of not working is linked to health problems or disability versus other reasons. In this way, we are able to isolate the effect of non-employment that is not determined by health and thus correct for the potential bidirectional causality bias. This led us to consider the following model:

(4) $y^*_{it} = \beta_0 + \beta_1 nat_i + \beta_2 nonemp^h_{it} + \beta_3 nonemp^o_{it} + \gamma X_{it} + \delta_1 \overline{nonemp^h}_i + \delta_2 \overline{nonemp^o}_i + \delta_3 \overline{X}_i + \eta_{it},$

where $nonemp^h$ and $nonemp^o$ are dummy variables capturing non-employment for health reasons and non-employment for other reasons, respectively.

So far, we have assumed the health effect of non-employment to be the same across migrant groups. More importantly, previous specifications do not take into account the health effects of different labour market statutes such as part-time employment, unemployment and inactivity. In terms of reverse causality, it means that an individual can choose to work part-time, to be unemployed or to be out of the labour force because of health problems. In a first step, we ignore this problem and consider an alternative version of equation 2 for nationality group j:

(5a) $y^*_{ijt} = \beta^j_0 + \beta^j_1 lms_{ijt} + \gamma^j X_{ijt} + \delta^j_1 \overline{lms}_{ij} + \delta^j_2 \overline{X}_{ij} + \upsilon_{ijt},$

where lms is a vector of labour market status dummies. According to this equation, for a given nationality group, individuals working part-time, those being unemployed and those being inactive are compared with individuals working full-time. In a second step, to minimize the possibility of reverse causality, we propose an extended specification in which lms is decomposed into two vectors

on the basis of the reasons for choosing a particular status:

(5b) $y^*_{ijt} = \beta^j_0 + \beta^j_1 lms^h_{ijt} + \beta^j_2 lms^o_{ijt} + \gamma^j X_{ijt} + \delta^j_1 \overline{lms^h}_{ij} + \delta^j_2 \overline{lms^o}_{ij} + \delta^j_3 \overline{X}_{ij} + \omega_{ijt}.$

As in equation 4, the superscripts h and o denote "health reasons" and "other reasons". To compare the likelihood of chronic illness between migrant groups and the Swiss, equations 5a and 5b are estimated separately for six subsamples: the Swiss, Italians, Germans, the Portuguese/the Spanish, Turks and former Yugoslavians.

5 Results

5.1 The Migrant Health Gap

Table 1 shows the difference in the prevalence of chronic illness between the Swiss and certain migrant groups. In order to test the significance of this difference, we conducted a t-test of equal means of the two groups (the Swiss vs. a migrant group), assuming unequal variances. The first cell in the first column shows that Italians have a significantly higher prevalence of chronic diseases than the Swiss. As we are interested in potential differences by labour market status, the total sample for each selected group are split up into full-time employment, part-time employment, unemployment and inactivity. As shown from the second to the fifth columns, this distinction leads to contrasting results, indicating that labour market status may be an important variable in explaining the health gap for some migrant groups. For example, the inactive Italians have a 22% higher prevalence of chronic illness than the inactive Swiss, whereas the full-time Italian workers have a 1% lower prevalence than the full-time Swiss workers.

In general, the Italians, the Portuguese/Spaniards, the Turks, and the ex-Yugoslavians have a higher prevalence of chronic illness than the Swiss. On the other hand, the German and the French nationals have on average a lower prevalence of chronic illnesses than the Swiss, and this is true for all types of labour market status. In sum, there is an unconditional health gap between the Swiss and different migrant groups: the German and French nationals are in better health than the Swiss and the reverse applies for the Italians, the Portuguese/Spaniards, the Turks, and the ex-Yugoslavians. When disaggregating the health gap by labour market status, there is a large variation in the different health gaps, implying that labour market status may be an important determinant of the health gap.

