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: an application to Switzerland

Macculi, Iris

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**Essays on Polarization, Multidimensional
Poverty and
Health-related Effects:
An Application to Switzerland**

PhD Thesis

Iris MACCULI
Department of Economics
University of Geneva

December 2009
Supervisor: Prof. Yves Flückiger

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One could be *well-off*, without being *well*.
One could be *well*, without being able to
lead the life he or she *wanted*.
One could have got the life he or she
wanted, without being *happy*. One could
be *happy*, without having much *freedom*.
One could have a good deal of *freedom*,
without *achieving* much. We can go on.
[Amartya Sen, in *Development as
Freedom*, 1999]

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Abstract

The present thesis examines the extent of poverty and welfare in Switzerland from a multidimensional perspective, using data from the Swiss Household Panel 1999-2007, a period of major economic and social changes in Switzerland. The thesis is divided into four chapters. The first two chapters examine the levels of deprivation and social exclusion, and their association to income poverty. The third chapter looks at the potential effects of income and multidimensional poverty on health status, with a focus on mental health. In this case, an instrumental variable method is used in order to take into account the endogeneity of explanatory variables. The last chapter provides a distributional analysis of earnings in Switzerland by examining the extent of inequality and polarization, and providing a decomposition analysis by socio-economic subgroups.

Introduction

For decades, Switzerland has been a prosperous country, with one of the highest GDP per capita in the world and extremely low levels of unemployment. In the 1990s, however, the country began to stagnate, a downturn from which the economy never fully recovered. The 1990s were indeed a decade of poor economic performance, unemployment rose rapidly, levelling out the rates of other small European countries. Slow growth continued throughout the beginning of this decade, accompanied by rapid social changes including demographic ageing, rising individualism, and changes in the household structure.

Important transformations also occurred on the labour market side. If on one hand the high flexibility of the Swiss market with the erosion of full-time positions made employment more uncertain, on the other hand an increasingly educated and skilled working population forced some people to leave the market. As a result, a growing number of people began to rely on social assistance (3.3 percent in 2006, according to the Swiss Federal Statistical Office, that is three times the figures in 1988), putting the welfare system under increasing pressures.

Thus, a new sense of insecurity has arisen in Switzerland during the last decade, with increasing concerns about unemployment and poverty, conditions that are probably more difficult to accept in a traditionally affluent country like Switzerland. This thesis is devoted to enrich the existing literature by analysing specific aspects of individuals' welfare during this period of social and economic turbulence.

The goal of the first chapter is to examine and explain poverty in Switzerland from a multidimensional perspective, between the end of the 1990s and today. In particular, we will try to understand the role played by income in explaining poverty. But also, what are the other relevant dimensions and how are they related to income? What are the most important socio-demographic factors driving individuals into poverty? Chapter 1 seeks to provide answers to these questions using data from the Swiss Household Panel.

It is widely accepted today that poverty is a multidimensional phenomenon, and that traditional income-based indicators are no longer sufficient to full capture individual living standards. Material and social aspects of life,

including housing conditions, possession of assets or participation in social activities are an essential part of individual well-being, and must be taken into account for a full understanding and a correct evaluation of poverty.

Since the pioneering work of Townsend (1979), a considerable amount of research has focused on multidimensional poverty measurement, and many empirical studies reported a substantial mismatch between poverty measured in terms of income and poverty measured using a variety of indicators, advocating the need for a multidimensional approach to poverty (Nolan and Whelan, 1996, Halleröd, 1996, Whelan et al. 2003). In Switzerland, however, studies on poverty are still scarce, Suter and Iglesias (2005) and Ferro-Luzzi et al. (2005) and Miceli (2006) representing the major contributions in this respect. This chapter aims at extending this literature by performing a comparative analysis of income poverty and multidimensional deprivation. For this purpose, we build on measures of deprivation, using a list of non-monetary indicators clustered into six basic dimensions of life. Deprivation indices for each dimension are obtained adopting the *prevalence weighting* procedure proposed by Desai and Shah (1988), where the weights reflect the proportion of individuals possessing the items in the population. We then examine levels and trends of multidimensional deprivation across dimensions, and test the consistency of our results with traditional income poverty measures. In the second part, we attempt to identify which factors lie behind poverty and deprivation in Switzerland. For this purpose, we use for the first time in this context a bivariate probit model, in order to quantify simultaneously the marginal effect of individual and household characteristics on poverty and deprivation by taking into account the positive correlation between these two outcomes.

The second chapter develops the analysis of the previous one by moving the emphasis on social exclusion. This has been the subject of considerable attention in recent years, especially in European countries where commitment was made to promote social cohesion and social inclusion in the Lisbon Treaty in 2002. Despite the many attempts to find a consistent definition of social exclusion and the actual lack of agreement among academics, it is generally accepted that social exclusion is a *multidimensional* phenomenon, dealing with the inability to participate in the basic social, economic, and political aspects of life. Another salient aspect of social exclusion is that it is indeed a *dynamic* process. Atkinson

(2002) and Bossert et al. (2007), for instance, define social exclusion as the cumulative process of deprivation that is likely to affect participation of individuals in the society. While different interpretations are indeed plausible pointing to specific aspects of exclusion, more generally it seems reasonable to think that social exclusion may arise when a condition of deprivation persists or worsens over time. Building on this construct, we extend the analysis of the first chapter to social exclusion by examining levels of individual and social exclusion over time and across dimensions. In the second part, we perform a multivariate analysis in order to identify the determinants of social exclusion. Given the large number of null values characterizing the exclusion index, we propose a two-part model estimation allowing to assess the relative incidence of a series of individuals and household characteristics on both the *probability* and the *levels* of social exclusion, assuming that these might be driven by different factors.

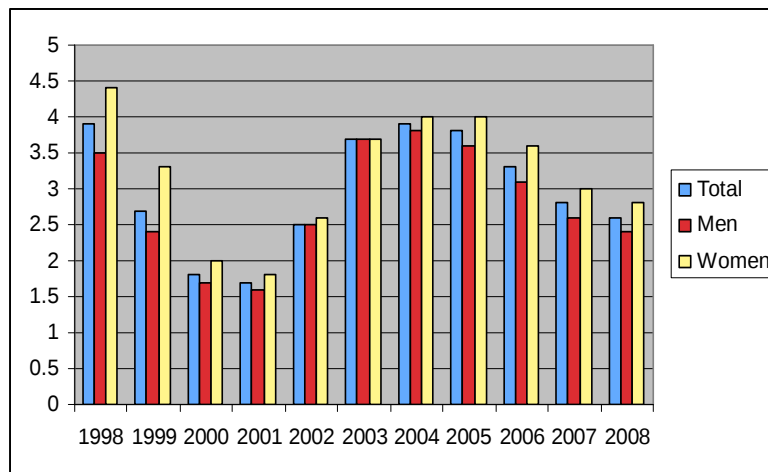
In the third chapter we look at the potential effects of poverty and deprivation on mental health. There is wide recognition today that symptoms of anxiety and depression are associated with conditions of poverty and feelings of social exclusion. In a wealthy country like Switzerland, where social pressures and individual ambitions are widening, low socio-economic conditions appear to be important risk factors for the onset of depression and other common mental disorders. While this association between low socio-economic status and mental health is well documented, the nature of the relationship is not yet clearly understood. In the social sciences and epidemiological literature, for instance, there is ongoing debate on the direction of the causality (Dohrenwend et al., 1992, Johnson et al. 1999, Ritche et al. 2001, Hudson, 2005, among others). While some argue that poverty, with its limited access to financial resources and access to health care, is in itself a stressful situation leading to mental illness (the *social causation* theory), others advocate the reverse, that is individuals genetically-prone to mental illness eventually “drift” down into poverty (the *social selection* or *social drift* theory). While some evidence has shown that the latter is more often observed in case of highly psychotic disorders like schizophrenia (Duhnam, 1965, Dohrenwend et al. 1992), the majority of studies support the hypothesis of social causation in the poverty and health relationship. The goal of our third chapter is then to assess the effect of income and multidimensional deprivation on health in Switzerland, with a particular focus on mental health.

A number of studies have reported a deterioration in psychological health in Switzerland in most recent years. Jägger et al. (2008), for instance, show that 25 percent of the population suffers today from some forms of depression, particularly among women. Though the government has recently committed itself to take action against depression and other mental diseases, empirical research in Switzerland is still lacking. Two studies are worth mentioning. Domenighetti et al. (2000), who investigate the effect of job insecurity on health, and Vetter et al. (2006), who examine the impact of financial deprivation on psychological well-being. Both these studies, however, perform logistic regressions analyses, which do not allow controlling for endogeneity in the model.

The original feature of this chapter is to use an instrumental variable method in order to account for the endogeneity of income and deprivation. Moreover, the use of panel data allows us to control for unobserved heterogeneity, an issue that is particularly important in health outcomes.

The last chapter shifts the focus on distributional analysis and examines more specifically the extent of inequality and polarization of earnings distributions in Switzerland. As mentioned at the beginning of the introduction, labour markets went through a series of structural changes in recent years. After a period of increasing labour force that characterized the 1980s, the six-year recession of the early 1990s led to an unprecedented high unemployment rate, with a trend that continued throughout this decade (see Figure 1 below). Further, an increasing number of often low-paid part-time and temporary jobs made employment more uncertain. Immigration also increased in recent years, foreign residents making up about 25 percent of the total working population today (they were only 14 percent in 1980), and the majority of immigrants are today highly educated workers and their family members. Moreover, the Bilateral Agreements signed between Switzerland and EU members on the free movement of people and implemented in 2002 produced also important changes in the labour market structure.

Figure 1: Switzerland Unemployment Rate (in %)



Source: State Secretariat for Economic (Swiss Labour Force Survey)

Another important feature of the Swiss labour market is its segmentation as regards to gender, women working mainly part-time while men occupy more often full-time positions, resulting in increased earnings inequalities between men and women.

But then, how large are these inequalities? What is the impact of all those recent changes on earnings distributional patterns? Have distributions become more unequal and/or more polarized? How the between and within-group differences among subgroups contributed to explain the inequality and polarization of earnings? These are some of the questions that form the backdrop of our last chapter.

In recent years, polarization has received much attention, both theoretically and empirically, as an alternative measure to inequality in the analysis of income distributions. In particular, polarization reflects the clustering around local poles on the distribution that inequality measures fail to detect. In a more sociological perspective, it captures the tendency of economic agents to cluster into groups that are internally homogenous but increasingly different (or distant) from each other. In this construct, polarization may be potentially more relevant than inequality in explaining social conflicts and tensions within members of the society (Esteban and Ray, 1999).

While there is evidence on the extent of income inequalities in Switzerland (Leu et al. 2000, Gerfin, 1994, Piketty et al. 2007, K  ng and Blank, 2000, among

others), all documenting an increase in inequality since the early 1980s, we are not aware of studies assessing the polarization of incomes. This paper brings a new contribution to this literature, by examining patterns of polarization and inequality between the end of the 1990s and today, providing a decomposition analysis by socio-economic subgroups.

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Chapter 1:

A multidimensional analysis of poverty and deprivation in Switzerland

Abstract

In this paper we provide empirical evidence on multidimensional aspects of poverty in Switzerland, using data from the Swiss Household Panel for the period 1999-2004. We define measures of multiple deprivation using a range of non-monetary indicators and test the consistency of our results with traditional income poverty measures. We then perform a bivariate probit analysis to determine the simultaneous incidence of a set of observed characteristics on the probability of both poverty and deprivation. Results show that deprivation decreased over the period, with some notable differences among dimensions, people appearing more highly deprived in the financial and housing dimensions. The low degree of overlap between income and other dimensions of deprivation underlines the importance of the measure used and its implications for social policy targeting.

1. Introduction

A few years ago, Swiss Minister Pascal Couchepin warned that the Swiss society could be sitting on a bomb if it doesn't do more to help people getting out of poverty. He added that even if the great majority of the population was doing alright, the authorities could not ignore the conditions faced by part of the population (*Neue Zürcher Zeitung*, November 2006).

For several decades, Switzerland has been one of the countries with the highest GDP per capita, with unemployment and inflation rates well below those of other developed countries. In recent years, however, the economic and social context has changed. The 1990s were a decade of poor economic performance. Unemployment rose rapidly and an increasing number of people began to rely on social assistance (3.3 percent of the population in 2006, according to the Federal Statistical Office). The beginning of the twenty-first century was also characterized by slow economic growth and increasing tensions in the labour market, fostering the debates on poverty and welfare issues among policy makers and social institutions¹.

Poverty is indeed a multidimensional phenomenon. If income is an important dimension as it provides the material resources to fulfil a subsistent life, individual well-being depends also on other attributes, including for instance housing conditions, education, health or participation in social activities. As Amartya Sen has put it, "the role of income and wealth has to be integrated into a broader and fuller picture of success and deprivation" (Sen, 1981).

While multidimensional poverty has been subject to much investigation in the international literature, empirical evidence in Switzerland is still scarcer, Suter and Iglesias (2005), Ferro-Luzzi et al. (2005) and Miceli (2006) representing the major contributions in this respect. While the latter adopted the fuzzy set approach to examine multidimensional poverty using data from the Swiss Household Panel, Ferro-Luzzi et al. (2005) carried out a factor and cluster analysis on the same database to identify the relevant dimensions and the groups most affected by poverty. They identified four main dimensions of poverty in Switzerland, namely financial poverty, poor health, bad neighbourhood and social exclusion. Finally, in a comparative study, Suter and Iglesias (2005) examined material and social

¹ Kehoe and Ruhl (2005) argue that recession started well before the 1990s, showing that indeed since the mid-1970s Switzerland is suffering an authentic period of "great depression", in terms of decreasing growth of productivity and GDP per capita.

deprivation using the Euromodule data for the year 2000. Their results showed that Switzerland enjoys in fact the highest living standards and subjective well-being compared to other Western countries, including Germany and Spain. They also found that the Swiss are not much demanding in terms of possession of durables while they give larger importance to savings. Finally, long-term unemployed, divorced and disabled persons were reported to be the groups with the highest risk of deprivation in Switzerland.

This paper attempts to extend this line of research by providing a comprehensive analysis of income and multidimensional poverty in a comparative perspective, for the period 1999-2004. For this purpose, we build on measures of material and social deprivation and look at their consistency with traditional income poverty measures. In the second part, we try to identify the major determinants of income poverty and deprivation simultaneously, while examining the link between their risk factors. For this purpose, we make use of a bivariate probit model, which takes explicitly into account the correlation between the two outcomes. To our knowledge, this is done for the first time in this context, as most of the previous studies have generally performed OLS regressions (Layte et al. 2001a), or logistic estimations (Layte et al. 2001b, Whelan et al. 2003).

Assuming that a correlation exists between income and deprivation, we suspect however to find a low degree of consistency between these two outcomes, meaning that individuals who do fall below the income poverty line are not necessarily poor in terms of living conditions. Current income is only a transitory flow of cash, and people might well have been cumulating assets or good housing conditions as to ensure them a decent life. Or it might be that individuals are actually poor in terms of income but do not “feel” that they are poor, in terms of subjective well-being (Nolan and Whelan, 1996, Layte et al. 2001). Such analysis would help us identifying who exactly are the poor and in what dimensions individuals are poor, a result that should have important policy implications in terms of poverty targeting.

The rest of the paper is structured as follows. The next section provides a short review of the literature on multidimensional poverty. Section 3 discusses the definitions and methodologies used in the paper, and presents the estimation model, while section 4 describes the data. Results are given in section 5, and section 6 provides some concluding remarks and suggestions for future work.

2. Relevant literature

Multidimensional poverty analysis has received a considerable amount of attention in recent years, both theoretically and empirically. Implicit in this approach is the idea that income alone is not a sufficient nor an appropriate measure of welfare, being often underestimated and of irregular nature, and that composite indicators should be used to take account of the complexity and multidimensional nature of poverty, including housing and environmental conditions, material deprivation and lack of social relations. In the words of Atkinson, “there is widespread agreement that deprivation is multidimensioned. It is not enough to look only at income poverty; we have to look at other attributes.” (Atkinson et al. 2002). The multidimensional nature of poverty seems nowadays to be well-established and fully integrated into the social and political discourse of major institutions², the best example being probably the United Nations Millennium Development Goals project to end poverty by 2015.

In 1979, Townsend was the first to define poverty in terms of *relative deprivation*, opening the way to a multidimensional approach to poverty. Inspired by the work of Runciman (1966)³, he defined relative deprivation as “the absence of those diets, amenities, standards, services and activities, which are common or customary in society. People are deprived of the conditions of life which ordinarily define membership of society, if they lack or are denied resources to obtain access to these conditions of life and so fulfil memberships of society, they are in poverty.” (Townsend 1979:915). In the following years, Ringen (1988)

² The European Commission declared that “(...) the poor shall be taken to mean persons, families and groups of persons whose resources (material, cultural and social) are so limited as to exclude them from the minimum acceptable way of life in the member state in which they live” (EEC, 1985). Similarly, the United Nations, during the World Summit for Social Development, defined poverty in the following terms: “The lack of income and productive resources to ensure sustainable livelihoods: hunger and malnutrition; ill health; limited or lack of access to education and other basic services; increased morbidity and mortality from illness; homelessness and inadequate housing; unsafe environments and social discrimination and exclusion. It is also characterised by lack of participation in decision-making and in civil, social and cultural life.” (The Copenhagen Declaration, UN, 1995, p.57)

³ Runciman (1966) developed the idea that an individual’s feeling of deprivation arises when comparing her situation with that of others who are better off: « The magnitude of a relative deprivation is the extent of the difference between the desired situation and that of the person desiring it » (Runciman, 1966).

acknowledged that poverty must be intended as “a state of general deprivation characterised by both a low standard of consumption and a low level of income”.

In 1985, Sen introduced a new perspective on multidimensional poverty analysis, defining the individual well-being as “an index of the person’s functionings”, where *functionings* represent all the things a person can manage to do or be, and *capabilities* are the freedom of a person to choose her functionings (Sen, 1985). Sen’s capability approach inspired much of the literature on multidimensional poverty that followed, including the construction of the Human Development Index by the UNDP, which aggregates for each country the functioning achievements in terms of life expectancy, real GDP per capita and educational levels (UNDP, 1990).

European countries have also developed a long tradition on multidimensional poverty measurement, principally based on the use of material and social indicators as a more direct measure or living standards. This approach, inspired by Townsend’s work, has been applied in a large number of empirical studies, all advocating the use of non-monetary indicators in the measurement of poverty as they are also more stable over time (Mack & Lansley 1983, Halleröd, 1996, Nolan & Whelan 1996, Muffels 1993, Bradshaw and Finch, 2003, Whelan et al., 2003 among others). The idea is to aggregate a set of indicators into a number of relevant dimensions, and count the number of dimensions in which individuals are deprived. Many of these papers focused on the relation between income – an indirect measure of well-being - and multidimensional deprivation – a more direct measure of well-being, finding that such relationship was far from perfect. They showed, for instance, that while some low-incomes may not be suffering poor living conditions, other individuals who are above the poverty line are probably experiencing deprivation in other aspects of life.

Along with this empirical evidence, the axiomatic approaches to multidimensional poverty began to gain ground in the last decade. Brandolini and D’Alessio (1998) applied Sen’s capability approach to the multidimensional analysis of deprivation and inequality, while Tsui (2002) generalized the class of subgroup consistent poverty indices introduced by Foster and Shorrocks (1991) to the multidimensional context. Atkinson (2003) and Bourguignon and Chakrawarty (2003) added important contributions by developing new multidimensional poverty indices and setting the properties that each of these should satisfy. More recently, Deutsch and Silber (2005) examined

multidimensional poverty making an empirical comparison of various approaches, while Kakwani and Silber (2008a, 2008b) published a collection of articles on multidimensional poverty measurement covering also different approaches, including information theory, fuzzy sets, as well as the axiomatic and the social welfare theories.

3. Methodological issues

3.1. Concepts and definitions

In this essay, we use two different poverty measures. The first is a unidimensional measure, based on a level of income - usually 50 or 60 percent of the mean or median income – that is considered the threshold below which individuals are considered to be poor. It is the traditional and most commonly used *relative income* measure, applied in many poverty studies. Despite its limitations related to the arbitrary definition of a poverty line and to its reliance on the income distribution, this measure is straightforward and allows for comparison of poverty levels across countries. In our analysis, the variable of interest is the annual household income, net of taxes and social contributions, and adjusted using the OECD-modified equivalence scale in order to correct for households' different size and needs. We set the poverty line at 50 percent median income and use the individual as the unit of analysis, although many variables are taken at the household level.

The second measure is multidimensional and based on a range of non-monetary indicators covering various social and material dimensions of welfare. The *ability* of households to afford such items is at the base of this approach (Townsend, 1979). Hence poverty, defined here in terms of multiple *deprivation*, arises from the “enforced” absence of items and activities⁴, which are considered to be customary in the society in which we live.

Under this construct, deprivation appears to be a more sensitive measure of “command over resources” than current income, as it provides a more accurate assessment of individuals' consumption patterns and living conditions (Whelan et

⁴ « Enforced » in terms of the lack of financial resources.

al. 2003). The next section describes in details the construction of the deprivation measure.

3.2. *Constructing indices of deprivation*

If using income to identify the poor does not involve particular difficulties, except for the choice of the poverty line, measuring poverty in the multidimensional space requires a certain number of decisions as to how to select the relevant indicators and dimensions of poverty, as well as the weights to apply in the aggregation process. All or at least most of these decisions, though inevitably arbitrary, rely on the data availability and on the objective of the study.

The first step in the analysis relies on the choice of indicators. Given the information available in our dataset and following the suggestions given by Atkinson et al. (2002), we select a set of 27 items and activities reported in Table 1. Although not exhaustive, this list of indicators is selected on the basis of what we consider to be common items in Switzerland today and whose lack would be considered as a *socially-perceived* deprivation. The "enforced lack" criterion introduced for the first time by Mack and Lansley (1985) is adopted whenever this was possible, meaning that only individuals who could not afford the item because of lack of resources would be considered as deprived⁵. However, as the perception of *necessity* is intrinsically influenced by subjective tastes and attitudes^{6 7}, and given the arbitrariness embedded in the choice of indicators, as mentioned above, we test the reliability of the indicators using the index of Cronbach's Alpha, a statistic measuring the internal consistency (or homogeneity) of the underlying indicators and expressed as a function of the number of items and the average of all covariances between them. Overall, the values obtained are relatively high (around 0.8 for all indicators), which is indicative of a reliable measure. The range of indicators is then aggregated into six dimensions, covering

⁵ Sometimes, as for the housing dimension, this information is not available and in this case the simple shortage is accounted as deprivation.

⁶ Mc Kay (2004) shows how some families who cannot afford necessities often possess a number of non-necessities (generally luxury goods), and these atypical preferences reveal that « such families may be classified as poor using deprivation indicators, when it might be more accurate to say that their consumption preferences deviate from the average » (McKay, 2004, p. 220).

⁷ Some studies, for instance, have found differences in the perception of necessities between men and women, and between different age groups (Payne and Pantazis, 1997).

the following areas of deprivation: basic deprivation, housing conditions, possession of durables, lifestyle, financial and subjective deprivation. The choice of dimensions is also central in multidimensional poverty analysis. What dimensions should be more relevant? The answer is indeed not easy. Our choice is driven by main suggestions given in the existing literature (Atkinson et al., 2002 and Layte et al. 2001) and by what we believe to be important dimensions of life in the Swiss contemporary society⁸.

