Working Paper Series

Why has happiness inequality increased? Suggestions for promoting social cohesion

Leonardo Becchetti
Riccardo Massari
Paolo Naticchioni

ECINEQ WP 2010 – 177

ECINEQ 2010-177
August 2010

www.ecineq.org

Why has happiness inequality increased? Suggestions for promoting social cohesion

Leonardo Becchetti *
University of Rome Tor Vergata

Riccardo Massari
University of Rome La Sapienza

Paolo Naticchioni
Univ. of Cassino, Univ. of Rome La Sapienza, CeLEG (LUISS)

Abstract

The paper focuses on happiness inequality, an issue rather neglected in the literature. We analyze the increase in happiness inequality observed in Germany between 1991 and 2007 by means of the German Socio-Economic Panel (GSOEP) database. We make use of a recent methodology that allows decomposing the change in happiness inequality into the composition and the coefficient effect for each covariate. We find that the increase in happiness inequality is mainly driven by changes in the composition of covariates, while coefficient effect is negligible, i.e., returns from happiness "fundamentals" are stable over time. Among composition effect, the rise in happiness inequality is explained –among others- by labour market conditions. Furthermore, the increase in education levels has an inequality-reducing impact on happiness. One clear cut policy implication of our paper is that policies enhancing education and labour market performance are crucial to reduce happiness inequality and the potential social tensions arising from it.

Keywords: happiness inequality, education, income inequality, labour market performance.
JEL Classification: A13, I28, J17, J21, J28.

* **Address of correspondence**: Universita di Roma Tor Vergata, Facoltà di Economia, Dipartimento di Economia e Istituzioni becchetti@economia.uniroma2.it

1. Introduction

The investigation of the determinants of happiness has been one of the most salient topics of economists since the Classics. In his famous quote Malthus (1798), when commenting Adam Smith's *Wealth of nations,* says that: "*The professed object of Dr. Adam Smith's inquiry is the nature and the causes of the wealth of nations. There is another inquiry, however, perhaps still more interesting, which he occasionally mixes with it, I mean an inquiry into the causes which affect the happiness of nations*". In the history of economic thought the relevance of the investigation on the wealth-happiness nexus was also recognised, among others, by Malthus (1798), Marshall (1890), Veblen (1899) and, more recently, Dusenberry (1949) and Hirsch (1976). The topic at that time could be tackled only on philosophical grounds whereas, since a few decades, the wide availability of databases including measures of self declared life satisfaction has provided abundant empirical evidence for testing hypotheses stemming from the happiness debate.[1]

Within this framework the motivation for our paper may be illustrated by bringing the Ricardo's sentence from the field of growth to that of inequality: if the analysis of income inequality is of great salience for economists, that of happiness inequality may be even more interesting. On the one hand, the analysis of happiness inequality can contribute to the wide debate concerning the consequences of income and wage inequality on wellbeing (Fehr and Schmidt, 1999; Ferrer-i-Cabonell, 2005). On the other hand, understanding the determinants of happiness inequality might provide useful suggestions for policy measures aimed at monitoring social cohesion and wellbeing, since the presence of a wide life satisfaction gap among individuals or groups is a source of social tensions.

The hypothesis of the relationship between discontent, or life satisfaction gap, and social unrest is postulated by both "discontent theories" and "expected utility theories" of rebellion (or more mildly social protest). According to the former, lack of life satisfaction have a strong independent effect on social upheaval (e.g. Gurr 1996, Brown 1996). According to the latter, the effect is indirect since rational individuals participate in rebellious actions only if the costs are lower than the

[1] In this paper we use the terms "happiness" and "life satisfaction" as synonyms, as standard in the literature.

expected gain from this choice (Tullock, 1971). However, expected gains are reasonably proxied by the satisfaction gap between those who are happy and those who are unhappy[2] times the probability of riot success, suggesting that the life satisfaction gap has a crucial effect on social unrest also in this case.

In this setting, happiness gap can be considered as a direct cause of envy and social tensions, while income gap is an indirect one. This is because income and/or social divide may not necessarily result into happiness divide due to the compensating effect of many other non pecuniary factors affecting life satisfaction (chances of achievement, quality of leisure and relational life). Put in other terms, a social group may be much poorer than another group in a society but if it finds other sources of satisfaction, the economic divide will not generate *per se* social tensions.

Apart from the well known Sen's "happy slave" paradox, this point is made clear in the literature on income inequality. While in general the gap from the income of the reference group has negative effect on happiness, in some cases income inequality may be paradoxically perceived as even positive by those who are poor since it shows what they can achieve in the future.[3] In these cases expectations of vertical mobility are such that income divide does not translate into happiness divide and economic inequality may be not at odd with social cohesion.

These considerations represent an additional motivation to bridge the research gap between the widely debated topic of income inequality and that of happiness inequality, more so because of the rich anedoctical and historical evidence on the relationship between happiness inequality and social cohesion.[4]

---

[2] This is clearly set out in the Guimaraes and Sheedy (2010) model of equilibrium institutions where the authors postulate that "the most dissatisfied individuals have the most to gain from a rebellion".

[3] See Jiang et al., 2009, which address this issue in urban China, and of Senik, 2004, and Becchetti and Savastano, 2009, in transition countries. The standard rationale which may explain this anomaly is the so called *tunnel effect hypothesis* (Hirschman, 1973). If an individual is stuck in a traffic jam and observes that, after a while, a car in the contiguous lane starts moving he may get happier if interpreting the move as a signal that he is soon also starting to move.

[4] Among the many historical quotes that can be reported on this point we propose a short passage from the report of a deputy of the Italian Parliament in 1860 about "brigantaggio" (popular banditism in South of Italy), from Massari (1863): "The bad advice of misery, not moderated by education and good manners, […] prevails among those who are unhappy and the attitude to crime becomes a second habit […] In the provinces in which social and economic

Nonetheless, the empirical economic literature addressing happiness inequality issues is lacking. One exception is Stevenson and Wolfers (2008), which document that happiness inequality has substantially decreased in the US from 1970 to 2006, although, since the early 1990s, the authors observe an upward trend, which however does not compensate the massive decrease occurred in the previous decades. Stevenson and Wolfers (2008) explain this trend mainly in terms of a strong erosion of the race and gender happiness gaps. The authors also show that trends of income inequality and happiness inequality are completely different. Another related contribution is Van Praag (2010), which argues that to define properly the concept of wellbeing inequality one has to take into account the reference effect, i.e. the fact that individuals evaluate their conditions taking into account those of their peers. Further, Guven et al. (2009) shows a more direct link between happiness divide and disruption of relational ties. The authors document that the husband-wife happiness gap has significant and positive impact on the likelihood of separation, thereby documenting a specific case where happiness inequality reduces cohesion in a "small society" such as the household.

In this framework, the original contribution of our paper consists in analysing the determinants of both levels and over time changes of happiness inequality, in order to provide a reference for scholars and policy makers in understanding which factors may mitigate or trigger social tensions. We make use of a decomposition approach introduced by Firpo et al. (2007, 2010), which represents a generalization of the Oaxaca-Blinder procedure (Blinder, 1973; Oaxaca, 1973) since it can be applied to any distributional parameter other than the mean. The methodology allows us to split the overall change in happiness inequality into two aggregate effects, the first related the overall changes in the set of happiness determinants in the population, the *composition effect*, the second being the overall changes in the return of such drivers, the *coefficient*, or *structure*, *effect*. Once the aggregate decomposition has been carried out, it is also possible to compute the detailed decomposition, subdividing both the composition and coefficient effect

conditions of peasants are unhappy, the brigantaggio spreads rapidly, is continuously reinforced and can be hardly eliminated" (the original text is in Italian and the translation is ours). In this passage it is clearly argued that the unhappiness generated by misery and not moderated by religion and education is the source of riots against the new born Italian state.

into the contribution of each covariate. The approach has been already used to account for changes in wage inequality in several empirical contributions (Chi and Li, 2008; Firpo et al., 2007, 2009b; Schirle, 2009).

To the best of our knowledge, our work is the first that applies this decomposition method to happiness inequality. In particular, under the assumption of cardinality of the happiness variable, we investigate the evolution of happiness inequality in Germany, using the German Socio-Economic Panel (GSOEP), for the period 1991-2007.

The main findings are the following. First, most of the dynamics of happiness inequality is explained by composition effect, while the coefficient effect is negligible, suggesting that the returns of life satisfaction drivers are invariant over time. Second, changes in labour market conditions (unemployment and employment rates) play a significant role on happiness inequality. More specifically, the increase in unemployment rate and the decrease in employment rate positively contribute to the increase in happiness inequality. Third, the increase of the education level has a reducing effect on happiness inequality acting on both tails of the happiness distribution. Additional roles are played by a demographic effect, since the increase of the middle age cohort share of the population is associated with an increase in happiness inequality, and by the reduction of individuals with a saving account, suggesting that reduction of financial wellbeing contributes as well to the observed increase in inequality. Finally, mixed evidence is associated to the relation between income and happiness inequality. Under the assumption that happiness inequality is a driver of social tensions, we conclude by suggesting that education and labour market policies can affect social cohesion, reducing happiness inequality.

