DISCUSSION PAPER SERIES

IZA DP No. 8914

The Asymmetric Experience of Positive and Negative Economic Growth: Global Evidence Using Subjective Well-Being Data

Jan-Emmanuel De Neve
George W. Ward
Femke De Keulenaer
Bert Van Landeghem
Georgios Kavetsos
Michael I. Norton

March 2015

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

The Asymmetric Experience of Positive and Negative Economic Growth: Global Evidence Using Subjective Well-Being Data

Jan-Emmanuel De Neve
University College London and CEP (LSE)

Bert Van Landeghem
University of Sheffield, Maastricht University and IZA

George W. Ward
CEP (LSE)

Georgios Kavetsos
London School of Economics

Femke De Keulenaer
Ipsos

Michael I. Norton
Harvard Business School

Discussion Paper No. 8914
March 2015

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

IZA Discussion Paper No. 8914
March 2015

ABSTRACT

The Asymmetric Experience of Positive and Negative Economic Growth: Global Evidence Using Subjective Well-Being Data*

Are individuals more sensitive to losses than gains in terms of economic growth? Using subjective well-being data, we observe an asymmetry in the way positive and negative economic growth are experienced. We find that measures of life satisfaction and affect are more than twice as sensitive to negative economic growth as compared to positive growth. We use Gallup World Poll data from over 150 countries, BRFSS data on 2.5 million US respondents, and Eurobarometer data that cover multiple business cycles over four decades. This research provides a new perspective on the welfare cost of business cycles and has implications for growth policy and our understanding of the long-run relationship between GDP and subjective well-being.

JEL Classification: D03, O11, D69, I39

Keywords: economic growth, business cycles, subjective well-being

Corresponding author:

Bert Van Landeghem
Department of Economics
The University of Sheffield
9 Mappin Street
Sheffield S1 4DT
United Kingdom
E-mail: b.vanlandeghem@sheffield.ac.uk

* We thank Philippe Aghion, Dan Benjamin, Chris Boyce, Sarah Brown, Andrew Clark, Angus Deaton, Paul Dolan, Richard Easterlin, Carol Graham, Ori Heffetz, David Hemous, Daniel Kahneman, Richard Layard, George Loewenstein, Andrew Oswald, Amine Ouazad, Nick Powdthavee, Eugenio Proto, Matthew Rabin, Johannes Spinnewijn, Tim Van Zandt, and Fabrizio Zilibotti for comments and helpful suggestions. Participants at the 2014 AEA Annual Meeting, INSEAD Economics Symposium, and the LSE Centre for Economic Performance annual conference provided helpful comments. The usual disclaimer applies. De Neve and Ward gratefully acknowledge financial support from the US National Institute on Aging (Grant R01AG040640) and the Economic & Social Research Council.

1 Introduction

This paper explores a simple question: are individuals more sensitive to losses than gains in terms of economic growth? We use subjective well-being data drawn from three large and complementary datasets to investigate whether economic downturns are associated with decreases in well-being that are significantly different from increases associated with equivalent upswings. Our analyses reveal an asymmetry in the way that individuals experience positive and negative macroeconomic fluctuations. We find evidence that measures of life satisfaction and affect are more than twice as sensitive to negative growth as compared to positive economic growth.

Since the seminal work of Easterlin (1974), the linkages between subjective well-being and national income have become the subject of a substantial research literature. Although recent evidence shows that across countries the relationship between per capita GDP and subjective well-being is roughly log-linear (Stevenson and Wolfers, 2008; Deaton, 2008; Helliwell et al., 2013), the time-series relationship remains the subject of an extended debate. Whilst subjective well-being tends to covary with macroeconomic variables (Di Tella et al., 2003, 2001), evidence of a long-run relationship between growth and happiness is mixed. Whereas some recent research identifies a positive relationship between the level of per capita GDP and subjective well-being over time (Sacks et al., 2012), others fail to find the significant relationship between growth and well-being over the long-run that one might expect given the cross-sectional and short-run time-series evidence (Easterlin et al., 2010; Layard, 2005; Graham, 2010). However, none of these contributions considers potential differences between positive and negative economic growth. In this paper, we find that the economic growth rate is significantly related to subjective well-being, but that the gradient is more than twice as steep when growth is negative compared to when it is positive. This finding highlights the importance of business cycle dynamics and may help to reconcile the conflicting short versus long-term findings in order to advance our understanding of the relationship between GDP and subjective well-being.

A large behavioral literature shows that humans are prone to a 'negativity bias,' and has established—broadly—that "bad is stronger than good" (Baumeister et al., 2001). One famous example of this is that individuals typically display a form of "loss aversion," in that '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). In this paper, we relax the implicit assumption of a symmetric association between positive and negative growth rates and measures of subjective well-being, and find that individuals are more sensitive to economic downturns than they are to equivalent upswings.

We analyse data from three large data sets—the Eurobarometer, the Gallup World Poll, and the US Behavioral Risk Factor Surveillance System (BRFSS)—and employ piecewise (or 'segmented') regression models that introduce separate terms for macroeconomic gains and losses. These datasets are to our knowledge three of the largest subjective well-being surveys

available, and are complementary in that they each contribute a different setting to test for asymmetric sensitivity to gains and losses in economic growth. The BRFSS data consist of nearly 2.5 million observations drawn from samples of each US state between 2005 and 2010, allowing us to look at within-state variation in the economic growth rate. The Eurobarometer and Gallup World Poll are both at the international level, and each total over one million individual observations. The Eurobarometer data stretch back to the early 1970s and thus cover multiple business cycles, whilst the Gallup data are drawn from a shorter (2005-2013) time period but cover a wider range of over 150 countries. In the Eurobarometer and BRFSS we focus on evaluative self-reports of life satisfaction, whereas the Gallup World Poll asks respondents a number of questions designed to give a fuller picture of individuals' well-being, allowing us to to explore the effects of macroeconomic fluctuations on both emotional as well as evaluative elements of subjective well-being.

The findings contribute to various strands of literature in behavioral- and macroeconomics. First, as noted above, the analysis relates to the expanding literature on economic growth and subjective well-being (e.g. Proto and Rustichini (2013); Stevenson and Wolfers (2013)). Although our analysis centers firmly on the short-run relationship between the economic growth rate and subjective well-being, the finding of an asymmetry allows us to revisit the longstanding debate on the long-run relationship. The "Easterlin Paradox" resulting from the conflicting findings in the short-term versus long-term can perhaps be better understood in light of our findings on macroeconomic "loss aversion," in that recessions can rapidly undo the well-being gains from longer expansionary periods and lead to an insignificant relationship between national income and average well-being when considered in the long-run.

Second, this work addresses the welfare cost of business cycles (Lucas, 1987, 2003). The use of an 'experienced utility' rather than a 'decision utility' measure (Kahneman et al., 1997) means that welfare is considered here in terms of subjective well-being rather than consumption. Although these welfare measures show considerable overlap (Benjamin et al., 2012), their relationship to the business cycle contrast. The difference between volatile versus smooth growth in terms of consumption is often considered small (Otrok, 2001; Lucas, 2003),[1] but the psychological impact of volatile growth on individual well-being is mostly overlooked. One notable exception to this is Wolfers (2003), who uses subjective well-being data to estimate the welfare cost of volatility, finding that greater unemployment volatility undermines well-being and that the same holds to a lesser extent for inflation. To our knowledge, there is no in-depth study that allows for a heterogeneous association of positive and negative growth with subjective well-being. Doing so may provide insight into the underlying mechanism that drives the welfare cost of volatile versus smooth business cycles in terms of human well-being.