Table 1: Differences in proportions of men reporting a chronic illness by nationality and labour market status

	All	Employment		Non-Employment	
		Full-time	Part-time	Unemployed	Inactive
Italy	0.013***	-0.010***	0.064***	0.043*	0.218***
	(0.003)	(0.002)	(0.016)	(0.019)	(0.015)
N	14,454	11,855	728	563	1,308
Germany	-0.040***	-0.021***	-0.090***	-0.026	-0.099***
	(0.003)	(0.003)	(0.011)	(0.025)	(0.020)
N	7,807	6,438	717	218	434
Portugal/Spain	0.011**	-0.009**	0.077**	0.027	0.178***
	(0.004)	(0.003)	(0.025)	(0.023)	(0.019)
N	8,063	6,635	301	336	791
France	-0.037***	-0.027***	-0.050*	-0.111***	-0.039
	(0.004)	(0.004)	(0.023)	(0.020)	(0.029)
N	2,887	2,314	205	138	230
Turkey	0.074***	0.016*	0.104**	0.031	0.195***
	(0.007)	(0.006)	(0.037)	(0.026)	(0.025)
N	2,568	1,722	150	270	426
Former Yugoslavia	0.059***	-0.002	0.125***	0.001	0.253***
	(0.003)	(0.003)	(0.024)	(0.016)	(0.013)
N	12,066	8,887	386	792	2,001

Source: Swiss Labour Force Survey 2003-2009. *Notes*: *** p<0.01, ** p<0.05, * p<0.1 from a two-sample t-test for equal means with unequal variances. The Swiss constitute the base group for comparison. N_{Swiss} = 62,583; $N_{Swiss\ full-time}$ = 49,673; $N_{Swiss\ part-time}$ = 5,524; $N_{Swiss\ unemployed}$ = 1,391; $N_{Swiss\ inactive}$ = 5,995. Data are unweighted.

5.2 The Health Effects of Non-Employment

Table 2 displays the estimation results of equations 1, 2, 3b and 4. The first column presents the results of the pooled probit regression analysis according to which all regressors are assumed strictly exogenous. Non-employment is significantly associated with a higher probability of a chronic illness. Males who are non-employed are 17.2 percent more likely to suffer from chronic illness than employed males. The other raws present the health gap estimates between the Swiss and migrant groups. Compared to the results presented in Table 1, we find that, ceteris paribus, the health gap goes in the opposite direction for migrants from Italy and Portugal/Spain. For the migrants from Turkey and

Table 2: Health effects of non-employment and differences in the prevalence of chronic illnesses between Swiss and migrant men

Equation	(1) Pooled Probit	(2) RE Probit with CRE	(3b) Simultaneous Pooled Probit	(4) RE Probit with CRE and reasons for non-employment
Variables				
Non-employment	0.172***	0.013***	0.008*	
	(0.002)	(0.001)	(0.005)	
for health reasons				0.023***
				(0.002)
for other reasons				0.005***
				(0.001)
Italy	-0.020***	-0.009***	-0.024***	-0.007***
	(0.003)	(0.002)	(0.003)	(0.001)
Germany	-0.025***	-0.013***	-0.019***	-0.008***
	(0.004)	(0.003)	(0.005)	(0.002)
Portugal/Spain	-0.014***	-0.006***	-0.016***	-0.006***
	(0.004)	(0.002)	(0.004)	(0.002)
France	-0.038***	-0.021***	-0.029***	-0.013***
	(0.007)	(0.004)	(0.007)	(0.003)
Rest of EU-15/AELE	-0.031***	-0.013***	-0.027***	-0.007***
	(0.005)	(0.003)	(0.006)	(0.002)
New Members of the EU	-0.004	-0.001	0.013	0.001
	(0.012)	(0.007)	(0.013)	(0.005)
Turkey	0.027***	0.011***	0.047***	0.008***
	(0.005)	(0.003)	(0.006)	(0.002)
Former Yugoslavia	0.019***	0.007***	0.032***	0.003*
	(0.004)	(0.002)	(0.004)	(0.002)
Rest of the World	-0.028***	-0.012***	-0.004	-0.007***
	(0.005)	(0.003)	(0.005)	(0.002)
Observations	122,384	122,384	122,384	122,384
Number of i		53,328		53,328
Percent correctly predicted	91.9%	91.5%	90.6%	92.3%
Pseudo R^2	0.19	0.14		0.17

Source: Swiss Labour Force Survey 2003-2009. *Notes*: Estimates of average marginal effects, standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data are unweighted. Additional controls are unreported.

former Yugoslavia, the health gap is strongly reduced but remain still positive. On the other hand, the health gap for the Germans and the French is more or less unchanged, which means that non-employment and other exogenous controls do not play a significant role in explaining these migrant groups' advantage in terms of health.

