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**Structural changes in economic growth and well-  
being. The case of Italy's parabola**

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# Structural changes in economic growth and well-being. The case of Italy's parabola

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## Abstract

The controversies on the relationship (called 'gradient') between the long-run trends of GDP and subjective well-being oppose those who claim that the gradient is positive, to those who argue that it is nil. The possible existence of structural breaks of the gradient within the same country is a challenge to both views. By focusing on the case of Italy, we show that the long-run trends of GDP and of well-being turned from increasing to decreasing, and that the gradient exhibits a rise through two structural breaks. We adopt macro- and micro-economic approaches to explain why the gradient changes. We find evidence consistent with the 'loss aversion' hypothesis. In addition, the gradient changed because the erosion of trust in others, the increase of financial dissatisfaction and worsened health hinder well-being independently from income.

## 1 Introduction

Does economic growth go with improving people's well-being in the long run? 'Yes' is the answer of the scholars who claim that there exists a positive and stable association (or gradient) around the world between subjective well-being and income (e.g. Stevenson and Wolfers (2008), Sacks et al. (2012)). 'No' is the answer of those who claim that in many countries the trends of subjective well-being are flat or unrelated to economic growth, which is the so-called 'Easterlin Paradox' (e.g. Easterlin (1974), Easterlin (1995), Easterlin et al. (2017), Easterlin et al. (2010), Layard et al. (2010)). Still other

scholars argue that economic growth goes with improving well-being over time depending on certain conditions, such as declining income inequality and rising trust in others (Oishi and Kesebir, 2015; Mikucka et al., 2017). The common implicit assumption of such diverse views is that the well-being-income gradient does not change over time, despite the fact that it may be either positive, nil, or negative. In this paper, we challenge the assumption of time-stability of the gradient, and we claim that structural changes can take place in the trends of Gross Domestic Product (GDP) per capita and of subjective well-being, and in their relationship, i.e. the gradient.

We use macro data for time-series about economic growth and life satisfaction to investigate the changes of the gradient over the long-run. Then we use individual level data drawn from the European Values Study (EVS) and the European Quality of Life Study (EQLS) for the more detailed explanation of the changes of the gradient. In particular, we account for the change in the importance that people attach to income, and for the role of trust in others, of perceived health, and of financial dissatisfaction, which is a micro proxy for income inequality. We employ two micro-econometric techniques: a simple regression with interaction effects, and the Blinder-Oaxaca decomposition.

Italy provides a most interesting case study because its economy turned from a remarkable development after WWII, to a no less remarkable long-run decline that preceded the onset of the Great Recession. These facts challenge both the estimates of a single rising trend of subjective well-being of the Italian population over the entire period (Easterlin, 2017; Clark et al., 2008), and the stability and even the similarity of Italy's gradient to the world gradient (Stevenson and Wolfers, 2008).

Cyclical changes in the relationship between subjective well-being and economic growth have already been noticed, and, specifically, a greater gradient has been found when growth is negative, i.e. during contractions (De Neve et al., 2018). The justification for this finding has been referred to the behavioural phenomenon of 'loss aversion'.<sup>1</sup> However, this explanation may not be exhaustive because other factors may be involved in the changes of the gradient, like changes of income inequality and of trust in others.

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<sup>1</sup>'Loss aversion' occurs when "the aggravation that one experiences in losing a sum of money appears to be greater than the pleasure associated with gaining the same amount" (Kahneman and Tversky, 1979, p. 279). The need to further investigate the 'loss aversion' effect within the Economics of Happiness has been recently raised in the survey by Clark (2018).

Therefore, a more fine-grained exploration is required.

The specific investigation of the Italian case allows us to show whether the trend of subjective well-being exhibits structural breaks, whether the well-being-income gradient significantly change over the long run, whether other factors may condition these changes, and also whether the changes in the importance attached by people to income and to the other factors plays a role. This investigation is supported by the fact that sufficient historical data and even individual data (for a few key years) are available for a case of such great changes in economic development. A better understanding of these phenomena may also help to identify the main shocks that turned Italy's development into a parabola.

One may observe that the simplest explanation of the Italian case is that subjective well-being is subject to the diminishing returns to income, so that it can cease to increase after some threshold, and it may even decline, as some cross-sectional studies suggest (e.g. Proto and Rustichini, 2013). Such observation, however, counters the fact that, after a period of sustained development and catching up, the recent economic decline has brought the Italian economy to diverge from the economic growth of the core of the European Union (EU).

Figure 1 shows the structural changes of the Italian economy from a macro point of view. Panel A shows a parabola in which real GDP per capita rises and declines running from 1973 to 2016, so that it approached the real GDP per capita of the core of the European Union only in the middle period.<sup>2</sup> Panel B shows how subjective well-being (and specifically 'life satisfaction') has changed over the same period in Italy and in the core of the EU.<sup>3</sup> Subjective well-being of the Italian population firstly exhibits a rising trend, then it exhibits an almost flat trend around the 1990s, which is the only experience of approaching the European standards, and finally a declining trend. Structural changes thus emerge for the Italian case in the series of both real GDP per capita and subjective well-being. But structural changes seem to emerge also in the relationship between the two series, i.e. in their gradient. In fact, the decline of Italian well-being begins well before

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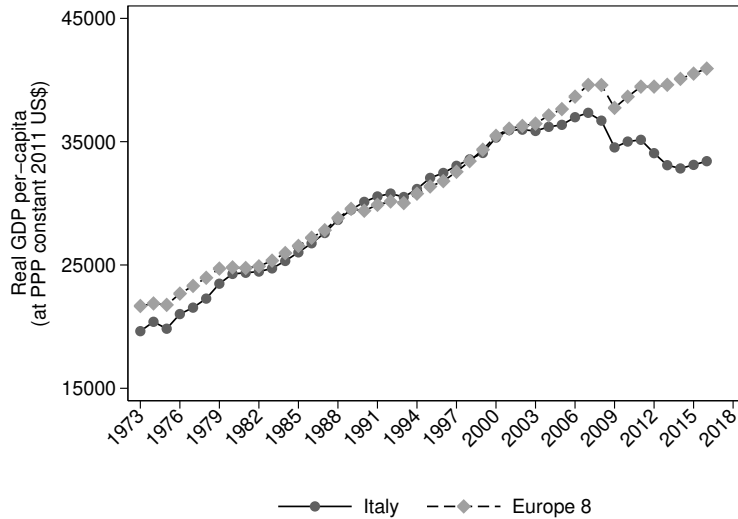
<sup>2</sup>GDP per capita is at PPP constant 2011 international dollars (World Bank data).

<sup>3</sup>The data of the figure are drawn from three sources: from the Eurobarometer Survey, which provides the share of 'very' and 'fairly' satisfied with life for the entire period, from the European Values Survey, which provides the average life satisfaction over 0-10 scale for only 1981, 1990, 1999 and 2005, and from the European Quality of Life Survey, which provides the same index for 2003, 2007, 2009 and 2016.

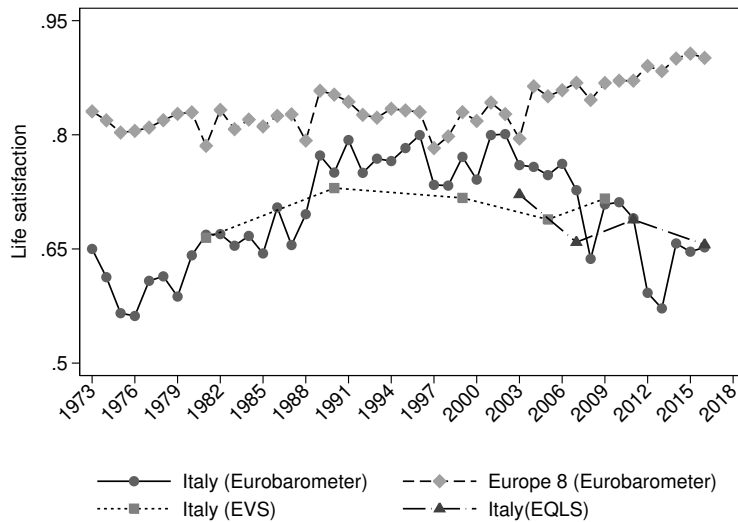
the onset of the Great Recession, and it seems to be steeper than the decline of real GDP per capita.

The rest of the paper is organized as follows. Section 2 introduces the case of Italy from the macro perspective by going into more formal details of what Figure 1 suggests. In particular, it shows that the gradient between life satisfaction and GDP per capita significantly changes twice, thus distinguishing three sub-periods of more than 10 years, through which Italy turns from a growing to a declining country. Section 3 provides an historical perspective indicating the shocks that most probably explain Italian parabola to derive our main testable hypothesis using micro data. Section 4 investigates what accounts for the long-run downturn by using individual data. It shows that the rise and fall of income account little for the rise and fall of life satisfaction, because the importance of income for Italians' well-being changes even more, and because of the rise and fall of financial satisfaction, of trust in others, and of self-reported health. Section 6 concludes.

Figure 1: Real GDP per capita (Panel A) and share of people ‘very’ or ‘fairly’ satisfied with life (Panel B) in Italy and in Europe-8 (Belgium, Denmark, France, Germany, Ireland, Luxembourg, Netherland, and the United Kingdom) in the period 1973-2016



(a) Real GDP per capita in Italy and Europe (8 countries).



(b) Life satisfaction in Italy (Eurobarometer, European Values Study and European Quality of Life Survey) and in Europe (8 countries).

## 2 The structural changes in Italy from the macro perspective

In the studies on the dynamics of subjective well-being, Italy is usually presented as ‘well-behaved’, i.e. with a rising trend, and positively correlated with real GDP per capita (e.g., Stevenson and Wolfers (2008), Clark et al. (2008), Hagerty and Veenhoven (2003)). However, simple tests on the existence of breaks in both the trend of life satisfaction and in its relationship with ‘GDP’ (which stands for ‘real GDP per capita’ hereafter) tell a different story: we detect two structural breaks going in the same downward direction between 1973 and 2016, namely around 1989 and around 2005. Table 1 shows the results of simple computations of the relevant changes.