Third, the analysis relates to the famous behavioral finding of individual loss aversion, which underpins Prospect Theory (Tversky and Kahneman, 1991) and has by now been demonstrated in a variety of settings (Barberis, 2013). Whilst Prospect Theory suggests that

[1] See also, e.g., Yellen and Akerlof (2006); Barlevy (2004) and De Santis (2007) for alternative interpretations.

prospective losses loom larger than equivalent prospective gains in determining individuals' decisions and actions, we observe that individuals also actually experience real losses more acutely than gains, at least in a macroeconomic context. That is, rather than appealing to the concept of 'decision utility' and seeking to reveal loss averse preferences through individuals' choices and behavior, we employ subjective well-being data to proxy 'experienced utility' and show that a greater welfare weight is placed on national income losses as compared to equivalent gains. This is important, since although experimental evidence shows that individuals make decisions based on the anticipation that the experience of a loss will be more acute than that of a comparable gain, Kahneman (1999, p. 19) nevertheless notes that 'the extent to which loss aversion is also found in experience is not yet known.' Indeed, loss averse preferences may simply reflect an 'affective forecasting error' explained by individuals overestimating the impact that losses will eventually have (Kermer et al., 2006; Rick, 2011). While our study focuses on macroeconomic fluctuations, related research has explored microeconomic effects on subjective well-being of gains and losses in personal income and status (Boyce et al., 2013; Di Tella et al., 2010; Vendrik and Woltjer, 2007).

Finally, the findings add to research into the well-being impact of the recent Great Recession, which has identified large psychological costs associated with economic downturns (Deaton, 2012; Montagnoli and Moro, 2014). For example, Deaton (2012) uses individual daily self-reports of well-being in the USA between 2008 and 2011 to show that subjective well-being declined sharply when GDP fell and unemployment rose. In a similar vein, Stuckler et al. (2011) show that economic downturns are associated with decreases in mental and physical health, whilst Barr et al. (2012) find evidence of an increased prevalence of suicide. Importantly, however, these studies do not consider whether economic downturns have a disproportionate effect on subjective well-being as compared to economic upswings.

The paper is structured as follows. Sections II and III outline the data and methods used to derive our results, which are presented in section IV. Section V includes follow-up analyses that explore possible mechanisms underlying macroeconomic loss aversion as well as a discussion of the scholarly and policy implications.

2 Data

2.1 Subjective Well-being

In order to examine how macroeconomic fluctuations are experienced by individuals and investigate the welfare costs of periodic downturns, we use subjective well-being data as a welfare measure. Economic research using subjective well-being—or "happiness"—data is burgeoning,[2] but such cardinal measures of 'experienced utility' remain distinct from the neoclassical notion of welfare that uses ordinal measures of 'decision utility' by way of revealed preferences (Kahneman et al., 1997; Rabin, 1998; Kahneman and Thaler, 2006; Fleurbaey and

[2]See Dolan et al. (2008) for a review of the literature.

Blanchet, 2013). More recent work compares and bridges notions of experienced and decision utility. Evidence presented by Benjamin et al. (2012) suggests that measures of subjective well-being—and 'life satisfaction' in particular—are relatively good predictors of choice and can potentially be considered as a proxy (albeit an imperfect one[3]) for the standard concept of decision utility (see also Benjamin et al., 2014; Perez-Truglia, 2010; Charpentier et al., 2015). For a summary of the variety of ways in which the validity and reliability of subjective well-being measures have been demonstrated, see Krueger and Stone (2014).

Self-reported well-being can be broadly subdivided into evaluative and emotional measures (see Kahneman and Deaton, 2010, for a discussion). In line with the literature on macroeconomics and subjective well-being, we focus primarily on evaluative measures. In the BRFSS and Eurobarometer, we use responses to a life satisfaction question, and in the Gallup World Poll we employ answers to a Cantril Ladder question. Nevertheless, our analysis also considers the association of economic growth with emotional measures of well-being. The Gallup survey asks respondents a number of different questions designed to capture various dimensions of human well-being, allowing us to go beyond life evaluation and also examine how economic ups and downs are experienced in varied measures of positive and negative affect.

2.1.1 Gallup World Poll

The Gallup World Poll is a large-scale repeated cross-sectional survey covering more than 150 countries (although not all countries participated in all waves). The period covered in our analysis is 2005-2013. All samples in the Gallup World Poll are probability based and nationally representative of the resident population aged 15 and older. The typical Gallup World Poll survey wave interviews 1,000 individuals.[4]

As well as a broad set of questions on socio-economic background, civic engagement, and other topics, the survey also asks a variety of subjective well-being questions. The main evaluative question of interest in this paper is the standard Cantril Self-Anchoring Striving Scale (Cantril, 1965).[5] Respondents are also asked the same question about where they think they will stand in life about five years from now. We focus principally on the current ladder, in line with most other research using the Gallup World Poll (see e.g. Stevenson and Wolfers, 2008; Kahneman and Deaton, 2010). Following Aghion et al. (2014), we also present further analyses that test our results using the future/anticipated ladder.

[3]Benjamin et al. (2012) do find some systematic reversals for the link between decision utility and experience (see also Kahneman and Thaler, 2006).

[4]Telephone surveys are used in countries where telephone coverage represents at least 80% of the population (or is the customary survey methodology). In Central and Eastern Europe, as well as in the developing world, including much of Latin America, the former Soviet Union countries, nearly all of Asia, the Middle East, and Africa, an area frame design is instead used for face-to-face interviewing. Details about the methodology for each country are available at http://www.gallup.com/se/128171/Country-Data-Set-Details-May-2010.aspx.

[5]The Cantril Self-Anchoring Striving Scale (Cantril, 1965) asks individuals the following: "Please imagine a ladder with steps numbered from zero at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?"

Table 1: Gallup World Poll

Variable	Obs	Mean	Std. Dev.	Min	Max
Current Ladder	1,166,517	5.5	2.22	0	10
Future Ladder	1,074,085	6.74	2.36	0	10
Yesterday: Happiness	806,864	.69	.46	0	1
Enjoyment	1,169,277	.7	.46	0	1
Sadness	1,155,071	.21	.41	0	1
Stress	1,057,236	.29	.45	0	1
Worry	1,156,273	.34	.47	0	1
Positive Expectations	973,632	.37	.48	0	1
Negative Expectations	973,632	.37	.48	0	1
Economic Growth	968	.041	.055	-.18	1.045
Negative Growth	123	.035	.037	.001	.18
Positive Growth	845	.052	.048	0	1.045
GDP per capita (US$2005)	968	10,741	15,242	150	81,852
Inflation Rate	961	.085	.062	0	.475
Unemployment Rate	963	.061	.081	-.727	1.57
HH consumption growth	801	.03	.09	-.359	1.792

Further questions focus on affective or emotional well-being, and ask respondents whether they felt "happiness/sadness/worry/stress/anger/enjoyment/love a lot of the day yesterday?" These questions illicit a dichotomous yes/no response. We concentrate on two such measures of negative affect (whether respondents felt "worry", or "stress" yesterday) and two of positive affect (whether respondents felt "happy" or "enjoyment").

2.1.2 Eurobarometer

The Eurobarometer is an opinion survey carried out on behalf of the European Commission that has typically, though not always, taken place twice a year. For each wave, a random sample of approximately 1,000 individuals from each country in the European Union is interviewed on a range of issues including how satisfied they are with the life they lead. The response options are: *very satisfied, fairly satisfied, not very satisfied, and not at all satisfied*. This four category subjective well-being question has been included at least once every year from 1973 to 2013, apart from 1974, and is translated for our purposes onto a 1-4 scale (on which 4 corresponds to the "very satisfied" response). The Eurobarometer began with 9 countries and has grown over time along with the expansion of the EU. The data we use in this analysis come from the 15 longest-serving members of the EU (the so-called EU-15), for which the minimum time-series is 18 years and the maximum 39 years as represented in Figure A1.[6]

[6] A number of countries joined the EU—and the Eurobarometer—after 2004 but are not included in our sample as there is only a comparatively small amount of data available for these (mostly Eastern European) nations. Eurobarometer country-years excluded this way are, however, included in the Gallup World Poll data which span the 2005-2013 timeframe.