The results displayed in the second column rely on a correlated-random-effects (CRE) estimator, which is based on a RE probit including the individual means of time-variant variables to filter out the correlation between the error term and the right-hand-side variables. Taking into account unobserved individual heterogeneity decreases the estimates of average marginal effects considerably, in particular the one associated with non-employment. Non-employed men are 1.3 percent more likely to experience a situation of chronic illness compared to employed men. The test for fixed vs. random effects shows that the means of the time-variant explanatory variables are jointly highly significant ($\chi^2(25)$=1,385.34; p-value=0.000), implying that the pure random effects model is not consistent.

The third column presents the results derived from a simultaneous pooled probit approach. It should be noted that each of the excluded variables in the structural form equation for chronic illness (i.e. being married, age squared and years since migration squared) significantly affect non-employment (see Table 5 in the appendix). Moreover, the estimated parameter for the correlation between the error terms from equations 3a and 3b is significant, indicating that non-employment is endogenous and thus estimates from the standard pooled probit are not consistent. We show that the negative health effect of non-employment is even more reduced, remaining significant at a level of 10 per cent. However, the health gap between migrants and the Swiss does not change much compared to the standard pooled probit results in the first column.

The last column, finally, shows the estimations results of equation 4 that aims to mitigate the problems of simultaneity and omitted variable bias. It is found that the health gap estimates are the lowest in absolute value compared with those displayed in others columns. What is more, being non-employed for other reasons than health increases the probability of chronic illness by only 0.5 percentage points. As a matter of fact, the magnitude of this estimate is close to that derived from the simultaneous pooled probit model in the third column.

Table 3: RE Probit with CRE: subgroups of nationalities - detailed labour market status

Variables	Swiss		Italy		Germany		Portugal/Spain		Turkey		Former Yugoslavia	
Part-time	0.009***		0.032***		-0.001		0.025***		0.063**		0.025**	
	(0.002)		(0.007)		(0.003)		(0.009)		(0.028)		(0.011)	
for health reasons		0.020***		0.055***		-0.005		0.046***		0.211***		0.038**
		(0.003)		(0.011)		(0.006)		(0.014)		(0.073)		(0.016)
for other reasons		0.003*		0.017**		-0.001		0.009		0.029		0.013
		(0.002)		(0.007)		(0.002)		(0.009)		(0.027)		(0.013)
Unemployed	0.010***		0.023***		-0.005		0.007		0.002		0.024***	
	(0.003)		(0.006)		(0.003)		(0.007)		(0.019)		(0.008)	
for health reasons		0.028***		0.045***		-0.006		0.015		0.107***		0.060***
		(0.007)		(0.012)		(0.008)		(0.012)		(0.039)		(0.015)
for other reasons		0.004**		0.013**		-0.003		0.002		-0.028		0.010
		(0.002)		(0.006)		(0.002)		(0.007)		(0.019)		(0.008)
Inactive	0.013***		0.032***		0.004		0.019***		0.063***		0.058***	
	(0.002)		(0.006)		(0.003)		(0.007)		(0.022)		(0.008)	
for health reasons		0.018***		0.044***		0.011*		0.032***		0.152***		0.071***
		(0.003)		(0.008)		(0.006)		(0.009)		(0.036)		(0.009)
for other reasons		0.007***		0.018***		0.002		0.005		0.030		0.045***
		(0.002)		(0.006)		(0.003)		(0.007)		(0.021)		(0.008)
Observations	62,583	62,583	14,454	14,454	7,807	7,807	8,063	8,063	2,568	2,568	12,066	12,066
Number of i	26,824	26,824	6,168	6,168	3,538	3,538	3,546	3,546	1,161	1,161	5,250	5,250
Percent correctly predicted	91.8%	93.0%	92.6%	93.3%	90.6%	92.8%	92.7%	93.1%	92.6%	93.4%	92.7%	93.5%
Pseudo R^2	0.11	0.17	0.23	0.28	0.11	0.15	0.23	0.27	0.25	0.30	0.30	0.32
Test for joint significance of $\overline{lmsi}$ & $\overline{X}_i$	546.7***	829.7***	214.0***	235.9***	45.2**	66.4***	142.6***	144.8***	57.7***	52.1***	238.3***	248.0***