A further step in multidimensional poverty measurement concerns the choice of the weighting structure. In the process of aggregation, weights should reflect the importance of each indicator in the overall deprivation measure. Rather than using equal weights, whereby all items are assigned the same value, we apply a method where the weights reflect the spread of each item among the population⁹. For this purpose, we follow the *prevalence weighting procedure* introduced by Desai and Shah (1988), whereby each weight corresponds to the share of individuals possessing the corresponding item among the entire population. This “frequency-based” method has the advantage of giving more weight to situations of minor deprivation among the population. To be more specific, if an individual does not possess an item that is owned by the majority of the population (say, a television) because of a lack of resources, such a deprivation will be given a higher weight compared to the case where the same individual does not possess an item that is not very common in the population (say, a garden)¹⁰.

After aggregation, the **partial index of deprivation** for each dimension m ($m=1,2, \dots, M$) is therefore given by the following expression:

$$D_i^m = \frac{\sum_j w_j^m I_{ji}^m}{\sum_j w_j^m} * 100 \quad [1]$$

⁸ We explicitly exclude education from the analysis, as one of our goals is in fact to assess the effect of education on deprivation.

⁹ In their paper, Suter and Iglesias (2005) used the proportional deprivation index introduced by Halleröd (1985), in which the weights reflect the proportion of individuals who consider a specific item as absolutely necessary.

¹⁰ As a robustness check, it would certainly be of interest to run some sensitivity analysis by using more than one approach, and see how, for instance, the results differ when using equal weighting.

where I_{ji}^m is a dichotomous variable taking value of 1 if individual i lacks item j ($j=1,2,\dots,J^m$) of dimension m , and 0 otherwise, and w_j^m is the proportion of people *not* lacking item j of dimension m ¹¹. We then normalize to obtain a partial index of deprivation (one for each dimension), with values varying between 0 and 100. These values, or scores, can therefore be interpreted as the percentage of deprivation experienced by each individual, compared to a maximum value of 100 that would be given to an individual experiencing deprivation in all items in that specific dimension. A total index of deprivation is then obtained by weighted sum of all partial indices, using the same aggregating structure as in [1], but with weights being in this case an average of the weights applied in partial indices¹². Hence, for each individual, the **total deprivation index** is given by:

$$D_{Ti} = \frac{\sum_{m=1}^M \bar{w}^m D_i^m}{\sum_{m=1}^M \bar{w}^m} \quad [2]$$

where D_i^m represent the index of deprivation in each dimension m , and $\bar{w}^m$ the corresponding average weights.

3.3. The empirical model

The goal in this section is to identify the factors affecting the probability of poverty and deprivation in Switzerland, and trying to understand if a link exists between their risk factors. For this purpose, we build a model with two binary dependent variables:

- income poverty: Y_1 , equal to 1 if the individual is below the poverty line set at 50 percent median income, and 0 otherwise
- multiple deprivation: Y_2 , equal to 1 if the individual is below the deprivation line, and 0 otherwise.

¹¹ Applying the enforced lack criterion, it is important to bear in mind that this group includes all individuals not lacking the item, but also individuals lacking the item by choice and not by lack of resources.

¹² This method seems preferable to the simple sum of all items, as it is independent of the number of items included in each dimension (Ayllón, 2004)

In order to allow comparison throughout the analysis, the deprivation line is set at a level giving the same proportion of deprived as we have of poor¹³.

Assuming correlated errors and normality in the distribution functions, we use a maximum-likelihood *bivariate probit* model to estimate the relative incidence of the independent variables on each of the two outcomes. The independent variables include a range of characteristics specific to the individual (age, gender, sex, citizenship), market-related (occupation, education) and life-related (household type, civil status, community typology, language region).

4. Data

Our analysis is based on data drawn from the first six waves of the Swiss Household Panel (SHP), covering the period 1999 through 2004. The SHP started in 1999 as part of the project *Living in Switzerland* run by the National Science Foundation, the Swiss Federal Statistical Office and the University of Neuchâtel. The original sample consists of around 13'000 respondents aged 15 and over and belonging to more than 5'000 households. The annual questionnaires, based on a Computer-Assisted Telephone Interview, are held in French, German or Italian depending on the preference of the respondent. People are interviewed on their individual and household characteristics in a broad range of economic and social subjects, from all sources of income to various living aspects, including housing, health and leisure activities. Subjective assessment of well-being is given along with factual information¹⁴.

Cross-sectional analysis is based on data from 1999, on a total sample of 12'931 individuals. We use the individual as the unit of analysis, although most of the information is collected at the household level. Finally, taking into account the initial non-response, we use the appropriate cross-sectional sample weights in order to correct for sample selection bias.

¹³ While the choice of any threshold in welfare analysis is inevitably arbitrary, we select a deprivation line allowing consistent comparisons with levels of income poverty (Layte et al., 2001b, Whelan et al. 2003).

¹⁴ Detailed information on the panel structure is given in the Appendix.

5. Empirical results

5.1. Income and multiple deprivation

Table 2 presents the distribution of population by levels of deprivation in each dimension at the beginning of the period (1999). As we can see immediately from the table, differences across dimensions are significant. While more than 90 percent report no deprivation (score=0) in the possession of durables, about two-third of the population suffer deprivation in the housing dimension, with more than 9 percent reporting high levels of deprivation in this area (score over 40). From a policy perspective, such differences are indeed interesting, suggesting that each dimension is a phenomenon *per se* reflecting in fact different facets of deprivation.

Looking at the relation between income and multiple deprivation in Table 3, we find that correlations are very low, consistent with results found in previous studies¹⁵, and only two dimensions, namely the financial and lifestyle dimensions, show slightly higher correlations, a result somehow expected given the nature of the indicators included in these dimensions. Housing appears the least correlated with income, in line with findings reported by Ayllón et al. (2004) for Spain. The link between income and deprivation is further illustrated in Figure 1, which plots the distribution of deprivation by income decile. As we can see, the gradient for the basic and the financial dimensions is much steeper but also less smooth than the other dimensions, while housing deprivation appears once again the least correlated with current income. These findings seem to confirm some predictions from economic theory, since housing is more often associated with decisions of investment and savings, and therefore related possibly to a form of long-term income rather than current income. Exploring a little further the degree of overlap between income and the other dimensions of deprivation, we calculate the mean deprivation scores around points on the income distribution usually taken as poverty thresholds (Table 4). The outcomes are rather surprising, as some individuals appear to be more deprived when their income is between 40 and 50 percent of the median, than when this is below 40 percent of the median. This result is a further proof that people who are identified as poor in terms of income

¹⁵ Townsend (1979) or Nolan and Whelan (1996), for instance, obtain correlation coefficients as low as -0.12.

are not necessarily poor in other dimensions of life. Also, it acknowledges that the identification of the poor depends dramatically on the measure adopted.

Finally, correlations between dimensions are in all points positive but relatively low, most likely due to the different nature of the indicators included in each dimension, and suggesting that each dimension does reflect different aspects of deprivation (results are reported in the Appendix).

5.2. Trends in poverty and deprivation

In this section we examine the evolution of income poverty and deprivation between 1999 and 2004. Table 5 reports the mean deprivation scores for each dimension of deprivation with estimates for income poverty expressed by the head count ratio. Although the levels for these measures are not comparable, as they differ in nature, we can compare how they evolve over time. We can see that conditions improve particularly in the housing dimension, the deprivation score decreasing from 16 to around 11 over the period, with a striking fall at the beginning of the period, while it remains more or less stable for the other dimensions. The lowest level of deprivation is observed in the possession of durables, with a total mean score below 3. Income poverty follows a different pattern. The head-count ratio decreases until 2001, possibly as an effect of the first recovery of the late 1990s, and then moves up again by the end of the period. Interestingly, a similar trend is only observed in the financial area, the same showing the highest correlation with income and the highest levels of deprivation at the beginning of the period. Finally, changes in total deprivation are observed particularly in the lower tail of the distribution, the percentage of non-deprived having more than doubled in six years (Figure 2).

5.3. Results from multivariate analysis

As a first step to regression analysis, Table 7 reports the different profiles of poverty and deprivation, according to the threshold defined in the previous section. In 1999, 87 percent of the population is neither poor nor deprived, and this proportion increases over the period. At the other extreme, 1.24 percent of individuals was simultaneously poor and deprived, a condition often regarded as “consistent” or “persistent” poverty (Layte et al. 2001b, Whelan et al. 2003).

Table 8 presents the estimates from the bivariate probit regressions performed for 1999. In particular, we report the marginal effects of a set of explanatory variables on the four profiles of poverty described in Table 7, all other factors held constant. This econometric strategy allows to directly comparing the relative incidence of each explanatory factor on the relevant outcome. Employment and education appear to be the highest predictors for both poverty and deprivation. In particular, unemployment increases by almost 16 percent the probability of being deprived but not poor, while education (secondary or tertiary compared to primary) allows individuals to escape poverty and deprivation by around 13 percent. Employment plays indeed a major role in protecting against adverse outcomes. An individual who is unemployed, while being excluded from work, is also denied access to resources, assets and participation in many other aspects of life. Quite surprisingly however, being retired or working part-time does not have a significant effect on neither of the two outcomes.

Being foreign does not seem to affect the risk of poverty, but has a significant positive effect on multiple deprivation, in line with results found by Ferro-Luzzi et al. (2005). The household structure plays also a role on both outcomes. In particular, large families (three or more children) and single-parent families are much more likely to experience poverty, though their effects remain small in magnitude (around 3-4 percent). Finally, being married, compared to a single, increases by 18 percent the likelihood of escaping both poverty and deprivation, suggesting that not only the emotional support of a partner, but her material support would tend to be an important protective factor against adversity.

6. Concluding remarks

Poverty is becoming increasingly relevant in a country like Switzerland traditionally regarded as a “rich” country. In this paper we examine the extent of poverty from a multidimensional perspective, drawing data from the Swiss Household Panel for the period 1999-2004. In particular, we compare and test consistency between traditional income poverty and multidimensional deprivation, defined by a set of economic, material and social indicators. Results show that in 1999, around 6.7 percent of individuals are identified as poor in

terms of low-income, against 7.4 percent who are deprived in several aspects of living. In comparison, consistent poverty – the simultaneous condition of poverty and deprivation – is however relatively small (1.24 percent). Among the various dimensions, the Swiss seem to be better off in the possession of durables, whilst the highest levels of deprivation are found in housing, where more than 65 percent of individuals experience some degree of deprivation in this area. Housing is also the least correlated with income, in line with results found in previous studies, and consistent with economic theory suggesting that housing is often the result of investment choices and, therefore, more related to savings and cumulated wealth rather than current income. The low degree of overlap between income and the other dimensions of deprivation confirms also the importance of analysing each of these dimensions separately as they all reflect different aspects of individual welfare. Finally, we identify in employment and education the major predictors of both poverty and deprivation, a result suggesting that policies should probably focus on improving access to labour markets and investments in human capital. Direct social transfers to the poor are important, but they will probably not solve all the evils. Housing conditions are also an important aspect of well-being, and more than half of the population suffer some form of deprivation in this area. Urbanization policies and easing access to credit would probably contribute to improve environmental and housing conditions for many.

From a social policy perspective, these results should therefore help policy makers to elaborate policies targeted to specific dimensions of deprivation and specific groups of the population. Indeed, more work needs to be done. One further step would be to extend the analysis to other dimensions, including for instance health and education. It would be also interesting to incorporate a dynamic measure of deprivation, which would help identifying possible sequences of deprivation while contributing to understand its real causes.

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Table 1 : Indicators used to construct deprivation indices (% of enforced lack), 1999

Items	%	Weight
Basic deprivation (B)		
Arrears in payments in the last 12 months	11.94	0.88
Cannot afford to invite friends at least once a month	2.58	0.70
Cannot afford a meal at a restaurant at least once a month	14.65	0.54
Cannot afford to go to the dentist if needed	3.05	0.97
Durable goods (D)		
Cannot afford a car	3.09	0.89
Cannot afford a colour TV	0.26	0.94
Cannot afford a private washing machine	1.04	0.69
Cannot afford a dishwasher	2.92	0.71
Cannot afford a computer	4.83	0.68
Housing conditions (H)		
Accommodation in bad condition	31.59	0.68
Accommodation too small	15.15	0.85
Accommodation badly heated	8.82	0.91
Accommodation with noisy external environment	20.56	0.79
Accommodation: problems with pollution, traffic or industry	14.69	0.85
Accommodation with violence or vandalism around the house	13.70	0.86
Life-style and social deprivation (LS)		
Cannot afford one-week holiday away from home per year	7.75	0.83
Cannot afford a home with a garden or terrace	2.24	0.83
Cannot afford a second home	29.58	0.16
Cannot afford internet access from home	6.62	0.33
Financial deprivation (F)		
Unable to save 100CHF min per month	13.48	0.83
Unable to save for retirement saving schemes ("3 rd pillar")	11.96	0.65
Payments of monthly premiums in the last 12 months	15.40	0.85
Financial situation unmanageable (unable to make ends meet)	23.24	0.77
Reception of financial help	19.67	0.80
Subjective deprivation (S)		
Satisfaction with financial situation of household	18.16	0.93
Satisfaction with standard of living	9.88	0.90
Satisfaction with accommodation	6.77	0.82

Note: All variables are dichotomous, taking value of 1 if household does not have or cannot afford such items, 0 otherwise.

Table 2: Distribution of population by levels of individual deprivation, 1999 (%)

Segments	Dimensions						Total
	Basic (B)	Housing (H)	Durables (D)	Lifestyle (LS)	Financial (F)	Subjective (S)	
0	75.93	34.44	90.77	64.84	51.90	75.60	14.68
1-20	8.94	38.45	4.93	23.09	10.03	-	68.83
21-40	8.65	18.19	2.73	5.55	19.52	15.66	13.49
41-60	5.13	6.54	1.47	4.58	12.29	-	2.67
61-80	0.99	2.12	0.06	1.53	5.10	7.28	0.33
81-100	0.35	0.26	0.03	0.41	1.16	1.46	-
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Mean	7.48	16.73	2.32	7.08	16.74	11.28	10.40
Std Dev	(15.50)	(16.66)	(8.08)	(14.73)	(21.92)	(22.25)	(11.31)

(Obs: 12931)

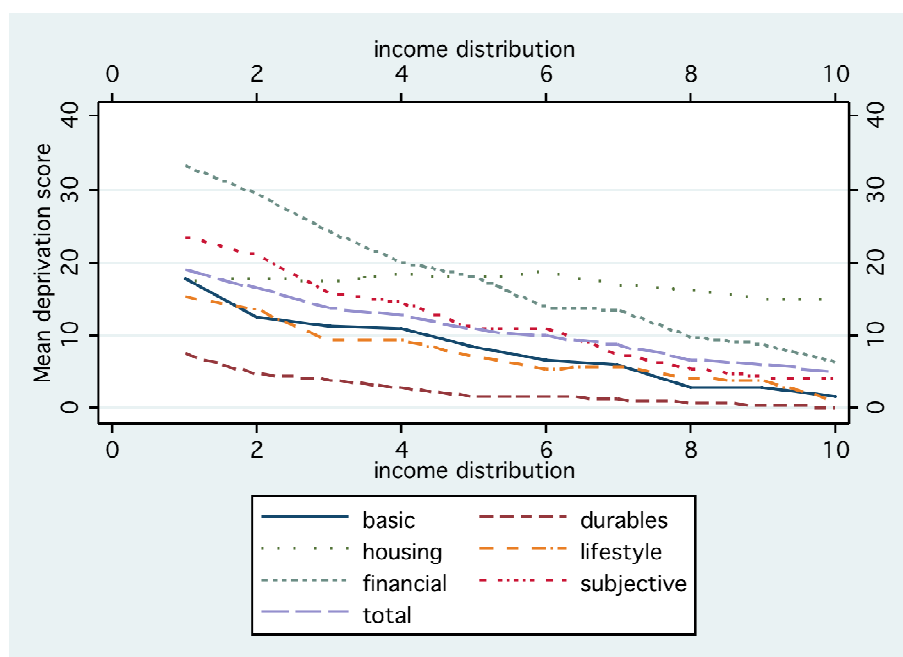
Note: For each dimension, the deprivation score is divided in quantiles representing levels of deprivation, from null (0) to maximum level of deprivation (100).

Table 3: Correlation between deprivation dimensions and household disposable income (1999)

	Basic	Durables	Housing	Lifestyle	Financial	Subjective	Total
Income	-0.20	-0.15	-0.04	-0.19	-0.26	-0.18	-0.25
Logincome	-0.27	-0.22	-0.05	-0.25	-0.34	-0.24	-0.34

(Obs: 10055). All coefficients are significant at 5 percent level.

Figure 1: Distribution of deprivation, by income decile (1999)



Note: Mean deprivation scores are given for each dimension.

Table 4: Average deprivation scores, by income ranges (1999)

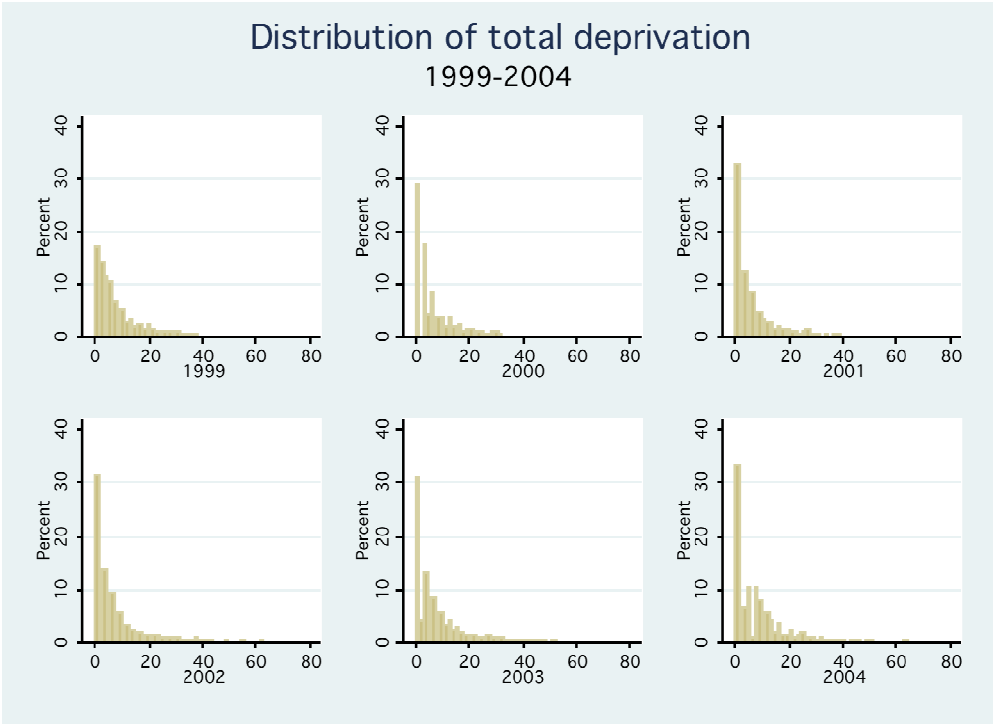
% of the median	Obs	% of pop	Basic	Durable	Housing	Life- style	Financial	Subjective	Total
<40	333	2.58	16.51	6.71	19.26	11.83	27.52	19.45	16.52
40-50	376	2.91	21.07	8.01	17.50	18.06	32.92	20.74	19.52
50-60	744	5.75	13.02	6.31	18.28	14.28	33.68	24.28	18.33
60-70	914	7.07	12.81	4.22	16.80	13.03	28.34	21.27	16.00
>70	10564	81.70	5.87	1.53	16.51	5.52	13.62	8.91	8.84
Total	12931	100	7.49	2.32	16.73	7.08	16.74	11.28	10.40

Table 5: Trends in income poverty and deprivation, 1999-2004

Year	Dimensions							
	Income poverty	(B)	(H)	(D)	(LS)	(F)	(S)	(T)
1999	6.82	7.49	16.73	2.32	7.08	16.74	11.28	10.40
2000	5.61	7.14	11.42	2.18	7.24	16.00	11.58	9.39
2001	4.85	6.69	11.27	1.60	6.62	15.30	11.36	9.09
2002	5.95	6.68	10.64	1.43	6.26	15.78	11.51	8.93
2003	6.23	6.74	11.10	1.38	6.28	16.48	10.65	9.04
2004	6.01	6.65	11.48	1.27	-	16.46	-	8.83

Note: The head count ratio for poverty and the mean values for deprivation scores are given respectively.

FIGURES 2 : Trends in total deprivation, 1999-2004



Note: Distribution of the total deprivation score, by levels and year.

Table 7 : Profiles of poverty and deprivation

Poverty profiles	1999		2004	
	<i>N. of individuals</i>	<i>%</i>	<i>N. of individuals</i>	<i>%</i>
Non-poor and non-deprived	8758	87.10	5622	89.24
Poor but non-deprived	549	5.46	294	4.67
Deprived but non-poor	623	6.20	302	4.79
Poor and deprived	125	1.24	82	1.30
<i>Total</i>	10055	100.00	6300	100.00

Table 8 : Marginal effects after biprobit (dy/dx), 1999 :

DEPENDENT VARIABLES : (1999)	POOR AND DEPRIVED	POOR BUT NOT DEPRIVED	DEPRIVED BUT NOT POOR	NON-POOR AND NON- DEPRIVED
	Pr(y ₁ =1, y ₂ =1)	Pr(y ₁ =1, y ₂ =0)	Pr(y ₁ =0, y ₂ =1)	Pr(y ₁ =0, y ₂ =0)
Control Variables:				
Children (ref. adults)	-0.014* (0.0015)	-0.063* (0.005)	-0.034* (0.006)	0.111* (0.008)
Young	-0.008* (0.0011)	-0.042* (0.004)	-0.009 (0.006)	0.060* (0.008)
Elderly	-0.005* (0.0017)	0.014 (0.013)	-0.032* (0.006)	0.023 (0.015)
Female (ref. male)	-0.003* (0.001)	-0.016* (0.004)	0.005 (0.004)	0.024* (0.006)
Couple with: 1 child (ref. couple, no child)	-0.005* (0.0015)	-0.025* (0.007)	-0.002 (0.008)	0.033* (0.011)
2 children	-0.008* (0.0012)	-0.040* (0.005)	-0.013** (0.006)	0.061* (0.008)
3 children or more	0.001 (0.0022)	0.030* (0.011)	0.015** (0.007)	-0.017 (0.014)
At least one child over 16	-0.004* (0.0012)	0.011 (0.007)	-0.031* (0.004)	0.024* (0.009)
Single-parent	0.012* (0.0038)	0.024** (0.011)	0.033* (0.011)	-0.070* (0.017)
Others	-0.004* (0.0012)	-0.013** (0.006)	-0.011** (0.005)	0.028* (0.009)
Married (ref. single)	-0.021* (0.0023)	-0.066* (0.006)	-0.041* (0.006)	0.130* (0.009)
Divorced, separated or widow	-0.007* (0.0011)	-0.040* (0.004)	-0.001 (0.007)	0.048* (0.008)
Secondary education (ref. primary)	-0.022* (0.0022)	-0.059* (0.005)	-0.050* (0.005)	0.130* (0.007)
Tertiary education	-0.016* (0.0015)	-0.054* (0.004)	-0.055* (0.003)	0.124* (0.005)
German-speaking (ref. French)	-0.018* (0.002)	-0.021* (0.004)	-0.066* (0.005)	0.106* (0.007)
Italian-speaking	-0.006* (0.0012)	-0.007 (0.009)	-0.030* (0.005)	0.043* (0.011)
Foreign (ref. native)	0.006* (0.0019)	-0.020* (0.005)	0.070* (0.009)	-0.055* (0.011)
Part-time paid work (ref. full-time work)	-0.001 (0.0014)	-0.004 (0.007)	-0.004 (0.006)	0.009 (0.010)
Retired	0.003 (0.0027)	0.011 (0.012)	0.003 (0.010)	-0.017 (0.016)
At home	-0.001 (0.0017)	0.013 (0.009)	-0.017* (0.006)	0.004 (0.012)
Unemployed	0.049* (0.015)	0.018 (0.02)	0.159* (0.036)	-0.226 (0.041)
In school	-0.003*** (0.0018)	0.012 (0.010)	-0.026* (0.006)	-0.016 (0.013)
Others	0.000 (0.0046)	0.069** (0.030)	-0.026* (0.009)	-0.042 (0.033)

Obs=8949. Rho: 0.368. Log pseudo-likelihood=-4188.0555. Robust standard errors in parenthesis.