Table 2: Eurobarometer

Variable	Obs	Mean	Std. Dev.	Min	Max
Life satisfaction (1-4)	1,094,963	3.07	.75	1	4
Positive Expectations	386,169	.2	.4	0	1
Negative Expectations	386,169	.39	.49	0	1
Economic Growth	508	.023	.027	-.089	.108
Negative Growth	78	.021	.02	0	.089
Positive Growth	429	.031	.019	0	.108
GDP per capita (US$2005)	508	31,873	12,750	10,767	86,127
Unemployment Rate	508	.081	.042	0	.273
Inflation Rate	508	.045	.046	-.045	.245
HH consumption growth	508	.017	.024	-.104	.09

Table 3: BRFSS

Variable	Obs	Mean	Std. Dev.	Min	Max
Life satisfaction	2,260,476	3.387	0.628	1	4
Economic growth	1,233	0.001	0.015	-0.097	0.068
Negative growth	507	0.013	0.012	0.000	0.097
Positive growth	726	0.010	0.009	0.000	0.068
State income per cap' (US$2005)	1,222	35,644	6,149	26,312	64,598
Unemployment rate	1,233	6.031	2.39	2.067	14.367
Inflation rate	1,233	0.580	0.983	-2.828	2,195

2.1.3 BRFSS

The Behavioral Risk Factor Surveillance System (BRFSS) contains data obtained through telephone surveys and is carried out by the Centre for Disease Control and Prevention (CDC) in the United States. The primary aim is to collect data on the most important risk factors leading to premature death, such as cigarette smoking, alcohol use, and hypertension. A four category life satisfaction question—with response categories: *very satisfied, satisfied, dissatisfied, very dissatisfied*—was included from 2005 until 2010. The BRFSS samples a large number of US individuals with approximately 400,000 respondents per year, divided across the different states and different months of the year (totaling approximately 2.5 million respondents). In most quarters, there have been surveys in 50 or 51 states, with outliers in 2008/1 (46 states) and 2009/1 (38 States). In total there are 1,233 state-quarter observations from 2005/1 to 2010/4.

2.2 Macroeconomic Data

The principal source of economic growth and GDP data for the two international panels is the World Bank's World Development Indicators. GDP is measured per capita in purchasing power parity (PPP) constant 2005 US dollars. Household consumption expenditure is measured per capita at constant 2005 prices. Unemployment and inflation data are drawn from the same source, with any gaps being filled where possible using data from the IMF's World

Economic Outlook database and the OECD. For the two international datasets, macroeconomic data points correspond to country-years.

The BRFSS data is matched to life satisfaction with macroeconomic data at the state-quarter level. State personal income per capita data are taken from the Bureau of Economic Analysis, and quarterly state-level unemployment data as well as quarterly nationwide inflation data are both drawn from the Bureau of Labour Statistics.

3 Empirical Estimation

To investigate the relationship between economic growth and subjective well-being we estimate the baseline equation

$$SWB_{ijt} = \beta_1 GROWTH_{jt} + X'_{ijt} + \xi_j + \gamma_t + \varepsilon_{ijt} \tag{1}$$

where SWB_{ijt} is a subjective well-being measure of individual i in country j in year t in the international panels, and the subjective well-being of individual i in U.S. state j in quarter t in the BRFSS sample. $GROWTH_{jt}$ is the rate of economic growth from year t-1 to year t (or in the US sample the quarter-to-quarter economic growth rate). X'_{ijt} is a vector of individual-level demographic characteristics that are known to influence self-reports of well-being, such as age, gender, education level and marital status. ξ_j is a country/US state fixed effect. γ_t is a survey-wave fixed effect in the international panels, or a seasonal dummy in the case of the BRFSS. ε_{ijt} is the error term, clustered on country-years (state-quarters).

In all models, entity and time/survey fixed effects are included. Country(state)-specific intercepts diminish the threat of omitted variable bias by controlling for unobserved heterogeneity across countries (states), such that time-invariant factors like culture and climate are controlled for. Survey-specific intercepts control for time-variant trends and shocks that apply equally across the sample. Another important reason to include such intercepts is to partial out variance in survey design over time. Deaton (2012) shows that question ordering and context effects are typically substantial in relation to subjective well-being questions (see also Sacks et al., 2013; Schwarz and Strack, 1999).

To test for any asymmetric effects of economic growth, we then fit a piecewise linear regression model that introduces separate terms for negative and positive growth, such that

$$SWB_{ijt} = \beta_1 GROWTH^+_{jt} + \beta_2 |GROWTH^-|_{jt} + X'_{ijt} + \xi_j + \gamma_t + \varepsilon_{ijt} \tag{2}$$

where X^+ is equal to economic growth in country-years (state-quarters) in which growth is positive, 0 otherwise; and X^- is equal to the economic growth rate where growth is negative, 0 otherwise. We use the absolute value of negative growth in order to make the direction of the resulting coefficients more intuitive to interpret - an "increase" in negative growth corresponds to a negative change in well-being.

Our main contribution to the debate on the relationship between growth and well-being

is to provide empirical analyses that relax the implicit assumption of a symmetric association between positive and negative growth on the one hand, and measures of subjective well-being on the other. In line with the literature, the core of the analysis is reduced-form. Indeed, both the causes and consequences of fluctuations in GDP can be numerous, and are likely to vary across both time and space. For example, recessions can lead to high unemployment and/or inflation, macroeconomic factors both shown to be good predictors of subjective well-being (Di Tella et al., 2001). Equally, adverse economic and labour market conditions can also lead to social tensions and changing attitudes that might have an impact on subjective well-being. One might imagine that a multitude of studies, both micro-case studies as well as more macro-oriented studies, will be needed to thoroughly understand the effects of all these factors on subjective well-being. Nevertheless, as a first step towards understanding the mechanisms behind a disproportionate association of negative growth and well-being, we introduce various macroeconomic covariates (unemployment rate, household consumption growth, and inflation rate) into the equation as well as considering the impact of current expectations about the future of the economy.[7]

4 Results

4.1 Baseline

Our main result is that, across all three data sets, subjective well-being is more sensitive to decreases in national income than it is to equivalent increases. Table 4 shows that evaluative subjective well-being is positively and significantly associated with the economic growth rate. Introducing separate terms for positive and negative growth—and thus allowing the slope gradient to differ for economic gains and losses—we find in all three data sets that the statistical relationship between economic growth and well-being appears to be driven principally by episodes of negative growth. The negative growth terms are greater in both magnitude and statistical significance.[8]

To illustrate, using the Gallup sample, we can see that a 10% economic contraction corresponds to a 0.135 standard deviation drop in life satisfaction, but an equivalent 10% expansion of the economy relates only to a statistically ill-defined increase of around 0.023 standard deviations. These estimates correspond to a 0.33 decrease and a 0.05 increase on the 0-10 Cantril Ladder scale, respectively. From a human well-being perspective, the results from the three data sets would suggest that some 2 to 6 percent of economic growth would be required to

[7] Although we present for illustrative purposes models including further key macroeconomic variables, we prefer the more parsimonious models. First, they are more comparable with the models in other studies. And second, there exist complex two-way causal relationships between inflation and unemployment on the one hand, and economic growth on the other, and simultaneous inclusion of all these variables in regression models may bias our results.

[8] The magnitude of the coefficients in the Eurobarometer is generally larger, but it is worth noting that the standard deviation among this relatively homogenous group of high-income countries is likely to be relatively small compared with that of the Gallup World Poll, which encompasses a wide range of nations.