The annual changes of the share of people declaring to be ‘very’ and ‘fairly’ satisfied with their life turn in 1989 from positive to almost flat, and then they turn again to (significantly) negative in 2005 (see the second column of table 1). Panel 1b in Figure 1 shows that the pattern of downward looking parabola is confirmed by the evidence from two other data sources, i.e. the European Values Study and the European Quality of Life Survey (see the next section for details <sup>4</sup>). The positive trend for the entire period (fifth row of Table 1), the one referred to by the opponents of the Easterlin paradox, is misleading because of the structural break detected in 1989 (Wald test=31.6, p=0.0000) and in 2005 (Wald test=14.7, p=0.0006).

GDP growth is positive in the first two sub-periods, although decelerating, and it is (significantly) negative in the third sub-period (see the third column of Table 1). The positive trend for the entire period (fifth row) is again misleading because of the structural break in 1989 (Wald test=67.4, p=0.0000) and in 2005 (Wald test=281.7, p=0.0000).

The fourth column of Table 1 reports the gradient between the trends

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<sup>4</sup>These two data sources report the average of people’s life satisfaction. The Gallup World Poll, as fourth data source, reports a significant decline of life evaluation in Italy from 2005-2007 to 2014-2016 (Helliwell et al., 2017). ISTAT, as fifth data source, confirms and updates the decline for 2017 with respect to both 2016 and 2010. For the details of the five sources see:

<http://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/Archive/index>

<http://www.worldvaluessurvey.org/wvs.jsp>

<https://www.eurofound.europa.eu/surveys/european-quality-of-life-surveys>

<https://www.gallup.com/services/170945/worldpoll.aspx>

[https://www.istat.it/it/files//2018/12/Bes\\_2018.pdf](https://www.istat.it/it/files//2018/12/Bes_2018.pdf)



Table 1: The trends of life satisfaction, of real GDP per capita, and of their gradient in three sub-periods between 1973 and 2016 in Italy.

Time period	Annual changes of the proportion of people ‘very’ and ‘fairly’ satisfied with life	Annual growth rate of real GDP per capita	Gradient between life satisfaction and real GDP per capita (times 100)
1973-1989	0.0080***	2.47***	0.33***
1989-2005	-0.0003	1.44***	-0.01
2005-2016	-0.0114***	-1.18***	0.85** <sup>◦</sup>
1973-2016	0.0017**	1.37***	0.23***

*Notes:* The results are obtained as coefficients of the regressions of, respectively, life satisfaction against years (I column), the logarithm of real GDP per capita against years (II column), life satisfaction against the logarithm of real GDP per capita (III column). Real GDP per capita is at purchasing power parity in constant 2011 U.S. dollars. Asterisks indicate statistical significance at the \* 10%, \*\* 5%, \*\*\* 1%. The symbol <sup>◦</sup> indicates that the positive gradient is due to the decline of both life satisfaction and real GDP per capita.

*Sources:* Elaborations on data from Eurobarometer, and Maddison Project Database (Bolt et al., 2018).

of the two variables. Figures indicate that, between 1973 and 1989, the proportion of people satisfied with life increases by 0.33 percentage points yearly for one percentage point of economic growth. Between 1989 and 2005, when economic growth is rather slow, the share of satisfied people decreases, although very slightly and not significantly. Finally, in the third period (2005-2016), the share of satisfied people significantly decreases by 0.85 percentage points per year for one percentage point of economic decline. The gradient of 0.23% for the entire period (fifth row) is thus again misleading because of the presence of structural breaks in 1989 (Wald test=19.2,  $p=0.0017$ ), and in 2005 (Wald test=61.2,  $p=0.0000$ ).<sup>5</sup>

The changes of the gradient may be biased by the short-run changes of GDP. However, if the trend component of GDP is disentangled from its cyclical component by using the Hodrick-Prescott filter (with  $\lambda = 6.25$  of smoothness), the results change very little (see Table 7 in the Appendix).

The greater gradient in 2005-2016 compared to the gradient in 1973-1989 indicates that life satisfaction tends to decrease, and at a greater rate, when the trend of GDP is negative, while it tends to increase less, and at a reduced rate, when the trend of GDP is positive. This asymmetry makes the economic decline an even more painful phenomenon for the population, and it clearly recalls Kahneman and Tversky (1979)'s concept of 'loss aversion', according to which people tend to prefer avoiding losses over acquiring gains of the same size. Analyzing a world sample of countries, De Neve et al. (2018) have recently documented the existence of a greater (and more significant) gradient during economic decline, but only for cyclical changes. Our results suggest that 'loss aversion' can take place also over the long run.

Compared to the rest of Europe, Italy stands out in some important aspects. We first consider the European countries for which historical series of life satisfaction are available as long as those for Italy, i.e. Belgium, Denmark, France, Germany, Ireland, Luxembourg, Netherland, and the United Kingdom. The trends of this set of countries are broken in a rather different way. Table 2 replicates the exercise of Table 1 for the (weighted) average of the 8 European countries. Structural changes emerge also in this case, but the trend of life satisfaction significantly turns upward (Wald test=47.7,

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<sup>5</sup>The most significant break of the gradient within the entire period is detected in 2007 (Wald test=60.8,  $p=0.0000$ ), but the test for the break in 2005 is very similar (Wald test=58.9,  $p=0.0000$ ). The most significant break of the gradient between 1973 and 2005 is detected in 1989 (as reported in the text), which is the same year as the most significant break of the gradient between 1973 and 2007.

Table 2: The trends of life satisfaction, of real GDP per capita, and of their gradient in three sub-periods between 1973 and 2016 in Europe-8 (Belgium, Denmark, France, Germany, Ireland, Luxembourg, Netherland, and the United Kingdom).

Time period	Annual changes of the proportion of people 'very' and 'fairly' satisfied with life	Annual growth rate of real GDP per capita	Gradient between life satisfaction and real GDP per capita (times 100)
1973-1997	0.0005	1.72***	0.03
1997-2016	0.0056***	1.03***	0.49***
1973-2016	0.0017***	1.57***	0.10***

*Notes:* The results are obtained as coefficients of the regressions of, respectively, life satisfaction against years (I column), the logarithm of real GDP per capita against years (II column), life satisfaction against the logarithm of real GDP per capita (III column). Real GDP per capita is at purchasing power parity in constant 2011 U.S. dollars. Asterisks indicate statistical significance at the \* 10%, \*\* 5%, \*\*\* 1%.

*Sources:* Elaborations on data from Eurobarometer, and Maddison Project Database.

$p=0.0000$ ) with a gradient that increases (Wald test=51.8,  $p=0.0000$ ), which is contrast with Italy.<sup>6</sup> We notice that while the performance of GDP does not improve in both Italy and Europe-8, life satisfaction points in the opposite direction since the 1990s.

The departure of Italy from Europe-8 as a whole is confirmed by comparing the heterogeneity of the group of the Europe-8 countries with that of the Europe-9 countries, which includes Italy. In fact, the standard deviations of life satisfaction (normalized with the average) are 0.086, 0.078 and 0.056 for Europe-8 over the sub-periods 1973-1989, 1989-2005 and 2005-2016 respectively; the standard deviations are 0.120, 0.085 and 0.104 for Europe-9. In words, although Europe-9 always exhibits a greater dispersion than Europe-8, the difference between countries *diminishes* from the first sub-period to the second one, but it *increases* from the second to the third. By contrast,

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<sup>6</sup>The test for the increase of the gradient in the endogenously determined breaking year is provided in the Appendix (Table 8) for each country. In Table 2 the entire period is subdivided according to the year of maximum break for Europe-8, but if we take the same subdivision as for Italy the results are very similar (see Table 9 in the Appendix).

the heterogeneity within Europe-8 becomes *smaller* by moving from one sub-period to the next.

Therefore, the case of Italy in which the two parabolae of the economy and of life satisfaction approached Europe-8 at their peak, appears as a peculiar phenomenon of structural change. In particular, the changes in the gradient between life satisfaction and GDP placed Italy in an especially bad condition compared to other Western European countries. In 2016, Italy reports the same percentage of satisfied people as in 1983, when GDP was 26% lower; and the gap with Europe-8 would be halved if Italy had maintained the gradient of 1975-1989 for the rest of the period considered, despite the recent deceleration and decline of the GDP.

Second, we compare Italy to a set of Mediterranean European countries for which data are available. Also in this case Italy stands out exhibiting both differences and similarities. Greece experienced slow economic growth and a stagnating life satisfaction until 2009, so that it remained rather distant from Europe-8. After 2009, the Great Recession hit Greece more severely than Italy, but life satisfaction declined less severely. The change in the gradient has thus been much smaller. Spain performed better than Italy, because the first sub-period of expansion lasted from 1981 to 2008, with higher rates of growth of GDP. Since this was accompanied by growing life satisfaction, Spain approached the level of life satisfaction of Europe-8. The Great Recession hits Spain less strongly than Italy, because both the economy and life satisfaction declined less. In 2016, the gap in life satisfaction with Europe-8 is 12% for Spain, while it is 22% for Italy. Portugal maintained a large economic gap with Europe-8 over the entire period 1985-2016, mainly because its initial conditions were especially backward. Despite high economic growth until 2008, life satisfaction declined, and, after 2008, the mild recession in the economy was accompanied by a virtually constant life satisfaction. Fortunately, by looking at the most recent period, life satisfaction has almost doubled, by jumping from 33% in 2011 to 65% in 2016 (see Table 10 in the Appendix for details).

The case of Italy addresses some general economic issues by challenging two empirical and contrasting regularities found in the economic research on happiness: first, the stable gradient found in the studies on the positive cross-country correlation between life satisfaction and GDP; second, the flat time trend of life satisfaction in countries which may be growing in GDP. The first empirical regularity was claimed by Stevenson and Wolfers (2008), but it did not convince all commentators (Krueger, 2008), and it was criticized

by Richard Easterlin. He and his collaborators in fact showed that the cross-country correlation between life satisfaction and GDP disappears if referred to the *trends* over at least 10 years, and that the trend of life satisfaction is not rising in both developing and developed countries, thus confirming the ‘Easterlin paradox’ (Easterlin et al., 2010).<sup>7</sup>

This section challenges both empirical regularities by considering the possible changes of the trends in a same country. The case of Italy in fact shows that such changes can be substantial, and that the trend of life satisfaction over periods of more than 10 years can be either rising with GDP, or flat, or declining. The downward arm of this pattern suggests, in contrast with the core of Europe, that the ‘decreasing returns to income’ are not a sufficient explanation, and the fact that such downward arm began around 1989 and prolongs for almost 30 years suggests that the Great Recession is not a sufficient explanation either. A deep-rooted investigation is thus needed.