Marginal effects (dy/dx) are for discrete changes of the dummy variables from 0 to 1, and significance is given at 1 percent (***), 5 percent (**) and 10 percent level (*).

Appendix

Table A.1. : Participation in the “ Living in Switzerland Survey”, 1999-2004

<i>Number of participating units</i>	1999 (W1)	2000 (W2)	2001 (W3)	2002 (W4)	2003 (W5)	2004 (W6)
Participating households	5,074	4,532	4,314	3,685	3,289	2,918
Persons living in participating households	12,931	11,678	11,116	9,537	8,478	7,517
Persons aged 14 years and older eligible for individual interviewing	10,293	9,297	8,942	7,553	6,719	5,976
Personal interviews	7,799	7,073	6,601	5,700	5,220	4,413
Proxy Interviews	2,638	2,381	2,174	1,984	1,724	1,482
Persons responding in current and all previous waves	-----	6,335	5,429	4,480	3,888	3,076

Source: Swiss Household Panel

Table A.2. : Description of variables used in multivariate analysis (1999)

Variable Name	Variable description
Age	Categorical variable for age in year of interview (0=children 0-17, 1=young 18-29, 2=adults 30-64, 3=elderly >65)
Sex	Dichotomous variable for sex (0=male, 1=female)
Civil Status	Categorical variable for civil status (0=single, 1=married, 2=separated/divorced/widow)
Education	Categorical variable for the highest education level achieved (0=primary, 1=secondary, 2=tertiary)
Citizenship	Dichotomous variable for citizenship (0=Swiss, 1=other)
Household type	Categorical variable for type of household (0=couple without children, 1=couple with 1 child, 2=couple with 2 children or more, 3=lone-parent with one or more children, 4=others)
Number of children	Cat. variable for the number of children (0=no child, to 6=six or more)
Region of residence	Categorical variable for region of residence (1=French-speaking, 2=German-speaking, 3=Italian-speaking)
Urban	Categorical variable for community typology (0=urban/suburban, 1=rural/others)
Working status	Categorical variable for working status (0=active occupied, 1=unemployed, 2=not in labour force)
Employment status	Categorical variable for employment status (1=full-time paid work, 2=part-time paid work, 3=retired, 4=at home, 5=unemployed, 6=in school, 7=others)
Unemployment risk	Dichotomous variable for risk of unemployment in the next 12 months (0=low risk, 1=high risk)
Working time	Dichotomous variable for working time (0=part-time, 1=full-time)

Table A.3. : Summary statistics (1999)

Variable	Mean	Std. Dev.	Min	Max
<i>Dependent Variables</i>				
Income poverty index	0.07	0.25	0	1
Total deprivation index	10.40	10.31	0	100
<i>Socio-demographic variables</i>				
Age	1.44	0.97	0	3
Sex	0.51	0.49	0	1
Civil status	0.64	0.64	0	2
Education	0.84	0.69	0	2
Region of residence	0.76	0.52	0	2
Citizenship	0.13	0.33	0	1
Household type	2.77	2.08	0	7
Number of children	1.11	1.24	0	6
<i>Occupational variables</i>				
Working status	0.66	0.93	0	2
Risk of unemployment	0.09	0.29	0	1
Working time	0.62	0.48	0	1
(Obs: 12931)				

Table A.4. : Correlation between dimensions (1999)

	Basic	Durables	Housing	Lifestyle	Financial	Satisfact	Total
Basic	-						
Durables	0.37	-					
Housing	0.17	0.13	-				
Lifestyle	0.48	0.43	0.12	-			
Financial	0.54	0.37	0.15	0.42	-		
Satisfaction	0.42	0.33	0.21	0.35	0.51	-	
Total	0.72	0.55	0.46	0.61	0.79	0.79	-

(Obs: 12413) All coefficients are significant at 5 percentage level.

Chapter 2:

An assessment of social exclusion in Switzerland

Abstract

Over the last decade social exclusion has become a key issue in social debates in Switzerland as in many other countries, as a result of the rapid changes in the social and economic structures, increasing job insecurity and individualism of people in the society. This paper aims at characterizing social exclusion in Switzerland for the period 1999-2004, using data from the Swiss Household Panel. We follow the methodology introduced by Bossert, D'Ambrosio and Peragine (2007) and measure of deprivation and social exclusion in a multidimensional and dynamic framework. We propose a two-part modelling estimation to determine the incidence of a set of observed characteristics on the probability and levels of deprivation and exclusion, assuming that these may be driven by different underlying mechanisms. Results show that social exclusion is highest among the younger, single-parent families and unemployed, with particular relevance in the financial and housing areas. Unemployment appears also to be the most important risk factor for social exclusion in Switzerland, both on its probability and levels.

1. Introduction

In recent years, welfare economists have progressively extended their attention from traditional concepts of poverty and deprivation to social exclusion. In a context of rapid socio-economic changes, higher job insecurity and increasing individualism, social exclusion has become a central issue in the debates of many developed countries and a real priority in their social and political agenda¹⁶.

But what does the term *social exclusion* actually mean? While there is still a lack of consensus on a precise definition, it is yet widely accepted that social exclusion is a multidimensional phenomenon, dealing with the inability to participate in the basic economic, social and political aspects of life, generally due to constraints rather than choices (Duffy, 1995, Lee and Murie, 1999). In the European programmes for socio-economic research (TSER), social exclusion is also described as “the disintegration and fragmentation of the social relations and hence a loss of social cohesion”. Others define social exclusion in terms of increasing distance between groups in the society (Akerlof, 1997, Bossert et al. 2007), while for Atkinson (1998) the term refers to the actual dynamic process leading to social exclusion.

While conceptualizations are numerous and often unclear, there is common agreement that social exclusion is indeed more than poverty and deprivation (Atkinson, 1998). If poverty is generally understood as the lack of material resources needed to participate in the society, social exclusion goes beyond the economic dimension by emphasizing the social and relational aspects of poverty (Room, 1995, Sen 2000). Income poverty, by preventing people to fully participate in the society, may then be seen as a cause or a component of social exclusion. As Klasen (1998) points out, “income poverty is neither a necessary nor a sufficient condition for exclusion as non-poor may be excluded from participation and some poor may not necessarily be or feel excluded”.

In Switzerland, empirical evidence on social exclusion is dramatically lacking, despite increasing signs of social marginalization and disintegration of social networks. The country has undergone major changes in recent years. The

¹⁶ In the Treaty of Amsterdam (1999) and the Lisbon Summit (2007), social exclusion has been listed among the top priorities of the European Union, promoting higher employment and an adequate social protection within its social clauses.

economic slow-down and increasing unemployment characterizing the last two decades have hampered the well-being of some parts of the population, with more people relying on social assistance¹⁷. Despite growing concerns among scientists and policy makers, to the best of our knowledge no empirical study has focused on social exclusion in Switzerland to date, except for some regional analyses (Cunha et al. 1995) and a work published by the OECD, examining social exclusion and social assistance in Switzerland and Canada (OECD, 1999).

This paper aims to fill in part this gap and measure the extent of social exclusion in Switzerland during the period 1999-2004, from a multidimensional and dynamic perspective. The purpose is threefold:

- build a measure of social exclusion by integrating a dynamic component in the indicator of deprivation, following the procedure introduced by Bossert et al. (2007)
- track patterns of social exclusion in Switzerland across dimensions and socio-economic subgroups
- identify the major determinants of social exclusion using a two-step model, where the probability and the levels of exclusion are estimated separately. This econometric specification, generally used in health econometrics as an alternative to sample selection models¹⁸, is entirely new in welfare analysis, and will allow us to disentangle the effect of different factors on the levels of social exclusion, conditional on the probability of exclusion being positive.

The rest of this paper is organized as follows. The next section reviews the definitions and main literature on social exclusion. Section 3 gives information on the methodology used in this paper and section 4 describes the estimation model. The data is presented in section 5 while descriptive and estimation results are given in section 6. Section 7 concludes.

¹⁷ In 2006, they were 3.3 percent of the population, according to the Swiss Federal Statistical Office.

¹⁸ See Cragg (1971), Duan et al. (1984), Manning et al. (1987) or Leung and Yu (1996) for a full discussion on these models.

2. Defining social exclusion

Defining social exclusion is not an easy task. The debates on its definition and measurement are numerous and still subject to ongoing discussions. Historically, the term social exclusion originated in France in the mid '70s, where it referred to people excluded by the social insurance system (Lenoir, 1974), including the lone parents, disabled, and unemployed individuals. In Britain, until the late '90s, the term was used to refer to the workless households (Levitas, 1998). Amartya Sen (1985, 2000) conceives social exclusion as part of his capability framework. He defines it as “the failure to attain adequate levels of various *functionings* that are deemed to be valuable”, while emphasizing its *relational* aspect in the participation of social activities and access to opportunities. Paugam (1993, 1996), in his sociological approach to poverty, defines social exclusion as a process of “social disqualification”, which points to the social discredit of the excluded and emphasizes the role of social assistance in the stigmatization of exclusion.

An important feature on which researchers seem to agree though is the *multidimensional* nature of social exclusion, as the concept may refer to phenomena as diverse as poverty, unemployment, poor housing or lack of opportunities. Many also acknowledge the idea that social exclusion is a *dynamic process*, and specifically the dynamic process of deprivation (Atkinson, 1998, Bossert et al., 2007). Social exclusion may in fact arise from a condition of cumulative or persistent deprivation that is likely to affect living patterns and participation of individuals in the society, a condition also defined as “chronic cumulative disadvantage” (Tsakloglou et al. 2005), which jeopardises economic opportunities while increasing vulnerability to future poverty (Calvo, 2008).

In a more general framework, Mayes et al. (2001) describe social exclusion as “a blend of multidimensional and mutually reinforcing processes of deprivation, associated with a progressive dissociation from social *milieux*, resulting in the isolation of individuals and groups from the mainstream of opportunities society has to offer”. The authors also identify in unemployment, poverty and ill-health the three main reasons lying behind social exclusion.

Room (1995) adds a new rights-based dimension to social exclusion, when he talks about the “denial or non-realization of civil, political and social rights of citizenship”. The author also argues that the move from poverty to social

exclusion implies three main steps: from income to multidimensional, from static to dynamic analysis, and from an individual or household level to a society or community level. This straightforward distinction shows clearly the shift from the traditional idea of poverty based on income to a dynamic and multidimensional concept of social exclusion. In the same spirit, Atkinson (1998) also points out the three main features that should characterize social exclusion:

- *relativity*, social exclusion is relative to the position of the other individuals in the society and to the period in which individuals live
- *agency*, in that social exclusion results from the actions taken by individuals in the society
- *dynamics*, as social exclusion is the result of the processes of individuals over time and can be transmitted by generations.

While attempts to conceptualize social exclusion are numerous, yet few empirical studies are found in the literature. Among them, Bradshaw et al. (1999) and Burchardt et al. (2002), who identify four key aspects of social exclusion providing empirical evidence for Britain. Tsakloglu and Papadopoulos (2002, 2005) measure the extent of social exclusion in the European Union among four population subgroups, while Klasen (1998) focuses on social exclusion among children in the OECD countries. Finally, Chakrawarty and D'Ambrosio (2006) and Bossert et al. (2007) employed an axiomatic approach to build on measures of deprivation and social exclusion with application to EU countries and Italy respectively. This paper builds on the methodology proposed by Bossert et al. (2007) to measure the extent of social exclusion in Switzerland between 1999 and 2004 in different dimensions of life. The original feature of this paper is the specification of a two-part model to assess the effect of different individual and household characteristics on the probability and levels of social exclusion, assuming that these may be driven by different underlying mechanisms. The use of this econometric strategy, generally applied in the demand of health care (Hay and al. 1987, Mullan, 1998 among others), has never been used before in welfare analysis.

3. Measuring deprivation and social exclusion

To derive an operational measure of social exclusion, we adopt the view suggested by Atkinson (1998) and Bossert et al. (2007) and define social exclusion as the dynamic process of deprivation. Among the many facets that social exclusion may take in various dimensions of life, we find indeed reasonable to think that an individual can become socially excluded if her situation of deprivation persists over time.

For this purpose, we use the set of indicators and dimensions defined in the first chapter of this thesis (section 3.2) and define the index of deprivation as follows:

$$D_i^m = \frac{\sum w_j^m I_{j\ i}^m}{\sum w_j^m} * 100 \quad [1]$$

where I_j is a dichotomous variable taking value of 1 if individual i does not possess item j of dimension m , and 0 otherwise, and w_j^m the proportion of people *not* lacking item j of dimension m ¹⁹. This index, therefore, defines the degree of deprivation suffered by individual i in each dimension m , in a single period.

A total deprivation index is also obtained for each individual as the weighted sum of all partial indices of deprivation:

$$D_{Ti} = \frac{\sum_{m=1}^M \bar{w}^m D_i^m}{\sum_{m=1}^M \bar{w}^m} \quad [1\text{-bis}]$$

These individual measures of deprivation are then aggregated across individuals to obtain a measure of **social deprivation**:

$$D_T = \frac{1}{N} \sum_{i=1}^N D_{Ti} \quad [2]$$

¹⁹ Details and descriptive statistics on the list of items and dimensions are given in Table 1.

defined as the arithmetic mean of individual levels of deprivation in each dimension, for each period²⁰. By subsequently integrating the time component in the above measure of deprivation we derive the measure of **individual exclusion**, defined as the individual deprivation across time:

$$E_{Ti} = \frac{1}{T} \sum_{t=1}^T D_{Ti} \quad [3]$$

Finally, this index is summed up across individuals to obtain an aggregated measure of **social exclusion**:

$$E_T = \frac{1}{N} \sum_{i=1}^N E_{Ti} = \frac{1}{N} \sum_{i=1}^N \frac{1}{T} \sum_{t=1}^T D_{Ti} \quad [4]$$

interpreted as the arithmetic mean across individuals and periods, using the same aggregate procedure as in [2]²¹.

4. The estimation model

The measures of exclusion defined in the previous section, after normalization, represent continuous variables or alternatively exclusion scores with values varying between 0 and 100²². A social exclusion line is therefore defined on the distribution of these measures, in order to identify individuals who would be regarded as socially excluded. To allow full symmetry with income poverty, the line is set at a level giving the same number of deprived as we have of income poor²³. As a result, we obtain a dichotomous variable, taking value of 1

²⁰ The axiomatic justification of the arithmetic mean as the proper aggregator function is given by Aczél (1966).

²¹ This set of equations are similarly computed for total exclusion as well as for exclusion in each dimension.

²² For sake of simplicity, we will continue to write on social exclusion, but all the analysis is performed on both deprivation and exclusion measures, as defined in the previous section.

²³ For a detailed discussion on this methodology, see Nolan and Whelan (1996).

if individuals are excluded and 0 otherwise. The assumption at this stage is that the probability of being below the exclusion threshold and the actual levels of social exclusion on the distribution may not necessarily be influenced by the same factors. In order to test such hypothesis, we define a model allowing us to estimate the levels of exclusion, conditional on its probability being positive, and controlling for a series of individual and household characteristics. Our first option was to use a sample selection model, as we deal with levels of exclusion conditional on the probability of exclusion being positive, and the latter being characterized by a large number of null values. However, given the difficulty in selecting the true parameters of identification, we propose the specification of a two-part model. Two-part modelling strategies have been increasingly used in the estimation of health care costs (Hay et al. 1987, Mullay 1998). While sharing some common features with the sample selection model, different studies have proved the superiority of the two-part model over the sample-selection model in the absence of “good” exclusion restrictions, showing that the two-part model performs better, even when the sample selection model is the true model (Duan et al. 1984, Manning et al. 1987, Hay et al. 1987, Mullay, 1998, Leung and Yu, 1996)²⁴.

The specification of the two-part model is based on the following decomposition:

$$E(y | x) = P(y > 0 | x) \cdot E(y | y > 0, x)$$

More specifically, the first part of the model (the *selection* equation) predicts the *probability* of social exclusion, where exclusion is described by a binary variable d , which is only observed is $d=1$, that is when the exclusion score is greater than z (the exclusion line), and $d=0$ otherwise. The *level* of social exclusion can then be characterized by the conditional density $f(y | d = 1)$. Naturally, if $d=0$, the level of exclusion is not observed. For the selection equation, we use a probit specification:

$$\Pr(d = 1 | x) = \Phi(x' \beta)$$

²⁴ A Tobit model would have also been probably inappropriate in this case, as it considers the zeros in the dependent variable as censored observations, which is not the case here (Tobin, 1958). See also Heckman (1979) for the use of sample selection models.

where Φ represents the cumulative normal function of the probit and x' a vector of individual and household characteristics, and β the corresponding vector of estimation parameters. Finally, the level of exclusion is specified as a lognormal model, as follows²⁵, and estimated by OLS:

$$\ln y | d = 1 \approx N(x'\gamma, \sigma^2)$$

where y is the observed level of social exclusion, x' is again a vector of individual and household characteristics²⁶, and γ the corresponding vector of estimation parameters.

5. The data

The analysis is based on the first six waves of the Swiss Household Panel (SHP), covering the period 1999 through 2004. The SHP started in 1999 as part of the project *Living in Switzerland* run by the National Science Foundation, the Swiss Federal Statistical Office and the University of Neuchâtel. The original sample consists of around 13'000 respondents aged 15 and over and belonging to more than 5'000 households. The annual questionnaires, based on a Computer-Assisted Telephone Interview, are held in French, German or Italian depending on the preference of the respondent. People are interviewed on individual and household characteristics in a broad range of subjects, going from all sources of income to living conditions, including housing, health and leisure activities. Subjective assessments are also given along with factual information.

Cross-sectional analysis is based on data from 1999, including a total sample of 12'931 individuals. The sample shrinks to 6'078 when we use the balanced panel of individuals over the entire period. Given the high number of drop-outs, we use the appropriate longitudinal weights provided by the dataset in order to correct for attrition. Finally, we use the individual as unit of analysis, though most of the information is collected at the household level.

²⁵ The log-normal is chosen as the variable is typically right-skewed.

²⁶ For simplicity, we take the same covariates used in the selection equation, but these could be different.

6. Empirical results

6.1. Assessing levels of individual exclusion

Table 2 reports the distribution of population by levels of individual exclusion. Major differences are observed between dimensions. Housing appears the most important dimension of social exclusion, with 5 over 6 individuals experiencing some degree of exclusion in this area, against only one over 5 who suffer exclusion in the possession of durables. The degree of exclusion is very high for some individuals in the financial and subjective dimensions, as we can see from the two highest quantiles of the exclusion distribution. Figure 1 illustrates the distribution of individuals excluded in each dimension over the period. The housing dimensions shows a smoother curve but also one that is more right-skewed, in line with results found for deprivation. Statistics produced for social exclusion (Table 3) are consistent with those found for individual exclusion. The table presents the mean scores for each dimension, and again social exclusion is higher in the financial and housing dimensions. Also, some people report very high levels of exclusion (score close to 100) in the financial area, with a mean score close to 15, against only 1.39 for durables. Finally, almost 3 percent of people show an overall index of exclusion above 60.

6.2. Social exclusion, by subgroups of population

Among the population, as shown in Figures 2 to 6, the highest levels of exclusion are found among the unemployed (mean score of 17.5), among lone-parent families (13.5) and foreign residents (12.4). In the existing literature, unemployment is one of the factors most often associated with social exclusion (Tsaksoglou, 2005). An individual who is unemployed is also more likely to lack the material resources necessary to maintain a subsistent life, and at the same time more likely to miss participation in everyday social and political life. Social exclusion is also higher among young adults (9.4), a result showing out the link between education and social exclusion, and the potential role of human capital in reducing social exclusion²⁷. Finally, individuals living in the French-speaking cantons are also more concerned with social exclusion, while differences are not particularly significant between genders.

²⁷ For a full discussion on the relation between social exclusion and education, see Klasen (1998).

6.3. Results from multivariate analyses

Table 4 presents the estimates from the two-part model, reporting the marginal effects of a range of explanatory factors on the *probability* of deprivation (and social exclusion) as well as on the *levels* of deprivation (and social exclusion) respectively. Unemployment has the greatest effect on social exclusion, affecting dramatically its probability and levels, with a much a bigger effect on the level, although the result is significant only at 10 percent level. Also predictedly, higher education protects from being deprived and excluded, and has a strong incidence on both their probabilities and levels. Finally, there is no significant gender effect on the two outcomes, a result that would be interesting to explore further by performing the regression on men and women separately.

There is also an age effect, as being younger or older, compared to adults, is positively and significantly associated with deprivation, while it has no significant effect on social exclusion. Similarly, being married is not significant, but there is a positive effect on deprivation of being divorced, compared to single, with a much stronger impact on the levels of deprivation. Interestingly, the level of deprivation and exclusion is foreign citizens are much more likely to be deprived, and their levels of deprivation and exclusion increased by over 40 percent for foreigners compared to natives, while the effect on the probability of deprivation and exclusion is in both cases not significant. This result is interesting, as it might reflect a form of polarization in the distribution of deprivation for foreigners compared to natives, a hypothesis deserving further investigation.

Household composition also plays a major role in the risk of deprivation. Having 1 or more children in the household increases the levels of deprivation and exclusion by around 20 percent. Lone-parent families are the group with the highest risk of deprivation. This increases by over 50 percent, compared to a two-parent family (the reference category). The burden of bringing up children by her own increases indeed the risk of material deprivation for a single-parent, while at the same time moving her away from basic participation in the society.

7. Concluding remarks

The objective of this paper was to measure the extent of social exclusion in Switzerland, and identify some of its main determinants, drawing data from the first six waves of the Swiss Household Panel. The work is new insofar as to our knowledge no other empirical study has yet attempted to address this issue systematically in Switzerland. Defining social exclusion as the process of persistent deprivation, we built on measures of social exclusion and deprivation at the individual and aggregate level in a unified and multidimensional framework, following the procedure introduced by Bossert et al. (2007).

The Swiss population seems to be better off in the possession of durables, while people are more persistently deprived in the housing area, with more than 85 percent of individuals experiencing exclusion in this dimension. Multivariate analysis showed that unemployment is by far the highest risk factor for social exclusion in Switzerland, a result that points clearly to the role of human capital and market-oriented policies for reducing social marginalization of individuals. Being able to understand what factors influence the probability but also the degree of social exclusion is indeed crucial for academic understanding but also for the implementation of more effective social policies. The rapid changes in the Swiss social and economic structure, exacerbated by the recent economic crisis, should be an incentive to keep monitoring the evolution of deprivation and social exclusion, while calling for the need of more research to reduce the risk and future costs of social disintegration.