The paper is divided into six sections. In section 2 we illustrate our sample and provide descriptive findings. In section 3 we outline analytical features of the decomposition approach. In section 4 we present econometric findings. In section 5 we discuss further the economic implications. The sixth section concludes.

2. Sample and descriptive findings

The GSOEP is one of the most accurate panel databases containing information on life satisfaction and, as such, it is widely used in empirical papers in this literature.[5] We select for our inquiry the 1991-2007 period, as this time span is homogeneous from a social and political point of view, being posterior to the reunification between East and West Germany. In particular, since we are interested in evaluating changes in happiness inequality over time, we focus our analysis on two time periods, the pooled waves of 1991 and 1992 and those of 2006 and 2007. Excluding the individuals for which at least one variable of the analysis is missing, we end up with 24,060 observations, 13,625 for 1991-92 and 10,435 for 2006-07.

The main variable of interest, Life Satisfaction, is measured in the GSOEP database as a 0-10 categorical ordered variable.[6] In this work we consider this variable as cardinal[7] and this enables us to evaluate some standard measures of distribution inequality, like Gini coefficient, which is a scale independent index, and variance.

Even though cardinal evaluations of happiness must be taken with caution (see next section), it is interesting to see that, on average, happiness decreased over time from 7.177 to 6.629 (Table 1), while happiness inequality increased strongly over the period. More specifically, the happiness Gini index increased by 17.3%, from 0.126 to 0.148, and the variance increased by 15.1%, from 2.968 to 3.416.[8] This is consistent with the trends observed in the US by Stevenson and Wolfers (2008), which observe a fall in happiness inequality from the seventies, with an inversion of such trend from the beginning of the nineties.

In order to find out which are the driving forces of happiness inequality we focus on a set of covariates that the literature has shown to be relevant happiness determinants (age, individual income and relative income, education, marital status and having children, employment status, saving status and house

[5] See, among others, Frijters et al. (2004a and 2004b).
[6] The GSOEP question is "How satisfied are you with your life, all things considered?". The responses are rated from 0 (completely dissatisfied) to 10 (completely satisfied).
[7] For a discussion of such assumption and related methodological issues see section 3.1.
[8] It is worth noting that there is evidence of a significant drop in self reported life satisfaction as an individual is in the panel for a long period (Frijters and Beatton, 2008). However, this should hardly affect our results, since we analyze data in a cross section perspective. As long as this bias is attributable to attrition effects related to time-varying unobservables, cross-section results remain still valid.

ownership).[9] Table A1, in appendix, provides definitions of these covariates, while Table 2 reports covariates' mean values in the two considered time periods.[10]

The main trends observed in the GSOEP sample are the following: a) the German population is getting older and more educated; b) the shares of separations, divorces and households without children increase, while the share of marriages decreases; c) income inequality increases, since the share of individuals in the lower class rises, as well as that of those in the top class, while shares of the three middle classes fall;[11] d) on average, relative economic conditions of individuals, with respect to their reference group, get worse over the observed period; e) labour market conditions deteriorate, since the employment rate decreases and the unemployment rate (as well as the share of retired) increases; f) the share of individuals that own his/her house remains stable over time, while g) the share of individuals having a saving account gets lower.

Can the rise in happiness inequality be explained by the above mentioned changes in covariates and to what extent? In the following section we outline the methodological approach which allows answering to these questions.

3. The decomposition approach and its application to life satisfaction data

3.1. Methodological problems

To evaluate happiness inequality properly, we have to address at least two methodological problems raised by the empirical life satisfaction literature. On one hand, there are no reasons to assume that scales used for self reported life

[9] All the variables are expressed as dummies, apart from relative income. This is far from being restrictive and it is useful to ease the interpretation of the composition effect, in particular. To measure the income variable, we consider the quintiles of the yearly disposable equivalent income deflated using OECD deflator (base 2007), computed on the pooled sample of the four years (1992, 1993, 2006 and 2007). Relative income is considered in order to control for the influence of the reference group (Van Praag, 2010). It is computed as the ratio between individual income and the average income of the reference group (individuals with the same gender, age classes, education, Lander). The variable is then standardized to have zero mean and standard deviation equal to one, to ease the economic interpretation of a continuous variable in the decomposition analysis (Firpo et al., 2007).

[10] For an overview of findings on happiness and its determinants see, among others, Frey and Stutzer (2002a), Dolan et al. (2008), and Clark et al. (2006), the latter specifically addressing the relationship between happiness and income.

[11] Such changes in income inequality in the nineties are consistent with the documented increase in wage inequality both in East and West Germany (Gernandt and Pfeiffer, 2007, Dustmann et al. 2008).

satisfaction are homogenous across different individuals, suggesting extreme caution when making interpersonal comparisons (Harsanyi, 1955).[12] On the other, evaluation of happiness inequality requires the cardinality of self reported life satisfaction.

As for the scale heterogeneity issue, several authors argued that these problems do not prevent the use of life satisfaction data in empirical analysis, and a large and growing literature has evolved and conquered space in economic journals. Cantril (1965) finds that individual evaluations on the 0-10 scales are quite comparable. Di Tella and McCulloch (2006) argue that, even in presence of heterogeneity in individual scales, there are no a priori reasons to believe that such heterogeneity is systematically affected by drivers of life satisfaction. On the same line, Frey and Stutzer (2002a) admit the existence of heterogeneity in the scales used for self-reported life satisfactions, but argue that this does not invalidate regression results, since they expect such heterogeneity to be random.

An important advance in this discussion is provided by the possibility to test empirically whether such heterogeneity alters estimates from standard life satisfaction regressions. In this respect, Beegle et al. (2009) provide a clear example of frame of reference bias, and tests the validity of the Frey and Stutzer (2002a) arguments by means of the vignette approach. Individuals are asked to rank the economic status of theoretical vignette households, as well as of their own status. Respondent's own scales are derived from their vignette rankings. The authors' findings confirm the heterogeneity in individual scales, but also reject with three tests the hypothesis that such heterogeneity alters results of the standard life satisfaction regressions. First, heterogeneity is uncorrelated with happiness regressors. Second, vignette rankings are not correlated with the residual of the standard life satisfaction regressions. Third, results on the determinants of life satisfaction do not change when self declared life satisfaction is rescaled with vignette results.

[12] An additional problem is when interpersonal comparisons are among people from different countries end up being complicated by the presence of different language nuances, given that the word "happiness" has not the same meaning in different languages. Furthermore, cultural habits are also likely to generate additional biases (it may be considered polite and correct in a given culture to declare oneself always satisfied while, in another one, people may tend to overcomplain).

The second methodological issue discussed in the literature concerns the fact that the life satisfaction variable is usually reported in an ordinal scale, while measuring happiness inequality requires a cardinal concept of happiness, since we want to detect not only if an individual is happier than another, but also how much he is happier.

The literature pointed out that evaluating happiness, or other satisfaction ordinal variables, as cardinal leads to similar results in a regression framework (Ferrer-I-Carbonell and Frijters, 2004; Van Praag and Ferrer-i-Carbonell, 2004, 2006; Van Praag, 2007).[13] Further, Clark et al. (2008) observe that doctors implicitly reveal to believe in cardinality when asking to their patients how much a given part of the body hurts after a touch (and base on an implicit comparison of other patients' declarations their evaluation of the relevance of the pain). As a matter of fact, doctors and psychologists also use cardinality in the self assessed health (SAH) literature with measures that are precise predictors of future mortality and morbidity (Idler and Benyamini, 1997).

Based on these considerations, and on the general consensus on the use of happiness data in the growing literature on life satisfaction, we assume that our dependent variable, self-reported life satisfaction, is cardinal.

3.2. Decomposition methodology

In this subsection we illustrate the decomposition methodology applied to the measure that we analyze, the happiness inequality.

Let Y be the self reported degree of life satisfaction. Adopting the potential outcomes jargon, which is useful to illustrate the decomposition problem, Y_{i1} is the potential life satisfaction of an individual i observed in period 1, and Y_{i0} the corresponding value in period 0. For each individual i the observed degree of life satisfaction is $Y_i = Y_{i1} \cdot T_i + Y_{i0} \cdot (1 - T_i)$, where $T_i = 1$ if individual i is observed in

[13] Van Praag (2007 p. 18) argues that "*All these specifications amount to different specifications of the labeling system of the underlying indifference curves, but the indifference curves themselves are unchanged and are these indifference curves which are estimated, either by Ordered Probit, Logit or what else.*"

period 1, and 0 otherwise. Finally, let X be a vector of *K* individual covariates, which can be observed in both periods.

The conditional mean of *Y* on *X* at time *t*=0,1 is:

$$E\left(Y\middle|X,T=t\right)=X\beta_t$$

where β_t is the vector of regression coefficients, which can be estimated by OLS.