Table 4: Economic Growth and Well-Being

	Gallup World Poll		Eurobarometer		BRFSS	
	(1)	(2)	(3)	(4)	(5)	(6)
	Cantril Ladder		Life Satisfaction		Life Satisfaction	
Economic Growth	0.561***		2.312***		0.443***	
	(0.168)		(0.435)		(0.077)	
Negative Growth		-1.354***		-5.788***		-0.511***
		(0.340)		(1.293)		(0.153)
Positive Growth		0.233		0.913**		0.339**
		(0.201)		(0.375)		(0.138)
Countries/States	157	157	15	15	51	51
Macro observations	968	968	508	508	1233	1233
Micro observations	1,166,517	1,166,517	1,092,999	1,092,999	2,260,476	2,260,476
R-squared	0.034	0.034	0.030	0.031	0.062	0.062

Robust standard errors in parentheses, adjusted for clustering at the country-year level in the Gallup and Eurobarometer, and at the state-quarter level in the BRFSS. All outcomes variables are standardised (mean=0, SD=1). Gallup World Poll data is collected between 2005-2013; Eurobarometer 1973-2013; BRFSS 2005-2010. All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Country fixed effects and survey wave dummies are included in all of the Eurobarometer and Gallup models; state fixed effects and seasonal dummies are included in the BRFSS models. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

offset just 1 percent of economic contraction.

The asymmetry in the relationship between economic growth and well-being can be seen more clearly in Figure 1, which plots the coefficients for negative and positive growth separately on the x-axis, and subjective well-being on the y-axis. This representation looks similar to the well-known utility function of Prospect Theory—showing that losses loom larger than gains in decision utility (Kahneman and Tversky, 1979). Here, Figure 1 suggests that individuals experience macroeconomic losses more acutely than equivalent gains in economic growth.

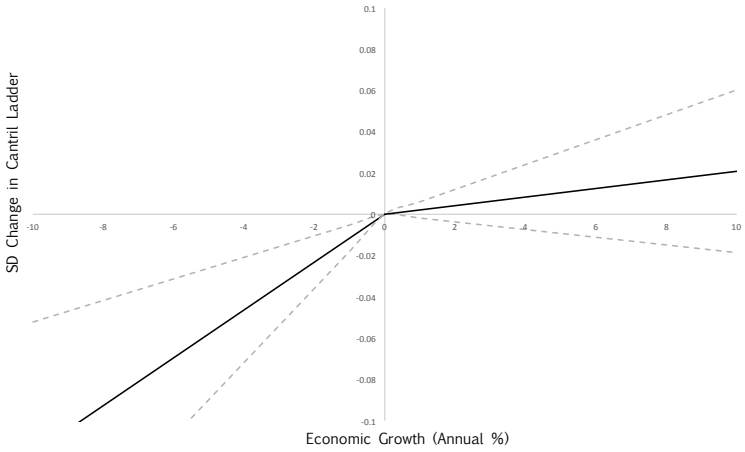
4.2 Addition of further macroeconomic covariates

Having observed an interesting correlational asymmetry in Table 4, we now move on to gradually introduce further macroeconomic variables into the equation. Two issues are of principal interest here: first, whether the short-run growth effect or long-run level effect of GDP dominates, and second, whether or not the disproportionate negative growth association is merely a reflection of the already well-established non-pecuniary negative effects of unemployment and inflation.

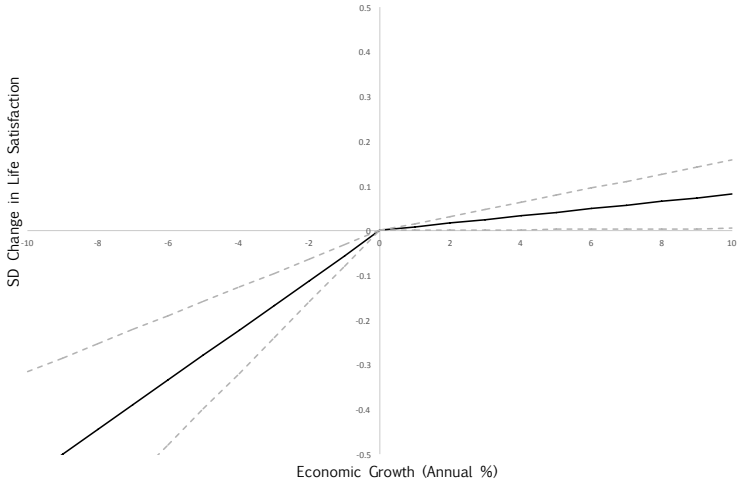
All three datasets, which cover different time-frames and vastly different sets of countries, produce similar results in Tables 6, 5 and 7. As one would expect, the unemployment rate is negatively associated with subjective well-being over time. In all three datasets, the introduction of the unemployment rate alongside economic growth leads to a reduction in the coefficient on negative growth, suggesting that at least some (though not all) of the association between negative growth and subjective well-being, which remains significantly different from zero, is mediated through increases in unemployment that occur during recessionary periods.

In all three cases, once the level of (log) GDP per capita is introduced alongside the growth rate in columns (1) and (2), both level and change effects appear to be present. However, once all the main macroeconomic indicators are included together in columns (7) and (8) the only significant predictors of subjective well-being are negative economic growth and the unemployment rate, with the level of GDP and inflation not significantly associated with evaluative self-reports of well-being.

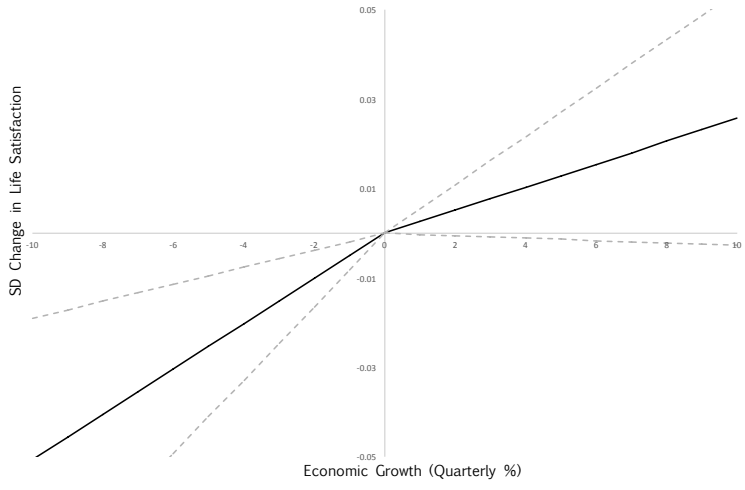
Figure 1: The Asymmetric Experience of Positive and Negative Growth



(a) Gallup World Poll



(b) Eurobarometer



(c) BRFSS

Notes: Graphs plot the coefficients for negative and positive growth from regressions of evaluative SWB on splines of negative and positive growth, the level of log GDP per capita, a vector of personal controls, country/state fixed effects, and year/season dummies. These regressions correspond to model 2 of each of Tables 6, 5 and 7. See text for further details. 95% confidence intervals reported.