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Table 1 : Indicators used to construct deprivation indices (% of *enforced lack*), 1999

Items	%	Weight
Basic deprivation (B)		
Arrears in payments in the last 12 months	11.94	0.88
Cannot afford to invite friends at least once a month	2.58	0.70
Cannot afford a meal at a restaurant at least once a month	14.65	0.54
Cannot afford to go to the dentist if needed	3.05	0.97
Durable goods (D)		
Cannot afford a car	3.09	0.89
Cannot afford a colour TV	0.26	0.94
Cannot afford a private washing machine	1.04	0.69
Cannot afford a dishwasher	2.92	0.71
Cannot afford a computer	4.83	0.68
Housing conditions (H)		
Accommodation in bad condition	31.59	0.68
Accommodation too small	15.15	0.85
Accommodation badly heated	8.82	0.91
Accommodation with noisy external environment	20.56	0.79
Accommodation: problems with pollution, traffic or industry	14.69	0.85
Accommodation with violence or vandalism around the house	13.70	0.86
Life-style and social deprivation (LS)		
Cannot afford one-week holiday away from home per year	7.75	0.83
Cannot afford a home with a garden or terrace	2.24	0.83
Cannot afford a second home	29.58	0.16
Cannot afford internet access from home	6.62	0.33
Financial deprivation (F)		
Unable to save 100CHF min per month	13.48	0.83
Unable to save for retirement saving schemes ("3 rd pillar")	11.96	0.65
Payments of monthly premiums in the last 12 months	15.40	0.85
Financial situation unmanageable (unable to make ends meet)	23.24	0.77
Reception of financial help	19.67	0.80
Life satisfaction (S)		
Satisfaction with financial situation of household	18.16	0.93
Satisfaction with standard of living	9.88	0.90
Satisfaction with accommodation	6.77	0.82

Note: All variables are dichotomous, taking value of 1 if household does not have or cannot afford such items, 0 otherwise.

Table 2: Distribution of population, by levels of individual exclusion score (%)

Segments	Dimensions						Total
	Basic	Housing	Durables	Life-style	Financial	Subjective	
0	55.04	15.32	82.91	36.26	26.96	51.32	2.98
1-20	35.86	63.70	15.56	54.65	44.21	31.62	87.82
21-40	6.90	17.52	1.40	6.89	20.35	12.04	8.35
41-60	1.71	3.08	0.13	1.94	5.45	3.27	0.79
61-80	0.50	0.36	-	0.25	2.86	1.36	0.06
81-100	-	0.02	-	-	0.18	0.39	-
Total	100.0	100.00	100.00	100.00	100.00	100.00	100.00

(Obs: 6078)

Note: For each dimension, the individual exclusion score is divided in quantiles, representing levels of exclusion, from no exclusion (0) to maximum level (100).

Figure 1 : Distribution of exclusion scores, in each dimension

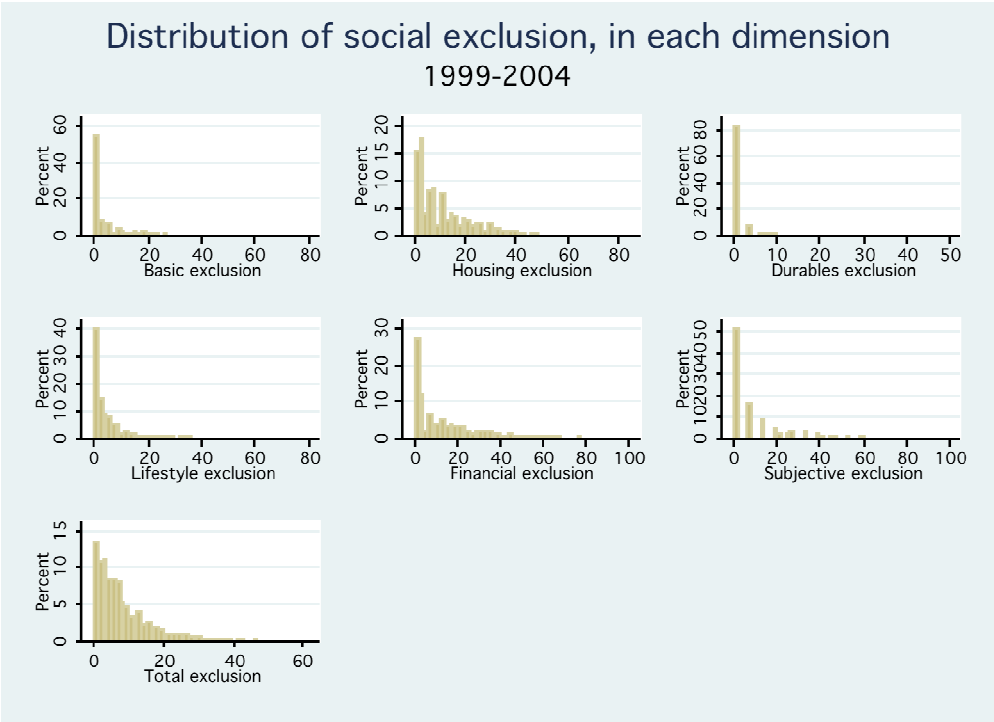


Table 3: Index of *social exclusion*, in each dimension (1999-2004)

Dimensions	Index (mean values)	Standard Deviation	Min	Max
Basic	6.10	10.72	0	79.70
Housing	11.78	12.05	0	84.09
Durables	1.39	4.33	0	48.74
Life-style	6.26	10.26	0	79.05
Financial	14.59	16.61	0	100
Subjective	9.94	16.61	0	100
Total	8.37	8.34	0	61.75

(Obs: 6078)

Figure 2 : Index of social exclusion, by age (mean values)

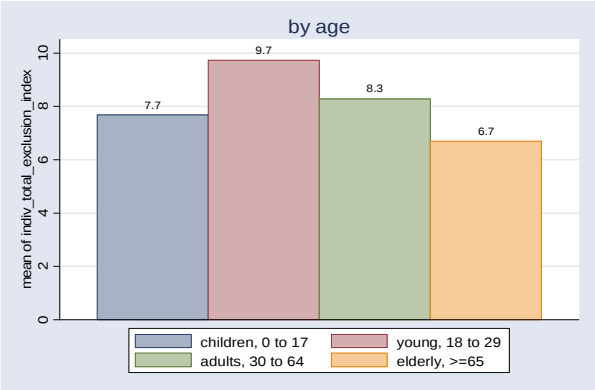


Figure 3 : Index of social exclusion, by type of household

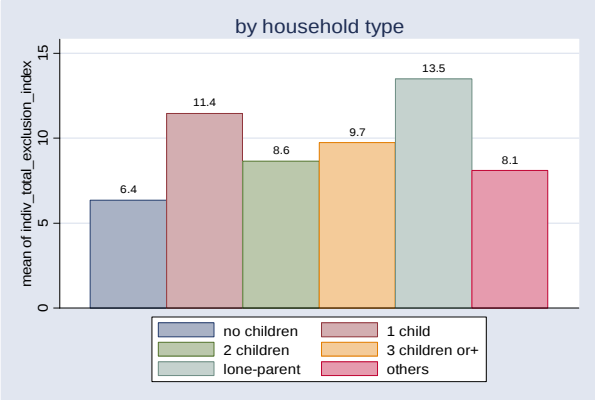


Figure 4 : Index of social exclusion, by sex and language region

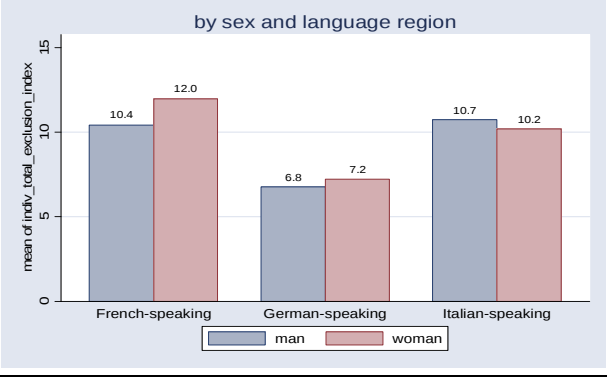


Figure 5 : Index of social exclusion, by nationality

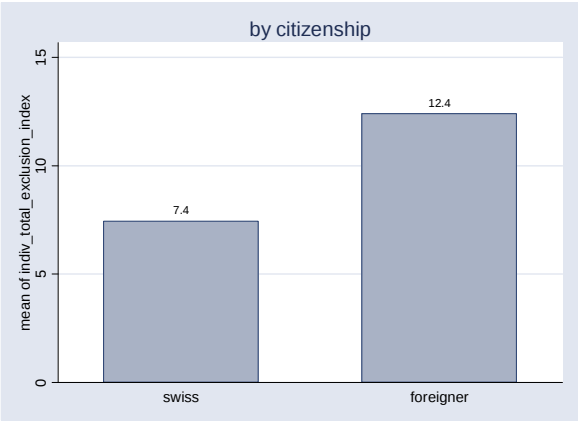


Figure 6 : Index of social exclusion, by working status

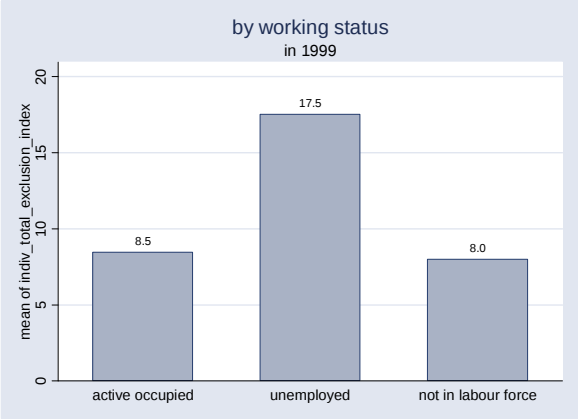


Table 4: Two-part model (2PM) estimations on deprivation and social exclusion

EXPLANATORY VARIABLES:	PROB AND LOGLEVEL OF DEPRIVATION (1999)		PROB AND LOGLEVEL OF SOCIAL EXCLUSION (1999-2004)	
	Probit	OLS	Probit	OLS
Children (ref. adults)	0.011 (0.012)	0.048 (0.053)	-0.013 (0.013)	-0.085 (0.092)
Young	0.029* (0.009)	0.155* (0.034)	-0.001 (0.012)	0.226* (0.058)
Elderly	-0.030* (0.006)	-0.164* (0.054)	-0.018 (0.011)	-0.105 (0.085)
Female (ref. male)	0.003 (0.004)	0.011 (0.018)	0.004 (0.006)	0.001 (0.030)
Couple with:				
1 child (ref.couple, no child)	0.008 (0.009)	0.281* (0.039)	0.073 (0.024)	0.430* (0.068)
2 children	0.005 (0.008)	0.191* (0.031)	0.044 (0.016)	0.498* (0.050)
3 children or more	0.006 (0.009)	0.230* (0.037)	0.032** (0.017)	0.540* (0.058)
At least one child over 16	-0.013** (0.006)	0.038 (0.028)	- (0.010)	- (0.045)
Single-parent	0.101* (0.019)	0.562* (0.047)	0.0124 (0.035)	0.776* (0.080)
Others	0.031* (0.011)	0.268* (0.036)	0.019* (0.010)	0.167* (0.045)
Married (ref. single)	0.005 (0.008)	0.138 (0.035)	-0.010 (0.011)	-0.117** (0.053)
Divorced, separated or widow	0.035* (0.012)	0.134* (0.043)	0.023 (0.018)	0.085 (0.071)
Secondary education (ref. primary)	-0.029* (0.005)	-0.222* (0.026)	-0.030* (0.008)	-0.253* (0.050)
Tertiary education	-0.046* (0.004)	-0.412* (0.032)	-0.041* (0.006)	-0.454* (0.058)
German-speaking (ref. French-speaking)	-0.054* (0.005)	-0.325* (0.020)	-0.062* (0.008)	-0.412* (0.034)
Italian-speaking	-0.023* (0.006)	-0.045 (0.043)	-0.018*** (0.008)	-0.036 (0.063)
Rural (ref. urban/suburban)	-0.005 (0.005)	-0.015 (0.020)	-0.003 (0.006)	0.040 (0.033)
Foreign (ref. native)	0.092 (0.009)	0.415* (0.028)	0.089 (0.016)	0.489* (0.051)
Part-time paid work (ref. full-time work)	0.009 (0.007)	0.040 (0.028)	-0.007 (0.008)	-0.044 (0.046)
Retired	0.025** (0.013)	0.116** (0.051)	0.034** (0.021)	0.022 (0.079)
At home	-0.005 (0.007)	-0.028 (0.033)	0.007 (0.011)	-0.065 (0.053)
Unemployed	0.241* (0.039)	0.849* (0.067)	0.237* (0.087)	0.829* (0.099)
In school	-0.013 (0.007)	-0.134* (0.042)	-0.005 (0.012)	-0.267* (0.074)
Others	-0.017 (0.012)	-0.084 (0.069)	- (0.010)	0.045 (0.137)
Deprivation : Obs.eq1=11070. Wald-chi2(24)=701.13 Eq2 : N=9350. F(24, 9325)=69.05. R-squared : 0.1345 Soc exclusion : Obs.eq1=4581. Wald-chi2(22)=242.49 Eq2 : N=4509. F(23, 4485)=35.26. R-squared : 0.1330 Marginal effects (dy/dx) are provided, along with robust SE. ***Significance at 1% level ** Significance at 5% level * Significance at 10% level				

Appendix

Table A.1. : Participation in the “ Living in Switzerland Survey”, 1999-2004

<i>Number of participating units</i>	1999 (W1)	2000 (W2)	2001 (W3)	2002 (W4)	2003 (W5)	2004 (W6)
Participating households	5,074	4,532	4,314	3,685	3,289	2,918
Persons living in participating households	12,931	11,678	11,116	9,537	8,478	7,517
Persons aged 14 years and older eligible for individual interviewing	10,293	9,297	8,942	7,553	6,719	5,976
Personal interviews	7,799	7,073	6,601	5,700	5,220	4,413
Proxy Interviews	2,638	2,381	2,174	1,984	1,724	1,482
Persons responding in current and all previous waves	-----	6,335	5,429	4,480	3,888	3,076

Source: Swiss Household Panel

Table A.2: Description of variables used in multivariate analysis (wave 1, 1999)

Variable Name	Variable description
Age	Categorical variable for age in year of interview (0=children 0-17, 1=young 18-29, 2=adults 30-64, 3=elderly >65)
Sex	Dichotomous variable for sex (0=male, 1=female)
Civil Status	Categorical variable for civil status (0=single, 1=married, 2=separated/divorced/widow)
Education	Categorical variable for the highest education level achieved (0=primary, 1=secondary, 2=tertiary)
Citizenship	Dichotomous variable for citizenship (0=Swiss, 1=other)
Household type	Categorical variable for type of household (0=couple without children, 1=couple with 1 child, 2=couple with 2 children or more, 3=lone-parent with one or more children, 4=others)
Number of children	Cat. variable for the number of children (0=no child, to 6=six or more)
Region of residence	Categorical variable for region of residence (1=French-speaking, 2=German-speaking, 3=Italian-speaking)
Urban	Categorical variable for community typology (0=urban/suburban, 1=rural/others)
Working status	Categorical variable for working status (0=active occupied, 1=unemployed, 2=not in labour force)
Employment status	Categorical variable for employment status (1=full-time paid work, 2=part-time paid work, 3=retired, 4=at home, 5=unemployed, 6=in school, 7=others)
Unemployment risk	Dichotomous variable for risk of unemployment in the next 12 months (0=low risk, 1=high risk)
Working time	Dichotomous variable for working time (0=part-time, 1=full-time)

Chapter 3:

Income, deprivation and mental health:

What is the nature of the relation?

(cowritten with Macel Bilger)

Abstract

There is increasing recognition today that symptoms of anxiety, depression and other common mental disorders are associated with episodes of poverty and feelings of deprivation. In modern societies where social pressure and personal ambition are gaining in importance, socio-economic conditions might be an important determinant of individual health. The objective of this paper is to examine the association between deprivation and mental health in Switzerland for the period 1999-2007, using instrumental variable techniques due to the likely endogeneity of these variables. The analysis is stratified by gender in order to identify the differential effects of deprivation on men and women respectively. Results show that the effect of income and deprivation on health is negligible, a result suggesting that other factors might be acting as underlying mechanisms between these two outcomes. The household structure indeed is shown to be an important determinant of mental health, particularly for women.

1. Introduction

The association between socio-economic status (henceforth SES) and health has been a topic of considerable research in social sciences and health economics over the past three decades. One of the most consistent result in this literature is the existence of a graded relationship between socio-economic conditions and health, suggesting that wealthier people live longer and have better health, both in adulthood (Marmot et al. 1997, 1999, Adler et al, 1994, Ecob and Smith, 1999) as well as in childhood (Case et al. 2002). This social gradient, however, appears to be much steeper in the lower strata, where limited resources, psychological distress and health risk-behaviours act as mediating mechanisms, exacerbating the effect of social conditions on health (Thiebe and Traube, 1997, Mulatu and Schooler, 2002, Gallo and Matthews, 2003).

In developed countries, there is also increasing recognition that not only physical health but also common mental disorders, such as anxiety and depression, are associated with episodes of poverty and feelings of social exclusion (Ortega et al. 1990, Weich and Lewis, 1998, Miech et al. 1999). With increasing social pressures and the race for success in modern societies, low socio-economic conditions appear to be important risk factors of mental illness (Allen Miech and Shannan, 2000, Eaton et al. 2001).

Poverty potentially affects mental health through multiple mechanisms. First, limited financial resources reduce individual personal care and access to health care services. Low socio-economic conditions are also more stressful, affecting individual self-esteem and control over their lives. Additional factors, such as unemployment, material deprivation or poor housing conditions further reduce individuals' capacity to manage stress, thereby increasing vulnerability to negative emotions and social isolation (Thiebe and Traube, 1997, Mulatu and Schooler, 2002, Gallo and Matthews, 2003).

This vicious circle reveals clearly the problem of reverse causality between SES and mental health²⁸. Are poor socio-economic conditions leading individuals to mental illness, or are genetically-prone mental disorders that eventually drive individuals down to poverty? In other words, is poverty a cause or a consequence of mental illness? In the epidemiological literature, these two hypotheses are

²⁸ See Benzeval and Judge (2001) for a full review of the literature.

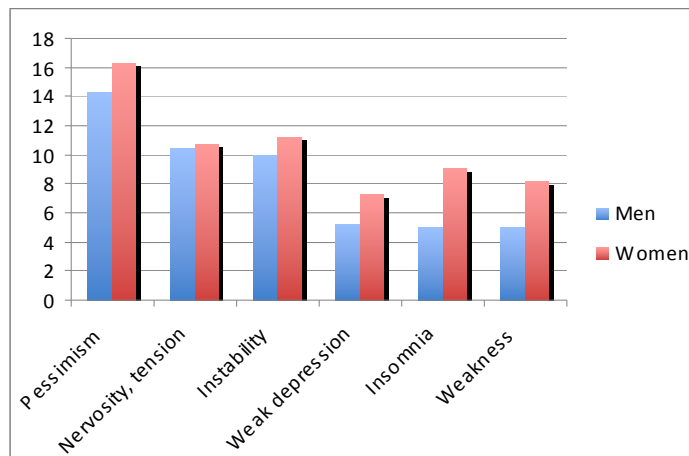
known as the *social causation* and the *social selection* theories (Johnson et al. 1999, Hudson, 2005, among others). While most of the existing evidence is supportive of the social causation theory, the selection theory is gaining ground in recent years, suggesting that mental illness may also reduce individual productivity, ability to work and look after oneself (Dohrenwend et al. 1992, Eaton et al., 2001).

In Switzerland, as in many other developed countries, mental health is becoming an increasingly relevant problem, and remains in many cases a taboo²⁹. Social and economic pressures arising from increasingly competitive environments are today a major cause of distress among lower groups, often reflected in feelings of sadness, pessimism, and depression (Miech et al. 1999, Ritcher et al. 2001). The shame and stigmatization of poverty, which can be particularly high in a wealthy society, exacerbates these feelings driving individuals into social isolation.

The most prevalent forms of mental disorders in Switzerland are anxiety and depression as well as substance dependence disorders (Jägger et al., 2008). According to the Federal Office of Public Health, in 2002 almost 30 percent of the population was suffering some forms of mental disorder in Switzerland, and most of them are women (see Figure 1 below). Jägger et al. (2008) estimate that this proportion has risen today, with about half of the population experiencing mental illness at least once in their life. Rüschler and Schuler (2007), using data from the Swiss Health Survey, also find a rise in depression from 1997 to 2004, with an increasing number of individuals seeking professional help.

²⁹ Twenty-seven percent of the population in European countries suffer from common mental disorders, with an even higher proportion of unmet health needs (Wittchen and Jacobi, 2005).

Figure 1: Psychological health in Switzerland, by sex (2002)



Source: Federal Statistical Office, Swiss Health Survey, 2002

Not only is mental illness a severe and long-lasting health problem for individuals, but it is also greatly costly to society. A study commissioned by *Eurobrain*³⁰ shows that, among Western countries, Switzerland has the highest average costs of depression per patient per year (around USD 9'350) followed by Germany (USD 9'100). These figures include direct medical and non-medical costs as well as indirect costs such as sick leaves for instance.

Although the government has recently committed itself to make it a priority in its future agenda³¹, mental health policies in Switzerland are still lacking, and the issue remains largely unexplored in the empirical literature. Two major contributions are provided by Vetter et al. (2006), who examine the effects of economic deprivation on psychological well-being among the working population, and Domenighetti et al. (2000), who look at the effect of job insecurity on health and health-related behaviour. Our study brings a new contribution to this literature in a number of points. First, we examine the impact of income but also of specific aspects of material and social deprivation on health

³⁰ The study is part of a European project presented at ISPOR 8th annual meeting and aimed at assessing the total costs of brain disorders in Europe.

³¹ A project to improve Swiss national health with a focus on mental health was launched after a roundtable organized in 2001 in Denmark, by the President of the confederation with WHO members and health ministers of the world.

and common mental disorders in Switzerland. Further, we use longitudinal data from the Swiss Household Panel for the period 1999-2007, in order to capture the unobserved characteristics that might have an effect on health. Finally, we apply an instrumental variable econometric method to control for the potential endogeneity of our key variables, using instruments such as income of the other household members, social private transfers received from individuals within or outside the household, as well as urbanization.

Earlier works exploring the relation between poverty (or SES) and mental health have used more often logistic regressions, failing to control for endogeneity (Miech et al. 1999, Weich and Lewis, 1998, Richter et al. 2001, Vetter et al. 2006). Ettner (1996) and Meer et al. (2003) both use instrumental variable techniques to handle endogeneity, but their estimations are based on cross-sectional data, which does not allow accounting for unobserved heterogeneity. Moreover, both studies focus on a single indicator of SES, namely income and wealth respectively.

The aim of this paper is to assess the effect of a multidimensional measure of deprivation and income on various measures of health status. While arguing that low income might be detrimental for both physical and mental well-being, experiencing deprivation in other dimensions of life may also lead to poorer health outcomes. In this paper, deprivation is defined in the multidimensional space, as the lack of items or activities considered to be necessary today for living in Switzerland (Townsend, 1979). It covers four basic dimensions of life, namely housing, material, social and financial deprivation. Health outcomes include a measure of self-assessed health (subjective health), an indicator of impediment in everyday activities (physical health), and a measure of mental health, which is the main focus of our analysis. Mental health is defined by a series of common mental disorders, such as depression, stress and anxiety. The analysis is performed by looking at the effect of deprivation and income respectively on each of the above outcome variables. Several confounding factors are included in the regression, such as age, family structure and education. Finally, we stratify the analysis by gender to isolate the effect of poverty on health for men and women respectively.