The first decomposition approach of means is the one proposed by Oaxaca-Blinder (Blinder, 1973; Oaxaca, 1973), which contribution is twofold. On one hand, they propose to decompose the overall difference in means, $\Delta_O^\mu=\mu_1-\mu_0$, into two components, one related to the changes in the returns of the set of covariates, the *coefficient* or *structure* effect, Δ_S^μ, and the other linked to the changes in the distribution of these covariates, the *composition* effect, Δ_X^μ. By adding a subtracting a counterfactual conditional mean, for instance $E(X\,|\,T=1)\beta_0$, it is possible to identify the two effects of the Oaxaca-Blinder decomposition:

$$\Delta_O^\mu=\mu_1-\mu_0=E(X\,|\,T=1)\beta_1-E(X\,|\,T=0)\beta_0\pm E(X\,|\,T=1)\beta_0=$$
$$=E[X\,|\,T=1](\beta_1-\beta_0)+(E[X\,|\,T=1]-E[X\,|\,T=0])\beta_0=\Delta_S^\mu+\Delta_X^\mu$$

On the other hand, they identify the contribution of each covariate to these two effects. More specifically, the two effects can be then written in terms of the explanatory variables in the following way:

$$\Delta_S^\mu=E\left[X\middle|T=1\right]\left(\beta_1-\beta_0\right)=\sum_{k=1}^{K}E\left[X_k\middle|T=1\right]\left(\beta_{1,k}-\beta_{0,k}\right)$$
$$\Delta_X^\mu=\left(E\left[X\middle|T=1\right]-E\left[X\middle|T=0\right]\right)\beta_0=\sum_{k=1}^{K}\left\{E\left[X_k\middle|T=1\right]-E\left[X_k\middle|T=0\right]\right\}\beta_{0,k}$$

where X_k and $\beta_{t,k}$ are the *k*-th element of the vector of covariates and of the vector of regression coefficients, respectively.

Firpo et al. (2007, 2010) provide a methodology, very similar in spirit to the standard Oaxaca-Blinder decomposition, which allows extending this detailed decomposition to any distributional parameter other than the mean, ν, like

median, quantiles, variance or Gini coefficient. The basic idea is to estimate a linear regression where Y is replaced by the recentered influence function (RIF) of the parameter ν, $RIF(y;\nu)$, where the RIF is obtained by adding the distributional parameter of interest to the influence function $IF(y;\nu)$.[14]

A useful properties of the $RIF(y;\nu)$ is that its expected value is the statistic of interest. Hence, using the law of iterated expectations, it is possible to write:

$$\nu = E[RIF(Y;\nu)] = E_X\{E[RIF(Y;\nu)|X]\} \quad (1)$$

In its simplest form, the conditional expectation of the $RIF(y;\nu)$ can be written as a linear function of the covariates, yielding the RIF regression:

$$E[RIF(Y;\nu)|X] = X\gamma^{\nu} \quad (2)$$

where the parameters γ_t^{ν} are estimated by OLS.

Similarly to the case of the mean, it is possible to decompose the overall difference over time in the value of ν, $\Delta_O^{\nu} = \nu_1 - \nu_0 = \Delta_S^{\nu} + \Delta_X^{\nu}$, where, analogously to the Oaxaca-Blinder decomposition, the coefficient and composition effect can be written as:

$$\begin{aligned} \Delta_S^{\nu} &= E[X|T=1]\left(\gamma_1^{\nu} - \gamma_0^{\nu}\right) \\ \Delta_X^{\nu} &= \left(E[X|T=1] - E[X|T=0]\right)\gamma_0^{\nu} \end{aligned} \quad (3)$$

Note, however, that the above decomposition holds only in the case of a linear specification of the conditional expectation (2). Barsky et al. (2002) show that, in the case of the mean, the Oaxaca-Blinder decomposition is biased. Firpo et al. (2007) observe that this bias can occur also for other distributional statistics. Therefore they propose to modify the decomposition (4) in the following way:

[14] The influence function (Hampel, 1974) is a statistical tool, widely used to measure the robustness of a distributional statistic to the presence of outliers, which detects the contribution (also defined as *influence*) of each observation to the distributional parameter of interest. As an example, the influence function of the variance is $(y-\mu)^2 - \sigma^2$, and the RIF is $\sigma^2 + [(y-\mu)^2 - \sigma^2] = (y-\mu)^2$. Hence, each observation is replaced by its squared difference from the mean. For the influence function of the Gini coefficient see Monti (1981).

$$\Delta_S^{\nu} = E\left[X|T=1\right]\left(\gamma_1^{\nu} - \gamma_{01}^{\nu}\right)$$
$$\Delta_X^{\nu} = \left(E\left[X|T=1\right] - E\left[X|T=0\right]\right)'\gamma_0^{\nu} + R^{\nu} \quad (5)$$

where γ_{01}^{ν} are the parameters of the RIF regression computed on the distribution that we would observe had the sample at period 0 retained the individual characteristics as in period 1.[15] The approximation error, $R^{\nu} = E\left[X|T=1\right]\left(\gamma_{01}^{\nu} - \gamma_0^{\nu}\right)$ can be used as a specification term for the linear approximation. In fact, had the linear specification held true, the residual should be equal to zero, or, in other words, $\gamma_{01}^{\nu} = \gamma_0^{\nu}$.

As a final remark, note that the strict exogeneity condition, usually invoked in the standard Oaxaca-Blinder decomposition, is not necessary for the identification of the decomposition terms within this framework, and can be substituted with the less severe *ignorability* assumption. Under this hypothesis, the distributions of the errors conditional on *X* are the same across time periods, an assumption that in our context is reasonable. Moreover, under this assumption, it would be possible to give a causal interpretation to the decomposition results, in particular to the structure effect (Firpo et al., 2010).

4. The econometric analysis: results

In this section we first illustrate results on the cross-sectional impact of standard happiness drivers on happiness inequality at the beginning and at the end of the sample period, by means of the RIF regressions. We make use of two inequality indices, the Gini coefficient, which represents a standard measure of distributional inequality, and the variance. In the following step we apply the decomposition analysis to test the relevance of composition and coefficient in affecting the observed changes in happiness inequality. Further, to investigate separately the upper and lower tails of the happiness distribution, we apply the decomposition approach to the percentile differences 90-10, 90-50, 50-10. Interpretation of the main results follows.

[15] To consistently estimate the counterfactual distribution, Firpo et al. (2007, 2009) follow the same reweighting approach proposed by Di Nardo et al. (1996).

4.1. RIF regressions in the two time periods

Table 3 reports the results of the RIF regressions for the two periods examined, 1991-92 and 2006-07, both for Gini coefficient and for variance. As in standard regression analysis, coefficients represent the effect of each covariate on the inequality measure considered. At a first glance, results are highly comparable between the two indices since, besides few exceptions, both sign and significance of coefficients do not change much.

With regard to the contribution of each covariate on happiness inequality, education has a significant and monotonically negative impact on both indices, regardless the period observed (see our discussion of these findings in section 5). An intuition of what is behind this econometric result is given by the analysis of the histograms of the life satisfaction distribution for low, medium and high education levels (Figure 1): the comparison between low and high education happiness distribution clearly shows that higher education is related to a reduction in the density of both the left and the right tail (i.e. individuals with very low or very high satisfaction scores). The effect of high education become stronger in 2006-07, while medium education coefficient diminishes, and, with regards to the variance regression, becomes not significant. Moreover, also the gap between education categories becomes wider over time. Looking at the Gini regression, in 2006-07 having a high level of education has a negative impact three times higher than that of medium education (the benchmark is lower education). On the contrary, in 1991-92 there is little difference between medium and high education. This evidence is also consistent with the fact that the happiness Gini coefficient decreases in the level of education, and that this relation is steeper in 2006-07 (Figure 2).

As for income categories, it is possible to observe that, with respect to the omitted category (the first income quintile), an increase in income entails a negative impact on happiness inequality, and this effect is stronger for the top income quintile, especially in 2006-07. The inspection of histograms of life satisfaction values for different income quintiles (Figure 3) shows that the distribution of happiness is much less dispersed in the top income quintile than in the bottom one. The evidence provided by the income coefficients in the RIF regressions can be also reconciled with the fact that happiness Gini coefficient is highest for the lowest

income category and, as long as income increases happiness inequality decreases (Figure 4). Consistently, this relation is slightly steeper in 2006-2007.

Relative income, the ratio between individual income and the average income of the reference group, has, as expected, a negative effect on happiness inequality, which by and large does not change over time.

As for employment status, we observe a polarization of the behaviour between employed, on the one side, and unemployed on the other side (the omitted category being inactive), while the effect of being retired is never significant. Being employed reduces happiness inequality, while being unemployed has a positive effect. As it can be seen in Figure 6, trends of Gini coefficients computed by employment status in the two periods examined resemble that of corresponding RIF regression coefficients.

With regard to additional covariates, the effect of age on happiness inequality follows a concave trend, first increasing until the 45-54 age class, then decreasing. The effect is always significant only for individuals aged from 35 to 54, i.e. happiness in these age categories displays a large variability that increases over time. The reverse U-shape trend is consistent with the time pressure explanation that concerns mainly the middle aged (Engfer, 2009).[16] There is also a remarkable increase of the age effect for the elderly, in 2006-07, with respect to 1991-92. The reverse U-shape effect of age in happiness inequality can be seen also in Figure 5, where Gini coefficients by age classes are reported.