Table 5: Gallup 2005-2013 - Addition of main macroeconomic indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Cantril Ladder				
Economic Growth	0.481***		0.465***		0.517***		0.394**	
	(0.162)		(0.165)		(0.167)		(0.168)	
Negative Growth		-1.159***		-1.082***		-1.136***		-0.776**
		(0.325)		(0.352)		(0.322)		(0.323)
Positive Growth		0.208		0.214		0.274		0.249
		(0.201)		(0.197)		(0.200)		(0.199)
GDP per capita (log)	0.295***	0.276***					0.124	0.117
	(0.098)	(0.096)					(0.100)	(0.100)
Unemployment Rate			-1.829***	-1.767***			-1.653***	-1.625***
			(0.298)	(0.298)			(0.333)	(0.333)
Inflation Rate					-0.204	-0.168	-0.217	-0.195
					(0.143)	(0.140)	(0.147)	(0.147)
Country and Wave FEs	x	x	x	x	x	x	x	x
Individual Controls	x	x	x	x	x	x	x	x
Countries	157	157	156	156	156	156	155	155
Country-years	968	968	961	961	963	963	956	956
Individuals	1,166,517	1,166,517	1,158,490	1,158,490	1,158,549	1,158,549	1,150,522	1,150,522
R-squared	0.035	0.035	0.035	0.035	0.034	0.034	0.035	0.035

Robust standard errors in parentheses, adjusted for clustering at the country-year level. Subjective well-being responses are standardised (mean=0, SD=1). Country fixed effects and survey wave dummies are included in all models. All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Eurobarometer 1973-2013 - Addition of main macroeconomic indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	"On the whole, how satisfied are you with the life you lead?"							
Economic Growth	2.172***		1.253***		2.198***		1.263***	
	(0.415)		(0.333)		(0.386)		(0.333)	
Negative Growth		-5.570***		-3.687***		-5.181***		-3.688***
		(1.227)		(0.910)		(1.199)		(0.921)
Positive Growth		0.814**		0.360		1.025***		0.359
		(0.392)		(0.342)		(0.361)		(0.349)
GDP per capita (log)	0.252***	0.239***					-0.011	-0.009
	(0.079)	(0.074)					(0.071)	(0.067)
Unemployment Rate			-2.417***	-2.274***			-2.382***	-2.290***
			(0.235)	(0.214)			(0.256)	(0.236)
Inflation Rate					1.133***	0.930***	0.113	-0.010
					(0.308)	(0.286)	(0.247)	(0.250)
Country and Wave FEs	x	x	x	x	x	x	x	x
Individual Controls	x	x	x	x	x	x	x	x
Countries	15	15	15	15	15	15	15	15
Country-years	508	508	508	508	508	508	508	508
Individuals	1,092,999	1,092,999	1,092,999	1,092,999	1,092,999	1,092,999	1,092,999	1,092,999
R-squared	0.030	0.031	0.033	0.034	0.031	0.031	0.033	0.034

Robust standard errors in parentheses, adjusted for clustering at the country-year level. Life satisfaction responses are standardised (mean=0, SD=1). Country fixed effects and survey wave dummies are included in all models. All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: BRFSS 2005-2010 - Addition of main macroeconomic indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	"In general, how satisfied are you with your life?"							
Economic Growth	0.410***		0.398***		0.445***		0.385***	
	(0.079)		(0.074)		(0.077)		(0.075)	
Negative Growth		-0.506***		-0.457***		-0.511***		-0.487***
		(0.161)		(0.142)		(0.159)		(0.154)
Positive Growth		0.257*		0.309**		0.340**		0.215
		(0.145)		(0.132)		(0.146)		(0.147)
GDP per capita (log)	0.087***	0.092***					0.018	0.024
	(0.030)	(0.031)					(0.033)	(0.034)
Unemployment Rate			-0.197***	-0.196***			-0.196***	-0.197***
			(0.051)	(0.051)			(0.061)	(0.061)
Inflation Rate					0.037	0.001	-0.119	-0.178
					(0.108)	(0.115)	(0.111)	(0.116)
State and Season FEs	x	x	x	x	x	x	x	x
Individual Controls	x	x	x	x	x	x	x	x
States	51	51	51	51	51	51	51	51
State-quarters	1,233	1,233	1,233	1,233	1,233	1,233	1,233	1,233
Individuals	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476
R-squared	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062

Robust standard errors in parentheses, adjusted for clustering at the state-quarter level. Life satisfaction responses are standardised (mean=0, SD=1). State fixed effects and season dummies are included in all models. Economic growth refers to the quarter-on-quarter growth rate. All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Given that the BRFSS uses quarterly rather than yearly data, we also include in Table A4 a one quarter lag of the economic growth rate. The BRFSS data show results in line with the other two datasets, although the asymmetry is less immediately apparent. One reason for this may be that the use quarterly data, which may obscure any delayed well-being sensitivity to economic contractions. Adding a one quarter lag of growth terms seems to confirm this, and such extended models give much stronger evidence of "loss aversion". Two consecutive quarters of negative growth (the definition of a recession) is related to a much larger change in well-being than two quarters of consecutive positive growth of the same magnitude.

4.3 Positive and negative affect over the business cycle

The richness of the Gallup World Poll allows us in Tables 8 and 9 to go beyond the initial analysis of evaluative well-being, and examine how individuals experience economic expansions and contractions. We focus here on two positive and two negative emotions. The long-run level of (log) per capita GDP is not significantly related to the day-to-day emotional experience of individuals. However, emotional well-being is significantly related to macroeconomic movements over the business cycle. Regressing emotional well-being on the economic growth rate, we can see that short-run changes in GDP are associated with feelings of happiness, enjoyment, worry, and stress in the ways one might expect.

However, once we split the growth term into positive and negative splines, it is noticeable that these relationships are, in all four cases, driven exclusively by periods of economic contraction. Negative growth years are significantly associated with decreases in the happiness and enjoyment, and increases in worry and stress, experienced by respondents during those periods. Yet, positive growth does not seem to be related either to increased happiness and enjoyment or reduced worry and stress.

Table 8: Gallup 2005-2013 - Positive Affect over the Business Cycle

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Happiness				Enjoyment			
Economic Growth	0.158***		0.119*		0.161***		0.121**	
	(0.055)		(0.069)		(0.051)		(0.050)	
Negative Growth		-0.223***		-0.116		-0.356***		-0.231**
		(0.084)		(0.093)		(0.080)		(0.092)
Positive Growth		0.119		0.120		0.080		0.079
		(0.086)		(0.099)		(0.068)		(0.066)
GDP per capita (log)			0.004	0.004			0.037	0.035
			(0.073)	(0.073)			(0.029)	(0.029)
Unemployment Rate			-0.434***	-0.434***			-0.232***	-0.224***
			(0.157)	(0.158)			(0.086)	(0.086)
Inflation Rate			-0.050*	-0.050**			-0.048**	-0.042*
			(0.026)	(0.026)			(0.024)	(0.025)
Country and Wave FEs	x	x	x	x	x	x	x	x
Individual Controls	x	x	x	x	x	x	x	x
Countries	151	151	150	150	156	156	154	154
Country-years	625	625	616	616	967	967	955	955
Individuals	806,864	806,864	793,802	793,802	1,169,277	1,169,277	1,153,213	1,153,213
R-squared	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017

Robust standard errors in parentheses, adjusted for clustering at the country-year level. Outcome variables are dichotomous yes/no answers to the question "Did you feel happy/enjoyment a lot yesterday?" Country fixed effects and survey wave dummies are included in all models. All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Gallup 2005-2013 - Negative Affect over the Business Cycle

	Panel A				Panel B			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Worry				Stress			
Economic Growth	-0.156***		-0.128**		-0.079*		-0.054	
	(0.050)		(0.050)		(0.047)		(0.051)	
Negative Growth		0.359***		0.266**		0.328***		0.275**
		(0.124)		(0.127)		(0.120)		(0.128)
Positive Growth		-0.070		-0.075		0.034		0.034
		(0.065)		(0.062)		(0.065)		(0.067)
GDP per capita (log)			-0.004	-0.001			0.002	0.005
			(0.028)	(0.028)			(0.032)	(0.033)
Unemployment Rate			0.503***	0.493***			0.594***	0.580***
			(0.107)	(0.108)			(0.143)	(0.143)
Inflation Rate			0.021	0.013			0.015	0.000
			(0.022)	(0.022)			(0.019)	(0.021)
Country and Wave FEs	x	x	x	x	x	x	x	x
Individual Controls	x	x	x	x	x	x	x	x
Countries	157	157	155	155	156	156	154	154
Country-years	967	967	956	956	889	889	878	878
Individuals	1,156,273	1,156,273	1,142,209	1,142,209	1,057,236	1,057,236	1,044,172	1,044,172
R-squared	0.010	0.010	0.010	0.010	0.009	0.009	0.009	0.009

Robust standard errors in parentheses, adjusted for clustering at the country-year level. Outcome variables are dichotomous yes/no answers to the question "Did you feel worry/stress a lot yesterday?" Country fixed effects and survey wave dummies are included in all models. All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5 Discussion

Our findings have a number of theoretical implications. First, our results indicate that individuals actually experience losses more acutely than gains in a macroeconomic setting, a finding that may provide insight into the mechanism that drives the welfare cost of volatile versus smooth business cycles in terms of human well-being. Second, the results suggest that future research should consider positive and negative economic growth rates separately in piecewise analyses in order to more accurately interpret the gradient for the general relationship between economic growth rates and subjective well-being. Third, although we investigate the short-run association of macroeconomic movements and subjective well-being year-to-year (and in the case of the USA, quarter-to-quarter), the finding of macroeconomic loss aversion may be able to provide an alternative explanation for the long-term income-happiness paradox.