### 3 A brief historical analysis

Which shocks may have turned economic growth into economic decline? Answering this question goes beyond the scope of the paper, and it would take us too far. However, a brief account of the main historical facts concerning possible shocks can help us to interpret the gradient in the light of the ‘loss aversion’ hypothesis.

The turn of Italy’s parabola was prepared by three key facts: (i) in the 1970s, unions claimed higher, price-indexed, and more equal wages, after several years in which wage share shrank; (ii) in the 1980s, relaxed fiscal policy, including social expenditure, inflated Italy’s income growth thus further worsening public debt; (iii) during both decades, Italy and other European countries made several progressively more demanding attempts to build a common area of free trade. To this aim, a quasi-fixed regime of foreign exchange rates (the European Monetary System) was established.

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<sup>7</sup>The ‘Easterlin paradox’ arose from the pioneering 1974 and 1995 Easterlin’s articles, and it states that at a point in time happiness varies directly with income both among and within nations, but over time happiness does not trend upward as income continues to grow. “Happiness” is used here interchangeably with subjective well-being as a proxy for all evaluative measures of selfreported feelings of well-being, including life satisfaction [...]. “Income” is a proxy for real GDP per capita, the standard unitary measure of economic growth’ (Easterlin, 2017).

In the 1990s, a number of dramatic shocks, i.e. economic, political, judicial, and criminal ones, hit Italy. In particular, after the foreign exchange regime was subject to international disruptive forces, the Italian Lira was repeatedly attacked by speculators in 1992, so that it exited that regime and severely devalued.<sup>8</sup> The reaction of the government was similarly dramatic, because the primary balance of the public sector was reversed in a very short time from largely negative since many years to largely positive from then on. Secondly, labour market reforms brought Italy rapidly closer to Europe by making labour far more flexible.

These two shocks had the effect of tightening people, except the richest, in a grip: the fiscal restriction put people in conditions of greater economic needs, while labour flexibilisation made needs satisfaction more uncertain. People thus experienced a dramatic reversal of the tendency to less income inequality. In fact, while from the 1970s the Gini index steeply declined, in the 1990s it steeply increased. People further experienced more competition in the labour market just when public safety net was weakened, thus challenging their trust in others.<sup>9</sup> Therefore, when people realised that the world around them had changed, they cumulated various reasons for experiencing a greater reduction in their life satisfaction than in their income, i.e a greater well-being-income gradient.

In sum, by looking at historical facts, we expect a confirmation of the ‘loss aversion’ hypothesis, i.e. that people suffer more a 1% of income decline than they enjoy a 1% of income growth. In particular, we expect that Italians’ preferences for income increase when the trend of GDP declines because they experience increasing uncertainty about the future, and worsening economic conditions. However, the interpretation based on loss aversion requires that *other things remain constant*, which is difficult to maintain in the long run. Hence, in the next section, we will use micro data to put our expectation to a test. In particular, we will account for the change in the social context by focusing on the changes of trust in others and of financial dissatisfaction.

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<sup>8</sup>In the same year, the traditional parties lost the elections, many politicians were prosecuted for corruption, and two magistrates who led investigations on the mafia were killed.

<sup>9</sup>The social consequences of these shocks are worsened by the increased generational inequality that began in the mid-1990s. In fact, equivalent income of older cohorts of household heads improved, while that of younger cohorts deteriorated (Berloffa and Villa, 2010).

## 4 Explaining life satisfaction in Italy: evidence from micro data

Individual level data for Italy are available for some key-years of the period under examination: the European Values Study provides a dataset for 1981, 1990, and 2005, and the European Quality of Life Survey which covers the period from 2003 to 2016. We adopt two econometric approaches: the first one is a standard OLS regression in which we regress life satisfaction over income, year, their interaction and a standard set of control variables. The equation is as follows:

$$LS_i = \alpha + \beta_1 \cdot Income_i + \beta_2 \cdot Year + \beta_3 \cdot Income_i \cdot Year + \Theta \cdot \mathbf{X}_i + \varepsilon \quad (1)$$

where  $LS$  stands for life satisfaction; the subscript  $i$  indicates individuals;  $\mathbf{X}_i$  is a vector of control variables including age, age squared, gender, education, marital status, subjective health, and occupational status, and  $\Theta$  is the corresponding vector of coefficients;  $Year$  is a variable that includes all the years when the surveys have been administered. The regression uses sample weights and robust standard errors clustered by year.

The coefficient  $\beta_3$  indicates how the relationship between income and life satisfaction changes over time. Thus, it allows us to check whether income has become more significantly associated to life satisfaction in correspondence with the decline of the Italian economy. However, as discussed in section 3, well-being in Italy might have changed because of changes in the social context, or precisely, of how this is perceived by people. To account for this change, we extend equation 1 to include measures of trust in others and of financial dissatisfaction.

In order to study the relative contributions of income, trust in others, and of financial dissatisfaction to the changes of life satisfaction, we adopt a Blinder-Oaxaca decomposition. In the early 1970s, Oaxaca (1973) and Blinder (1973) independently developed a technique to study discrimination between men and women in the labour market. Since then, the Blinder-Oaxaca decomposition has been applied in many disciplines, including the literature on subjective well-being (Helliwell and Barrington-Leigh, 2010; Becchetti et al., 2014). In our case, the Blinder-Oaxaca decomposition is valuable to explain the changes in well-being as it allows to account for two possible sources of changes at the same time: first, the amount of a correlate

of life satisfaction may change – e.g. income increased over time; second, the association between independent variables and life satisfaction may change – e.g. the correlation of income and life satisfaction increased over time. If we consider life satisfaction as a proxy for utility, this amounts to recognizing that people’s preferences may change over time.

The Blinder-Oaxaca decomposition uses individual level data to decompose the difference (or gap) in life satisfaction between two points in time. In our case, the two points in time are the years delimiting the sub-periods in which we observe structural breaks (1989 and 2005). The life satisfaction difference is decomposed in two parts: the *explained* one, which accounts for differences in observed characteristics of the sample and the *unexplained* one, which considers the differences in the coefficients between the two groups (Jann, 2008). In other words, the decomposition allows us to establish how much of the overall difference in the average life satisfaction between two years can be attributed to changes in the set of variables as presented in equation 2 (the explained part) and to changes in how these variables are associated to well-being (the unexplained part).

The ordered nature of the dependent variable requires methods for categorical variables. However, we chose a linear model for ease of computation and comparison of the coefficients across years. Moreover, the literature on subjective well-being showed that, in presence of a sufficient number of categories, linear models and their ordered counterparts provide qualitatively equivalent results. In particular, Ferrer-i Carbonell and Frijters (2004) conclude that assumptions on ordinality or cardinality of the answers to a subjective well-being question are “relatively unimportant to results”<sup>10</sup>.

Formally, the decomposition is as follows:

$$\Delta LS = \underbrace{[E(X_{fy}) - E(X_{iy})]' \cdot \beta^*}_{\text{explained}} + \underbrace{[E(X_{fy})' \cdot (\beta_{fy} - \beta^*) + E(X_{iy})' \cdot (\beta^* - \beta_{iy})]}_{\text{unexplained}} \quad (2)$$

where  $\Delta LS$  is the gap in average subjective well-being between the final (*fy*) and the initial (*iy*) year of observations,  $E(X)$  is the yearly average (across individuals) of a vector of independent variables measured at the beginning and at the end of the period of observation,  $\beta_{fy}$  and  $\beta_{iy}$  are vectors of coefficients and  $\beta^*$  is a vector of *non-discriminatory* coefficients to quantify

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<sup>10</sup>Ferrer-i Carbonell and Frijters (2004, p. 655).



how much each group of variables explains the overall gap. The coefficients  $\beta^*$  are estimated by pooling the observations of the final and initial years.

In a second step, we extend equation 1 and 2 to account for trust in others and financial dissatisfaction. These additional control variables allow us to check whether the role of income is robust to controlling for two of the main explanations of the change in well-being provided so far in the literature, namely the erosion of social capital (Bartolini and Bonatti, 2008; Bartolini et al., 2013; Bartolini and Sarracino, 2015) and adaptation to past and others' income (Layard et al., 2010; Clark et al., 2017; Clark and Georgellis, 2010). We provide a detailed description of the variables of interest in section 4.1.

Unfortunately, there is no single source of individual level data that allows us to study Italians' well-being since the early 1970s. However, it is possible to use two separate data-sets covering respectively the period 1981-2005 (European Value Study data) and 2003-2016 (European Quality of Life Survey data). The changes in life satisfaction from these two data-sets confirm the trend indicated by Eurobarometer data (see Figure 1b). Yet, compared to Eurobarometer, these two surveys provide a rich set of harmonized and nationally representative data over time.

## 4.1 Data

### 4.1.1 European Values Study (1981-2005)

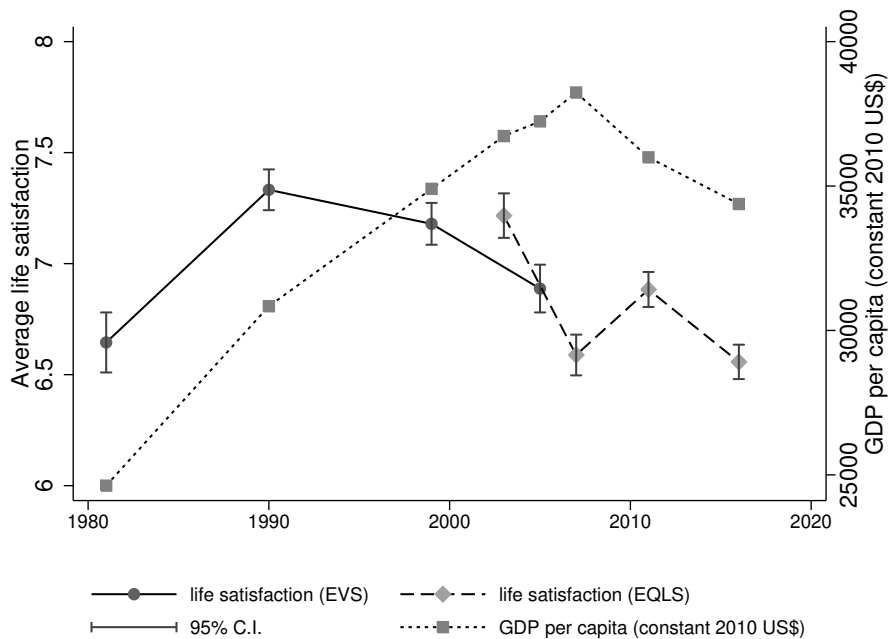
The EVS (2011) is a compilation of internationally comparable surveys collecting information on many aspects of people's lives including economic, social, cultural and political issues. Each survey provides nationally representative samples of the population of European countries. The survey has been administered in Italy in years 1981, 1990, 1999 and 2005. The sample comprises about 1000 observations per wave sampled according to multi-stage stratified sampling (EVS, 2011).