The rest of the paper is organized as follows. The next section presents the main literature on the relation between socio-economic conditions and mental health. Section 3 outlines the method used to construct deprivation indices, while section 4 describes the model. The data is presented in Section 5, and details are

given on the variables and instruments used in the analysis. Section 6 presents our empirical results and Section 7 concludes.

2. A review of the literature

There is increasing evidence today on the role played by socio-economic status and relative deprivation on both physical and psychological health. The “status syndrome”, as defined by Sir Michael Marmot (1997, 1999), reflects the idea that your health depends increasingly on “where you stand on the social hierarchy” rather than on absolute levels of poverty. Relative deprivation - that is the *perception* of one’s status in the socio-economic ladder – seems to play an increasingly important role in explaining the association between low income and poor health, by acting through social comparisons and increasing psychological stress (Yngwe et al. 2003, Eibner and Evans, 2005)³².

After the pioneering works by Sir Michael Marmot, the « social gradient » reflecting social inequalities in health has been the subject of much research both at population and individual levels. In particular, “ecological” studies using macro-level data suggest that societies characterized by wider inequalities in income and SES have lower life expectancies than societies in which income differences are smaller (Wilkinson, 1997, Judge et al. 1998, Deaton and Paxson, 1998). At the individual level, there is also support for an association between lower socio-economic conditions and poorer health, although the direction of the causality is still not clearly understood (Adler et al, 1994, Ettner, 1996, Deaton and Paxson, 1998, Benzeval and Judge, 2001, Meer et al. 2003 among others).

Two recent studies have also looked at the effect of polarization on health. In particular, Blanco-Pérez and Ramos (forthcoming) examine the impact of income polarization on individual health in Spain, finding that polarization does have a detrimental effect on health, while Apouey (also forthcoming) proposes a new measure to assess social polarization in health, complemented by a decomposition analysis of polarization among French women.

³² See Gallo and Matthew (2003) for a full review on this literature.

The possibility of reverse causality between poverty and health (particularly mental health) has also been a topic of considerable research for over a century in the epidemiological literature (Dohrenwend, 1992, Ritcher et al. 2001, Allen Miech and Shannan, 2000, Eaton et al. 2001, Hudson, 2005)³³. While most of the studies have found support for the *social causation* theory, suggesting that poverty is the cause of mental illness rather than the reverse, the *social selection* theory has been found important in case of high psychotic disorders like schizophrenia (Dohrenwend et al. 1992).

In terms of econometric strategies, instrumental variable techniques and structural equation models have been generally used to control for the endogeneity of income in health (Hudson, 2005, Ettner, 1996, Meer et al. 2003). Meer et al. use inheritance to instrument changes in wealth in the wealth-health nexus, and their results show that after instrumenting the effects of wealth on health are still positive but extremely small in magnitude. Ettner (1996) employs a variety of instruments, including individual work experience, state unemployment rate, parental education and spouse characteristics. Her findings show, rather surprisingly, that the effect of income on health becomes even negative after instrumenting, suggesting that long-term income would probably be a better and more relevant measure to be examined in its relation to health. Thus, the role played by SES and income on health status is still not clearly established. Our contribution to this literature is to assess the effect of a multidimensional measure of deprivation on health and use appropriate econometric techniques, in order to get the best possible identification.

3. Methodology

Construction of the deprivation indices

The measure of deprivation used in this study is a multidimensional index obtained applying the methodology described in Chapter 1 (Section 3.2).

We select in this paper a list of 18 items and activities from the information available in the panel, and aggregated them into four areas of

³³ During the 1930s, researchers formulated the hypothesis of “drift” to explain the social selection theory, according to which mental disorders deteriorate the functioning and the economic and social conditions of individuals, driving them eventually down to poverty.

deprivation, namely material (lack of durables), housing conditions, social/lifestyle deprivation and financial deprivation. Consequently, we define for each individual four partial indices of deprivation, one for each dimension, as well as an index of total deprivation, obtained by weighted sum of all partial indices:

$$D_{Ti} = \frac{\sum_{m=1}^M \bar{w}^m I_i^m}{\sum_{m=1}^M \bar{w}^m} * 100 \quad [1]$$

We recall that the weights in the aggregation process relate to the proportion of individuals possessing the items (Desai and Shah, 1988). In this respect, while not being a proper measure of *relative deprivation* in the sense of Yitzhaki (1979), this measure may be seen as a good approximation of relative deprivation, as the specification of the weights implicitly reflects the relative distance between individuals in the society in terms of deprivation.

4. Identification strategy

Our main objective is to measure the causal effect of deprivation on mental health. Because of the likely endogeneity of the former we will use an instrumental variable econometric method. Instruments are challenging to find in this context because of both the multi-dimensionality of our deprivation variable and, even more importantly, the extreme subjectivity of mental health, which, notably, is self-reported by the respondents. Good instruments typically need to be highly correlated with deprivation but not directly with mental health. Since deprivation is very closely related to economic resources, income-related variables are good candidates. However, these should not be related with work activity as it depends on health status. In the literature, analyzing the relationship between income and wealth with health, potential financial help received from the parents and job market conditions have notably been used (see for instance Ettner, 1996; Meer et al. 2003), but these seem nonetheless quite weak. In this study, we take advantage of a disaggregation of personal income and directly identify

private transfers (including gifts and heritance) received by the individual from inside and outside the household. In addition, we also use the income of the other household members who can potentially help the individual, not only financially but also with respect to many aspects encompassed in our deprivation variable. Finally, we also consider urbanization as it greatly influences living conditions. For instance, the necessity to have a car – and thus the potential deprivation of it – differs a lot between urban and rural areas.

Instrumental variable methods are able to deal with endogeneity arising from different sources, such as reverse causality explicitly discussed above and omitted variables correlated with both deprivation and mental health. In the context of health, omitted variables play a key role since the models explanatory power is typically extremely low. That is why we further improve identification by taking advantage of the panel structure of our dataset and controlling for individual-level unobserved factors by including individual fixed-effects. We prefer using fixed-effects over random ones as the latter are prone to the endogeneity bias, which is very likely in this context considering that most factors are influenced by mental health.

Finally, we use a binary version of the observed categorical mental health variable in order to focus on the most severe cases (those reporting more than average mental health problems) and in order to render model estimation tractable. Indeed, performing instrumental variable with panel data is already quite complex and the use of a binary variable makes it possible to use the Linear Probability Model (LPM) instead of a nonlinear specification such as the probit model. This model has been shown to perform very well, especially in the presence of many categorical explanatory variables (which is the case here) where its main drawback of making predictions outside the unit interval is contained (see for instance Wooldridge, 2001, for a discussion). Also, the use of a non-linear specification in a panel framework with fixed-effects would not be appropriate as subject to the incidental parameter problem (see Neyman and Scott, 1984). In addition, it is fairly simple to deal with the heteroscedasticity inherent to the binary dependent variable by using a robust estimation of the variance-covariance matrix. Throughout the analysis, though, it should be constantly born in mind that this linear approximation is only accurate near the centre of the distribution and predicting mental health for extreme values of deprivation could be misleading.

5. Data and description of variables

Our analysis is based on the first eight waves of the Swiss Household Panel (SHP). The Panel started in 1999 as part of the project *Living in Switzerland* run by the Swiss National Science Foundation, the Swiss Federal Statistical Office and the University of Neuchâtel with the principal aim of observing the dynamics of social changes. It is a longitudinal survey based on a representative sample of the Swiss population. The original sample (1999) consists of around 13'000 respondents aged 15 within more than 5'000 households. A second sample has been added in 2004, including around 2'500 households and 6'500 household members. By means of a Computer-Assisted Telephone Interview, people are interviewed in a broad range of economic and social subjects, from income sources to various aspects of life, including housing, health and leisure activities. Subjective assessment of well-being is given along with factual information.

For the purpose of our paper, we restrict our analysis to individuals aged 18-65 who answered the questionnaire. We thus exclude the elderly and children in order to get a more homogeneous sample. There is notably evidence that the effect of poverty on children's health follows different causal paths and is often mediated by parental long-run income (Case et al., 2002)³⁴.

The unit of analysis is indeed the individual, although some variables are taken at the household level. So overall, when using the panel structure of the sample, we obtain a total of 48'615 observations.

Our measure of mental health reflects what are often defined in the literature as "common mental disorders" (Weich and Lewis, 1998), and is based on the answer to the following question: "Do you often have negative feelings, such as having the blues, being desperate, suffering from anxiety or depression if 0 means "never" and 10 "always"?". We recode this 11-scale variable into a dichotomous variable in order to keep the modelization tractable, as we also deal with the additional difficulties raised by the use of panel data and treatment of an endogenous explanatory variable (see above). Our binary variable takes value of 1 for individuals experiencing any frequency of mental health problems and value 0 for those who never do. We think that this is a natural choice since not reporting any mental health problem seems to be qualitatively very different compared with

³⁴ These authors show that the parental accumulation of income over a long period seems to have a higher effect on children's health than current income.

admitting to be adversely affected to some degree. In other words, the mechanism explaining the presence of depression is likely to considerably differ from the one explaining its frequency.

Although the focus of our research is on mental health, we decide to include in our analysis two additional health variables, rather different in nature, in order to compare and evaluate the effects of the endogenous variables on different aspects of health. The second variable is a self-assessed health measure, which answers to the following question: “How do you feel right now?”. Although the question restricts to current health status, it captures a combination of both psychological and physical aspects of health, and is generally proved to be a good predictor of morbidity and mortality (Idler and Benjamini, 1997, Deaton, 2003)³⁵. A third outcome variable is a physical health measure, which reflects health impediment in everyday activities. All three variables have been dichotomized in order to render the comparative analysis more feasible³⁶.

The main endogenous variables include the multidimensional deprivation index as described in section 3, and the yearly household income, before taxes and social security contributions and equivalized using the OECD equivalence scale. An analysis is also performed using each of the four dimensions of deprivation separately, as to identify the effect of distinct aspects of poverty on health outcomes.

A short list of covariates is included in our analysis, namely age, household type and regional location (see Table 2 for detailed descriptive statistics). The inclusion of the fixed-effects in the model restricts our choice of covariates as such effects require selecting exclusively instruments and individual variables that change over time. Indeed, education is explicitly excluded for this reason, despite its very possible association with health outcomes. Other variables, particularly those related to employment are also excluded, as they are very likely to be endogeneous. Finally, we stratify the analysis by gender as the model for men and women is likely to be very different.

³⁵ Idler and Benjamini (1997), in a review of numerous studies, show that self-reported health is strongly correlated with mortality.

³⁶ The binary variable related to self-assessed health takes value one when the individual reports being in average, bad or very bad health. As for the binary variable associated to impediment in everyday activities, it takes value one when limitations are reported independently of their frequency.

6. Estimation Results

This section presents the results of the multivariate estimations performed on the sample described in the previous section. Note that we use different instruments for each estimation, excluding those that we had selected on a theoretical basis but which appeared not to be correlated with the endogenous variable, too weak for model identification, or endogenous themselves. The statistic or p-value of each of these tests is reported in our result tables along with the list of instruments we have selected (Tables 4 to 9). Moreover, as mentioned in the previous section, a number of instruments and covariates that we selected in the first place are finally excluded, as they do not fit into the actual fixed-effect framework since they are invariant over time. These notably include social origins of the parents (nationality, education and occupational status), which might have been used as instruments, given that parents can influence individuals' well-being through gifts, inheritance and other practical support.

We start the analysis with mental health status, which is the focus of our study. Table 4 presents the marginal effects of multidimensional deprivation and of various control variables on depression. Surprisingly, we do not find strong evidence of an effect of deprivation on mental health status, as we would expect. In most cases, coefficients are non-significant, and when they are, the magnitude is extremely small. Among men, for instance, a substantial 10 points increase in deprivation results only in a 1.2 percent higher probability of suffering from depression. After instrumenting, these results become in fact negative but in all cases non-significant, most likely due to loss of accuracy arising from instrumental strategies. The effect of deprivation on mental health - if it exists in the first place - is indeed too small to be detected by our estimation method.

The figures are slightly different when the effect of income on mental health is considered (Table 5). Quite surprisingly, income seems to increase the risk of depression among men. The effect, however, is extremely low in magnitude, and, again, only significant before instrumenting. While unexpected in theory, this result is in line with those found in other studies, including Zimmerman et Katon (2005), and especially Vetter et al. (2006), who use the same dataset and find that low income has no incidence on psychological well-being and unmet mental health need in Switzerland. These authors find however an association between health outcomes and “restricted standard of living”, which

may well approximate our measure of deprivation. Nevertheless, we should bear in mind that these two multidimensional variables are constructed in a rather different way, in terms of indicators included and aggregation structure, and, more importantly, the authors do not control for the endogeneity of their income and deprivation variables.

Instrumental variables are certainly a good method to control for the endogeneity of some explanatory variables. However, as mentioned above, these techniques can also introduce a bias due to the possibly “weak” identification of instruments. This was in fact the case for the analysis performed on the various dimensions of deprivation taken separately. The low values obtained for the F-statistics associated to the joint test of significance of the instruments reflected a weak identification bias, which would have most likely produced a wrong interpretation of the coefficients. In addition, the coefficients we obtained with the non-instrumented estimation were generally too low to draw conclusions concerning any possible effect of any dimension of deprivation on health. For this reason, results were not reported in the text.

Moving to the effect of covariates, an interesting finding in this first set of estimations is the age effect on health (Tables 4 and 5). Depression, indeed, seems to increase with age, irrespective of the dependent variable considered (income or deprivation). For instance, after instrumenting for deprivation, individuals over 55 have almost 22 percent more probability of experiencing depression compare to young individuals under 25 (our reference category). This probability is higher for women (23.6 percent) compared to men (20 percent), a difference that further increases when we instrument for income. This age gradient may well be a result of the fragmentation of social relations or other life events, which more often characterize older age (typically a divorce or the death of a close person), eventually leading to social isolation and increasing psychological distress.

We also find an interesting effect of the family structure on depression, especially for women. Every situation seems to be better than living alone. Indeed, being in a couple, with or without children, is protective against depression, even after controlling for other variables. This gender difference is also observed on self-assessed health (Table 6). For instance, after controlling for income, a woman living with a spouse and one or more children has around 7 percent less probability of experiencing depression than a woman living alone, whereas for men this difference is non-significant. This result is indicative of the

gender differentials in family structure. Although embodied in a traditional view, nowadays a large number of women still keep the main role of childcare and family housekeeper, and despite their burden of responsibilities fulfilled inside and outside the family, this maternal and family role turns out to be protective against adverse health outcomes. Reversely, men seem to rely more often on professional achievements and on their capacity to assure financial resources for the family. This hypothesis is somehow confirmed by the figures in Table 5, where we can see that the effect of income on health is indeed higher for men than for women, even though the overall effect remains rather small in magnitude. Still often, men constitute the household main wage earners, and being able to fulfil this role contributes to both their physical and mental health. This effect is completely reversed in the case of health impediment. The size of the family has now a significant and negative effect in everyday activities, and this particularly for women. The family burden appears here a real impediment in everyday activities, and the difficulty to fulfil their many responsibilities has altogether a detrimental effect of physical health.

A last interesting point in this analysis is that after controlling for income, the household composition has a higher effect on depression than it has after controlling for deprivation, a result possibly revealing that income is less correlated with the household structure than deprivation.

Finally, worth mentioning is that our geographical and cultural variable appears to be non-significant in all estimations, possibly due to its weak variation over time considering that only few individuals change (linguistic) region during the surveyed period.

7. Conclusions

The aim of this paper is to assess the impact of multiple forms of poverty on health status among the Swiss population between 1999 and 2007. The use of fixed-effects panel data allow us to take into account individual unobserved characteristics, while instrumental variable techniques are implemented in order to control for the endogeneity of deprivation in its association to health.

Our results indicate that the impact of both income and multiple deprivation on health are extremely small in magnitude, and this is particularly

true for depression. This finding, in line with results found in previous studies (Ettner, 1996, Meer et al. 2003) shows that the link between poverty and mental health is not clear-cut, giving support to the idea that other factors may be acting as mediators in the relation between poverty and mental illness. Future research is thus needed to identify more clearly the factors and the direction of the causality between income (or deprivation) and health. If poverty does not lead systematically to poorer health, it might be that the inverse relation is the actual reality. Many individuals living with mental disorders may be reluctant to receive any help from authorities and social institutions, driving themselves further at the margin of the society.

Another possibility would be that the association observed between health and poverty is due to their correlation with other factors that might play a major role in health. The household structure is, for instance, found to have a significant positive effect on both mental and self-assessed health status, particularly for women. Gender differentials appear consistently significant, regardless of the endogenous variable considered. This result suggests that the emotional support provided by the family members might be a potential protective factor for women, alleviating the adverse effects of depression. An age effect is also found across all outcomes, reflecting the increasing risk of depression for older people, possibly as a result of increasing social isolation in later stages of life. Depression and common mental disorders are becoming an increasingly relevant issue in developed countries, as an effect of globalization, deterioration of family ties and increasing social pressures. To better understand the link between poverty and mental health is to think of better policy strategies to alleviate the burden of poverty but also the psychological distress among the most vulnerable. The findings outlined above suggest that poverty is only weakly related to individual health, and that other factors seem to play a major role. Policy makers should probably focus on strategies aimed at increasing social integration, and more so for women, rather than simply providing direct benefits to the poor. The negative effect of age on health should also centre the attention of authorities on more targeted health interventions to the elderly to improve their status and reduce their sense of loneliness and social exclusion.

Although public policies are moving in this direction, more work needs to be done in academic research. This will involve applying more sophisticated econometric strategies that will allow us to disentangle the causal structure

between poverty and health. For instance, methods to correct for the endogeneity bias related to random-effects will allow the inclusion in the model of currently omitted variables, such as environmental factors or long-term measure of income, which may also play a role in explaining social inequalities in health.

Another interesting step in future research would be to examine the role of *relative* deprivation as a mediating mechanism in the income-health relationship. Some authors argue that being deprived in comparison to other individuals in the society may engender stressful conditions, which in turn might affect health, both directly through suicide or heart disease, or indirectly through smoking, alcohol abuse, poor eating or other health-related behaviours (Yngwe et al. 2003, Eibner and Evans, 2005). This may be particular relevant in wealthy societies, where the *perception* of deprivation relative to their peers may be potentially more detrimental to individuals' mental health than absolute levels of poverty. The objectives would then be:

- to test whether relative deprivation in Switzerland contributes to explain the link between income and health, via stressful social comparisons
- to identify the underlying mechanisms, including health-risk behaviours and environmental factors, and evaluate their impact on physical and mental health.

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Table 1: Indicators of deprivation

Items	%	Weight
Durable goods (D)		
Cannot afford a car	3.09	0.89
Cannot afford a colour TV	0.26	0.94
Cannot afford a private washing machine	1.04	0.69
Cannot afford a dishwasher	2.92	0.71
Cannot afford a computer	4.83	0.68
Housing conditions (H)		
Accommodation in bad condition	31.59	0.68
Accommodation too small	15.15	0.85
Accommodation badly heated	8.82	0.91
Accommodation with noisy external environment	20.56	0.79
Accommodation: problems with pollution, traffic or industry	14.69	0.85
Accommodation with violence or vandalism around the house	13.70	0.86
Life-style and social deprivation (LS)		
Cannot afford a one-week holiday away from home per year	7.75	0.83
Cannot afford to invite friends at least once a month	2.58	0.70
Cannot afford a meal at a restaurant at least once a month	14.65	0.54
Financial deprivation (F)		
Arrears in payments in the last 12 months	13.48	0.83
Unable to save for retirement saving schemes ("3 rd pillar")	11.96	0.65
Payments of monthly premiums in the last 12 months	15.40	0.85
Financial situation unmanageable (unable to make ends meet)	23.24	0.77

Note : Percentage and weights are given at the beginning of the period (1999).

Table 2: Descriptive statistics

	male		female	
	mean	s.d.	mean	s.d.
Dependent variables				
Suffers from depression (any frequency)	0.623	(0.485)	0.735	(0.441)
Does not feel well (at the moment)	0.107	(0.309)	0.154	(0.361)
health impediment in every-day activities	0.354	(0.478)	0.429	(0.495)
Endogeneous factors				
multi-dimensional deprivation score	8.228	(9.976)	9.124	(10.86)
equivalized household gross income	72601.3	(53848.8)	66324.4	(52252.2)
Exogeneous factors				
aged between 18 and 24	0.0995	(0.299)	0.0743	(0.262)
aged between 25 and 34	0.172	(0.377)	0.176	(0.381)
aged between 35 and 44	0.293	(0.455)	0.298	(0.457)
aged between 45 and 54	0.251	(0.434)	0.261	(0.439)
aged between 55 and 64	0.184	(0.388)	0.191	(0.393)
<i>Household structure</i>				
1 adult	0.148	(0.355)	0.144	(0.351)
1 adult with children	0.0375	(0.190)	0.0754	(0.264)
couple without children	0.247	(0.431)	0.247	(0.431)
couple with 1 child	0.146	(0.353)	0.136	(0.343)
couple with 2 children	0.256	(0.436)	0.243	(0.429)
couple with more than 2 children	0.142	(0.349)	0.128	(0.334)
other household type	0.0240	(0.153)	0.0268	(0.162)
<i>Linguistic region</i>				
German-speaking region	0.690	(0.463)	0.675	(0.468)
French-speaking région	0.272	(0.445)	0.287	(0.452)
Italian-speaking region	0.0383	(0.192)	0.0386	(0.193)
Instruments				
<i>I1: number of other household members working (full time equiv.)</i>	0.446	(0.562)	0.545	(0.612)
<i>I2: total gross income of the other household members</i>	39538.9	(72379.6)	73990.2	(83829.4)
<i>I3: informal social transfers</i>				
no transfers received	0.913	(0.282)	0.863	(0.344)
low level transfers received	0.0349	(0.184)	0.0388	(0.193)
average level transfers received	0.0305	(0.172)	0.0460	(0.210)
high level transfers received	0.0214	(0.145)	0.0521	(0.222)
<i>I4: degree of urbanization</i>				
city center	0.260	(0.439)	0.273	(0.446)
suburban region	0.285	(0.451)	0.280	(0.449)
rural area	0.295	(0.456)	0.282	(0.450)
wealthy, touristic or industrial commune	0.160	(0.367)	0.164	(0.371)

Table 3: Deprivation and income, by type of health status

		Deprivation		Income	
		men	women	men	women
Depression	no	7.416 (0.110)	7.439 (0.115)	72648.5 (673.5)	65677.6 (735.2)
	yes	8.720 (0.0965)	9.733 (0.0865)	72573.2 (529.1)	66549.5 (419.2)
Self-Assessed Health	no	7.804 (0.0734)	8.317 (0.0706)	73530.6 (448.8)	67305.2 (407.7)
	yes	11.78 (0.293)	13.57 (0.233)	64698.8 (1018.2)	60872.0 (749.4)
Impediment	no	7.635 (0.0839)	7.878 (0.0837)	73779.1 (490.1)	67594.5 (495.6)
	yes	9.311 (0.138)	10.78 (0.120)	70487.0 (760.2)	64649.5 (534.8)

Table 4 : Marginal effects after 2SLS estimation of deprivation on common mental disorders