Mechanisms and further research

In line with previous research on macroeconomic growth and subjective well-being, the analysis of this paper is reduced-form. Further research is required in order to understand what is driving these macroeconomic fluctuations and why these drivers seem to have an effect on subjective well-being. The questions of why individuals experience macroeconomic losses more negatively than they experience equivalent gains positively, as well as whether this relationship is causal, are beyond the scope of this paper. Nevertheless, there are several possible avenues for further research in order to address this important follow-up question.

One conjecture is that there is a pure behavioral "loss aversion" effect. Indeed, one deep-rooted mechanism could be that individuals simply react more strongly to negative developments. Humans' disproportionate sensitivity to negative stimuli and the general finding that "bad is stronger than good" (Baumeister et al., 2001) may have an explanation rooted in evolutionary biology (McDermott et al., 2008), since in terms of survival the avoidance of threats is more important than a missed opportunity.

An important potential alternative, or complementary, explanation is that the asymmetry is driven largely by the non-pecuniary negative effects of unemployment (Clark and Oswald, 1994; Kassenboehmer and Haisken-DeNew, 2009; Winkelmann and Winkelmann, 1998), which typically increases during recessions. Including the unemployment rate as a covariate in our analysis, we find that some of the association between the negative growth rate and subjective well-being is indeed driven by unemployment. However, not all of the disproportionate association of downturns and well-being can be explained in this way, suggesting that further mechanisms may be driving the results.

Periods of economic contraction not only involve a loss of national income but also an increase in economic uncertainty (Bloom, 2009, 2014). One non-psychological conduit between recessions and subjective well-being may simply be consumption behavior. Rosenblatt-Wisch (2008), for example, shows that negative growth has a disproportionate effect on consump-

tion (see also Bowman et al., 1999; Foellmi et al., 2011). Economic uncertainty may lead individuals to consume fewer goods and services compared to any increases brought about by equivalent economic upswings, thus leading to disproportionate losses of well-being that are at least to some extent linked to the enjoyment of consumption. A more psychological explanation is that the uncertainty caused by volatility has a direct effect upon subjective well-being. Further, feelings of uncertainty are attention-seeking (Wiggins et al., 1992), and may prevent individuals from adapting to shocks (Wilson and Gilbert, 2008). Uncertainty is also arguably intensified by the disproportionate coverage of negative news about macroeconomic trends compared to respective positive trends (Soroka, 2006). Eggers and Fouirnaies (2014) leverage the arbitrariness of the cut-off of two consecutive quarters of negative growth for the official announcement of a recession to show that negative economic newspaper coverage reduces consumer spending and confidence. Luechinger et al. (2010) highlight the role of economic insecurity in increasing angst and stress by showing that the subjective well-being of employed individuals working in the public sector, who in general enjoy more job protection, is less acutely affected by economic shocks than comparable workers in the private sector.

We are able to use the data to look further into this potential instability mechanism in a number of ways, none of which is able to fully explain away the apparent behavioral loss aversion effect. First, the disproportionate increase in worry and stress that our analysis shows is associated with recessions suggests direct effects of uncertainty on well-being as well as showing that individuals may fear for their financial future and choose to save rather than to enjoy consumption. Second, using the future Cantril Ladder as the outcome variable in Table A1, we see that current negative growth has a disproportionate association with respondents' anticipated well-being in five years time, though the asymmetry is not as stark as with the current ladder of life. Third, we are able to test this potential conduit using the Eurobarometer and Gallup data by introducing the annual growth rate in household consumption expenditure per capita into our baseline equation. Table A2 shows that growth in consumption, and negative growth in particular, is significantly associated with subjective well-being; however, the asymmetric experience of negative and positive growth is robust to the inclusion of consumption growth, suggesting that this mechanism is unable to explain all of the disproportionate association between negative growth and well-being. Fourth, we exploit the fact that the Eurobarometer and Gallup World Poll include (in some though not all survey waves) questions on future economic expectations. In each case, respondents are asked whether they expect the national economic situation to get "better", "worse" or "stay the same". In Table A3 we introduce dummies for positive and negative economic expectations (omitting the neutral category) into our baseline equation. These regressions suggest expectations about the future do indeed have an effect on current subjective well-being, with negative expectations having a stronger impact. Nevertheless, the baseline result of an asymmetric experience of negative and positive growth is robust to the inclusion of these current expectations.

An important avenue for further research will focus on more precisely determining the

level of economic growth against which populations evaluate gains and losses. In this paper we have assumed the current level of income (that is, zero growth) to be the reference point, negative growth away from the status quo is a loss, positive growth a gain. However, it is conceivable that the reference point might be the previous year's growth rate, or some other growth rate that is considered "normal".[9] A growth rate of 4% may well feel like a loss if the population had expected something closer to a 10% rise having just experienced several years of much more rapid economic expansion. Equally, a population that experienced -4% growth in year $t-1$ may well consider a growth rate of -1% in year t a gain, even though it represents an absolute loss of national income. In this sense, individuals get used to a certain level of growth and expect this growth to continue going forward, and then use these expectations as a reference point, judging growth that falls below the expected rate as a loss even if it is actually an absolute gain (cf. Kőszegi and Rabin, 2006). Models (not reported) that include terms for (positive and negative) Δ growth in order to explain subjective well-being do not uncover any significant relationships, however.

An alternative explanation for the long-term income-happiness paradox

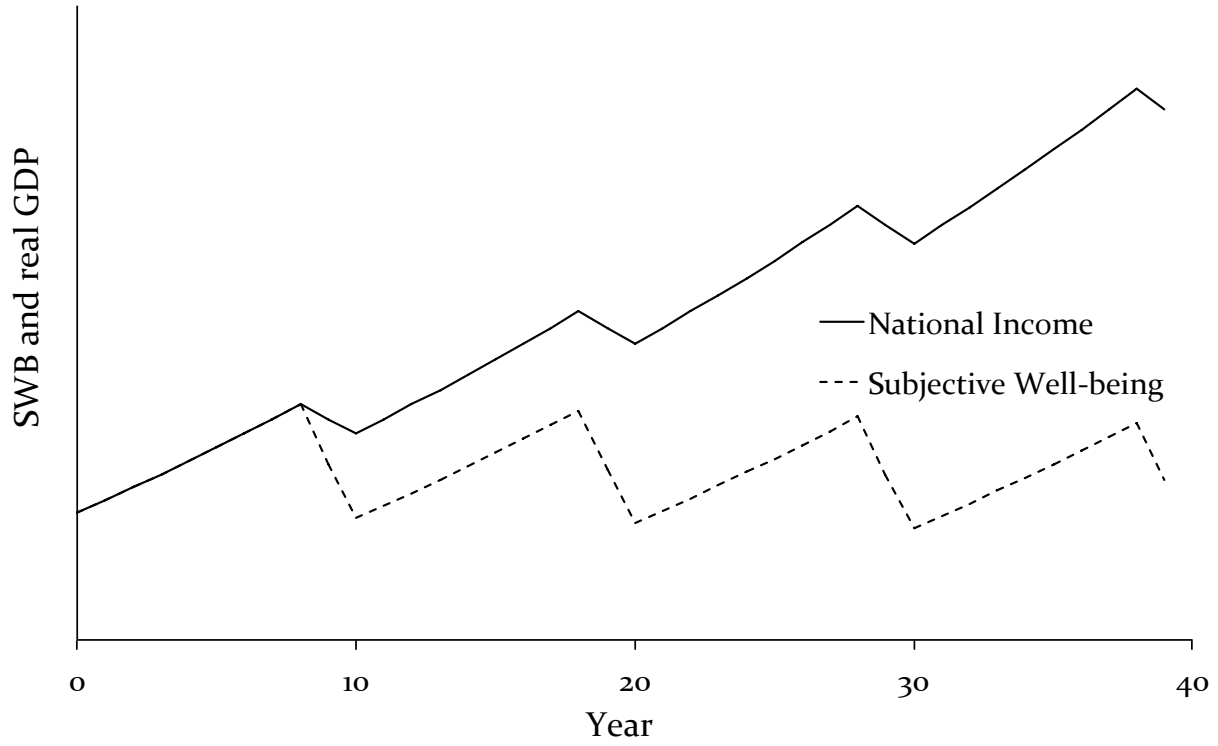
The asymmetry in the subjective experience of negative growth may help to reconcile the short versus long-term trends in the income-happiness relationship. The apparent "paradox" resulting from the conflicting findings in the short- versus long-term relationship between national income and subjective well-being can perhaps be better understood in light of the results on macroeconomic loss aversion presented here. Periodic recessions can rapidly undo the well-being gains from longer expansionary periods and lead to an insignificant relationship between national income and average well-being when considered in the long run.