[16] Our finding closely resembles the often documented U-shaped relationship between age and happiness (among others, Frijters and Beatton, 2008 and Van Landeghem, 2008). Furthermore, a possible related rationale for these findings is that, due to time pressure, life satisfaction of working adults depends almost exclusively on their job and relational satisfaction within the household, since not much time is left for the rest. Different patterns are observed for students and retired individuals, which have more leisure time that can be dedicated to activities that compensate for lack of satisfaction in other life dimensions, in such a way stabilizing the happiness distribution. Finally, as observed above, the literature stressed that there is evidence of a significant drop in self reported life satisfaction as an individual is in the panel for a long period (Frijters and Beatton, 2008). As a robustness check we have controlled for the individual "seniority" in the decomposition analysis, i.e. the number of years of participation to the survey, and results are largely the same.

Living in the East Länders increases inequality, but the effect decreases over time. The disabled worker status has a negative impact on both indices.[17] Note that its effect falls dramatically in 2006-07 in variance regression estimates.

Being divorced or separated, with respect to having never been married, has a significant positive effect on inequality in both periods. Having no children significantly increases happiness inequality only in 2006-07.

Finally, being house owner and having a saving account reduces happiness inequality, as expected.

4.2. Decomposition results

The results of the decomposition analysis applied to identify the driving forces of the increase in the Gini coefficient and the variance are reported in Table 4. As a general remark, it is important to underline that the composition effect almost entirely explains the variation of both Gini and variance, while coefficient effect is never significant, as well as the contribution of almost all covariates to the coefficient effect.[18] This suggests that returns to the determinants of happiness inequality remain stable over time. For these reasons, we focus our comments on the analysis of the composition effect.

Two main findings emerge. First, high education negatively affects the variation of happiness inequality. As for Gini, *ceteris paribus*, had only the shares of education levels changed over time, happiness inequality would have decreased of -0.0012 (5% of the overall between period change). This is due to the combination of two facts. The first is the increase in the shares of high education, from 12% to 19%, as documented in Table 1. The second is that having a high level of education (with respect to the omitted category, low education) has a negative impact on the

[17] Due to a progressively broader interpretation, disability has gradually become in Germany a shock absorber in the labour market. In principle, d*isability benefits* are provided by the German system to workers of all ages not able to carry on a regular employment. When the inability is complete the individual is entitled to the disability pension ("*Erwerbsunfähigkeitsrente*", EU). However also a person that can work only half –or less- of the time, compared to a healthy person, may receive two-thirds of old age benefits ("*Berufsunfähigkeitsrente*", BU). In the 1970s and early 1980s, the rule has been interpreted broadly so that disability became the most relevant pathway to retirement for civil servants (in the year 1999 47% of retired used disability retirement). See Börsch-Supan and Wilke (2004) for details on this issue.

[18] Note also that the residual component is not statistically different from zero, meaning that the linear approximation holds true.

evolution of happiness inequality, as can be seen from RIF regression results (Table 3). It is also worth noting that this result is robust to the definition of the education variables. We also used the variable 'year of education' in tercile categories, and results were even stronger, with both medium and high education associated to a reducing impact on happiness inequality.[19]

Second, interesting results come out from the labour market variables. The decrease in employment rates over time (from 73% to 70%) has a positive impact on happiness inequality, since being employed reduces happiness inequality in a cross-section perspective (Table 3). Similarly, the increase in the unemployment rate positively affects the variation of happiness inequality by 0.0035 (15% of the Gini variation).

As for the other variables, it is worth noting that mixed results emerge when looking at income categories. As for Gini, income redistribution has no overall impact on happiness inequality changes, since the positive effect of the second and third income categories is counterbalanced by the negative value of the top income quintile. As for variance, increase of income inequality has a slight overall negative effect on the variation of happiness inequality over time. Another interesting finding is that, once controlling for individual income, relative income has no effect on the increase of happiness inequality. This can be considered as a preliminary test of Van Praag (2010), which indeed stress the importance of relative living conditions to address happiness inequality issues. However, this result might depend on the way the reference group has been computed.[20]

It is also worth noting that demographic changes are noticeable only for the 35-45 and 45-54 age classes, which both have a positive effect on the evolution of the happiness inequality, consistently with findings emerging from RIF regressions in Table 3. Further, from descriptive statistics in Table 2 it emerges that the size of these cohorts increased, because of the ageing of the German population and of the baby boomers. Hence, the rising happiness inequality is explained by the higher population share ageing from 35 to 54 years, which displays higher happiness

[19] Results are available on request.

[20] As explained above, in this paper the reference group is identified by individuals with the same age, gender, education, Lander. We also tried to change the definition using different covariates, and the effect in the decomposition analysis remained not statistically different from zero.

inequality, as confirmed also by Figure 5. As explained above, these findings could be related to time pressure effects.

The reduction in the share of those who have a saving account positively affects happiness inequality. This is due to the fact that according to the RIF regression having a saving account is associated to lower happiness inequality, and since the share of individuals with a saving account decreased over time the impact of this variable on the evolution of happiness inequality is positive. Instead, the other proxy for wealth, being owner of the house, is not significant in the decomposition.

Finally, the increase in the share of those who live in the East Länders entails a positive effect on the variation of happiness inequality, since living in this area is positively associated to higher happiness inequality (Table 3).[21] Since the socio-economic differences between West and East Germany are still pronounced, we also carry out two separate decomposition exercises for the two macro regions. The findings for the whole country are mainly driven by the West Germany.[22] This could be due to the small number of observations for East Germany (12% of the total in 1991-92 and 20% in 2006-07), which might affect the significance of composition or coefficient effects when applying the decomposition for this region. Since a more in-depth analysis of the drivers of income inequality in East Germany is beyond what achievable with our data, we discard this issue in the rest of the paper.

4.3. An analysis of upper and lower tails of happiness distribution

GSOEP data shows that happiness inequality increased. A step forward is to check whether the rise in inequality is due to the lower or the higher part of the happiness distribution. We hence apply the decomposition analysis to the interdecile range (90-10), as well as to the upper (90-50) and lower (50-10) tails of the happiness distribution (Table 5). It has to be noted that in this setting the percentiles are computed from a kernel density estimation, implicitly assuming the continuity of the happiness distribution.

[21] A reasonable interpretation is that individuals in East Germans -after the fall of the communist regime and in a more competitive and less protected environment- suffers more from relative comparisons.

[22] Results are available from the authors on request.

From the last row of Table 5 it is possible to note that the 90-10 interdecile range increased by 29.7% from 1991 to 2007. Further, it comes out that there are no happiness polarization trends at work, since both indices 90-50 and 50-10 increased overtime. Since the raise in the 50-10 is much greater than that of the 90-50 (25.1% *vs* 4.6%), it is possible to state that the most important changes occurred in the lower tail.

As for the decomposition analysis, like in the cases of Gini and variance, only the composition effects are significant, hence, for sake of space, we do not report the coefficient effects in Table 5. Results are comparable with those reported in Table 4, even if only for a fewer number of variables the impact is statistically different from zero.

In particular, the two main findings of our analysis are confirmed. First, high education has an inequality-reducing effect on the overall distribution. It is also interesting to note that this effect is driven by the upper tail of the distribution, while, in the lower tail, education has still a negative effect but not statistically different from zero. Second, as for labour market variables, only being employed is significant when using the interdecile range and this effect is driven by the impact on the lower tail of the happiness distribution.

5. Further discussion of the results

Two main findings of the paper deserve a further investigation: the negative impact of education, and the positive impact of labour market variables.

As for the impact of education on the happiness distribution, in Table 6 are reported the results of two separate logistic regressions, to detect which factors affect the probability of falling in the considered (upper or lower) tail of life satisfaction distribution. We recode as Low happiness a degree of life satisfaction lower or equal to 5, while High happiness corresponds to a degree higher or equal to 8. Overall, results are consistent with previous findings: education is the only factor affecting both tails in the same (negative) way. In particular, being more educated reduces the probabilities of being unsatisfied. On the other hand, a higher level of education also reduces the probability of falling in the higher tails of life satisfaction.

A general interpretation for the negative impact of higher education on happiness inequality is then that education enables individuals to increase their set of functionings and, through them, to enhance their capabilities.[23] Since functionings may be defined as "various things a person may value being or doing" (Sen, 1999, p.75), it is reasonable to relate the increase of functionings, and the enhancement of capabilities, to higher life satisfaction. All this considered, if we conveniently assume that an important part of happiness inequality is explained by fat low tails (higher share of individuals with very low life satisfaction scores), we can argue that education, by enlarging the set of functionings and capabilities, reduces the probability that individuals lack of sufficient resources to avoid the "low satisfaction trap". Just as examples, more educated individuals are more likely to find satisfactory and well remunerated jobs, are relatively more able to care about their health and benefit more from leisure since they can appreciate a wider range of cultural products.[24]

It is worth noting that the happiness inequality-reducing effect of education acts also on the upper tail of happiness distribution. How can be interpreted this effect (Table 6 and Figure 1)? It is probably due to the fact that education raises aspiration levels and therefore, everything else being equal, the gap between realisations and aspirations.[25]

An additional interesting result for high education is that its effect on happiness inequality has become stronger in the last decade (Figure 1). Since what we are measuring here is a direct effect of education, net of the indirect effect via income

[23] Following Sen's definition capabilities are "the alternative combinations of functionings that are feasible for a person to achieve" (Sen, 1999, p.75).