Our proxy for well-being is life satisfaction as observed through answers to the question: "all things considered, how satisfied are you with your life as a whole these days?". Answers range from 1 = "dissatisfied" to 10 = "satisfied". The EVS provides also another proxy for well-being, happiness. However, we focus only on the former variable for two main reasons: i. life satisfaction (1-10 points scale) provides better and more differentiated information than happiness (1-4 points scale); ii. despite the fact that the evidence from the two variables is often consistent, happiness is usually re-

garded as a more emotional measure of well-being, whereas life satisfaction is considered a more cognitive evaluation of well-being. Hence, the second is usually regarded as a more reliable proxy for well-being (Diener, 2006).

Figure 2 represents the changes of life satisfaction over time along with economic growth. The curves confirm the observation from Eurobarometer data (see Figure 1) that the gradient between life satisfaction and economic growth changes in the 1990s. Thus in our analysis we will focus on the sub-periods 1981-1990, and 1990-2005. Unfortunately, the European Values Study does not cover the period up to 2016. This is why, later in the paper, we will turn our attention to the European Quality of Life Study which, instead, covers the period 2003-2016.

Figure 2: Trends of GDP per capita (constant 2010 US\$) and life satisfaction.



*Note:* Figures about life satisfaction from 1981 to 2005 are from the EVS. Figures from 2003 to 2016 are from the EQLS, which is described in section 4.1.2.

Household income, financial dissatisfaction and trust in others are the three main independent variables. Income is measured through respondents'

declaration of their own household income. Respondents are asked to place themselves on a scale from 1 to 10 where each point corresponds to a specific income bracket. For present analysis, we substituted each value on the scale with the average value of the bracket. Subsequently, the income has been transformed in real Euro of 2010 and converted in logarithm to normalize its distribution.

Financial dissatisfaction is based on answers to the question: “how satisfied are you with the financial situation of your household?”. The answers range on a 10 points scale where higher scores indicate higher satisfaction. Previous studies documented that, after accounting for personal income, financial dissatisfaction correlates with measures of social deprivation (D’Ambrosio and Frick, 2007, 2012). In other words, financial dissatisfaction reflects respondents’ relative achievements, rather than absolute ones. Hence, this variable can be regarded as a proxy for social comparisons. The advantage of using a self-assessed measure of relative deprivation, rather than defining reference groups and computing relative income, is that the former solution does not hinge on any assumption about the composition of the reference group. Such an assumption is particularly stringent in our case because few of the components of a reference group remain the same over large periods of time. Letting people to decide to whom they compare their achievements at each point in time and to evaluate their condition accordingly allows us to overcome the limitations of the alternative solutions. Recent studies provided additional evidence in support of the interpretation of financial dissatisfaction: Brockmann et al. (2009) and Bartolini and Sarracino (2015) show that financial dissatisfaction in China increased since 1990 despite a formidable economic growth. This suggests that financial dissatisfaction reflects relative rather than absolute concerns. Additionally, the growth of financial dissatisfaction emerged along with increasing income inequality: by widening the differences between people, high income inequality increases the changes to witness the living conditions of others and, therefore, to establish social comparisons. This can explain the association between financial dissatisfaction (at micro level) and income inequality (at macro level). For the purposes of the present study, we converted financial dissatisfaction in three dummies to distinguish people with low satisfaction (those who chose the first three categories) from those with high satisfaction (those who chose the upper three categories). The intermediate categories constitute the third dummy which we use as reference category in the analysis.

We observe trust in others using a measure of generalized trust as adopted

by Knack and Keefer (1997). Trust in others is measured with the answers to the question: “Generally speaking, would you say that most people can be trusted, or that you can’t be too careful in dealing with people?”. Answers are coded 1 if the respondent answers positively, 0 otherwise.

To account for individual heterogeneity, we include a set of socio-demographic control variables such as gender, age, marital and employment status, and the share of people reporting to have poor or very poor health. We also account for respondents’ education including a control for the age at which respondent finished his/her studies. We are aware that this is an imperfect proxy of the education of the respondent, but other measures are not consistently observed across the waves of the EVS. Table 3 summarizes the main variables used in this study and it reports some descriptive statistics.

Table 3: Descriptive statistics of European Values Study data for Italy in 1981 and 2005.

variable	mean	sd	min	max	obs
satisfaction with life	6.763	2.194	1	10	2233
log income (real 2010 Euro)	9.942	0.649	7.988	12.25	1687
low financial dissatisfaction	0.352	0.478	0	1	2269
high financial dissatisfaction	0.182	0.386	0	1	2269
trust in others	0.278	0.448	0	1	2248
age	42.06	16.65	17	86	2294
age squared/100	20.46	14.89	2.890	73.96	2294
woman	0.505	0.500	0	1	2294
age education completed	17.04	5.980	4	80	2223
married	0.566	0.496	0	1	2294
divorced	0.00959	0.0975	0	1	2294
separated	0.0201	0.140	0	1	2294
widowed	0.0519	0.222	0	1	2294
part time	0.326	0.469	0	1	2294
retired	0.159	0.365	0	1	2294
housewife	0.158	0.365	0	1	2294
student	0.156	0.363	0	1	2294
unemployed	0.0789	0.270	0	1	2294
other	0.0567	0.231	0	1	2294
poor health	0.40	0.490	0	1	1979
year	–	–	1981	2005	2294

### 4.1.2 European Quality of Life Survey (2003-2016)

Eurofund, the European Foundation for the Improvement of Living and Working Conditions, carries out the European Quality of Life Survey (EQLS). This is a collection of surveys administered regularly every four years since 2003. The surveys examine objective and subjective aspects of people’s lives, including issues such as employment, income, education, housing, health, work-life balance and well-being. In 2003 the survey covered 27 European countries, and in 2016 it included all 28 European Union member states.

EQLS collects nationally representative, harmonized data across countries. This permits to track key trends in the quality of people’s lives over time. The national samples include about 1000 respondents randomly drawn from the adult population living in private households. Respondents are selected using multi-stage, stratified, random sampling in each country. Interviews are conducted face-to-face using computer-assisted personal interviewing (CAPI).

The list of the considered variables mirrors the one used in the previous section. Our dependent variable is life satisfaction, which ranges from 1 to 10 where higher scores indicate more satisfaction with life. The EQLS provides also information about respondents’ happiness on a scale from 1 to 10. However, for the same reasons illustrated in the previous section, we focus on life satisfaction (average figures about life satisfaction from EQLS data are shown in figure 2).

Household income is measured through respondents’ declaration of their own household income. The administrators of the survey harmonized this variable providing the equivalized monthly income in real Euro of 2010. We converted the household income in logarithm to normalize its distribution.

Similarly to the EVS, financial dissatisfaction is based on answers to the following question: “Could you please tell me on a scale of 1 to 10 how satisfied you are with each of the following items, where 1 means you are very dissatisfied and 10 means you are very satisfied? Your present standard of living”. We converted this variable in three dummies to distinguish people with low satisfaction (those who chose the first three categories) from those with high satisfaction (those who chose the upper three categories). The intermediate categories constitute the third dummy which we use as reference category in the analysis.

We observe trust in others with the answers to the question: “Generally speaking, would you say that most people can be trusted, or that you can’t

Table 4: Descriptive statistics of European Quality of Life Survey data for Italy in 2003 and 2016.

Variable	mean	sd	min	max	obs
life satisfaction (1 very dissatisfied, 10 very sa	6.753	1.749	1	10	2967
age	49.74	16.15	18	95	2976
age squared /100	27.35	16.69	3.240	90.25	2976
women	0.603	0.489	0	1	2976
married or living with partner	0.568	0.495	0	1	2975
separated or divorced and not living with	0.0914	0.288	0	1	2975
widowed and not living with partner	0.0982	0.298	0	1	2975
unemployed for less than 12 months	0.0165	0.127	0	1	2976
unemployed for more than 12 months	0.0316	0.175	0	1	2976
unable to work due to illness or disability	0.00370	0.0607	0	1	2976
retired	0.238	0.426	0	1	2976
homemaker	0.157	0.363	0	1	2976
student	0.0457	0.209	0	1	2976
upper secondary education	0.439	0.496	0	1	2966
tertiary education	0.171	0.376	0	1	2966
(log) equivalized monthly household income (real 2010 euro)	6.850	0.791	0.632	10.02	2243
low financial dissatisfaction	0.350	0.477	0	1	2973
high financial dissatisfaction	0.391	0.488	0	1	2973
high trust in others	0.298	0.458	0	1	2968
poor health	0.264	0.441	0	1	2973
year	–	–	2003	2016	2976

be too careful in dealing with people?”, which is the same wording used in the EVS. Answers range from 1 to 10, where 1 means that you can’t be too careful and 10 means that most people can be trusted. This variable has been recoded into a dummy for comparability with the EVS. The new variable is set equal to 1 if the respondent chose a score of 7 or higher (note that 7 corresponds to the 75<sup>th</sup> percentile of the distribution of trust), 0 otherwise.

Finally, we include a set of socio-demographic control variables such as gender, age, marital and employment status, as well as the share of people declaring to have poor or very poor health. We also account for respondents’ education including a set of three dummies reflecting the educational achievement of the respondent: primary, upper secondary, or tertiary. Table 4 provides summary statistics for the pooled 2003 and 2016 Italian samples.