	Whole population		Men		Women	
	LPM	IV LPM	LPM	IV LPM	LPM	IV LPM
mutli-dimensional deprivation score	0.000873*** (0.000317)	-0.00118 (0.00374)	0.00120** (0.000521)	-0.000755 (0.00664)	0.000642 (0.000398)	-0.0000668 (0.00419)
aged between 25 and 34	0.0321* (0.0184)	0.0291 (0.0192)	0.0295 (0.0264)	0.0267 (0.0292)	0.0347 (0.0257)	0.0337 (0.0253)
aged between 35 and 44	0.102*** (0.0215)	0.0977*** (0.0226)	0.0934*** (0.0316)	0.0894** (0.0356)	0.109*** (0.0295)	0.107*** (0.0293)
aged between 45 and 54	0.166*** (0.0237)	0.161*** (0.0252)	0.150*** (0.0358)	0.145*** (0.0400)	0.179*** (0.0318)	0.178*** (0.0323)
aged between 55 and 64	0.224*** (0.0262)	0.218*** (0.0283)	0.206*** (0.0401)	0.200*** (0.0463)	0.238*** (0.0349)	0.236*** (0.0357)
1 adult with children	0.0187 (0.0217)	0.0212 (0.0211)	0.0520 (0.0384)	0.0523 (0.0366)	-0.00100 (0.0274)	0.00000913 (0.0266)
couple without children	-0.0219 (0.0140)	-0.0247* (0.0150)	-0.00380 (0.0193)	-0.00565 (0.0209)	-0.0414** (0.0204)	-0.0427** (0.0212)
couple with 1 child	-0.0385** (0.0160)	-0.0406** (0.0164)	-0.0116 (0.0230)	-0.0125 (0.0233)	-0.0648*** (0.0226)	-0.0658*** (0.0230)
couple with 2 children	-0.0338** (0.0170)	-0.0351** (0.0169)	-0.0356 (0.0246)	-0.0359 (0.0243)	-0.0370 (0.0238)	-0.0378 (0.0235)
couple with 2+ children	-0.0326 (0.0201)	-0.0334* (0.0201)	-0.0140 (0.0295)	-0.0132 (0.0296)	-0.0516* (0.0278)	-0.0524* (0.0278)
other household type	-0.0417** (0.0212)	-0.0419** (0.0211)	-0.0314 (0.0320)	-0.0314 (0.0327)	-0.0531* (0.0283)	-0.0534* (0.0279)
French-speaking region	0.0536 (0.0476)	0.0582 (0.0507)	0.0405 (0.0618)	0.0456 (0.0801)	0.0611 (0.0723)	0.0624 (0.0640)
Italian-speaking region	-0.0206 (0.0430)	-0.0181 (0.0751)	-0.0731 (0.0490)	-0.0681 (0.131)	0.0247 (0.0715)	0.0246 (0.0686)
Constant	0.567*** (0.0266)		0.509*** (0.0369)		0.616*** (0.0384)	
Observations	42126	42126	18574	18574	23552	23552
Instruments		I2,I3,I4		I2,I3,I4		I2,I3,I4
Underidentification (Kleibergen-Paap rk LM p-value)		0.0000		0.0000		0.0000
Weak identification (Kleibergen-Paap rk LM statistic)		15.951		6.098		11.141
Overidentification (Hansen J p-value)		0.1204		0.3785		0.1267

Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01

Table 5 : Marginal effects after 2SLS of income on common mental disorders

	Whole population		Men		Women	
	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>
yearly household income equivalised, oecd, gross ⁽¹⁾	0.0000957 (0.0000604)	0.00406* (0.00231)	0.00208** (0.0000808)	0.00480 (0.00306)	0.0000916 (0.0000863)	0.00207 (0.00320)
aged between 25 and 34	0.0294 (0.0198)	0.0248 (0.0195)	0.0198 (0.0289)	0.0149 (0.0295)	0.0375 (0.0274)	0.0350 (0.0261)
aged between 35 and 44	0.100*** (0.0230)	0.0928*** (0.0229)	0.0725** (0.0342)	0.0651* (0.0352)	0.121*** (0.0312)	0.116*** (0.0301)
aged between 45 and 54	0.165*** (0.0253)	0.156*** (0.0254)	0.122*** (0.0384)	0.113*** (0.0392)	0.198*** (0.0337)	0.193*** (0.0332)
aged between 55 and 64	0.224*** (0.0282)	0.214*** (0.0283)	0.174*** (0.0432)	0.164*** (0.0443)	0.260*** (0.0374)	0.254*** (0.0366)
1 adult with children	0.0272 (0.0233)	0.0318 (0.0222)	0.0775* (0.0422)	0.0803** (0.0408)	-0.00617 (0.0294)	-0.00386 (0.0274)
couple without children	-0.0208 (0.0147)	-0.0255* (0.0154)	0.00508 (0.0201)	0.00327 (0.0213)	-0.0469** (0.0216)	-0.0515** (0.0226)
couple with 1 child	-0.0405** (0.0168)	-0.0405** (0.0171)	-0.00321 (0.0238)	-0.00104 (0.0250)	-0.0755*** (0.0241)	-0.0770*** (0.0237)
couple with 2 children	-0.0408** (0.0178)	-0.0382** (0.0180)	-0.0268 (0.0258)	-0.0221 (0.0268)	-0.0563** (0.0249)	-0.0563** (0.0246)
couple with 2+ children	-0.0400* (0.0213)	-0.0344 (0.0218)	0.00367 (0.0317)	0.0115 (0.0330)	-0.0787*** (0.0293)	-0.0771*** (0.0292)
other household type	-0.0346 (0.0228)	-0.0327 (0.0228)	-0.0191 (0.0349)	-0.0159 (0.0359)	-0.0507* (0.0301)	-0.0507* (0.0295)
French-speaking region	0.0625 (0.0534)	0.0643 (0.0539)	0.0434 (0.0715)	0.0473 (0.0843)	0.0745 (0.0790)	0.0740 (0.0685)
Italian-speaking region	-0.0204 (0.0410)	-0.0228 (0.0769)	-0.0714 (0.0482)	-0.0720 (0.132)	0.0211 (0.0724)	0.0187 (0.0715)
Constant	0.576*** (0.0285)		0.520*** (0.0395)		0.626*** (0.0412)	
Observations	36832	36832	16548	16548	20284	20284
Instruments		I2		I2		I2
Underidentification		0.0000		0.0000		0.0000
Weak identification		144.707		85.367		125.551
Overidentification		0.2018		0.3001		0.1812

Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01

⁽¹⁾ per 10'0000.

Table 6 : Marginal effects after 2SLS of deprivation on self-assessed health

	Whole population		Men		Women	
	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>
mutli-dimensional deprivation score	0.00127*** (0.000282)	-0.000551 (0.00314)	0.000879** (0.000406)	-0.000385 (0.00472)	0.00153*** (0.000385)	0.00240 (0.00398)
aged between 25 and 34	-0.0120 (0.0129)	-0.0147 (0.0132)	-0.0331* (0.0181)	-0.0349* (0.0181)	0.00772 (0.0185)	0.00900 (0.0189)
aged between 35 and 44	-0.00757 (0.0155)	-0.0112 (0.0160)	-0.0122 (0.0217)	-0.0148 (0.0225)	-0.000111 (0.0219)	0.00158 (0.0226)
aged between 45 and 54	-0.00198 (0.0175)	-0.00661 (0.0186)	-0.00654 (0.0246)	-0.00970 (0.0262)	0.00455 (0.0247)	0.00683 (0.0260)
aged between 55 and 64	-0.00711 (0.0199)	-0.0127 (0.0216)	0.00480 (0.0281)	0.000521 (0.0316)	-0.0129 (0.0280)	-0.0103 (0.0295)
1 adult with children	-0.0146 (0.0196)	-0.0124 (0.0188)	-0.0299 (0.0332)	-0.0296 (0.0316)	-0.0134 (0.0258)	-0.0147 (0.0245)
couple without children	-0.0251** (0.0119)	-0.0275** (0.0122)	-0.0201 (0.0157)	-0.0213 (0.0156)	-0.0301* (0.0180)	-0.0286 (0.0189)
couple with 1 child	-0.0309** (0.0136)	-0.0327** (0.0134)	-0.0251 (0.0189)	-0.0257 (0.0176)	-0.0381* (0.0201)	-0.0368* (0.0203)
couple with 2 children	-0.0319** (0.0143)	-0.0331** (0.0137)	-0.0251 (0.0197)	-0.0253 (0.0183)	-0.0394* (0.0209)	-0.0385* (0.0206)
couple with 2+ children	-0.0166 (0.0171)	-0.0173 (0.0163)	0.00837 (0.0238)	0.00885 (0.0220)	-0.0386 (0.0246)	-0.0377 (0.0242)
other household type	-0.0147 (0.0199)	-0.0149 (0.0185)	-0.0338 (0.0260)	-0.0337 (0.0247)	-0.00608 (0.0291)	-0.00576 (0.0267)
French-speaking region	0.0119 (0.0222)	0.0159 (0.0238)	-0.0366 (0.0268)	-0.0334 (0.0316)	0.0554* (0.0316)	0.0537 (0.0359)
Italian-speaking region	0.00590 (0.0932)	0.00807 (0.0880)	-0.0130 (0.0121)	-0.00976 (0.0160)	0.0189 (0.187)	0.0191 (0.179)
Constant	0.147*** (0.0189)		0.136*** (0.0245)		0.151*** (0.0278)	
Observations	42126	42126	18574	18574	23552	23552
Instruments		I2,I3,I4		I2,I3,I4		I2,I3,I4
Underidentification		0.0000		0.0000		0.0000
Weak identification		15.951		6.098		11.141
Overidentification		0.0852		0.1874		0.1259

Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01

Table 7 : Marginal effects after 2SLS of income on self-assessed health

	Whole population		Men		Women	
	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>
yearly household income equivalised, oecd, gross ⁽¹⁾	-0.0000373 (0.0000406)	0.0000895 (0.00184)	-0.0000343 (0.0000633)	0.0000523 (0.0214)	0.0000395 (0.0000523)	0.0000543 (0.00282)
aged between 25 and 34	-0.0143 (0.0138)	-0.0162 (0.0136)	-0.0360* (0.0184)	-0.0367** (0.0182)	0.00531 (0.0202)	0.00413 (0.0198)
aged between 35 and 44	-0.0108 (0.0164)	-0.0138 (0.0164)	-0.0186 (0.0222)	-0.0197 (0.0220)	-0.00149 (0.0238)	-0.00340 (0.0236)
aged between 45 and 54	-0.00783 (0.0186)	-0.0115 (0.0187)	-0.0185 (0.0253)	-0.0198 (0.0253)	0.00289 (0.0268)	0.000408 (0.0268)
aged between 55 and 64	-0.00897 (0.0214)	-0.0129 (0.0214)	0.00357 (0.0293)	0.00207 (0.0294)	-0.0158 (0.0307)	-0.0183 (0.0303)
1 adult with children	-0.00417 (0.0206)	-0.00232 (0.0202)	-0.0281 (0.0347)	-0.0277 (0.0342)	0.00263 (0.0269)	0.00372 (0.0263)
couple without children	-0.0271** (0.0126)	-0.0290** (0.0125)	-0.0249 (0.0160)	-0.0251 (0.0154)	-0.0291 (0.0197)	-0.0313 (0.0204)
couple with 1 child	-0.0285** (0.0145)	-0.0285** (0.0139)	-0.0271 (0.0195)	-0.0268 (0.0181)	-0.0315 (0.0217)	-0.0322 (0.0212)
couple with 2 children	-0.0309** (0.0152)	-0.0298** (0.0146)	-0.0315 (0.0208)	-0.0308 (0.0194)	-0.0311 (0.0225)	-0.0311 (0.0220)
couple with 2 + children	-0.0115 (0.0182)	-0.00921 (0.0178)	0.00983 (0.0252)	0.0110 (0.0237)	-0.0300 (0.0263)	-0.0293 (0.0262)
other household type	-0.0148 (0.0221)	-0.0140 (0.0206)	-0.0292 (0.0275)	-0.0287 (0.0270)	-0.00754 (0.0326)	-0.00754 (0.0299)
French-speaking region	0.0230 (0.0253)	0.0237 (0.0263)	-0.0299 (0.0293)	-0.0293 (0.0317)	0.0681* (0.0373)	0.0679* (0.0404)
Italian-speaking region	0.0144 (0.0939)	0.0134 (0.0908)	-0.00507 (0.0102)	-0.00514 (0.0107)	0.0270 (0.190)	0.0259 (0.183)
Constant	0.156*** (0.0198)		0.150*** (0.0247)		0.158*** (0.0299)	
Observations	36832	36832	16548	16548	20284	20284
Instruments		I2		I2		I2
Underidentification		0.0000		0.0000		0.0000
Weak identification		144.707		85.367		125.551
Overidentification		0.6826		0.2069		0.6154

Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01

⁽¹⁾ per 10'0000.

Table 8 : Marginal effects after 2SLS of deprivation on health impediment

	Whole population		Men		Women	
	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>
mutli-dimensional deprivation score	-0.000574 (0.000373)	-0.0148** (0.00732)	-0.00104* (0.000576)	-0.0319*** (0.0123)	-0.000238 (0.000488)	-0.00136 (0.00930)
aged between 25 and 34	0.0345* (0.0198)	0.0138 (0.0225)	0.0312 (0.0254)	-0.0128 (0.0352)	0.0381 (0.0300)	0.0364 (0.0308)
aged between 35 and 44	0.0872*** (0.0234)	0.0590** (0.0276)	0.0983*** (0.0312)	0.0348 (0.0444)	0.0811** (0.0345)	0.0789** (0.0370)
aged between 45 and 54	0.144*** (0.0261)	0.108*** (0.0322)	0.165*** (0.0358)	0.0875* (0.0513)	0.131*** (0.0378)	0.128*** (0.0431)
aged between 55 and 64	0.209*** (0.0288)	0.164*** (0.0367)	0.257*** (0.0402)	0.152** (0.0617)	0.177*** (0.0410)	0.173*** (0.0475)
1 adult with children	0.0244 (0.0233)	0.0419 (0.0260)	-0.00282 (0.0395)	0.00279 (0.0437)	0.0502* (0.0296)	0.0518 (0.0330)
couple without children	0.0187 (0.0159)	-0.000534 (0.0193)	-0.00881 (0.0216)	-0.0381 (0.0277)	0.0476** (0.0230)	0.0456 (0.0281)
couple with 1 child	0.0201 (0.0182)	0.00576 (0.0201)	-0.0130 (0.0261)	-0.0273 (0.0301)	0.0511** (0.0254)	0.0495* (0.0286)
couple with 2 children	0.0519*** (0.0192)	0.0430** (0.0203)	0.0174 (0.0279)	0.0129 (0.0310)	0.0849*** (0.0264)	0.0838*** (0.0281)
couple with more than 2 children	0.0290 (0.0237)	0.0235 (0.0241)	0.00938 (0.0344)	0.0212 (0.0384)	0.0506 (0.0324)	0.0494 (0.0332)
other household type	0.0341 (0.0257)	0.0323 (0.0255)	-0.00908 (0.0421)	-0.00784 (0.0442)	0.0695** (0.0325)	0.0691** (0.0320)
French-speaking region	-0.0501 (0.0540)	-0.0188 (0.0520)	-0.106 (0.0910)	-0.0267 (0.0865)	0.0161 (0.0572)	0.0183 (0.0616)
Italian-speaking region	0.0374 (0.233)	0.0544 (0.138)	0.319** (0.146)	0.398* (0.206)	-0.259 (0.316)	-0.259 (0.196)
Constant	0.279*** (0.0309)		0.255*** (0.0429)		0.286*** (0.0406)	
Observations	42126	42126	18574	18574	23552	23552
Instruments		I4		I4		I4
Underidentification		0.0000		0.0000		0.0000
Weak identification		22.454		8.748		14.173
Overidentification		0.7493		0.7847		0.9049

Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01

Table 9 : Marginal effects after 2SLS of income on health impediment

	Whole population		Men		Women	
	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>	<i>LPM</i>	<i>IV LPM</i>
yearly hh income oecd-eqivalized, gross ⁽¹⁾	0.00181** (0.0000751)	0.00322 (0.00261)	0.00254*** (0.0000943)	0.00119 (0.00326)	0.00109 (0.00106)	0.00484 (0.00377)
aged btw 25 and 34	0.0250 (0.0211)	0.0228 (0.0208)	0.0238 (0.0279)	0.0262 (0.0293)	0.0264 (0.0311)	0.0216 (0.0293)
aged btw 35 and 44	0.0719*** (0.0249)	0.0686*** (0.0248)	0.0804** (0.0337)	0.0841** (0.0351)	0.0671* (0.0361)	0.0595* (0.0347)
aged btw 45 and 54	0.128*** (0.0278)	0.124*** (0.0278)	0.136*** (0.0385)	0.140*** (0.0396)	0.124*** (0.0397)	0.114*** (0.0387)
aged btw 55 and 64	0.185*** (0.0309)	0.181*** (0.0310)	0.237*** (0.0436)	0.242*** (0.0450)	0.150*** (0.0435)	0.140*** (0.0425)
1 adult with children	0.0330 (0.0254)	0.0350 (0.0258)	0.0245 (0.0461)	0.0231 (0.0444)	0.0485 (0.0317)	0.0529 (0.0326)
c. without children	0.0202 (0.0172)	0.0180 (0.0179)	-0.00124 (0.0231)	-0.000339 (0.0243)	0.0421* (0.0253)	0.0333 (0.0266)
couple with 1 child	0.0289 (0.0197)	0.0289 (0.0197)	-0.000462 (0.0282)	-0.00153 (0.0287)	0.0542** (0.0276)	0.0514* (0.0274)
couple with 2 children	0.0546*** (0.0209)	0.0558*** (0.0209)	0.0249 (0.0306)	0.0226 (0.0309)	0.0821*** (0.0286)	0.0820*** (0.0287)
c. with 2+ children	0.0411 (0.0257)	0.0436* (0.0256)	0.0230 (0.0370)	0.0191 (0.0379)	0.0602* (0.0354)	0.0632* (0.0346)
other household type	0.0387 (0.0284)	0.0395 (0.0273)	0.00726 (0.0464)	0.00566 (0.0445)	0.0642* (0.0360)	0.0642* (0.0345)
French-speaking region	-0.0549 (0.0595)	-0.0541 (0.0555)	-0.116 (0.104)	-0.118 (0.0915)	0.0167 (0.0605)	0.0158 (0.0637)
Italian-speaking region	0.0391 (0.235)	0.0381 (0.143)	0.317** (0.146)	0.317* (0.166)	-0.258 (0.321)	-0.263 (0.204)
Constant	0.277*** (0.0329)		0.244*** (0.0467)		0.294*** (0.0428)	
Observations	36832	36832	16548	16548	20284	20284
Instruments		I2		I2		I2
Underidentification		0.0000		0.0000		0.0000
Weak identification		144.707		85.367		125.551
Overidentification		0.1035		0.1259		0.4729

Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01

⁽¹⁾ per 10'0000.

Chapter 4:

Polarization and inequality of earnings in Switzerland: Outcomes and trends

Abstract

This paper provides empirical evidence on changes in earnings inequality and polarization in Switzerland between 1999 and 2006, using data from the Swiss Household Panel. This work is new insofar as to our best knowledge no study on income polarization has been realized in Switzerland to date. We start by presenting the properties and axioms of inequality and polarization and show the links between those measures. We show that although inequality and polarization are two distinct concepts, some indices of inequality may be used to assess polarization. We then provide a decomposition analysis in order to identify which groups contribute most to overall polarization. Groups are defined exogenously, as in Zhang and Kanbur (2001). Results show a significant progress in inequality and reveal a phenomenon of bipolarization in the earnings distributions, with notable differences between groups. Polarization is highest when groups are identified by age and education, across all regions.

1. Introduction

Polarization has received much attention in recent years, both theoretically and empirically, as an alternative measure to inequality in income distribution analysis. Pioneered by Wolfson (1994, 1997) and Esteban and Ray (1994), these authors have separately conceptualized and developed measures of polarization, which turned to be rather different while sharing some common motivations. In Wolfson's bipolarization approach (1994), polarization represents essentially the shrinkage of the middle class and the consequent increase of individuals in the high and low tails of the income distribution. Esteban and Ray (1994), hereafter ER, propose an axiomatic measure of polarization based on the notions of intra-group identification and inter-group alienation, and related to the idea of social conflict. In both cases, polarization results from clustering around local poles and changes in specific parts of the income distribution that inequality measures fail to capture.

Axiomatically, the major difference between inequality and polarization lies on the *Pigou-Dalton transfer* principle, a fundamental property of all inequality measurement, according to which any transfer from a richer to a poorer person will result in a less unequal distribution but one which is also more polarized, when both individuals are on the same side of the median. So polarization and inequality are different but complementary dimensions of the same distribution, and a number of authors have shown how some of the properties of inequality indices can be used to build polarization measures (Zhang and Kanbur, 2001; Rodriguez and Salas, 2003; Chakrawarty et al. 2007, Deutsch et al. 2007).

Also, some authors have recently proposed extensions to the original Wolfson and Esteban and Ray measures. Among them, the axiomatic generalization of the Foster-Wolfson index (Wang and Tsui, 2000), the introduction of multidimensional indices of polarization (Montalvo and Reynal-Querol, 2005; Gagliarano and Mosler, 2009)³⁷ and new alternative measures of polarization taking into account the case of overlapping groups (Anderson, 2008). Several studies have examined the extent of polarization in different countries. For instance, Jenkins (1995a), D'Ambrosio and Wolff (2001), Gradin (2000), Zhang and Kanbur (2001) and Esteban et al. (2007) among others have provided

³⁷ The original characterizations focused on the so-called "pure income polarization", in which individuals are identified solely on the basis of their income levels.

empirical evidence on polarization in UK, USA, Spain and China and OCDE countries respectively.

Recently, a series of decomposition methods have also been proposed in polarization analysis, in order to assess the marginal contribution of income sources and/or population subgroups to overall polarization. For policy and redistributive purpose, it is indeed important to know which groups or income sources contribute most to distributional changes. Gradin (2000) was among the first to look at polarization in terms of socio-economic characteristics other than income using an extension of the Esteban and Ray (1994) approach, while D'Ambrosio (2001) proposed a non-parametric method of decomposition based on kernel density techniques and applied to social distance measures of polarization. In the same year, Zhang and Kanbur (2001) propose a straightforward but intuitive method to measure polarization in China when individuals are defined exogenously on the basis of characteristics other than income. In two recent papers, Deutsch and Silber (2008a and b) use the index of polarization suggested by Deutsch et al. (2007) to derive the marginal contribution of income sources and population subgroups to overall polarization, using the Shapley decomposition procedure originally introduced by Shorrocks (1999). Recently also, Araar (2008b) proposed a method to decompose the Duclos, Esteban and Ray (2004) index of polarization by income sources and population subgroups, with an application to Chinese and Nigerian data. In this paper, we will use the index and method proposed by Zhang and Kanbur (2001), based on the decomposition of the Generalized Entropy measures of inequality in within and between-groups and described in detail in Section 2.3.

Despite this rich theoretical and empirical literature, investigation in Switzerland on income polarization is still lacking. If Switzerland is a small but prosperous modern market economy with one of the highest GDP per capita in the world enjoying, thus, relatively high levels of welfare, the figures on the long-term evolution of income *per capita* (corrected by PPP) show a lower growth in comparison with EU countries and with the United States³⁸. Some authors have provided evidence on income distributions and inequality in Switzerland in multi-

³⁸ In 1970, the index of per capita income in Switzerland was almost 40% higher than in the EU countries and 25% higher than in the United States. In 2005, the gap between Switzerland and the EU reduced to 4%, and became even negative in comparison with the US (-15%) (cf. *Vie économique*, 4-2008).

country studies, such as Nielsen et al. (2005), and Piketty and Saez (2006), who focused mainly on the evolution of top-incomes. Others studied income inequality using exclusively national data (Leu et al., 1997; Burri, 1998; Ernst et al., 2000; Zürcher, 2004), and the main result one can extract from their works is that income inequality increased significantly between the early '80s and the early '90s.