[24] Hayward et al (2005) document that "Educational attainment is positively associated both with health status and with healthy lifestyles. For example, in the 1996-97 [Canadian] National Population Health Survey, only 19% of respondents with less than high school education rated their health as 'excellent', compared with almost 30% of university graduates. Self-rated health, in turn, has been shown to be a reliable predictor of health problems, health-care utilization, and longevity. From a health determinant perspective, education is clearly a good investment that can reduce long-term health care costs" (pp.37-38).

[25] The point is well resumed by Frey and Stutzer (2002b, p. 59) claiming that "the level of education, as such, bears little relationship to happiness. Education is highly correlated with income ... Education may indirectly contribute to happiness by allowing a better adaptation to changing environments. But it also tends to raise aspiration levels. Further, it has been found that the highly educated are more distressed than the less educated when they are hit by unemployment (Clark and Oswald, 1994)". Also Ferrante (2009) discusses "how systematic frustration over unfulfilled expectations can be connected to people's educational achievement".

generated by "returns to schooling"[26], our findings cannot be explained by the rise in skill wage differentials due to the global integration of product and labour markets in the nineties.[27] A possible interpretation for the increasing direct effect of education on happiness inequality might concern the diffusion of the web and of new technologies which provides both an amount of additional information (together with an increase in its speed of circulation) and new tools to enjoy leisure and culture. However, the capability of enjoying of the benefits available on the web and new technologies crucially depends on education (i.e. language knowledge, capacity of identifying and selecting relevant information, capability of using new techniques on internet, etc.).

Another major finding of the paper regards the impact of labour market variables on the evolution of happiness inequality: the decrease in the employment rate and the increase in the unemployment rate exerted a positive impact on both the Gini and variance. This evidence provides straightforward policy implications: measures aiming at increasing (decreasing) the employment (unemployment) rate generate, apart from the clear cut effects on economic performance, additional spillovers in terms of reduction of happiness inequality and, in turn, of enhanced social cohesion.

6. Conclusions

The contribution of our paper to the happiness literature lies in the investigation of determinants of both levels and over time changes of happiness inequality, and in the decomposition of happiness inequality changes in composition and coefficient effects. By applying the methodological approach proposed by Firpo et al (2007, 2010) to the German case in the period 1991-2007, we find what follows.

First, changes in coefficient effects are almost nil, documenting the invariance across time of what factors (and how much they) make individuals happier.

[26] For a review of this literature see Card (1999).

[27] In this perspective the role of education is becoming more and more important by allowing individuals to climb up the "scale of skills" (Acemoglu, 2002). The scale ranges from the bottom level "reservation army" of the low paid and precarious unskilled workers to the top level of superstars who get enhanced benefits from selling their products in global market.

Second, happiness inequality has risen mainly due to the deterioration of labour market conditions and to a demographic effect (the increase in the middle age cohort population share). These changes have been less than compensated by the increase of the share of highly educated individuals which entails a negative effect on the dynamics of happiness inequality. More mixed is the relation between income inequality and happiness inequality.

What may be learned from our findings in terms of policies? If we consider that more happiness inequality creates the premises for social tensions, our main suggestion is that education is a crucial factor for social cohesion. Education has a strong direct effect in reducing happiness inequality and such effect has risen over time (probably due to the increased availability of goods and services through internet and new technologies, which can be increasingly enjoyed according to educational skills). Further, higher education might give more resources to avoid falling in the low satisfaction trap by affecting health, individual productivity and the capacity of enjoying leisure. The role of education on happiness inequality is probably the most important result of our paper. The economic literature has deeply investigated the impact of this variable on individual earnings and as a factor of macroeconomic conditional convergence. As far as we know, this is the first time that such variable, net of its role on personal income, has been found to affect happiness inequality and, as such, to be a factor of social cohesion.

Beyond education, we also documented that labour market conditions have a direct smoothing effect on happiness inequality. This finding suggests that apart from direct effect on economic performance, improving labour market conditions entails a spillover effect in reducing happiness inequality and, through this channel, increasing social cohesion.

References

Acemoglu D. (2002), "Technical Change, Inequality, and the Labor Market", *Journal of Economic Literature*, 40, pp.7-72.

Barsky, R., Bound, J., Charles, K., Lupton, J. (2002), "Accounting for the Black-White Wealth Gap: A Nonparametric Approach", *Journal of the American Statistical Association*, 97(459), 663-673.

Becchetti L., Savastano S. (2010), "The money-happiness relationship in transition countries: evidence from Albania", Transition Studies Review (forth.)

Beegle K., Himelein K., Ravaillon, M. (2009), "Frame-of-Reference Bias in Subjective Welfare Regressions", World Bank Policy Research Working Paper n. 4904

Blinder, A. (1973), "Wage discrimination: Reduced form and structural estimates", *Journal of Human Resources*, 8(4), 436–455.

Börsch-Supan, A., Wilke, C.B. (2004), "The German Public Pension System: How it Was, How it Will Be", NBER Working Paper 10525.

Brown, Michael E. (1996). "The Causes and Regional Dimensions of Internal Conflict," in *The International Dimensions of Internal Conflict* by Michael Brown ed., Cambridge, MA: MIT Press.

Card., D. (1999), "The causal effect of education on earnings" In O. Ashenfelter and D. Card (eds.) *Handbook of Labor Economics, vol. 3,* New York: Elsevier Science.

Cantril, H. (1965), *The pattern of human concern,* Rutgers University Press.

Chi, W., Li, B. (2008), "Glass ceiling or sticky floor? Examining the gender earnings differential across the earnings distribution in urban China, 1987-2004", *Journal of Comparative Economics*, 36(2), 243-263.

Clark, A.E., Frijters, P., Shields, M.A. (2006), "Income and Happiness: Evidence, Explanations and Economic Implications", Paris Jourdan Sciences Economiques, working paper 2006-24.

Clark, A., Krinstensen, N., Westengaard, N. (2008), "Economic Satisfaction and Income Rank in Small _neighbourhoods", Paper presented at the XVII Tor Vergata financial conference.

Clark, A., Oswald, A. (1994), "Unhappiness and Unemployment", *The Economic Journal*, 104(424), 648–659.

Di Nardo, J., Fortin, N. M., Lemieux, T. (1996), "Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach", *Econometrica,* 64(5), 1001–1044.

Di Tella, R., MacCulloch, R. (2006), "Some Uses of Happiness Data in Economics", *Journal of Economic Perspectives*, 20(1), 25-46.

Dolan, P., Peasgood, T., White, M. (2008), "Do we really know what makes us happy? A review of the economic literature on the factors associated with subjective well being", *Journal of Economic Psychology*, 29, 94 – 122.

Dusenberry, J. (1949), Income, Saving and Theory of Consumer Behavior, Harvard University Press, Cambridge.

Dustmann C., Ludsteck J., Schönberg U. (2008), "Revisiting the German Wage Structure", *The Quarterly Journal of Economics*, MIT Press, vol. 124(2), pages 843-881.

Engfer, U. (2009), "Restructuring of activities and rising satisfaction with time use after retirement: Findings from the German time budget survey", paper presented at the 2009 ISQOLS Conference, Florence 2009.

Fehr, E., K.M. Schmidt, (1999), "A Theory of Fairness, Competition and Co-operation." *Quarterly Journal of Economics*, 114, 817-868.

Ferrante, F. (2009), "Education, Aspirations and Life Satisfaction", *Kyklos*, Vol. 62, No. 4, pp. 542-562.

Ferrer-i-Carbonell, A., (2005), "Income and Well-being: An Empirical Analysis of the Comparison Income Effect", *Journal of Public Economics*, 895-6,: 997-1019.

Ferrer-i-Carbonell, A., Frijters, P. 2004. "How Important is Methodology for the estimates of the determinants of Happiness?", *Economic Journal*, 114, 641-659.

Firpo, S., Fortin, N.M., Lemieux, T. (2007), "Decomposing wage distributions using recentered influence function regressions", Unpublished manuscript. PUC-Rio and UBC.

Firpo, S., Fortin, N.M., Lemieux, T. (2009a), "Unconditional quantile regressions", *Econometrica* 77(3), 953–973.

Firpo, S., Fortin, N.M., Lemieux, T. (2009b), "Occupational Tasks and Changes in the Wage Structure", Unpublished manuscript. PUC-Rio and UBC.

Firpo, S., Fortin, N.M., Lemieux, T. (2010), "Decomposition Methods in Economics", NBER Working Paper No. 16045.

Frijters, P., Beatton, T. (2008), "The mystery of the U-shaped relationship between happiness and age", National Centre for Econometric Research Working Paper Series No.26.

Frijters, P., Shields, M.A., Haisken-DeNew, J.P. (2004a), "Money Does Matter! Evidence from Increasing Real Incomes in East Germany Following Reunification". *American Economic Review*, 94, pp. 730-741.