## 5 Results

Panel A in Figure 3 shows the marginal effect of income on life satisfaction in successive years (restricted model), i.e. the main result from equation

1.<sup>11</sup> The marginal effects in 1981 and 1990 are not statistically different from zero, which suggests that in the period of economic expansion, differences of income among individuals are not correlated with differences of life satisfaction. This relationship changes after the year 2000: when the trend of the Italian economy changed sign, income turned out to be significantly associated to life satisfaction. This evidence confirms the macro findings illustrated in section 2: the changes in the association between income and life satisfaction are consistent with the loss aversion hypothesis. Panel B in Figure 3 shows the marginal effect of income on life satisfaction over time after accounting for the effect of trust in others and financial dissatisfaction (complete model). The results change compared to the restricted model, but qualitatively they convey the same message: the importance of income for well-being is negative and weakly significant in the period of economic expansion, whereas it turns positive and significant after 2000.<sup>12</sup>

Table 5 summarizes the results from the Blinder-Oaxaca decomposition.<sup>13</sup> During the 1980s, on average Italians' life satisfaction increased by 7.7 percentage points; it then lost 3.9 percentage points between 1990 and 2005, and further 6 percentage points between 2003 and 2016. Hence, in the final year of observation, Italians' life satisfaction was basically at the same level of 1981. The decomposition reveals that the Italian trajectory of life satisfaction is the result of two transformations: one in the endowments of the correlates of life satisfaction (the explained part of the decomposition), and one in the magnitude of the association of each correlate with life satisfaction (the unexplained part). As the coefficients reflect the association between independent variables and life satisfaction, we interpret them as people's preferences. Each of the two sides of the decomposition explains approximately 50% of the overall variation of life satisfaction in correspondence of the first two structural breaks (1989 and 2005). In the last period, the explained part predicts about two thirds (i.e. -0.40 points) of the life satisfaction gap (-0.60 points). In other words, the changes of Italians' preferences play a minor role in the last period compared to previous years. Put it differently, the explained part of the decomposition, i.e. the part associated to the changes in the levels of the explanatory variables, explains an increasing share of the life satisfaction difference over time: from 47% in the first period, to 67% in

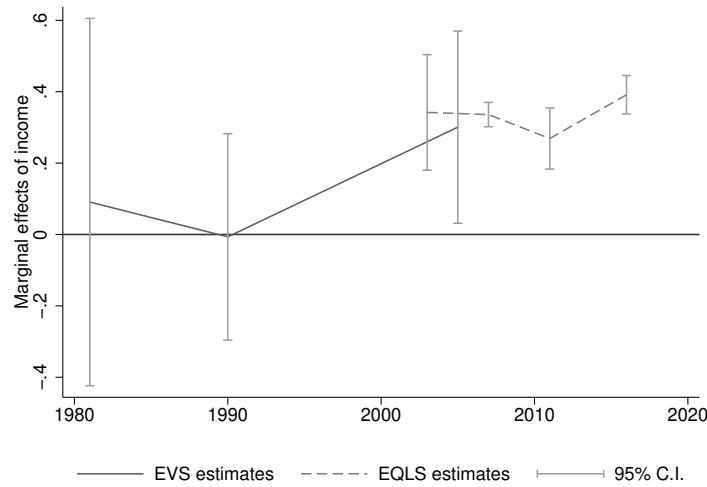
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<sup>11</sup>The complete set of results from the OLS model is available in Appendix B.

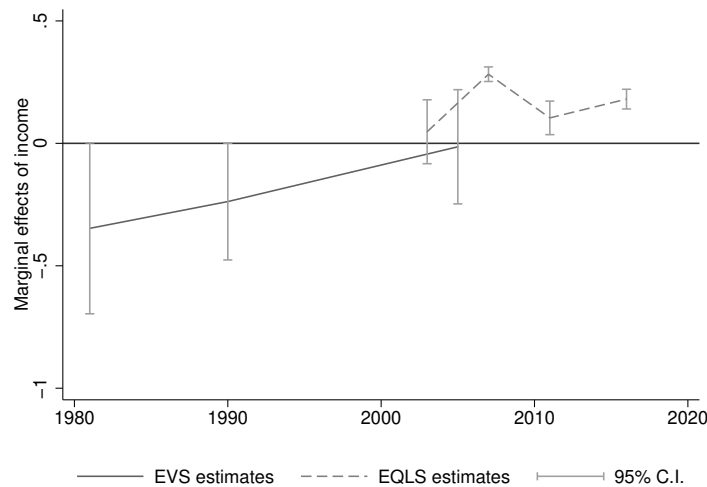
<sup>12</sup>Tables with the complete set of results are available in Appendix B

<sup>13</sup>The detailed results from the decomposition are available in tables 14, 16 and 18 in Appendices C and D.

Figure 3: The association between income and life satisfaction is stronger in the years when the Italian economy declines (2003 - onward), than before. Panel A shows the marginal effects of income on life satisfaction after controlling for the set of socio-demographic control variables (restricted model). Panel B shows the results of the complete model, i.e. after adding trust in others, financial dissatisfaction and subjective health.



(a) Restricted model.



(b) Complete model.

*Note:* average marginal effects after OLS regression with sample weight and clustered standard errors by year. The complete list of control variables is available in section 4.1.



Table 5: Summary of the results from the decomposition.

	EVS 1981-1990	EVS 1990-2005	EQLS 2003-2016
LS difference	0.77***	-0.39***	-0.60***
explained part	0.36***	-0.23***	-0.40***
unexplained part	0.41***	-0.17***	-0.19***
Observations	2322	1913	2243

Asterisks indicate statistical significance at the \* 10%, \*\* 5%, \*\*\* 1%.

Estimates use sample weights and clustered standard errors by year.

the last period.

Hence, a generalized impoverishment of the correlates of well-being explains the declining trajectory of life satisfaction in Italy. Impoverishment of what, exactly? Results from the decomposition document that since 1990 Italians experience a pattern of declining social relationships, worsening health conditions, and increasing financial dissatisfaction. These changes allow us to explain the variation of life satisfaction along with the role of income. More in detail, between 1981 and 1990 the share of people reporting poor health decreased from 49% to 43.6%; financial dissatisfaction was fairly low: highly dissatisfied people decreased from 25% to 11%, whereas those reporting low levels of dissatisfaction increased from 34% to 47% (see table 6 for detailed figures). These changes are associated to increasing life satisfaction because of increasing average income and of limited income inequality that characterized the 1980s. Moreover, in the same period, social relations improved: the share of people trusting others increased from 24% to 35.5%, while the share of divorced and separated people did not change significantly. These two changes contributed to increasing average well-being between 1981 and 1990.

This picture changes in the 1990s and worsens after 2000: the stagnating life satisfaction is the net result of contrasting forces. On one side, improving health conditions (the share of people with poor health declined from 43.6% to 27.5%); on the other, the negative impact of increasing financial dissatisfaction. Between 1990 and 2005, the share of people trusting others did not change significantly, although the share of divorced and separated people nearly doubled (divorced: from 1.6% to 2.2%; separated: from 1.7%

Table 6: Share of people reporting poor health, high and low financial dissatisfaction and trusting others by year.

Variable	1981 <sup>a</sup>	1990 <sup>a</sup>	2003 <sup>b</sup>	2005 <sup>a</sup>	2016 <sup>b</sup>
poor health	49%	43.6%	14.5%	27.5%	33%
high financial dissatisfaction	25%	11%	31.9%	14.4%	42.87%
low financial dissatisfaction	34%	47%	40.5%	31.4%	30.2%
trust in others	24%	35.5%	36.7%	34.2%	25.9%

*Note:* <sup>a</sup> data sourced from EVS. <sup>b</sup> data sourced from EQLS.

The percentages represent the share of respondents in the sample. Weighted data.

to 4.2%). In the same period the share of people declaring low financial dissatisfaction went from 47% to 31.4%, whereas the highly dissatisfied people went from 11.8% to 14.4%. Our results indicate that the net result for life satisfaction of these forces acting in opposite directions is negative.

The social changes that took place in 1990s continued after 2000s: the worsening of social, health, and economic conditions explain the loss of nearly half a point of life satisfaction between 2003 and 2016. People declaring to be in poor health doubled (from 14.5% to 33%), those declaring to trust others went from 36.7% to 25.9%, while average income declined, and financial dissatisfaction increased: in 2016 the share of people highly dissatisfied with their financial situation was 42.7%.

Financial dissatisfaction requires some attention. Previous studies documented that financial dissatisfaction in a country correlates with income inequality (Brockmann et al., 2009; Bartolini and Sarracino, 2015). The idea is that the chances for distressing interpersonal comparisons – and therefore to be dissatisfied with own financial conditions – increase in a society with high inequality. The case of Italy confirms this evidence. Figure 4 shows that the increase in life satisfaction between 1981 and 1990 is associated to a declining trend of the Gini index (notice that this association extends to the period before 1981).<sup>14</sup> After 1990, however, income inequality increases and, correspondingly, life satisfaction begins its declining trajectory. The sudden increase of income inequality, which continues beyond 2005, contributes to

<sup>14</sup>The trend of income inequality is confirmed if we use the standard deviation of income as a measure of income inequality (see figure 5 in Appendix E). The standard deviation of income is computed by year on EVS and EQLS samples.

explaining the decline of life satisfaction and the decoupling between economic growth and life satisfaction (Oishi and Kesebir, 2015; Mikucka et al., 2017).

In sum, the change of Italians' life satisfaction over the last 35 years seems largely due to the fact that Italians got less of what matters for life satisfaction: less health, less trust in others, less income and more financial dissatisfaction. The negative impact of these changes on life satisfaction are reinforced by changes in Italians' preferences, which – however – play a diminishing role in explaining the life satisfaction gap over time. The changes in preferences concern basically income and age.