But what happened since then? During this decade, the Swiss economy went through important structural and institutional changes. The most recent recovery at the beginning of this decade was also accompanied by major transformations, including the recent bilateral agreements signed with the EU/EFTA countries on the free mobility of people and implemented in 2002. No doubt that these structural adjustments affected the economic environment and the well-being of some parts of the population, raising new concerns on inequality and welfare issues in the public and political debates.

Historically, Switzerland has been a country of strong immigration, and its society is today widely multicultural, with resident and temporary foreigners making up around 22 percent of the total population and about one quarter of the total labour force (Gross, 2006). Immigration policy has undergone major changes in recent years, in order to attract more highly skilled immigrants and limit the arrival of unskilled workers. Though this policy has been relatively successful, an important number of unskilled workers continue to arrive because of the inertia produced by migration laws (e.g. family reunion). As a result, the group of recently arrived immigrants is highly heterogeneous with respect to skills. In addition, this increasingly active policy has been recently exacerbating the political pressure from some of the most xenophobic groups, with the government trying to accommodate their demands for stricter controls with the increased opportunities of foreign labour.

All these facets of the Swiss society might be reasons for potential conflicts between groups in their distribution of earnings that we will attempt to investigate in this paper, by examining how inequality and polarization of earnings for different groups in Switzerland have changed between the end of the '90s and today. The rest of the paper is organized as follows. The next section provides an overview of income inequality and polarization measurements, with their properties and decompositions. Section 3 describes the data used and gives

some descriptive statistics, while section 4 is devoted to the discussion of empirical results. Section 5 concludes.

2. Income inequality and polarization: basic concepts and properties

2.1. Measuring Inequality

Let y be a vector of incomes $(y_1, \dots, y_n) \in \mathbb{R}_{n++}$, with y_i the positive income of individual $i \in N = \{1, 2, \dots, n\}$, and $\bar{y} = \frac{1}{n} \sum y_i$ the arithmetic mean income. $F(y)$ is the cumulative distribution function of y , for y being in all points differentiable, $m(y)$ the median income and $\mu(y)$ the mean income respectively.

The Gini coefficient is defined as the average difference between all pairs of incomes, normalized by twice the mean, for incomes arranged in ascending order:

$$Gini = \frac{\frac{1}{n^2} \sum_i \sum_j |y_i - y_j|}{2\bar{y}}$$

In the case of continuous distributions, the Gini coefficient can be rewritten as:

$$Gini = \frac{1}{\mu_0} \int_0^\infty F(y)(1 - F(y)) dy$$

Although very appealing and easy to interpret, the Gini coefficient has shown several drawbacks. It is most sensitive to changes in the middle of the income distribution, but most importantly, it is not additive across subgroups, unless groups are strictly ordered by income and do not overlap.

An alternative class of measures to the Gini coefficient are the Generalized Entropy measures (GE). This is a large family of inequality indices that are able to capture the changes in different parts of the income distribution, depending on the value assigned to parameter c ³⁹:

$$GE(c) = \frac{1}{c^2 - c} \left[\frac{1}{n} \sum_{i=1}^n \left(\frac{y_i}{\bar{y}} \right)^c - 1 \right]$$

In particular, for values of c close to zero, these measures of inequality are sensitive to changes at the lower tail of the distribution, they are sensitive to

³⁹ For details on this class of measures and their properties, see Cowell (1980) and Shorrocks (1980).

changes at any point of the distribution when the parameter is equal to one, and sensitive to changes at the upper tail of the distribution for values higher than one:

For $c \in (0,2)$, these measures take the following forms⁴⁰:

$$GE(c=0) = \frac{1}{n} \sum_{i=1}^n \log \frac{\bar{y}}{y_i} \quad \text{is the mean logarithmic deviation}$$

$$GE(c=1) = \frac{1}{n} \sum_{i=1}^n \frac{y_i}{\bar{y}} \log \frac{y_i}{\bar{y}} \quad \text{is the Theil entropy index}$$

$$GE(c=2) = \frac{1}{y} \left[\frac{1}{n} \sum_{i=1}^n (y_i - \bar{y})^2 \right]^{\frac{1}{2}} \quad \text{is half the squared coefficient of variation}$$

Although less straightforward than the Gini index, these measures have the attractive feature of being additively decomposable, showing the “contribution” of different components of income or of population subgroups to overall inequality. Following Zhang and Kanbur (2001), we will exploit this class of inequality measures and its decomposition property to build our polarization measure.

The income inequality literature has also established the desirable properties that all inequality measures are required to meet:

1. *Anonymity*: inequality measures are independent of the individual characteristics except its income;
2. *Scale independence*: inequality measures do not change for uniform proportional increases of income;
3. *Population independence (Principle of Population)*: inequality measures are invariant to a replication of population size;
4. *Subgroup decomposability*⁴¹: inequality measures should be additive decomposable into its components of within and between inequality: $I_{\text{total}} = I_{\text{within}} + I_{\text{between}}$ ⁴²;

⁴⁰ Using a l’Hopital’s rule transformation.

⁴¹ Only the Generalized entropy class of measures satisfy this property. The Gini coefficient is decomposable only if the groups are not overlapping. The Atkinson class can be decomposed but the two components of within and between-group inequality do not sum to total inequality. Das and Parikh (1982) and Lasso de la Vega and Urrutia (2003) prove that the Atkinson index is in fact

5. *Pigou-Dalton transfer principle*: inequality decreases (or at least should not increase) when income is transferred from a richer to a poorer person⁴³.

The last axiom is fundamental in making the distinction between inequality and polarization.

Finally, although less satisfactory than the measures described above in terms of axioms and desirable properties, two additional measures of inequality have been added to our analysis for sake of comparison: the variance of logarithms and the coefficient of variation.

2.2. Measuring Polarization

The Wolfson bipolarization approach

Foster and Wolfson (1992) and Wolfson (1994, 1997), by putting forward the differences and similarities between inequality and polarization, were the first to formalize the concept in a bipolarization framework. In a society divided in two groups, the rich – individuals with income above the median, and the poor – those with income below the median, polarization represents the spread-out from the middle distribution, and the consequent decline of the middle-class⁴⁴.

The original Wolfson measure was derived from the Gini coefficient and formulated in the following equation:

$$P^w = 2 \frac{\mu}{m} (1 - 2L(0.5) - G) = \frac{T - Gini / 2}{m / \mu}$$

not additively decomposable, and propose a *factorial* decomposition method of the index into its within and between components.

⁴² Decomposability can apply to population subgroups, income sources and inequality levels across time (dynamic decomposition).

⁴³ With the exception of the variance of logarithms, most inequality measures satisfy this principle.

⁴⁴ The concept of *middle-class* may carry some ambiguity given the many and sometimes contradictory meanings given to it. The term here is simply used to refer to individuals with earnings around the median. But for a full discussion on the topic, see works by sociologists G.W. Mills, and D. Gilbert and H. College among others.

with $L(0.5)$ = the median share⁴⁵ and $T = 0.5 - L(0.5)$

Several extensions to the Wolfson index have been suggested in the literature. Wang and Tsui (2000) proposed an axiomatic generalization of the Foster-Wolfson index using the two axioms of increased bipolarity and increased spread, while Rodriguez and Salas (2003) reformulated the measure in terms of between-group and within-group Gini coefficients. Recently, Deutsch et al. (2007) also proposed a new index of bipolarization derived from a measure of skewness originally introduced by Berrebi and Silber (1989) and similar to the Pearson's measure of kurtosis.

The Esteban and Ray axiomatic approach

The second major approach to polarization was introduced by Esteban and Ray (1994) and is based on the notions of "identification" and "alienation". In their conception, in a society divided into groups or classes⁴⁶, polarization represents essentially the clustering of homogenous groups that antagonize each other. In this context, identification reflects the sense of belonging (or homogeneity) of individuals to a same group, while alienation measures the distance between groups.

The size of the groups is relevant, in that it increases the feeling of identification. The more the groups are identified and their opposite interests are higher, the more the society is said to be polarized. Hence, polarization arises from three main forces:

1. *identification*, reflecting the intra-group homogeneity;
2. *alienation*, reflecting the inter-group heterogeneity (an increasing function of the Gini coefficient);
3. *group size*, a small number of groups of relevant size increasing identification;

⁴⁵ The median share is defined as the share of earnings pertaining to the bottom half of the population.

⁴⁶ Groups can be identified in terms of income, in a pure income polarization approach, or in terms of socio-economic or individual characteristics, such as education, race or religion.

The ER polarization measure is therefore given by the “sum of all effective antagonisms” that may reinforce or counterbalance each other:

$$P^{ER}(\pi, y) = K \sum_{i=1}^n \sum_{j=1}^n \pi_i^{1+\alpha} \pi_j |y_i - y_j|$$

with K a normalizing constant greater than 0, π_i the sample weight of the i 'th observation, and α the “polarization sensitivity” factor capturing the importance of group identification⁴⁷. It is easy to see that when $\alpha=0$, the ER polarization measure reduces to the Gini coefficient. So what makes polarization fundamentally different from inequality is the *identification* component, captured by parameter α and increasing with the size of the groups.

An important aspect to point out is that the attributes and the way in which individuals are identified or grouped is done *ex-ante*, through the choice of parameter α , which implicitly captures the value judgment of the expert, thereby adding a degree of arbitrariness in this measurement.

In this characterization, polarization may appear as a potential cause of social conflicts and political instability. The alienation (or distance) between groups in the society, in fact, reinforced by the sense of identification of individuals to their own group, may result in greater tensions and unrest between groups in the society.

We can see here the essential differences with Wolfson's approach. While the latter assumes the society divided into two groups of equal size, the rich and the poor divided by the median, and defines polarization as the decline of the middle class, the Esteban and Ray approach allows n groups of potentially different size to antagonize each other, and has more to do with the potential social conflicts arising between groups⁴⁸.

An extension of the original Esteban and Ray measure of polarization was proposed by Estaban, Gradin and Ray (2007) in order to correct for intra-group inequality, thus minimizing the dispersions within the groups:

⁴⁷ Esteban and Ray (1994), in their original work, attributed a value of about 1.6 to the identification parameter.

⁴⁸ While the Wolfson approach is to some extent purely economic (as based on income groups divided by the median), the approach by Esteban and Ray incorporates more clearly social and political dimensions.

$$P^{EGR}(f, \alpha, \beta) = ER(\alpha, \rho^*) - \beta \varepsilon[f, \rho^*] \quad \text{with } \varepsilon(f, \rho^*) = G(f) - G(\rho^*)$$

where $G(\cdot)$ represents the Gini coefficient in its argument, ρ^* the correct representation of the n-groups (or modes) that minimize the error, and β a free parameter capturing the weight given to the measurement error or “lack of identification” (EGR, 2007).

The Esteban and Ray measure, originally conceived for *discrete* distributions, was further extended by Duclos, Esteban and Ray (2004) to *continuous* distributions:

$$P^{DER}(f) = \int \int f(x)^{1+\alpha} f(y) |y - x| dy dx \quad \text{with } \alpha \in [.25, 1]$$

In this case the area of the identification is determined by non-parametric kernel techniques, avoiding fixing the income ranges arbitrarily in order to identify groups. Also, this measure is normalized by population size and income scale, a property that is fundamental when comparing distributions.

The original ER measure and its extensions were conceptualized in order to satisfy a set of desirable axioms, defined as follows:

Axiom 1 - if a distribution is composed of a single density, then a mean-preserving reduction cannot increase polarization.

Axiom 2 - if a symmetric distribution is made up of three basic densities, then a mean-preserving reduction in the outer densities cannot reduce polarization⁴⁹.

Axiom 3 - if a symmetric distribution is made up of four basic densities with disjoint supports, then a separation of the two central distributions toward the extremes must increase polarization.

Axiom 4 (population-size invariance): given two distributions F and G , $P(F)$ and $P(G)$ being the respective polarization indices, if $P(F) \geq P(G)$, then it must be that $P(\alpha F) \geq P(\alpha G)$, where αF and αG represent rescaled versions of F and G ⁵⁰.

⁴⁹ By pooling in fact two masses closer without changing the distance from a third mass, identification increases, and so does polarization.

⁵⁰ In a more recent paper comparing various measures of polarization, Esteban and Ray (2005) introduce three additional axioms to characterize polarization. We refer the interested reader to their original paper for a full discussion on these properties.

2.3. Decomposing inequality and polarization by subgroups

When inequality measures are additively decomposable, as for the case of the General Entropy measures, total inequality can be decomposed by population subgroups (at one point in time), by income sources as well as across time⁵¹. For a decomposition across groups:

$$I = I_W + I_B = \sum_{j=1}^n w_j^\alpha f_j^{1-\alpha} GE(\alpha)_j + \frac{1}{\alpha^2 - \alpha} \left[\sum_{j=1}^n f_j \left(\frac{\bar{y}_n}{\bar{y}} \right)^\alpha - 1 \right]$$

where $f_j^{1-\alpha}$ is the population share, and w_j^α the income share of each partition.

This is indeed an attractive feature that allows assessing the contribution of the between-group and within-group inequality components for each group to overall inequality.

Zhang and Kanbur (2001) exploit this property to show that when population subgroups are defined exogenously, i.e. independently of income, the ratio of inequality between-groups to inequality within-groups can be regarded as a measure of polarization:

$$P = \frac{I_B}{I_W}$$

This ratio, in fact, captures the conflicts (the divide) *between* groups, given the spread or differences *within* each group. We can immediately see, in fact, that polarization increases with higher between-group inequality (the “alienation” effect) but increases also when groups become internally more homogenous, i.e. with lower within-group inequality or, alternatively, higher homogeneity within-groups, capturing the “identification” effect. This approach emphasizes well the difference between inequality and polarization, as any Pigou-Dalton transfer above the median or below the median that in fact lowers inequality, increases polarization.

⁵¹ For a full review on inequality decomposition methods, see Shorrocks (1980, 1984), Cowell (1989), Silber (1989), Lambert and Aronson (1993) and Jenkins (1995b), among others.

While we suppose that distributions may be polarized “purely” in terms of income, polarization may also take place between non-income groupings, that is groups that identify themselves on the basis of other socio-economic attributes. For this purpose, we compute levels of inequality and polarization for exogenously defined groups, following the approach defined by Zhang and Kanbur (2001) and using one of the generalized entropy measures of inequality. The groups are defined in terms of age, education, nationality (i.e. Swiss or not) and gender. Our analysis is carried out for each characteristic separately, and then by a combination of the same variables clustered together. In this case, each reference group is formed by individuals having the same nationality, gender, and about the same age group and educational level, giving a total of 24 subgroups⁵².

3. Data and descriptive statistics

The analysis is based on the first eight waves of the Swiss Household Panel (SHP), covering the period 1999-2006. The SHP started in 1999 as part of the project *Living in Switzerland* run by the National Science Foundation, the Swiss Federal Statistical Office and the University of Neuchâtel. The original sample consists of around 13'000 respondents aged 15 and over and belonging to more than 5'000 households. The annual questionnaires are set on a Computer-Assisted Telephone Interview and held in French, German or Italian depending on the preference of the respondent. People are interviewed on individual and household characteristics in a broad range of subjects, going from all sources of income to living conditions, including housing, health and leisure activities. Subjective assessments are also given along with factual information.

Our main variable is based on earnings, and corresponds to the yearly gross personal income from work, including wages, 13th and 14th month salary and gratifications and before social deductions. For the purpose of our paper, we kept all individuals in working age between 18 and 64 years old and working full-time, obtaining a total sample of around 4'000 individuals at the beginning of the period. Finally, taking into account the initial non-response, we used the appropriate cross-sectional sample weights in order to correct for sample selection bias.

⁵² See the Appendix for details on the formation of reference groups.

Table 1 reports summary statistics for 1999 and 2006 for earnings. We observe that both the mean and the median levels increased over the period, with a mean of almost 70'000 Swiss francs in 2006. Decomposing the statistics by subgroups shows that earnings are consistently higher for Swiss and educated individuals (Table 2 and 3). As expected, earnings are also higher among the adult population, and for men compared to women. In order to get a flavour on polarization, Table 4 provides some middle-earnings statistics regarded as traditional bipolarization measures (Wolfson, 1994). The figures show that the proportion of individuals in the centre of distribution decreased significantly over the period (about 22 percent for the median share and for individuals ranging between 80 and 150 percent of the median), revealing an apparent phenomenon of bipolarization in the earnings distribution in Switzerland.

4. Empirical Results

Figure 1 shows that inequality increased between 1999 and 2006, with a significant rise after 2001, the mean logarithmic deviation attaining almost 0.60 by the end of the period⁵³. The Gini index also increased from 0.38 to 0.45, a result contrasting with the decrease in earnings inequality found by Bolzani and Abul-Naga (2002) for the precedent decade, but very similar to those obtained by Araar (2008a) for Canada. These comparisons are interesting but are to be taken with caution, as the former use a different dataset for Switzerland (the Swiss Labour Force Survey)⁵⁴, while Araar's estimations are based on household total incomes.

The increasing trend in inequality is also observed in terms of polarization (Figure 2). The Wolfson index, around 0.3 over the period, appears in all points higher than the DER index, independently of the weight given to parameter α (the "identification" effect), a result suggesting a case of bipolarization in the distribution of Swiss earnings anticipated by descriptive statistics (Table 4). A notable increase in polarization is particularly observed from 2002, and one

⁵³ Table A.1 in the Appendix reports the trends in earnings distributions using a whole set of inequality measures.

⁵⁴ K ng Gugler and Blank (2000), using the same data but excluding independent workers from their sample, found only a slight increase in earnings inequality between 1992 and 1997.

explanation could be found in the labour market situation, unemployment registering an almost 60 percent variation between 2002 and 2005.

Decomposing by population subgroups, inequality appears systematically higher among women, although the spread reduces over the period (Figure 3.1). This result is hardly surprising, partly explained by gender segregation and discrimination characterizing labour markets. In terms of age, inequality has more than doubled among the young and less educated population (Figures 3.2 and 3.4), possibly due to a more “unequal” access to the labour market and the rising role of human capital premiums to education. Finally, differences in earnings are also higher among the non-natives, and one of the reasons can be found in the effect of the Bilateral agreements (2002), which pushed up earnings along with inequality. In all cases, the rise in inequalities resulted mainly from differences *within* groups, rather than from differences *between* group means.

After focusing on a “pure earnings” analysis, we compute polarization between groups defined exogenously, assuming that group identification can also take place on the basis of socio-economic characteristics other than earnings. We use in this case the Zhang and Kanbur (2001) measure of polarization, given by the ratio of between-group to within-group inequality and using the mean-logarithmic deviation measure of inequality. The Gini index is also included in the tables for sake of comparison. We first assess the levels of earnings inequality and polarization for groups defined by nationality, given the significant proportion of foreigners living in Switzerland. Surprisingly, results are statistically non significant. The “alienation” effect is extremely low, resulting in a level of polarization close to zero (Table 5). Polarization, however, becomes apparent when groups are identified in terms of nationality coupled with education (Figure 7). In this case, polarization is statistically relevant, but decreases over the period, as a result of reduced distance *between* groups, reinforced by increasing inequalities *within*-group (weak “identification”). Polarization appears clearly highest and moving upward (around 0.35 by the end of the period) when groups are identified by age and education (Figure 6). In this case, the rise in the distance between groups is slow, but is counterbalanced by a significant increase in the spread within groups. This result is important, suggesting that the degree of identification within a group may play an important role in explaining polarization of earnings in Switzerland.

5. Conclusion

The goal of this paper is to provide an empirical analysis of earnings inequality and polarization in Switzerland, for the period 1999-2006. After reviewing the basic properties and measures of inequality and polarization, we focus on the decomposition of polarization by population subgroups. Based on the measure proposed by Zhang and Kanbur (2001), we decompose one of the Generalized entropy measures in between and within-group inequality for exogenously defined socio-economic groups.

Results showed that inequality increased, particularly after 2001, a period of rising unemployment in Switzerland and important changes such as the implementation of the Bilateral agreements with the EU countries. Inequality resulted mainly from the rise in the within-group components and concerned more particularly less educated young people, revealing a problem of selection in the access to the labour market. In terms of polarization, the significant increase in the Wolfson index revealed the emergence of a more bipolarized society in terms of earnings distributions. Polarization is particularly high for groups defined exogenously by age and educational levels, a result proving that earnings polarization is also relevant when individuals identify themselves in socially-based rather than income-based reference groups.