Frijters, P., Shields, M.A., Haisken-DeNew, J.P. (2004b),. "Changes in the Pattern and Determinants of Life Satisfaction in Germany Following Reunification". *Journal of Human Resources*, 39, pp. 649-674

Frey, B.S., Stutzer, A. (2002a), "What can economists learn from happiness research?" *Journal of Economic Literature*, 40, pp. 402—435.

Frey, B. S., Stutzer, A. (2002b), *Happiness and Economics. How the Economy and Institutions Affect Well-being*, Princeton University Press, Princeton, New Jersey.

Gernandt, J, Pfeiffer, F. (2007), "Rising Wage Inequality in Germany", *Journal of Economics and Statistics (Jahrbuecher fuer Nationaloekonomie und Statistik)*, 227(4), 358-380

Guimaraes B. Sheedy K.D. (2010) "A model of equilibrium institutions", working paper LSE

Gurr, Ted R. (1994). "Peoples Against States: Ethnopolitical Conflict and the Changing World System," *International Studies Quarterly,* 38, 347-377.

Guven C., Senik C., Stichnoth H. (2009) "You Can't Be Happier than Your Wife: Happiness Gaps and Divorce", IZA working paper n. 2988

Hampel, F. R. (1974), "The influence curve and its role in robust estimation", *Journal of the American Statistical Association*, 69(346), 383–393.

Harsanyi, J.C. (1955), "Cardinal Welfare, Individualistic Ethics, and Interpersonal Comparisons of Utility", *The Journal of Political Economy*, 638(4), 309-321.

Hayward, K., Pannozzo, L., Colman, R. (2005), "Developing Indicators for the Educated Populace Domain of the Canadian Index of Wellbeing", Interim Report, GPI Atlantic, Halifax

Hirsch, F. (1976), *Social Limits of Growth*. Harvard University Press, Cambridge, Massachusetts.

Hirschman, A., (1973), "The Changing Tolerance for Income Inequality in the Course of Economic Development", *Quarterly Journal of Economics*, 87, 544-566.

Idler, E., Benyamini, Y. (1997), "Self-rated health and mortality: a review of twenty-seven community studies", *Journal of Health and Social Behavior*, 38(1), 21-37.

Jiang S., Lu, M., Sato, H. (2009), "Happiness in the dual society of urbanChina: Hukou identity, horizontal inequality and heterogeneous reference", Global COE Hi-Stat Discussion Paper Series n. 20.

Malthus, T. (1798), *An Essay on the Principles of Population*, J. Johnson, London.

Massari, G. (1863) Il brigantaggio nelle province meridionali. Relazione fatta a nome della commissione d'inchiesta della Camera dei deputati, Napoli, pp. 7-14

Marshall, A. (1890), *Principles of Economics*. MacMillan, London.

Monti, A. C., (1991), "The Study of the Gini Concentration Ratio by Means of the Influence Function", *Statistica*, 51, 561-577.

Oaxaca, R. (1973), "Male-female wage differentials in urban labor markets", *International Economic Review,* 14(3), 693–709.

Schirle, T. (2009), "Income Inequality Among Seniors in Canada: The Role of Women's Labour Market Experience", CLSRN Working Paper No. 51.

Sen, A.K. (1999), *Development as Freedom*, Oxford University Press: Oxford.

Senik, C. (2004) "Relativizing Relative Income," DELTA Working Papers 2004-17

Stevenson B, Wolfers J. (2008), "Happiness Inequality in the United States", *Journal of Legal Studies,* 37(2), 33-79

Tullock, G. (1971), "The paradox of revolution", *Public Choice*, 11, 89–100

Van Landeghem, B.G.M. (2008), "Human Well-Being over the Life Cycle: Longitudinal Evidence from a 20-Year Panel". LICOS Centre for Institutions and Economic Performance, Discussion Paper 213/2008.

Van Praag, B.M.S. (2007). "Perspectives from the Happiness Literature and the Role of New Instruments for Policy Analysis", IZA Discussion Paper No. 2568.

Van Praag, B.M.S. (2010). "Well-being Inequality and Reference Groups: An Agenda for New Research", IZA Discussion Paper No. 4727.

Van Praag, B.M.S. and Ferrer-i-Carbonell, A. (2004). *Happiness Quantified, A Satisfaction Calculus Approach*, Oxford University Press.

Van Praag, B.M.S. and Ferrer-i-Carbonell, A. (2006). "An Almost Integration-free Approach to Ordered Response Models", Tinbergen Institute Discussion Paper TI 2006-047/3.

Veblen, T. (1899), *The Theory of the Leisure Class*, Dover Publications, New York.

Tables

Table 1. Changes in mean happiness and happiness inequality

Year	1992-93	2006-07	Change	Change in %
Mean	7.177	6.629	-0.547	-7.6%
Gini	0.126	0.148	0.022	17.3%
Variance	2.968	3.416	0.447	15.1%

GSOEP weighted data.

Table 2. Changes in the mean of covariates over time

	1991-1992	2006-07
Male	0.501	0.472
Low Educated (*ISCED 1-2*)	0.250	0.156
Medium Educated (*ISCED 3-4*)	0.536	0.554
High Educated (*ISCED 5-6*)	0.214	0.290
Age 17_24	0.142	0.089
Age 25_34	0.246	0.197
Age 35_44	0.210	0.270
Age 45_54	0.210	0.246
Age 55_64	0.192	0.197
Living in the East	0.117	0.204
Disabled	0.087	0.104
Married	0.601	0.505
Separated	0.014	0.028
Divorced	0.076	0.120
Widowed	0.032	0.022
No Child	0.640	0.679
Income 1 (first quintile)	0.211	0.228
Income 2 (second quintile)	0.186	0.156
Income 3 (third quintile)	0.186	0.159
Income 4 (fourth quintile)	0.203	0.192
Income 5 (fifth quintile)	0.213	0.265
Relative Income	0.003	-0.003
Employed	0.732	0.695
Unemployed	0.067	0.141
Retired	0.100	0.070
House owner	0.471	0.480
Having a saving account	0.800	0.689

GSOEP Weighted data. For variable definitions see Table 1A in the Appendix.

Table 3. RIF Regressions for the two periods (1991-92 and 2006-07), for the Gini coefficient and variance.

	GINI				Variance			
	1991-92		2006-07		1991-92		2006-07	
	coeff	t-stud	coeff	t-stud	coeff	t-stud	coeff	t-stud
Male	0.004	1.58	0.006	1.89 *	0.237	2.49 **	0.309	2.8 **
Medium educ	-0.012	-4.4 **	-0.009	-2.11 **	-0.496	-4.27 **	-0.071	-0.46
High educ	-0.016	-4.48 **	-0.027	-5.75 **	-0.570	-3.84 **	-0.650	-3.66 **
Age 25_34	0.008	2.04 **	0.006	1.05	0.305	1.76 *	0.167	0.75
Age 35_44	0.018	3.91 **	0.031	4.98 **	0.643	3.26 **	0.580	2.48 **
Age 45_54	0.028	5.67 **	0.059	8.73 **	1.149	5.55 **	1.340	5.34 **
Age 55_64	0.005	0.87	0.029	3.98 **	0.165	0.73	0.515	1.91 *
East	0.060	15.25 **	0.018	4.98 **	1.316	7.97 **	0.223	1.64
Disabled	0.036	8.54 **	0.023	4.57 **	0.990	5.56 **	0.180	0.97
Married	-0.009	-2.35 **	-0.007	-1.57	-0.385	-2.51 **	-0.078	-0.49
Separated	0.050	5.28 **	0.024	2.67 **	1.396	3.51 **	0.595	1.74 *
Divorced	0.013	2.62 **	0.018	3.38 **	0.242	1.14	0.801	3.94 **
Widowed	-0.002	-0.28	-0.003	-0.3	-0.423	-1.29	0.303	0.78
No child	0.003	0.94	0.012	3.39 **	0.082	0.68	0.170	1.25
Inc_2	-0.020	-5.57 **	-0.019	-3.9 **	-0.799	-5.18 **	-0.622	-3.43 **
Inc_3	-0.016	-3.99 **	-0.015	-2.91 **	-0.588	-3.49 **	-0.276	-1.46
Inc_4	-0.007	-1.48	-0.021	-4.07 **	-0.329	-1.78 *	-0.599	-3.09 **
Inc_5	-0.018	-3.28 **	-0.032	-5.28 **	-0.753	-3.18 **	-0.818	-3.63 **
Relative Income	-0.005	-2.65 **	-0.004	-2.31 **	-0.099	-1.19	-0.077	-1.18
Employed	-0.023	-8.23 **	-0.022	-5.78 **	-0.966	-8.17 **	-0.962	-6.83 **
Unemployed	0.047	10.44 **	0.040	8.51 **	1.987	10.52 **	0.869	4.98 **
Retired	0.007	1.52	0.007	0.99	0.332	1.62	0.087	0.35
Owner	-0.011	-4.79 **	-0.006	-1.96 *	-0.272	-2.79 **	-0.058	-0.49
SavAccount	-0.028	-9.82 **	-0.031	-9.55 **	-0.997	-8.46 **	-0.833	-6.97 **
Constant	0.166	31.4 **	0.166	23.14 **	4.6244	20.83 **	4.224	15.79 **

* stands for statistically different from zero at 10%, ** at 5%. For variable definitions see Table 1A in the Appendix.