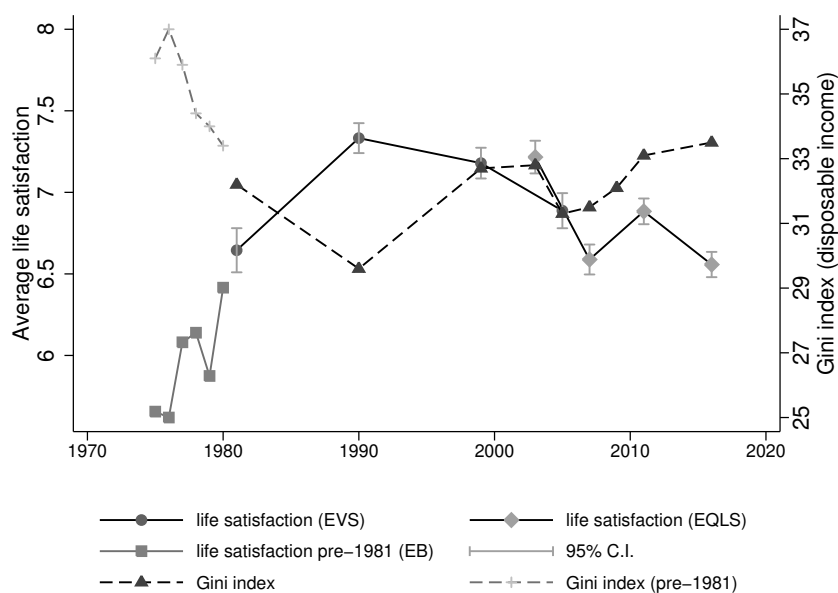
Over time, Italians' preference for income increases: in 1981 income attracted a negative coefficient, indicating that – ceteris paribus – richer people were less satisfied with their lives than poorer ones. This surprising result can be explained by the inclusion of financial dissatisfaction among the control variables. Financial dissatisfaction reflects respondents' relative deprivation, i.e. it is a measure of how the respondents fare compared to others in economic terms. If financial dissatisfaction attracts a large, negative coefficient – indicating that individual  $i$  life satisfaction correlates negatively with others' income – then it is possible that the overall impact of absolute income is positive, yet it attracts a negative coefficient.<sup>15</sup> This seems to be the case in Italy before 2000s: if we exclude financial dissatisfaction from the regression, income attracts a positive coefficient. After 2000s, the coefficient of income is positive also after controlling for financial dissatisfaction. These changes result in positive variations in life satisfaction. However, these changes diminish with time as a consequence of declining average income. This result is consistent with the hypothesis of loss aversion: when income becomes scarce, its association with well-being increases.

The relationship with age predicts negative changes of life satisfaction in the 1980s and positive ones in the years after 2000. This evidence suggests that aging contributed to life satisfaction in 1981, but not after 1990. The reason for this surprising result is that in 1981 the coefficient of age was positive, thus suggesting that elderly people fared well with their lives. However, as of 1990, the coefficient turned weakly negative. This may indicate

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<sup>15</sup>More formally, if financial dissatisfaction ( $F$ ) depends on others' income ( $Y^o$ ) so that  $F = Y^o - Y$ , then the life satisfaction regression can be written as:  $LS = \alpha + \beta \cdot Y - \gamma \cdot (Y^o - Y) + \varepsilon$  which is equivalent to:  $LS = \alpha + (\beta + \gamma) \cdot Y - \gamma \cdot Y^o + \varepsilon$  so that the coefficient of income ( $\theta = \beta + \gamma$ ) is positive even if  $\beta < 0$ , provided that  $\gamma > \beta$ . This is true in our regressions in which financial dissatisfaction attracts large coefficients.

Figure 4: Life satisfaction and income inequality.



*Note:* Gini index of disposable income is issued from the Standardized World Income Inequality (SWIID) Database v.7.1 (Solt, 2016). To illustrate the trends of life satisfaction and income inequality, we reported the data since 1975. Figures on life satisfaction between 1975 and 1980 are issued from the Eurobarometer and they are not included in our analysis because this dataset does not include the necessary variables. The SWIID provides a long and complete set of data on income inequality. It is based on data from the World Income Inequality Database (WIID), but it hinges on additional assumptions to impute missing data and ease cross-sectional comparability. For these reasons some scholars have expressed criticism towards the SWIID (Jenkins, 2015). However, our figure does not change if we use figures from the World Inequality Database (WID) or from the WIID.

that something has changed in the life of elderly people as a consequence, for instance, of a more expensive health care system, higher exposure to risk of poverty, and/or higher social isolation. The changes in the coefficients of the remaining explanatory variables do not predict any significant change in life satisfaction.

The results from the Blinder-Oaxaca decomposition confirm the explanation in terms of loss aversion, and they add further details to explain the trajectory of life satisfaction in Italy. In particular, they reveal a pattern of generalized material and social impoverishment.

## 6 Conclusion

One of the challenges of using Gross Domestic Product (GDP) per capita as a reliable measure of population's well-being is the presence of structural breaks in the long-run trends of GDP and subjective well-being, as well as in their relationship – also called well-being-income gradient. The problem of structural breaks has so far been overlooked in the controversies that revolve around this gradient, thus implicitly endorsing the assumption that the trends of GDP and subjective well-being are stable in the long run. Instead, structural breaks are at odds with the evidence provided by both supporters and opponents of GDP as a measure of well-being. In fact, the first ones claim that the gradient is universally positive and stable; the second ones defend the hypothesis that the trend of subjective well-being is flat irrespective of economic growth.

In this paper we claim that structural breaks in the trends of GDP and subjective well-being, and in the gradient may exist within the same country, and that a case of special interest is when the GDP trend reverses the sign. By using both macro and micro data, we provide evidence to identify possible explanations for these phenomena. Our results support scholars who claim that the question is not whether GDP is a good measure of well-being, but under which conditions this applies. To illustrate our point, we focused on Italy, a most interesting case because its recent history can be characterized by three phases: the 1970s and 1980s, when the economy grew along with well-being to approach levels similar to other Western European countries; the 1990s when, despite economic growth, the well-being stops growing; the years after 2000, when the economy slows down, well-being begins an uninterrupted (to date) decline, and Italy deviates from the growing trends of

other countries.

Our analysis provided a number of results. First, Italy's gradient and the underlying long-run trends of GDP and of well-being exhibit two structural breaks over time: the gradient is positive when both GDP and well-being are growing, then it is virtually zero when economic growth decelerates and the trend of well-being is flat, and it finally becomes again positive, but when both GDP and well-being are declining. The principle of 'diminishing marginal utility of income' cannot explain this pattern, because, at least, Italy's well-being falls below that of the European core countries after successfully catching up. The second result regards the asymmetry of the gradient, as it increases when both GDP and well-being decline. This asymmetry is consistent with the behavioural interpretation of 'loss aversion'.

The application of regressions with interaction effects, and of the Blinder-Oaxaca decomposition to micro data, issued from the European Values Study and the European Quality of Life Survey, strengthened our findings, and provided new ones. In fact, the third result is that people's preferences over income increase when the latter declines. The fourth result indicates that other factors are important in accounting for structural breaks. In particular, declining trust in others, worsening subjective health, and increasing financial dissatisfaction – the micro counterpart of economic inequality – are the main factors that contribute to explain why the well-being-income gradient increases when the trends decline.

The results from the macro- and micro-analysis are consistent with the historical analysis of the parabola of the Italian economy. The shocks that could explain why economic growth turned into a long-run decline might have increased people's uncertainty about the future, and worsened their perception of the social context, thus especially depressing their subjective well-being.

Our results indicate that both the well-being-income gradient and the slope of the trend of well-being can be positive, zero, or even negative. This evidence suggests that we should move from the general law of one gradient over time, and of the flat trend in well-being, toward the research of other factors that may condition the gradient, and of their change in the long run. This further suggests that the interpretation of asymmetry of the gradient based on people's 'loss aversion' should be enriched to account for the change of contextual factors, especially when the analysis focuses on long time periods.

## A Appendix

Table 7: The gradient between life satisfaction and the trend-component of real GDP per capita in three sub-periods of the 1973-2016 period in Italy.

Time period	Gradient between life satisfaction and the trend-component of real GDP per capita (times 100)
1973-1989	0.32***
1989-2005	0.01
2005-2016	1.01***
1973-2016	0.23***

*Notes:* The results are obtained as coefficients of the regressions of the index of life satisfaction against the trend-component of the logarithm of real GDP per capita, having controlled for its cyclical-component. The structural break between the first and the second sub-period is made evident by Wald test=17.99 (p=0.0004). The structural break between the second and the third sub-period is made evident by Wald test=62.14 (p=0.0000). For further Notes and Sources see Table 1. Asterisks indicate statistical significance at the \* 10%, \*\* 5%, \*\*\* 1%.

Table 8: Test of structural break in the relationship between life satisfaction and real GDP per capita in the period 1973-2016 in the countries of Europe-8.

Countries	<i>Wald test</i>	<i>Break year</i>
Belgium	40.0*** ( <i>upward</i> )	1982
Denmark	6.1 ( <i>upward</i> )	1990
France	28.3*** ( <i>upward</i> )	1989
Germany	67.7*** ( <i>upward</i> )	1997
Ireland	51.7*** ( <i>upward</i> )	1989
Luxembourg	15.0** ( <i>upward</i> )	1980
Netherland	13.1** ( <i>upward</i> )	2002
United Kingdom	27.5*** ( <i>upward</i> )	2009

*Notes:* The results are obtained as coefficients of the regressions of, respectively, the index of life satisfaction against years (I column), the logarithm of real GDP per capita against years (II column), the index of life satisfaction against the logarithm of real GDP per capita (III column). Real GDP per capita is at purchasing power parity in constant 2011 U.S. dollars. Asterisks indicate statistical significance at the \* 10%, \*\* 5%, \*\*\* 1%.

*Sources:* Elaborations on data from Eurobarometer, and Maddison Project Database (Bolt et al., 2018).



Table 9: The trends of life satisfaction, of real GDP per capita, and of the gradient between life satisfaction and real GDP per capita in three sub-periods of the 1973-2016 period in Europe-8 (Belgium, Denmark, France, Germany, Ireland, Luxembourg, Netherland, and the United Kingdom).

Time period	Annual changes of the proportion of people ‘very’ and ‘fairly’ satisfied with life	Annual growth rate of real GDP per capita	Gradient between life satisfaction and real GDP per capita
1973-1989	0.0006	1.86***	0.04
1989-2005	-0.0007	1.73***	-0.02
2005-2016	0.0051***	0.56***	0.56***
1973-2016	0.0017***	1.57***	0.10***

*Notes:* The results are obtained as coefficients of the regressions of, respectively, the index of life satisfaction against years (I column), the logarithm of real GDP per capita against years (II column), the index of life satisfaction against the logarithm of real GDP per capita (III column). Real GDP per capita is at purchasing power parity in constant 2011 U.S. dollars. Asterisks indicate statistical significance at the \* 10%, \*\* 5%, \*\*\* 1%.

*Sources:* Elaborations on data from Eurobarometer, and Maddison Project Database.

Table 10: The trends of life satisfaction, of per capita GDP, and of the gradient of life satisfaction with respect of per capita GDP in two sub-periods in Greece, Portugal, and Spain.