Source: Swiss Labour Force Survey 2003-2009. *Notes*: Estimates of average marginal effects, standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data are unweighted. Additional controls are unreported.

5.3 The Health Effects of Labour Market Status by Nationality

Table 3 presents results from RE probit models with correlate-random-effects by subgroups of nationality. First, we distinguish between working part-time, being unemployed and inactive (full-time employment being the reference category). In order to address potential biases due to bidirectional causality between health and each labour market status, we also consider whether the reasons for choosing a particular status is due to health problems or not. As shown in Table 3, the positive effects of working part-time, unemployment, and inactivity on the probability of having a chronic illness is considerably reduced and sometimes becomes insignificant, when the reasons for choosing a particular status is not linked to health problems. This implies that the health effects of labour market status may be overestimated if one, for instance, does not differentiate between non-participation for health and other reasons. It should be noted that, in line with previous empirical research, being unemployed or inactive has a detrimental impact on health; this is particularly the case for migrants from Turkey and Former Yugoslavia.

6 Discussion

In this paper we have investigated whether the health status in Switzerland varies by (group of) nationality and, in case of a health gap between foreigners and Swiss people, how it could be explained by the labour market status and other controls. We find that there is an unconditional health gap between the Swiss and migrants, and the direction of the gap differs depending on the group of migrants. Migrants from former Yugoslavia and Turkey are in worse health compared to Swiss nationals, while German migrants are in better health compared to the Swiss. These descriptive results reach the same conclusions as Gabadinho et al. (2007). When controlling for the labour market status and a set of individual characteristics, the health gap is reversed for migrants from Italy and Portugal/Spain, whereas this gap is reduced but still significant for migrants from Turkey and former Yugoslavia. This confirms that there exists health inequalities for some migrant groups in Switzerland.

Furthermore, in line with previous empirical research, the effects of unemployment and inactivity is found to be detrimental for health (Llena-Nozal, 2009; Sardadvar, 2015; Schmitz, 2011). We take advantage of the panel structure of the SLFS and have estimated RE probit models with the Mundlak correction in order to solve the problem of unobserved heterogeneity that may bias pooled probit estimates. We have also addressed potential endogeneity concerns due to the bidirectional causality of labour market status by considering whether the reasons for part-time employment, unemployment and inactivity result from health problems or not. The results show that, when controlling for these endogeneity issues, the average marginal effects estimates of each labour market status are considerably reduced and often insignificant. Unfortunately, the survey that we used contains only one subjective measure of health, so further research is needed to check the robustness of our findings with other measures of health.

The policy implications of our results are obvious in a context characterized by an increase in the migratory flows in Europe and the risk of deterioration of the labour market status for some groups,

especially those experiencing discriminatory practices. Up to now, in Switzerland, the migration policies do not take into account the health status of migrants, except for some specific groups such as asylum seekers who are screened at the arrival for epidemiological purposes. For the "regular" migrants arriving in Switzerland for job purposes or with a job contract, no specific screening program is undertaken and no specific health policy for foreigners or ethnic minorities exists. Results obtained here demonstrate the need for a deeper attention regarding health issues among migrants, at least for those with low skills – in particularly those coming from Turkey and former Yugoslavia who perform badly in terms of subjective health. Such attention should include for instance better information on primary and secondary prevention, or specific measures to guarantee access to health programs (such as access to cultural interpreters).

Our findings also raise the question about the need of an integration and migration policy taking into account health issues among migrants. Health and integration – in terms of structural integration – policies are up to now fully separated and our results suggest that efforts should be made to better integrate both aspects that are strongly intercorrelated. For instance, devoting efforts to enhance the employability of migrants would be more effective when taking into account their subjective and objective health, which is not the case for the moment.