Table 4. Life Satisfaction: composition and coefficient effects in explaining the evolution of the Gini coeff. and variance (between 1991-92 and 2006-07).

	GINI				Variance			
	Composition		Coefficients		Composition		Coefficients	
	coeff	t	coeff	t	coeff	t	coeff	t
Male	-0.0001	-0.93	0.0017	0.28	-0.0069	-1.32	0.0310	0.12
Medium educ	-0.0002	-1.31	0.0031	0.25	-0.0091	-1.21	0.3533	0.58
High educ	-0.0012	-2.39 **	-0.0019	-0.28	-0.0426	-2.04 **	0.0972	0.31
Age 25_34	-0.0004	-1.52	0.0010	0.19	-0.0147	-1.34	-0.0555	-0.24
Age 35_44	0.0011	2.56 **	0.0022	0.32	0.0385	2.08 **	-0.2481	-0.86
Age 45_54	0.0010	2.60 **	-0.0009	-0.10	0.0417	2.36 **	-0.4473	-1.13
Age 55_64	0.0000	0.27	0.0005	0.08	0.0009	0.23	-0.2703	-1.07
East	0.0052	10.35 **	-0.0090	-2.17 **	0.1148	5.43 **	-0.2146	-1.08
Disabled	0.0006	2.32 **	0.0008	0.28	0.0170	1.98 *	0.0196	0.14
Married	0.0008	1.40	0.0152	1.39	0.0374	1.39	0.9539	1.78 *
Separated	0.0007	2.20 **	0.0009	0.78	0.0193	1.37	0.0614	1.27
Divorced	0.0006	1.21	0.0030	0.78	0.0109	0.48	0.2573	1.43
Widowed	0.0000	0.18	0.0006	0.94	0.0041	0.78	0.0620	1.98 *
No child	0.0001	0.64	0.0161	2.05 **	0.0033	0.50	0.5103	1.72 *
Inc_2	0.0006	2.64 **	-0.0015	-0.36	0.0242	2.43 **	-0.0447	-0.22
Inc_3	0.0004	1.98 *	0.0007	0.18	0.0158	1.66 *	0.0924	0.51
Inc_4	0.0001	0.70	-0.0019	-0.37	0.0040	0.76	0.0097	0.04
Inc_5	-0.0010	-2.10 **	0.0008	0.11	-0.0388	-1.96 *	0.1831	0.52
Relative income	0.0000	0.17	0.0000	0.05	0.0004	0.13	0.0006	0.12
Employed	0.0009	2.92 **	0.0069	0.63	0.0369	2.86 **	0.1061	0.21
Unemployed	0.0035	4.86 **	-0.0029	-0.82	0.1492	4.38 **	-0.2655	-1.57
Retired	-0.0002	-0.91	0.0003	0.23	-0.0097	-0.86	0.0219	0.33
Owner	-0.0001	-0.83	0.0016	0.24	-0.0022	-0.77	0.0377	0.13
SavAccount	0.0031	5.17 **	-0.0008	-0.09	0.1123	4.33 **	0.1461	0.43
Constant			-0.0344	-1.27			-1.6906	-1.41
TOT	0.0157	9.49 **	0.0021	0.37	0.7358	3.95 **	-0.2929	-1.17
Residual	0.0041	1.25			0.0041	1.25		
Index change	0.0220	7.03			0.4429	3.54		

*stands for statistically different from zero at 10%, ** at 5%. Standard errors are computed bootstrapping the whole decomposition procedure (100 replications), as in Firpo et al. (2009). For variable definitions see Table 1A in the Appendix.

Table 5. Decomposition of the 90-10, 90-50 and 50-10 differences

	90-10			90-50			50-10		
	Coeff	**t**		**Coeff**	**t**		**Coeff**	**t**	
Male	0.0003	0.12		0.0019	0.99		-0.0016	-0.73	
Medium educ	-0.0055	-1.64	*	-0.0025	-1.18		-0.0030	-1.41	
High educ	-0.0322	-2.77	**	-0.0214	-2.48	**	-0.0108	-1.12	
Age 25_34	-0.0060	-0.78		-0.0044	-0.69		-0.0016	-0.28	
Age 35_44	0.0112	1.09		0.0069	0.70		0.0043	0.51	
Age 45_54	0.0164	2.15	**	0.0080	1.33		0.0084	1.40	
Age 55_64	0.0014	0.62		0.0012	0.48		0.0002	0.15	
East	0.0520	3.15	**	0.0340	3.82	**	0.0180	1.31	
Disabled	0.0074	1.68	*	0.0013	0.57		0.0061	1.53	
Married	0.0003	0.02		-0.0023	-0.20		0.0026	0.24	
Separated	0.0093	1.30		0.0049	1.82	*	0.0045	0.65	
Divorced	0.0064	0.60		0.0019	0.26		0.0045	0.55	
Widowed	0.0008	0.23		0.0014	0.62		-0.0006	-0.17	
No child	-0.0018	-0.36		0.0019	0.55		-0.0038	-1.11	
Inc_2	0.0114	2.21	**	0.0054	1.80	*	0.0059	1.37	
Inc_3	0.0036	0.86		0.0011	0.38		0.0025	0.79	
Inc_4	-0.0004	-0.12		0.0016	0.75		-0.0019	-0.81	
Inc_5	-0.0159	-1.38		-0.0156	-1.63		-0.0004	-0.04	
Relative Income	0.0000	-0.01		0.0000	0.02		-0.0001	-0.05	
SavAccount	0.0120	2.04	**	-0.0003	-0.08		0.0123	2.43	**
Employed	0.0574	3.64	**	0.0089	0.87		0.0485	3.44	**
Unemployed	-0.0022	-0.34		-0.0065	-1.48		0.0043	0.85	
Retired	-0.0010	-0.64		-0.0007	-0.63		-0.0003	-0.34	
Owner	0.0410	2.31	**	0.0249	2.31	**	0.0161	1.15	
TOT COMP	0.1658	4.16	**	0.0515	2.00	*	0.1143	3.30	**
TOT COEFF	0.1784	0.96		-0.0095	-0.08		0.1878	1.26	
Residual	-0.0471	-0.46		0.0045	0.06		-0.0516	-0.58	
Differences change over time	**0.2971**	**2.18**	**	**0.0466**	**0.61**		**0.2505**	**2.19**	**

*stands for statistically different from zero at 10%, ** at 5%. Standard errors are computed bootstrapping the whole decomposition procedure (100 replications), as in Firpo et al (2009). For variable definitions see Table 1A in the Appendix.

Table 6. Determinants of the probability to fall in the life satisfaction tails

	Low happiness			High happiness		
	Marg.eff.	t		Marg.eff.	t	
Male	0.006	1.20		-0.007	-1.65	*
Medium educ	-0.023	-3.25	**	-0.009	-1.69	*
High educ	-0.042	-4.92	**	-0.012	-1.78	*
Age 25_34	0.033	3.06	**	-0.031	-4.07	**
Age 35_44	0.080	6.82	**	-0.068	-7.91	**
Age 45_54	0.107	8.56	**	-0.067	-7.27	**
Age 55_64	0.066	4.76	**	-0.049	-4.92	**
East	0.133	22.36	**	-0.141	-23.02	**
Disabled	0.123	13.88	**	-0.067	-7.07	**
Married	0.004	0.48		0.018	2.67	**
Separated	0.076	3.84	**	-0.033	-1.64	
Divorced	0.037	3.20	**	-0.012	-1.17	
Widowed	0.028	1.56		-0.006	-0.37	
No child	0.032	4.95	**	0.000	0.01	
Inc_2	-0.045	-5.74	**	0.000	-0.05	
Inc_3	-0.053	-6.01	**	0.021	2.79	**
Inc_4	-0.052	-5.23	**	0.008	0.94	
Inc_5	-0.108	-7.87	**	0.006	0.66	
Relative Income	-0.015	-2.94	**	0.008	2.88	**
Employed	-0.038	-5.94	**	0.008	1.39	
Unemployed	0.081	10.29	**	-0.062	-6.47	**
Retired	-0.009	-0.82		0.015	1.52	
Owner	-0.036	-6.66	**	0.017	3.88	**
SavAccount	-0.064	-10.76	**	0.024	4.44	**
Constant	-0.199	-15.92	**	-0.153	-15.91	**

* stands for statistically different from zero at 10%, ** at 5%. The high happiness is defined as LifeSatisfaction>=8, while the low happiness as LifeSatisfaction<=5. For variable definitions see Table 1A in the Appendix.