Time period	Annual changes of the proportion of people 'very' and 'fairly' satisfied with life	Annual growth rate of real GDP per capita	Gradient between life satisfaction and real GDP per capita (times 100)
Greece			
1981-2009	-0.0004	1.89***	0.01
2009-2016	-0.0063	-2.28***	0.27* <sup>o</sup>
1981-2016	-0.0058***	1.39***	-0.07
Spain			
1981-2008	0.0073***	2.70***	0.26***
2008-2016	-0.0051	-0.99*	0.87**
1981-2016	0.0016	2.19***	0.17***
Portugal			
1985-2007	-0.0038*	2.63***	-0.09
2007-2016	-0.0032	-0.05*	2.26** <sup>o</sup>
1985-2016	-0.0079***	2.07***	-0.280***

*Notes:* The results are obtained as coefficients of the regressions of, respectively, the index of life satisfaction against years (I column), the logarithm of real GDP per capita against years (II column), the index of life satisfaction against the logarithm of real GDP per capita (III column). Real GDP per capita is at purchasing power parity in constant 2011 U.S. dollars. Asterisks indicate statistical significance at the \* 10%, \*\* 5%, \*\*\* 1%. The symbol <sup>o</sup> reminds us that the positive gradient is due to the decline of both life satisfaction and real GDP per capita.

*Sources:* Elaborations on data from Eurobarometer, and Maddison Project Database (Bolt et al., 2018).

## **B Relationship between income and life satisfaction over time**

Table 11: OLS regression of life satisfaction over income, year, and their interaction. The first two columns report the results for the restricted model, i.e. income is the main explanatory variable, whereas the last two columns report the results from the complete model, in which we account also for trust in others, financial dissatisfaction and subjective health. In both cases, we use sample weights and robust standard errors clustered by year.

	Restricted model		Complete model	
	EVS	EQLS	EVS	EQLS
age	-0.00927 (-0.26)	-0.0587** (-5.77)	0.000536 (0.02)	-0.0446** (-3.67)
age squared/100	-0.00110 (-0.02)	0.0512*** (7.72)	-0.00685 (-0.19)	0.0436** (4.67)
woman	-0.117 (-1.48)	0.0600 (1.76)	-0.157* (-3.69)	0.0959*** (6.43)
years of education	(yes)		(yes)	
education (dummies)		(yes)		(yes)
marital status (dummies)	(yes)	(yes)	(yes)	(yes)
occupational status (dummies)	(yes)	(yes)	(yes)	(yes)
year = 1981	(reference)		(reference)	
year = 1990	1.848* (3.30)		-0.601 (-2.33)	
year = 2003		(reference)		(reference)
year = 2005	-1.936 (-2.49)		-3.070** (-6.39)	
year = 2007		-0.392 (-1.35)		-1.869*** (-6.38)
year = 2011		0.183 (1.07)		-0.554** (-4.07)
year = 2016		-0.766* (-2.68)		-1.179** (-3.80)
income	0.0815 (0.66)	0.342*** (6.72)	-0.347* (-4.28)	0.0473 (1.15)
year = 1990 × income	-0.109 (-1.93)		0.109* (4.23)	
year = 2005 × income	0.225* (2.94)		0.333** (7.33)	
year = 2007 × income		-0.00605 (-0.15)		0.235** (5.73)
year = 2011 × income		-0.0731* (-2.97)		0.0567* (2.91)
year = 2016 × income		0.0494 (1.31)		0.133** (3.31)
trust in others (dummy)			0.300** (7.07)	
trust in others (low)				(reference) (1.56)
trust in others (medium)				0.164 (1.56)
trust in others (high)				0.503** (3.61)
financial dissatisfaction = fair			-1.207** (-9.08)	0.0854 (0.78)
financial dissatisfaction = high			-2.420*** (-25.06)	-1.575*** (-9.06)
perceived health = poor			-0.742** (-7.46)	-0.352*** (-5.90)
Constant	5.342*** (12.77)	5.703*** (52.68)	10.78*** (93.58)	7.782*** (36.98)
Observations	2912	4165	2912	4165

Table 12: OLS regression of life satisfaction over income, year, and their interaction: detailed results from the restricted model. Column 2 reports the results for the pooled EVS sample, whereas column 3 reports the results for the EQLS sample. In both cases, we use sample weights and robust standard errors clustered by year.

	EVS		EQLS	
age	-0.00927	(-0.26)	-0.0587**	(-5.77)
age squared/100	-0.00110	(-0.02)	0.0512***	(7.72)
woman	-0.117	(-1.48)	0.0600	(1.76)
years of education	0.0157	(2.08)		
upper secondary education			0.425**	(4.21)
tertiary education			0.591**	(4.56)
married	0.555*	(3.81)	0.424**	(5.63)
divorced	-0.813	(-1.27)	-0.288*	(-2.63)
separated	-0.963*	(-3.88)		
widowed	0.0233	(0.23)	-0.144	(-1.29)
part time	0.373*	(3.98)		
retired	0.593	(2.26)	0.248	(1.22)
homemaker	0.368	(1.08)	-0.0353	(-0.56)
student	0.367**	(7.19)	0.0802	(0.38)
unemployed	0.549	(2.65)		
unemployed (less than 12 months)			-0.551	(-2.23)
unemployed (more than 12 months)			-1.389***	(-8.55)
other	-0.775**	(-7.48)		
sick or disabled			-1.903***	(-7.71)
year = 1981		(reference)		
year = 1990	1.848*	(3.30)		
year = 2003				(reference)
year = 2005	-1.936	(-2.49)		
year = 2007			-0.392	(-1.35)
year = 2011			0.183	(1.07)
year = 2016			-0.766*	(-2.68)
income	0.0815	(0.66)	0.342***	(6.72)
year = 1990 × income	-0.109	(-1.93)		
year = 2005 × income	0.225*	(2.94)		
year = 2007 × income			-0.00605	(-0.15)
year = 2011 × income			-0.0731*	(-2.97)
year = 2016 × income			0.0494	(1.31)
Constant	5.342***	(12.77)	5.703***	(52.68)
Observations	2912		4165	
Adj. R <sup>2</sup>	0.065		0.114	

Table 13: OLS regression of life satisfaction over income, year, and their interaction: detailed results from the complete model. Column 2 reports the results for the pooled EVS sample, whereas column 3 reports the results for the EQLS sample. In both cases, we use sample weights and robust standard errors clustered by year.

	EVS		EQLS	
age	0.000536	(0.02)	-0.0446**	(-3.67)
age squared/100	-0.00685	(-0.19)	0.0436**	(4.67)
woman	-0.157*	(-3.69)	0.0959***	(6.43)
years of education	0.00905	(2.03)		
upper secondary education			0.114	(1.34)
tertiary education			0.147	(0.95)
married	0.573**	(7.58)	0.246	(2.03)
divorced	-0.559	(-0.96)	-0.158	(-1.58)
separated	-0.649	(-1.71)		
widowed	0.0345	(0.35)	-0.163	(-1.45)
part time	0.229	(2.12)		
retired	0.332	(2.09)	0.176	(0.94)
homemaker	0.175	(0.66)	0.0212	(0.71)
student	0.273**	(6.31)	-0.0896	(-0.59)
unemployed	0.311*	(3.31)		
unemployed (less than 12 months)			-0.183	(-0.67)
unemployed (more than 12 months)			-0.796***	(-6.14)
other	-0.723**	(-5.17)		
sick or disabled		-1.156**	(-3.88)	
year = 1981	<i>(reference)</i>			
year = 1990	-0.601	(-2.33)		
year = 2003			<i>(reference)</i>	
year = 2005	-3.070**	(-6.39)		
year = 2007			-1.869***	(-6.38)
year = 2011			-0.554**	(-4.07)
year = 2016			-1.179**	(-3.80)
income	-0.347*	(-4.28)	0.0473	(1.15)
year = 1990 × lnrealeuro	0.109*	(4.23)		
year = 2005 × lnrealeuro	0.333**	(7.33)		
year = 2007 × Scale of incomes			0.235**	(5.73)
year = 2011 × Scale of incomes			0.0567*	(2.91)
year = 2016 × Scale of incomes			0.133**	(3.31)
trust in others (dummy)	0.300**	(7.07)		
trust in others (low)			<i>(reference)</i>	
trust in others (medium)			0.164	(1.56)
trust in others (high)			0.503**	(3.61)
financial dissatisfaction = fair	-1.207**	(-9.08)	0.0854	(0.78)
financial dissatisfaction = high	-2.120***	(-25.06)	-1.575***	(-9.06)
perceived health = poor	-0.742**	(-7.46)	-0.352***	(-5.90)
Constant	10.78***	(93.58)	7.782***	(36.98)
Observations	2912		4165	
Adj. R <sup>2</sup>	0.221		0.331	

## C Detailed results from the European Values Study

Table 14: Detailed decomposition of the life satisfaction gap between 1981 and 1990.

	Decomposition	Detailed decomposition	
		Explained	Unexplained
avg. life satisfaction in 1990	7.320*** (8.31e + 14)		
avg. life satisfaction in 1981	6.553*** (2.05e + 15)		
difference	0.768*** (1.29e + 14)		
explained part	0.359*** (23.08)		
unexplained part	0.409*** (26.29)		
age		0.00782 (0.42)	-1.343*** (-72.55)
woman		0.000477** (3.16)	-0.0464*** (-307.98)
education (# of years)		0.0496 (1.55)	-0.395*** (-12.34)
married		0.000284*** (4.84)	-0.166*** (-2831.37)
divorced		-0.0142 (-1.19)	0.0394*** (3.31)
widowed		-0.00116*** (-23.38)	-0.00108*** (-21.73)
part-time		0.0170 (1.59)	-0.134*** (-12.50)
retired		-0.0161 (-0.98)	-0.0709*** (-4.30)
houseworker		0.00165 (0.47)	-0.157*** (-44.56)
student		-0.0130** (-2.77)	-0.0490*** (-10.44)
unemployed		0.00282*** (5.03)	-0.0111*** (-19.91)
other		-0.00631*** (-40.65)	-0.00133*** (-8.59)
income		-0.0440** (-2.10)	3.243*** (154.61)
low financial dissatisfaction		0.173*** (57.80)	0.0215*** (7.18)
high financial dissatisfaction		0.122*** (21.20)	-0.00826 (-1.44)
trust in others		0.0350*** (6.84)	-0.0180*** (-3.52)
poor health		0.0440*** (5.40)	0.110*** (13.52)
Constant			-0.603*** (-2.24e + 12)
Observations	2322		

*t* statistics in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$ .