This led us to conclude that further research needs to be implemented in order to understand which factors could explain the health gap between migrants and the Swiss. Another issue that was not treated is the necessity to understand the impact of migration policies on workers' health. Are our results explained by the fact that the Swiss integration policy is weak? Answering this question would probably imply an international comparison of the relationships between health and labour market status, which was so far never undertaken.

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Table 4: Summary statistics

Variable	Mean	Std. Dev.
Chronic illness	0.094	0.292
Swiss	0.511	0.500
Italy	0.118	0.323
Germany	0.064	0.244
Portugal/Spain	0.066	0.248
France	0.024	0.152
Rest of EU-15/AELE	0.038	0.192
New Members of the EU	0.005	0.070
Turkey	0.021	0.143
Former Yugoslavia	0.099	0.298
Rest of the World	0.055	0.227
Employment		
Full-time	0.788	0.409
Part-time	0.074	0.262
Non-employment		
Unemployed	0.037	0.189
Inactive	0.101	0.301
Foreign born	0.450	0.497
Years since migration	7.202	11.154
Married	0.565	0.496
Age	39.076	12.102
None/primary education	0.221	0.415
Secondary vocational education	0.449	0.497
Secondary general education	0.070	0.255
Tertiary education	0.260	0.438
Lake Geneva	0.205	0.403
Middleland	0.180	0.384
North-west Switzerland	0.134	0.341
Zurich	0.153	0.36
Eastern Switzerland	0.124	0.330
Central Switzerland	0.105	0.306
Ticino	0.099	0.299
2003	0.170	0.376
2004	0.155	0.362
2005	0.145	0.352
2006	0.134	0.340
2007	0.133	0.340
2008	0.130	0.336
2009	0.133	0.340
Wave 1	0.352	0.478
Wave 2	0.273	0.445
Wave 3	0.176	0.381
Wave 4	0.117	0.321
Wave 5	0.082	0.275
Observations	122,384	

Source: Swiss Labour Force Survey 2003-2009. *Notes*: A positive number for a given migrant group means that the prevalence of chronic diseases is higher for the group concerned compared to the Swiss, i.e. the Swiss are in better health. Data are unweighted.

Table 5: Simultaneous pooled probit estimation of the structural form of equations 3a and 3b

Variables	Chronic illness	Non-employment
Non-employment	0.052*	
	(0.030)	
Italy	-0.152***	-0.057***
	(0.022)	(0.020)
Germany	-0.122***	-0.007
	(0.030)	(0.027)
Portugal/Spain	-0.105***	-0.090***
	(0.027)	(0.025)
France	-0.186***	0.035
	(0.044)	(0.036)
Rest of EU-15/AELE	-0.177***	-0.002
	(0.035)	(0.031)
New Members of the EU	0.084	0.272***
	(0.082)	(0.069)
Turkey	0.304***	0.439***
	(0.035)	(0.032)
Former Yugoslavia	0.208***	0.316***
	(0.024)	(0.022)
Rest of the World	-0.028	0.435***
	(0.030)	(0.025)
Secondary vocational education	-0.272***	-0.346***
	(0.015)	(0.014)
Secondary general education	-0.288***	0.122***
	(0.023)	(0.019)
Tertiary education	-0.664***	-0.486***
	(0.019)	(0.017)
Foreign born	-0.113***	0.107***
	(0.020)	(0.018)
Years since migration	0.007***	0.002
	(0.001)	(0.002)
Years since migration^2		-0.000
		(0.000)
Married		-0.220***
		(0.012)
Age	0.025***	-0.186***
	(0.001)	(0.003)
Age^2		0.002***
		(0.000)
Constant	-2.089***	2.514***
	(0.037)	(0.043)
Region dummies	Yes	Yes
Year dummies	Yes	Yes
Wave dummies	Yes	Yes
Observations	122,384	122,384
Test for joint significance of the excluded instruments in the first stage		
$\chi^2(3)$		6144.71***

Source: Swiss Labour Force Survey 2003-2009. *Notes*: Coefficient estimates, standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Data are unweighted.