To illustrate, imagine a 10-year business cycle consisting of 8 years of steady growth followed by two recession years. If we treat positive and negative growth as qualitatively the same, then we would expect to see a general upward trend (much like that of real national income)—leading to a positive long-run growth-well-being relationship. However, if people are more sensitive to negative growth, than the well-being gains accumulated over 8 years of positive growth can be wiped out by 2 years of negative growth. Over the whole cycle (and over multiple cycles), despite the short-run relationship, the net change in aggregate life satisfaction can be zero. This dynamic can be seen in the theoretical representation of national income and subjective well-being shown in Figure 2.

This explanation for the long-term income-happiness paradox is complementary to the two most prominent current accounts, namely the psychological mechanisms of hedonic adaptation and social comparison (see Clark et al., 2008). Easterlin (2010, pp. 126-6) also considers the theoretical possibility that aspirations will rise with positive growth in national income but not fall with macroeconomic losses, leading to differential adaptation to gains and losses

[9] For example, disproportionate sensitivity to sub-zero economic growth does little to explain the stagnation of life satisfaction in China despite year-on-year positive growth over the past two decades (Easterlin et al., 2012).

Figure 2: Theoretical representation of the asymmetric experience of positive and negative growth over the business cycle



and the long-run stagnation of aggregate happiness over multiple business cycles. A better understanding of this dynamic has macroeconomic policy implications and addresses a long-standing debate. On the one hand, a possible reading of the income-happiness paradox suggests that further growth in the developed world is a futile means to the end of improving societal well-being. On the other hand, researchers who find evidence of a positive relationship between well-being and GDP typically take from this that further economic growth is good for society. Our findings suggest a more nuanced perspective: policy designed to engineer economic "booms", but that risks even relatively short "busts" is unlikely to improve societal well-being in the long-run. Steady positive growth that minimizes the risk of economic contraction seems the most likely route to an improvement in general well-being.

Further limitations

Estimates across datasets as diverse as the three employed in this paper should be compared with caution. On the one hand, there are conceptual differences among the well-being questions used across the three surveys. While the Eurobarometer and BRFSS data include a life satisfaction question, the Gallup surveys use Cantril's ladder, responses to which are anchored to the respondent's own reference point of their 'best possible life'. Discrepancies between these two types of evaluative questions have been documented (Bjornskov, 2010). Furthermore, self-reported measures are susceptible to mode of interview, with higher levels

of evaluative, experienced, and eudaimonic measures of well-being reported on telephone compared to face-to-face interviews (Dolan and Kavetsos, 2012). Mode effects have substantial implications for the comparability of our results between surveys given that the Eurobarometer uses face-to-face interviews, the BRFSS phone interviews, and Gallup uses a mix of phone and face-to-face interviews.[10] Our results aim to provide broad evidence in favor of the asymmetric experience of positive and negative growth across multiple sources of data frequently used in the economics literature, rather than highlighting the differences between these.

Comparing individuals across countries as diverse as those included in the Gallup World Poll is also potentially problematic. Indeed we might well expect the relationship between national income and subjective well-being to be very different in the developed and developing worlds. Reliable macroeconomic data is also difficult to obtain for a number of developing countries included in the Gallup sample.

To simplify the analysis, we have assumed (piecewise) linearity in the income growth–well-being relationship. Further research may relax this linearity assumption in order to test for any diminishing sensitivity to both positive and negative economic growth. It has also been shown, in the developed world at least, that populations adapt to changes in national income (Di Tella et al., 2010); a further avenue of research could well investigate any asymmetries in the way in which individuals adapt to gains and losses in national income. Indeed Easterlin (2010) conjectures that adaptation to losses is likely to be much less complete than adaptation to gains.

6 Conclusion

Existing literature has established that subjective well-being covaries with national income to some extent, with the exception of developed nations when considered in long time series. The results presented here build on this earlier research by demonstrating an asymmetry in the subjective experience of positive and negative growth. As a result, they may help to reconcile the short versus long-term trends in the income-happiness relationship.

Standard analyses of the income-happiness relationship could arguably be interpreted as 'growth is good.' However, in light of the asymmetric experience of positive and negative growth, an empirically more accurate interpretation of the income-happiness relationship would be that 'recessions are bad'. The problem of labeling results by one pole of a dimension reflects deep linguistic habits rather than the structure of the data (e.g. 'growth' conjures economic expansion whereas almost a quarter of the data in fact cover economic contractions). This semantic problem is widespread in the literature. For example, Kahneman and Deaton (2010) and De Neve and Oswald (2012) consider the relationship between personal income and subjective well-being, finding that earnings and happiness are to some extent predictive of each

[10] Moreover, each mode has, in turn, additional implications on reported subjective well-being based on the difficulty of reaching respondents on the phone (Heffetz and Rabin, 2013) and the presence of others during face-to-face interviews (Conti and Pudney, 2011).

other. However, in both these papers the underlying data structure is not tested for whether the relationship is perhaps principally accounted for by the negative poles of the earnings and happiness spectrums. This issue also extends beyond the income-happiness relationship. To illustrate, suppose that being very short is more likely to make one miserable than being very tall to make one happy. The relationship would still be described as connecting happiness to 'height'. Piecewise regressions such as detailed in this research can help distill important relationships and aid our interpretation of them.

Academic and policy discussions can overlook whether people are more sensitive to gains or losses in economic growth and focus instead on the benefits of economic growth. As a result, most policies are evaluated by their impact on economic growth as such with less regard to any disproportionate psychological toll that recessions may exert. Our analyses reveal an asymmetry in the way that individuals experience positive and negative macroeconomic fluctuations. We find evidence that self-reported life satisfaction of individuals is more than twice as sensitive to negative growth as compared to positive economic growth rates. Our work indicates the need for nuanced growth policies and the careful use of economic growth data when considering welfare effects in terms of well-being. In sum, we suggest that policymakers and academics should not only evaluate *how much* the economy has grown but also *how* the economy has grown.

References

Aghion, P., U. Akcigit, A. Deaton, and A. Roulet (2014). Creative destruction and subjective well-being. Mimeo.

Barberis, N. C. (2013). Thirty years of prospect theory in economics: A review and assessment. *Journal of Economic Perspectives 27*, 173–196.