Table 15:  $\beta$  coefficients and  $X$ -values for 1981 and 1990.

	Coefficients			Averages	
	$\beta_{1990}$	$\beta_{1981}$	$\beta_{reference}$	$X_{1990}$	$X_{1981}$
age	-0.037	0.041	0.014	45.719	45.862
age squared/100	0.040	-0.053	-0.019	23.680	24.207
woman	-0.206	-0.114	-0.160	0.503	0.506
education (# of years)	0.008	0.032	0.026	16.644	14.761
married	0.456	0.718	0.577	0.636	0.635
divorced	-0.435	-3.183	-0.921	0.016	0.005
separated	-0.433	-1.822	-0.929	0.017	0.012
widowed	0.035	0.056	0.130	0.082	0.091
part time	0.150	0.548	0.219	0.402	0.324
retired	0.115	0.692	0.222	0.064	0.136
housewife	-0.139	0.610	0.155	0.216	0.206
student	0.216	0.435	0.211	0.161	0.222
unemployed	0.197	0.440	0.295	0.051	0.042
other	-0.824	-0.780	-0.829	0.039	0.032
income	-0.167	-0.498	-0.261	9.908	9.739
low financial dissatisfaction	1.324	1.254	1.342	0.470	0.341
high financial dissatisfaction	-0.893	-0.873	-0.919	0.118	0.251
trust in others	0.249	0.296	0.307	0.355	0.241
poor health	-0.608	-0.847	-0.747	0.436	0.495
Constant	9.032	9.635	8.364	1.000	1.000

Table 16: Detailed decomposition of the life satisfaction gap between 1990 and 2005.

	Decomposition	Detailed decomposition	
		Explained	Unexplained
avg. life satisfaction in 2005	6.927*** (1.40e + 16)		
avg. life satisfaction in 1990	7.320*** (2.70e + 15)		
difference	-0.393*** (-1.46e + 14)		
explained part	-0.229*** (-5.09)		
unexplained part	-0.165*** (-3.66)		
age		-0.0166*** (-26.92)	-0.00454*** (-7.35)
woman		0.00117*** (5.49)	0.0411*** (192.03)
education (# of years)		0.0153** (1.97)	-0.0669*** (-8.60)
married		-0.0320*** (-6.51)	0.0735*** (14.97)
divorced		-0.0104** (-2.47)	0.0213*** (5.05)
widowed		-0.000584 (-0.28)	-0.0191*** (-9.25)
part-time		-0.00777*** (-9.79)	0.0141*** (17.80)
retired		0.0167** (2.34)	0.0237*** (3.31)
houseworker		0.000963 (0.59)	0.0959*** (58.30)
student		-0.0237** (-2.53)	0.0200** (2.14)
unemployed		0.00111*** (17.24)	0.00307*** (47.47)
other		-0.0164*** (-4.40)	0.0209*** (5.59)
income		-0.0390* (-1.77)	2.298*** (104.36)
low financial dissatisfaction		-0.189*** (-6.59)	-0.194*** (-6.78)
high financial dissatisfaction		-0.0253*** (-10.24)	-0.0193*** (-7.81)
trust in others		-0.00364*** (-4.36)	0.0538*** (64.43)
poor health		0.100*** (22.02)	-0.0484*** (-10.63)
Constant			-2.478*** (-3.48e + 13)
Observations	1913		

*t* statistics in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$ .

Table 17:  $\beta$  coefficients and  $X$ -values for 1990 and 2005.

	Coefficients			Averages	
	$\beta_{2005}$	$\beta_{1990}$	$\beta_{reference}$	$X_{2005}$	$X_{1990}$
age	-0.023	-0.037	-0.041	45.720	45.719
age squared/100	0.012	0.040	0.041	23.278	23.680
woman	-0.124	-0.206	-0.180	0.497	0.503
education (# of years)	0.004	0.008	0.004	20.147	16.644
married	0.577	0.456	0.525	0.575	0.636
divorced	0.280	-0.435	-0.122	0.022	0.016
separated	-0.227	-0.433	-0.382	0.042	0.017
widowed	-0.368	0.035	0.016	0.046	0.082
part time	0.189	0.150	0.153	0.351	0.402
retired	0.288	0.115	0.164	0.166	0.064
housewife	0.328	-0.139	-0.074	0.203	0.216
student	0.417	0.216	0.276	0.075	0.161
unemployed	0.248	0.197	0.182	0.058	0.051
other	-0.444	-0.824	-0.699	0.063	0.039
income	0.059	-0.167	-0.122	10.226	9.908
low financial dissatisfaction	0.766	1.324	1.203	0.314	0.470
high financial dissatisfaction	-1.041	-0.893	-0.974	0.144	0.118
trust in others	0.404	0.249	0.297	0.342	0.355
poor health	-0.776	-0.608	-0.622	0.275	0.436
Constant	6.554	9.032	8.720	1.000	1.000

## **D Detailed results from the European Quality of Life Survey**

Table 18: Detailed decomposition of the life satisfaction gap between 2003 and 2016.

	Decomposition	Detailed decomposition	
		Explained	Unexplained
avg. life satisfaction in 2016	6.568*** (1.30e + 15)		
avg. life satisfaction in 2003	7.163*** (4.56e + 15)		
difference	-0.596*** (-9.13e + 13)		
explained part	-0.403*** (-8.61)		
unexplained part	-0.192*** (-4.11)		
age		-0.00192 (-0.05)	1.114*** (28.05)
woman		-0.00217*** (-8.67)	0.0216*** (86.51)
married		0.000235 (0.77)	-0.135*** (-440.14)
divorced		0.00201*** (4.34)	-0.00915*** (-19.78)
widowed		-0.000341 (-1.20)	-0.0453*** (-159.34)
unemployed (less than 6 months)		-0.00667 (-0.89)	0.0274*** (3.66)
unemployed (more than 6 months)		-0.0222*** (-6.79)	0.00998*** (3.06)
other		-0.00886*** (-2.95)	0.0191*** (6.37)
retired		0.00482 (0.44)	-0.154*** (-14.03)
educational achievement		0.00377 (1.29)	0.0940*** (32.17)
income		-0.0549*** (-4.83)	1.385*** (121.88)
low financial dissatisfaction		-0.0868*** (-155.52)	0.00622*** (11.13)
high financial dissatisfaction		-0.111*** (-16.79)	-0.0466*** (-7.07)
high trust in others		-0.0590*** (-21.47)	0.0222*** (8.09)
poor health		-0.0607*** (-2.77)	0.0546** (2.49)
Constant			-2.557*** (-1.07e + 13)
Observations	2243		

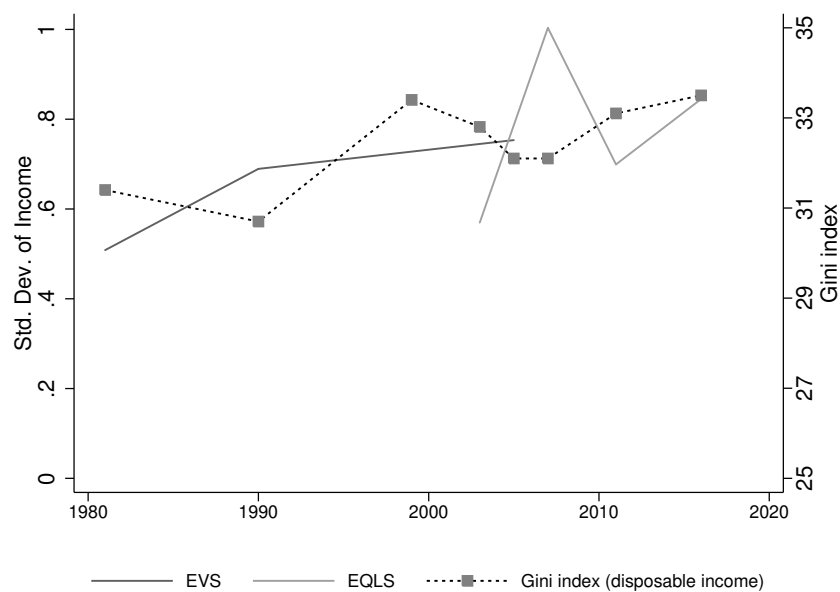
*t* statistics in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.001$ .

Table 19:  $\beta$  coefficients and  $X$ -values for 2003 and 2016.

	Coefficients			Averages	
	$\beta_{2016}$	$\beta_{2003}$	$\beta_{reference}$	$X_{2016}$	$X_{2003}$
age	-0.026	-0.052	-0.033	51.296	47.226
age squared /100	0.032	0.038	0.031	29.409	25.208
woman	0.116	0.076	0.106	0.518	0.539
married	0.007	0.235	0.070	0.595	0.592
divorced	-0.332	-0.178	-0.281	0.055	0.062
widowed	-0.456	0.009	-0.272	0.098	0.097
unemployed (less than 12 months)	-0.133	-1.865	-0.442	0.028	0.013
unemployed (more than 12 months)	-0.788	-1.149	-0.882	0.046	0.021
sick or disabled	-1.435	-3.353	-1.553	0.004	0.001
retired	-0.101	0.510	0.125	0.276	0.238
home maker	0.033	0.052	0.076	0.126	0.175
student	0.025	-0.269	-0.098	0.066	0.061
upper secondary education	0.290	0.189	0.216	0.429	0.426
tertiary education	0.385	0.028	0.225	0.150	0.137
income	0.182	-0.016	0.168	6.718	7.045
low financial dissatisfaction	0.825	0.813	0.837	0.302	0.405
high financial dissatisfaction	-1.062	-0.929	-1.024	0.427	0.319
high trust in others	0.565	0.499	0.549	0.259	0.367
poor health	-0.230	-0.484	-0.326	0.331	0.145
Constant	5.739	8.296	6.243	1.000	1.000

## E Standard deviation of income as a measure of inequality

Figure 5: The Gini index follows closely the trajectory of the standard deviation of income.



*Note:* Gini index of disposable income is issued from the Standardized World Income Inequality Database (Solt, 2016). The standard deviation of income is computed using survey data from the EVS and the EQLS.

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