Figures

Figure 1:Life Satisfaction distribution by ISCED education level

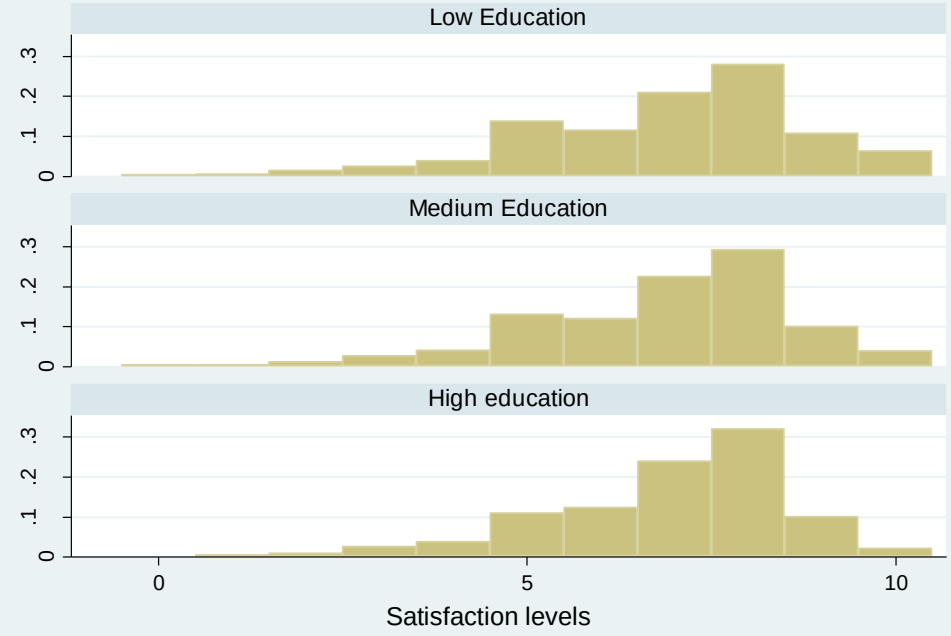

Figure 2: Gini Index by ISCED educational level

Figure 3: Life Satisfaction distribution by Income quintiles

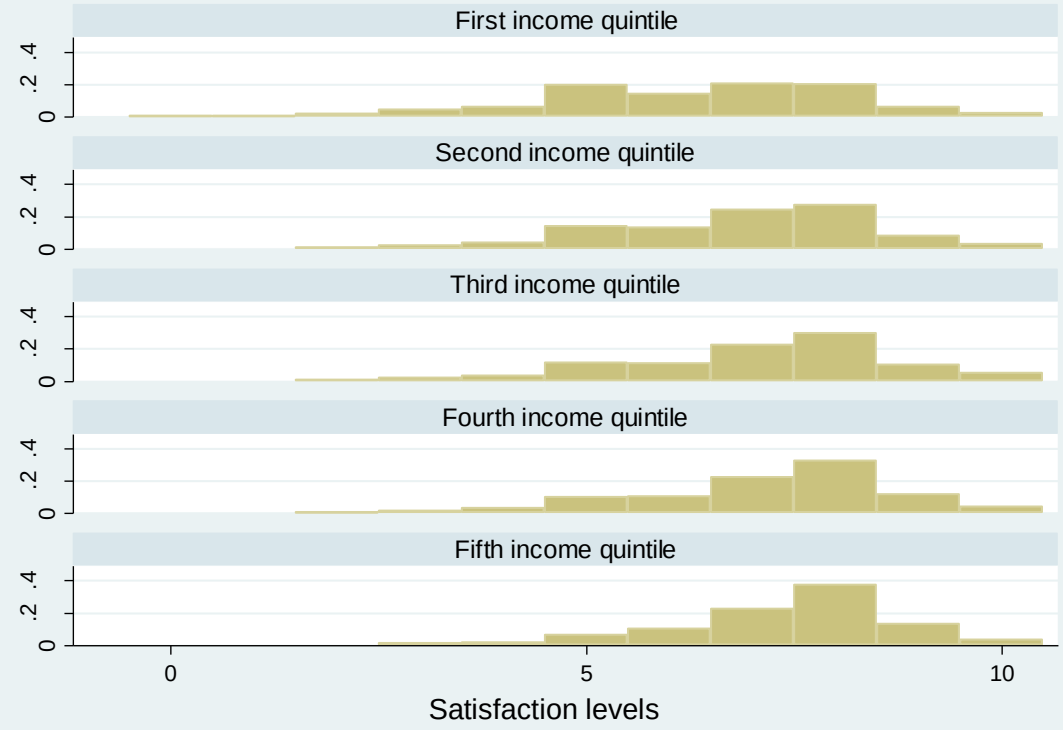

Figure 4: Gini index by income quintiles

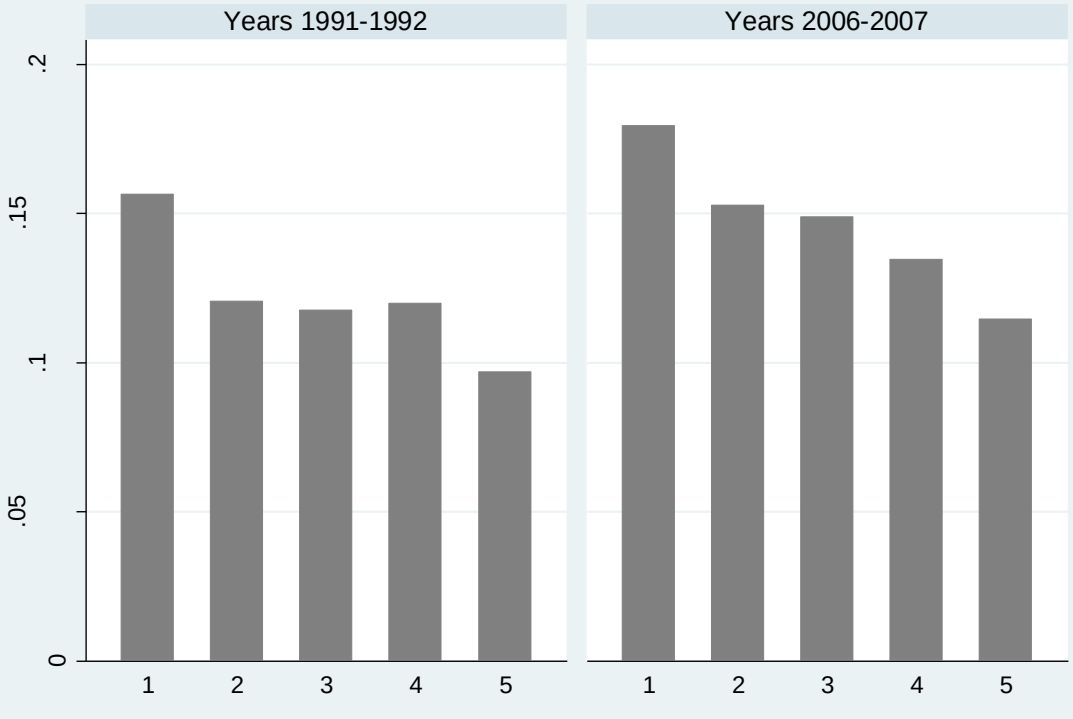

Figure 5: Gini index by age classes

Age classe on the X axes: 17-24(1); 25-34(2); 35-44(3); 45-54(4); 55-64(5).

Figure 6: Gini index by employment status

On the X axes: 1 for employed, 2 for unemployed, 3 for inactive.

Appendix

Table A1: Definitions of the variables	
Male	Dummy variable equal to one if respondent is male
East	Dummy variable equal to one if respondent lives in the East
Age 17-24	Dummy variable equal to one if respondent's age is between 17 and 24
Age 25-34	Dummy variable equal to one if respondent's age is between 25 and 34
Age 35-44	Dummy variable equal to one if respondent's age is between 35 and 44
Age 45-54	Dummy variable equal to one if respondent's age is between 45 and 54
Age 55-64	Dummy variable equal to one if respondent's age is between 55 and 64
Low educ	ISCED category 1-2
Medium educ	ISCED category 3-4
High educ	ISCED category 5-6
Inc_1	Dummy variable equal to one if the respondent's income is in the first income quintile of the pooled sample (1991, 1992, 2006, 2007)
Inc_2	Dummy variable equal to one if the respondent's income is in the second income quintile of the pooled sample (1991, 1992, 2006, 2007)
Inc_3	Dummy variable equal to one if the respondent's income is in the third income quintile of the pooled sample (1991, 1992, 2006, 2007)
Inc_4	Dummy variable equal to one if the respondent's income is in the fourth income quintile of the pooled sample (1991, 1992, 2006, 2007)
Inc_5	Dummy variable equal to one if the respondent's income is in the fifth income quintile of the pooled sample (1991, 1992, 2006, 2007)
Relative Income	Ratio between personal income and reference income (standardized)
Unemployed	Dummy variable taking value of one if the respondent is unemployed
Employed	Dummy variable taking value of one if the respondent is employed
Disabled	Dummy variable equal to one if respondent is Disable
Retired	Dummy variable taking value of one if the respondent is retired
Married	Dummy variable taking value of one if the respondent is married
Separated	Dummy variable taking value of one if the respondent is separated
Divorced	Dummy variable taking value of one if the respondent is divorced
Widowed	Dummy variable taking value of one if the respondent is widowed
Nochild	Dummy variable equal to one if the respondent has no child
SavAcc	Dummy variable taking value of one if the respondent has a saving account
Owner	Dummy variable taking value of one if the respondent is house owner