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TABLES and FIGURES

Table 1: Summary statistics for earnings (gross)

	Obs	Mean	Median	Std. Dev.	Min	Max
1999	3887	64656	58786	53534	169	1170000
2006	2439	69340	60200	81226	100	2640000

Table 2: Summary statistics for earnings, by subgroups (1999)

	Obs	Mean	Median	Std. Dev.	Min	Max
Man	1983	85556	77350	54952	169	770000
Woman	1904	42889	39000	42166	169	1170000
Swiss	3406	65529	59888	55476	169	1170000
Non-swiss	481	58469	54600	36423	2400	360000
Prim educ	554	38464	33554	29856	169	180000
Sec educ	2345	57771	54600	45703	169	1170000
Tert educ	967	96306	89726	66453	360	770000
Young	840	41121	44200	25589	169	140000
Adults	3047	71144	65000	57280	169	1170000

Table 3: Summary statistics for earnings, by subgroups (2006)

	Obs	Mean	Median	Std. Dev.	Min	Max
Man	1168	96215	87100	194226	290	2640000
Woman	1271	44644	39000	37533	100	555560
Swiss	1839	75001	68340	66101	330	1339000
Non-swiss	195	84737	65000	189629	390	2640000
Prim educ	522	28526	13040	36035	20	420000
Sec educ	1301	62101	60000	43456	200	518000
Tert educ	597	111025	98000	138189	330	2640000
Young	453	35094	26090	38094	100	518000
Adults	1986	77152	69010	86280	330	2640000

Table 4: Traditional polarization measures

			Population share in ranges of median income	
	Median share	Median/Mean	80-150%	60-200%
1999	23.07	0.926	36.07	60.72
2000	24.67	0.916	40.36	64.28
2001	24.41	0.911	39.11	62.45
2002	23.19	0.926	36.14	58.40
2003	20.90	0.896	32.56	56.39
2004	19.73	0.898	30.41	54.29
2005	19.05	0.905	30.94	52.34
2006	17.95	0.874	28.17	50.99
Δ (99-06)	-22%	-6%	-22%	-16%

Figure 1: Trends in inequality (1999-2006)

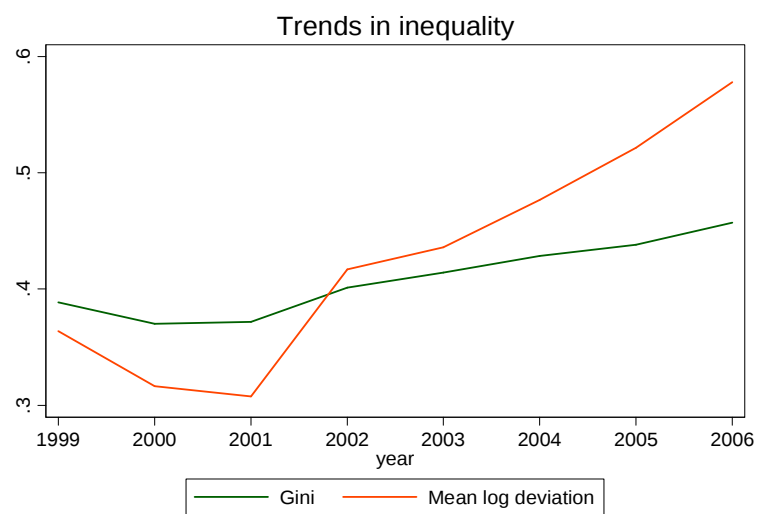
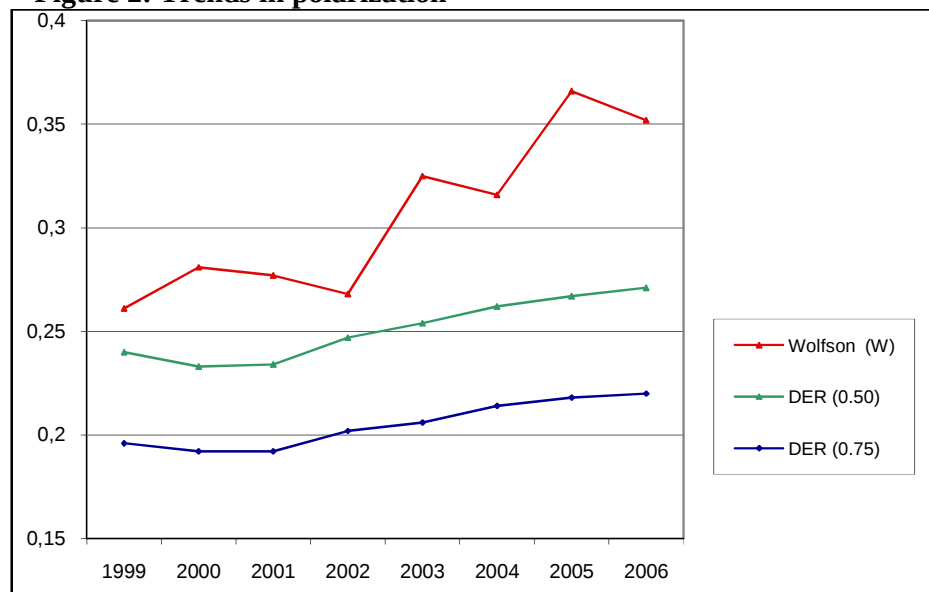
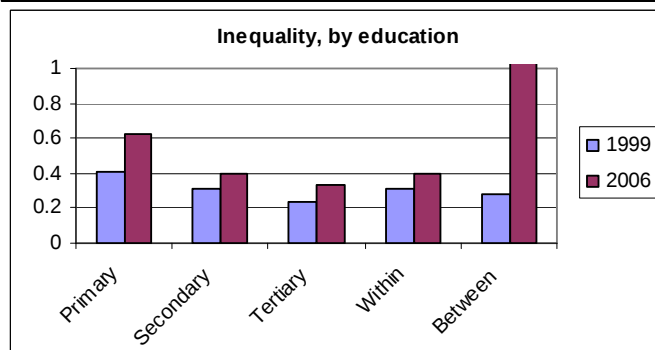
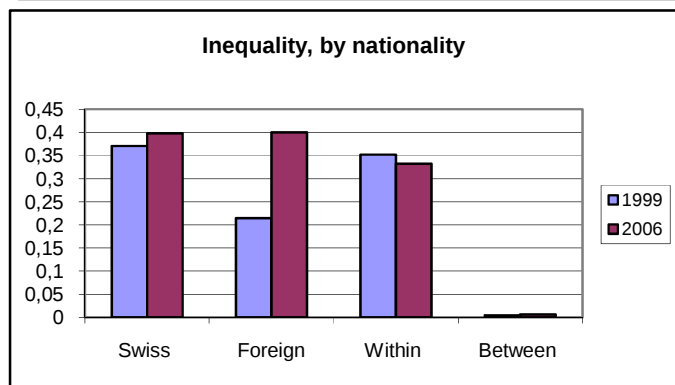
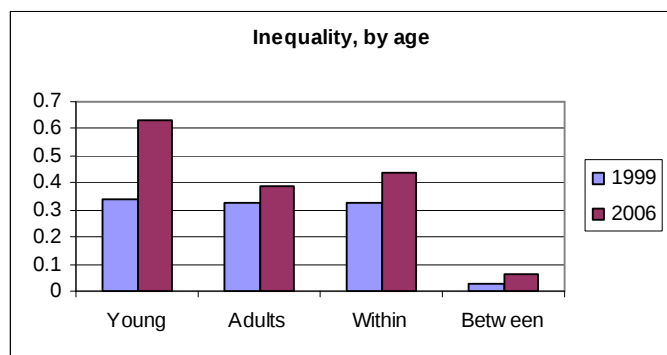
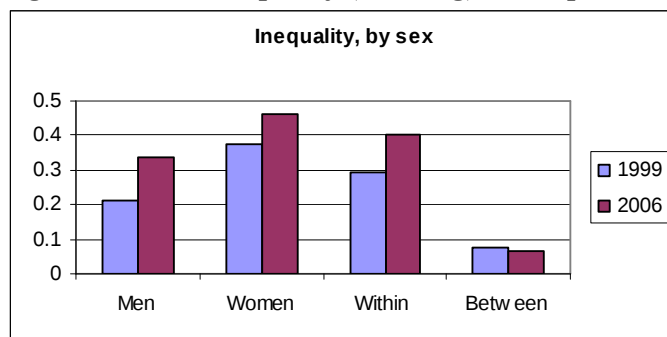


Figure 2: Trends in polarization



Note: The DER index is computed using CF-kernel estimation. Confidence interval: 95%

Figures 3.1-3.4: Inequality (meanlog) decompositions, by subgroups



Note: The between-group inequality is bounded to 1, with a real value equal to 4.22.

Figure 4: Inequality (meanlog) decomposition, by nationality and education

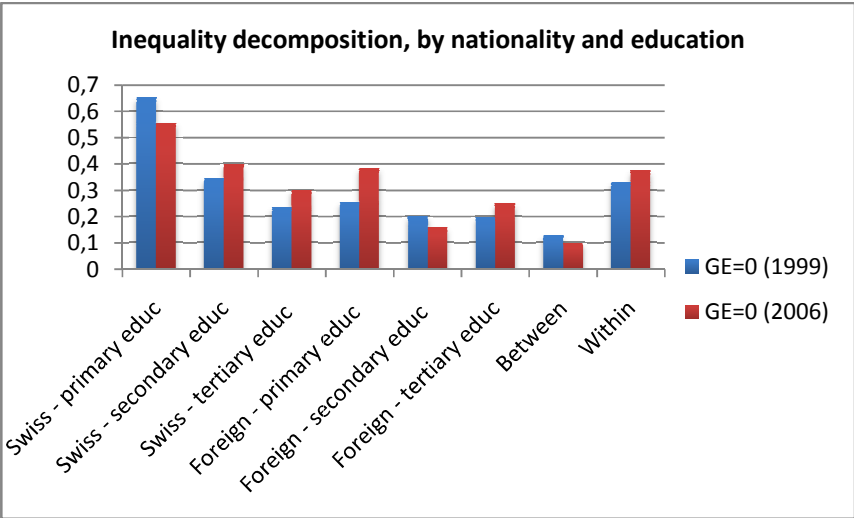


Figure 5: Inequality (meanlog) decomposition, for all groups

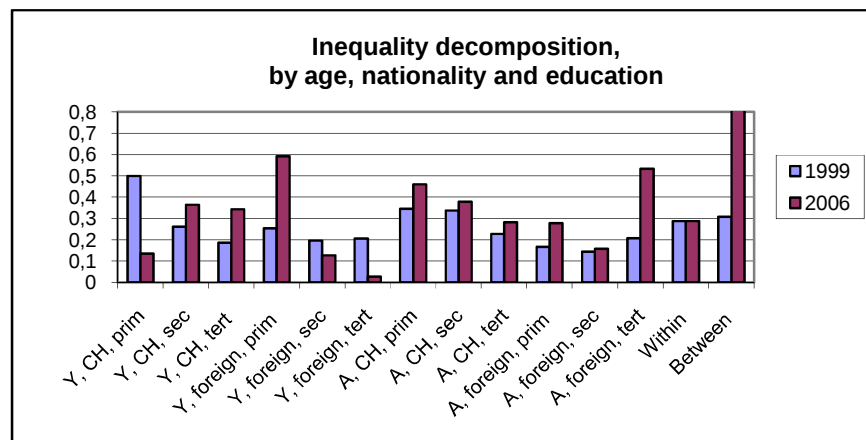
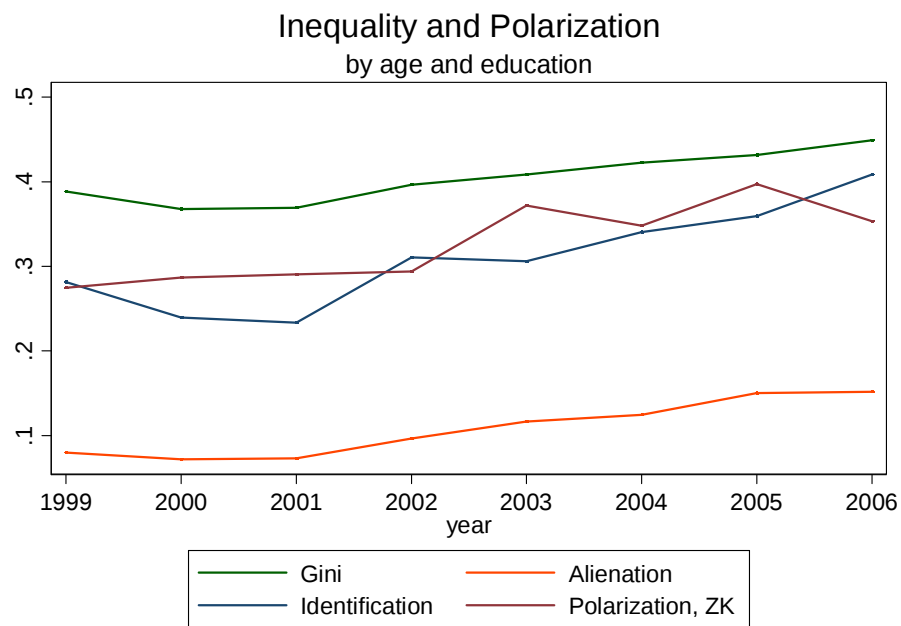


Table 5: Inequality and Polarization, by nationality

Year	Gini	GE ($\alpha=0$)	Polarization (ZK)	Identification	Alienation
1999	0.389	0.364	0.0013	0.363	0.00049
2000	0.370	0.316	0.0000	0.316	0.00000
2001	0.372	0.308	0.00009	0.308	0.00003
2002	0.401	0.417	0.00002	0.417	0.00001
2003	0.414	0.436	0.00016	0.435	0.00007
2004	0.429	0.477	0.00081	0.476	0.00039
2005	0.438	0.522	0.00034	0.521	0.00018
2006	0.457	0.578	0.00087	0.577	0.00005

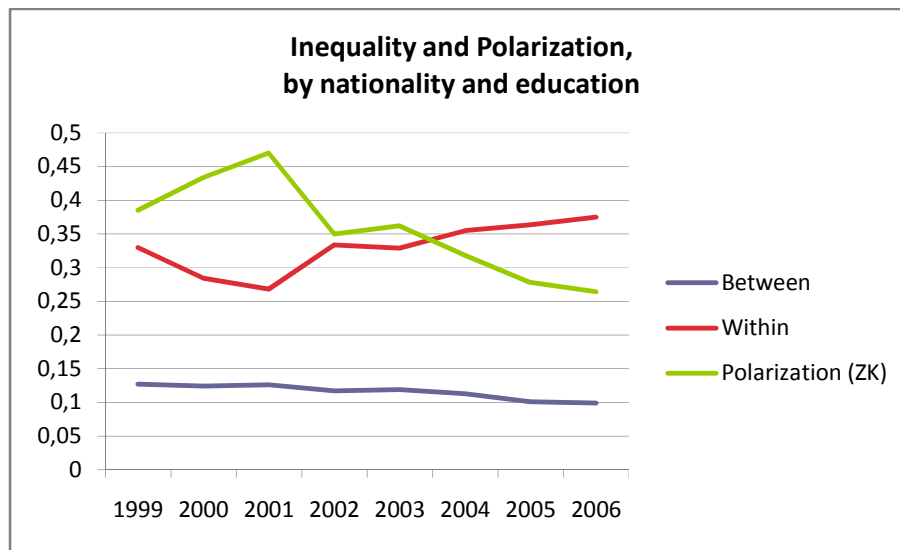
Note: Polarization is measured using the generalized entropy index and its components, as in Zhang and Kanbur (2001), where *alienation* represents the between-group inequality and *identification* the within-group inequality component. Within-group and between-group inequality are both measured using the mean-logarithmic deviation (GE index with $\alpha=0$).

Figure 6: Inequality and Polarization, by age and education



Note: Polarization is measured using the ratio of the generalized entropy index and its components (with $c=0$), where *alienation* represents the between-group inequality component and *identification* the inverse of the within-group component.

Figure 7: Polarization, by nationality and education



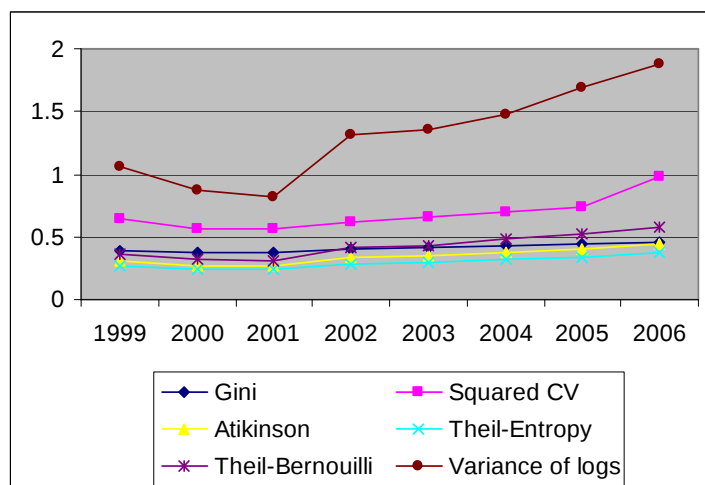
Note: Alienation is given by the between-group component, and identification by the inverse of the within-group component of inequality, measured here by the meanlog deviation (GE with $c=0$).

Appendix

Table A.1: Description of variables used in decomposition analysis

Variable Name	Variable description
Age	Categorical variable for age in year of interview (0=children 0-17, 1=young 18-29, 2=adults 30-64, 3=elderly >65)
Education	Categorical variable for the highest education level achieved (0=primary, 1=secondary, 2=tertiary)
Nationality	Binary variable for citizenship (0=native, 1=non-native)
Sex	Binary variable for sex (0=men, 1=women)

Figure A.1: Trends in inequality (all indices)



Conclusion

The present section reviews the key findings of this thesis, discussing their policy implications and proposing some suggestions for future research.

Each chapter aimed at analyzing a specific aspect of welfare in Switzerland in a recent period of socio-economic turbulence, using data from the Swiss Household Panel. Starting from a multidimensional analysis of deprivation (Chapters 1), we naturally extended this study to a dynamic framework, to assess the extent of social exclusion between 1999 and 2004 (Chapter 2). In Chapter 3 we used the same longitudinal data to look at the effect of income and multidimensional deprivation on health status. The final chapter moved to distributional analysis, by examining recent trends in polarization and inequality of earnings, providing a decomposition analysis by socio-economic groups.

The aim of the first chapter was to characterize multidimensional deprivation in Switzerland between 1999 and 2004, in a comparative analysis with traditional income poverty. Our results indicated significant differences among dimensions. While in 1999 only one over ten was deprived in the possession of durables, two-third of the population was experiencing some degree of deprivation in housing, in terms of dwelling and environmental conditions. Housing was also the least correlated with income, a result in line with previous studies and some theoretical intuitions, suggesting that housing is probably more correlated to some forms of long-term income and savings than to current income employed in the present study. A detailed analysis of the income-deprivation link showed that, for all dimensions, income and deprivation did not follow the same pattern. Correlations are very low, and the relation on the income distribution is non-linear, confirming that current income is not an appropriate nor a sufficient measure of well-being. All dimensions appeared, indeed, as complementary aspects of deprivation, a result that is crucial for correct policy targeting.

Comparing profiles of poverty, we found that in 1999, 6.7 percent of the population was identified as income poor, against 7.4 percent of individuals deprived. Only 1.24 percent of those were classified as simultaneously poor and deprived (or “consistently poor”), and these proportions remained quite stable over the period.

Results from multivariate analysis showed that along with education, unemployment was by far the major determinant of deprivation, increasing the probability of being deprived by 16 percent compared to an individual who was employed, an effect much weaker though on income poverty. Surprisingly, other variables, like age and gender, came out non significant on either of the two outcomes. Finally, living in a single-parent or large family proved to be an important risk factors for both poverty and deprivation.

With more data availability, it would have been interesting to include in the analysis some forms of long-term income or wealth, which would possibly represent a better approximation of living standards than current income.

The objective of Chapter 2 was to extend the analysis of the previous chapter to social exclusion, an original contribution as to our knowledge virtually no study on social exclusion has been realized in Switzerland to date. Social exclusion is clearly a complex and multidimensional phenomenon, and there is still no consensus on how to define and measure it correctly. In this work, we followed the suggestions given by Atkinson (2002) and Bossert et al. (2007) and defined social exclusion as the *dynamic* process of deprivation, arising when conditions of deprivation persists or worsens over time. Descriptive analysis showed that social exclusion was higher in the housing and financial areas, with mean scores well over 10, and three times higher than in the other dimensions. Social exclusion appeared also higher among foreign residents and younger individuals, as well as in single-parent families. Multivariate analysis performed using a two-part model estimation indicated that the effects of the explanatory factors were systematically higher on social exclusion than they were on deprivation. Education and unemployment were found to increase significantly both the probability and levels of social exclusion in Switzerland.

The relation between poverty and health represented the focus of Chapter 3. While there is consistent evidence of a graded association between socio-economic status and health, the nature of the relationship is not yet clearly understood. Using the same dataset as in the first two chapters, the aim of this chapter was to shed some light on this issue, trying to evaluate the effect of income and multiple deprivation on health outcomes, with a particular focus on mental health.

Non-linear logistic regressions, while extensively used in this literature, fail to capture the potential endogeneity of income on health. The specification of a two-step instrumental variable method in this paper allowed us control for the potential endogeneity by the inclusion of four instruments in the model. Moreover, the use of panel data contributed to capture the individuals' unobserved heterogeneity, an issue extremely relevant in this context.

Our results showed that, after instrumenting, the effect of income and deprivation on health was significant, but extremely small in magnitude, a result that must be however interpreted with caution, considering the potential weakness of some instruments. On the other hand, some confounding factors appeared to have a strong effect on health, after controlling for other socio-economic variables. The household structure had a significant and strong effect on both self-assessed and mental health, particularly for women. Age was also an important factor increasing the likelihood of adverse health.

This paper showed that income and deprivation are only weakly related to poor health, a result revealing the complexity of the relation and the need to obtain additional evidence about the mechanism of this linkage. If poverty is only weakly related to health, it might be in fact that other social, biological or psychological factors may be acting as mediating mechanisms in such relationship. Future research in this direction would be extremely useful, in order to identify those factors and unravel the complex underlying structure between poverty and health.

Further, we did not preclude the possibility of a reverse causation between poverty and health, in other words that mental disorders may be actually the *cause* of deprivation, an issue that would be extremely important to address in order to break this “vicious circle” and define appropriate policy strategies. Future improvements in this direction might include the use of structural equation models. While not eliminating the bias mentioned above, these models could help to track all potential causal paths between the entire set of variables (endogenous, exogenous and dependent). This extension would certainly rise new econometric challenges, but some that it would be worth facing given the serious policy implications and high costs to the society of mental health burdens.

While limiting access to health care and increasing health-risk behaviours, poverty drives also progressively individuals into social isolation, accelerating the occurrence of mental health problems. The association between social exclusion

and mental illness, therefore, would be also interesting to investigate in this context. As Edith Morgan, Chair of the “Focus, Poverty and Mental illness” forum in UK as put: “Surviving on a low income is a struggle at the best of times. But for people with mental health problems it is particularly tough. The stigma and discrimination which users of mental health services face on a daily basis, still regrettably widespread, make them amongst the most socially excluded groups in the society”. Authorities and policy makers should be wary of these risks, finding ways to alleviate poverty and improve access to health care, but at the same time setting the conditions for more vulnerable individuals to continue to fully participate in the society.

Finally, the last chapter was devoted to the measurement of polarization and inequality of earnings between 1999 and 2006. The purpose was to offer an analysis of earnings distributional patterns in Switzerland, in a period of economic slow-down, complementing for the first time inequality with polarization measurements, and providing a decomposition analysis by socio-economic classes.

Our results reported an increase in inequality of earnings in Switzerland, particularly since 2002, and showed the emersion of a higher bipolarized society. The rise in inequality resulted mainly from higher between-group (higher distance between earnings classes), and increased mostly among less educated young people, revealing a potentially more “unequal” access to labour market, and the need for higher investments in human capital to foster education of the younger. Polarization is also higher for groups identified (exogenously) by age and education, for all regions. Finally, inequality and polarization among the foreigners increased, possibly as an effect of the Bilateral agreements signed in 2002 between Switzerland and EU members, which pushed up income levels along with inequalities.

A large body of evidence have also shown that inequalities are among the major determinants of poor health (Marmot, 1999, Wilkinson, 1997 among others). Polarization, as a potential source of social conflicts and alienation between groups, might also affect individual health, as found in a recent study by Blanco Perez and Ramos (2008), an aspect that is worth exploring in future research.

This thesis has attempted to address some of the issues that have been animating social welfare debates over the last twenty years or so, suggesting new ways of thinking about welfare. It has taught us that different aspects of welfare are indeed intrinsically interrelated, and would need to be analyzed clearly in a multidimensional framework. Results have confirmed that income is only one facet of poverty, and that policy should also focus on other dimensions, in order to understand and reduce the risk of multiple forms of poverty. Social exclusion involves the need to consider a larger time window in the analysis of deprivation. The cumulative experience of deprivation may have short-term consequences, but more importantly, it may trap individuals into long-term spells of deprivation, with additional consequences on future attainments and health outcomes.

From a policy perspective, it is therefore essential to understand the interconnections between these phenomena, and this thesis should provide some guidelines to structure a complex set of strategies able to combat the multiple forms of disadvantage. Effective policies should involve not only social assistance, but also labour markets regulations, as well as interventions from public health and the educational system, in order to tackle and break the vicious circle between all sorts of disadvantage. While cash transfers, for instance, would more easily help individuals to get out of economic poverty, investments in human capital would contribute to reduce inequalities and increase the probability of keeping them out of poverty.

The recent economic and financial crisis that has erupted in the last couple of years should be a good reason to keep monitoring these phenomena. This crisis has been one of the sharpest global downturns in the last forty years, and as in many other countries, it has been hitting the Swiss economy particularly hard. Even though some experts see Switzerland well armed to face it in the near future, the long-term effects are still uncertain. Behaviours of individuals, firms and financial institutions will most likely be changing in the near future, with considerable consequences on the overall economy and living conditions of many. Government authorities and policy makers will have to be ready to respond with the most appropriate policy strategies.