Barlevy, G. (2004). The cost of business cycles under endogenous growth. *American Economic Review 94*(4), 964–990.

Barr, B., D. Taylor-Robinson, A. Scott-Samuel, M. McKee, and D. Stuckler (2012). Suicides associated with the 2008-2010 recession in the uk: a time-trend analysis. *British Medical Journal 245*.

Baumeister, R. F., E. Bratslavsky, C. Finkenauer, and K. D. Vohs (2001). Bad is stronger than good. *Review of General Psychology 5*(4), 323.

Benjamin, D. J., O. Heffetz, M. S. Kimball, and A. Rees-Jones (2012). What do you think would make you happier? what do you think you would choose? *American Economic Review 102*(5), 2083–2110.

Benjamin, D. J., O. Heffetz, M. S. Kimball, and A. Rees-Jones (2014). Can marginal rates of

substitution be inferred from happiness data? evidence from residency choices. *American Economic Review*.

Bjornskov, C. (2010). How comparable are the gallup world poll life satisfaction data. *Journal of Happiness Studies 11*, 41–60.

Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica 77*(3), 623–685.

Bloom, N. (2014). Fluctuations in uncertainty. *The Journal of Economic Perspectives 28*(2), 153–175.

Bowman, D., D. Minehart, and M. Rabin (1999). Loss aversion in a consumption-savings model. *Journal of Economic Behavior and Organization 38*, 155–178.

Boyce, C. J., A. M. Wood, J. Banks, A. E. Clark, and G. D. Brown (2013). Money, well-being, and loss aversion: Does an income loss have a greater effect on well-being than an equivalent income gain? *Psychological Science 24*(12), 2557–2562.

Cantril, H. (1965). *The pattern of human concerns*. New Brunswick, NJ: Rutgers University Press.

Charpentier, C., J.-E. De Neve, J. Roiser, and T. Sharot (2015). Models of affective decision-making: how do feelings predict choice? Mimeo, University College London.

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

Clark, A. E., E. Diener, and M. A. Shields (2008). Relative income, happiness, and utility: An explanation for the easterlin paradox and other puzzles. *Journal of Economic Literature 46*(1), 95–114.

Conti, G. and S. Pudney (2011). Survey design and the analysis of satisfaction. *Review of Economics and Statistics 93*, 1087–1093.

De Neve, J.-E. and A. J. Oswald (2012). Estimating the influence of life satisfaction and positive affect on later income using sibling fixed effects. *Proceedings of the National Academy of Sciences 109*(49), 19953–19958.

De Santis, M. (2007). Individual consumption risk and the welfare cost of business cycles. *American Economic Review 97*(4), 1488–1506.

Deaton, A. (2008). Income, health, and well-being around the world: Evidence from the gallup world poll. *Journal of Economic Perspectives 22*(2), 53–72.

Deaton, A. (2012). The financial crisis and the well-being of americans - 2011 oep hicks lecture. *Oxford Economic Papers 64*(1), 1–26.

Di Tella, R., J. Haisken-De New, and R. MacCulloch (2010). Happiness adaptation to income and to status in an individual panel. *Journal of Economic Behavior and Organization 76*(3), 834–852.

Di Tella, R., R. MacCulloch, and A. J. Oswald (2003). The macroeconomics of happiness. *Review of Economic and Statistics 85*(4), 809–827.

Di Tella, R., R. J. MacCulloch, and A. J. Oswald (2001). Preferences over inflation and unemployment: Evidence from surveys of happiness. *American Economic Review*, 335–341.

Dolan, P. and G. Kavetsos (2012). Happy talk: Mode of administration effects on subjective well-being. CEP Discussion Paper, No. 1159, LSE.

Dolan, P., T. Peasgood, and M. White (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.

Easterlin, R. A. (1974). Does economic growth improve the human lot? some empirical evidence. In P. A. David and M. W. Reder (Eds.), *Nations and Households in Economic Growth: Essays in Honor of Moses Abramovitz*, pp. 89–125. New York: Academic Press.

Easterlin, R. A. (2010). *Happiness, growth, and the life cycle*. Oxford University Press.

Easterlin, R. A., L. Angelscu-McVey, M. Switek, O. Sawangfa, and J. S. Zweig (2010). The happiness-income paradox revisited. *Proceedings of the National Academy of Sciences 107*(52), 22463–68.

Easterlin, R. A., R. Morgan, M. Switek, and F. Wang (2012). China's life satisfaction, 1990–2010. *Proceedings of the National Academy of Sciences 109*(25), 9775–9780.

Eggers, A. C. and A. B. Fouirnaies (2014). The economic impact of economic news. Mimeo, University of Oxford.

Fleurbaey, M. and D. Blanchet (2013). *Beyond GDP: Measuring Welfare and Assessing Sustainability*. Oxford University Press.

Foellmi, R., R. Rosenblatt-Wisch, and K. Schenk-Hoppe (2011). Consumption paths under prospect utility in an optimal growth model. *Journal of Economic Dynamics and Control 35*(3), 273–281.

Graham, C. (2010). *Happiness around the world: The paradox of happy peasants and miserable millionaires*. Oxford University Press.

Heffetz, O. and M. Rabin (2013). Conclusions regarding cross-group differences in happiness depend on difficulty of reaching respondents. *American Economic Review 103*, 3001–3021.

Helliwell, J., R. Layard, and J. Sachs (2013). *World Happiness Report*. UN Sustainable Development Solutions Network.

Kahneman, D. (1999). *Well-Being: The Foundations of Hedonic Psychology*, Chapter Objective Happiness. Russell Sage.

Kahneman, D. and A. Deaton (2010). High income improves evaluation of life but not emotional well-being. *Proceedings of the National Academy of Sciences of the USA 107*, 16489–16493.

Kahneman, D. and R. Thaler (2006). Anomalies: Utility maximization and experienced utility. *The Journal of Economic Perspectives 20*(1), 221–234.

Kahneman, D. and A. Tversky (1979). Prospect theory: An analysis of decisions under risk. *Econometrica 47*, 263–291.

Kahneman, D., P. Wakker, and R. Sarin (1997). Back to bentham? explorations of experienced utility. *Quarterly Journal of Economics 112*(2), 375–406.

Kassenboehmer, S. C. and J. P. Haisken-DeNew (2009). You're fired! the causal negative effect of entry unemployment on life satisfaction. *Economic Journal 119*(536), 448–462.

Kermer, D. A., E. Driver-Linn, T. D. Wilson, and D. T. Gilbert (2006). Loss aversion is an affective forecasting error. *Psychological Science 17*(8), 649–653.

Kőszegi, B. and M. Rabin (2006). A model of reference-dependent preferences. *The Quarterly Journal of Economics*, 1133–1165.

Krueger, A. B. and A. A. Stone (2014). Progress in measuring subjective well-being: moving toward national indicators and policy evaluations. *Science 346(6205)*, 42–43.

Layard, R. (2005). *Happiness: Lessons from a new science*. Penguin.

Lucas, R. (1987). *Models of Business Cycles*. New York: Blackwell.

Lucas, R. (2003). Macroeconomic priorities. *American Economic Review 93*(1), 1–14.

Luechinger, S., S. Meier, and A. Stutzer (2010). Why does unemployment hurt the employed? evidence from the life satisfaction gap between the public and the private sector. *Journal of Human Resources 45*(4), 998–1045.

McDermott, R., J. H. Fowler, and O. Smirnov (2008). On the evolutionary origin of prospect theory preferences. *The Journal of Politics 70*(02), 335–350.

Montagnoli, A. and M. Moro (2014). Everybody hurts: banking crises and individual wellbeing. *Sheffield Economic Research Paper Series no. 2014010*.

Otrok, C. (2001). On measuring the welfare cost of business cycles. *Journal of Monetary Economics 47*(1), 61–92.

Perez-Truglia, R. (2010). A samuelsonian validation test for happiness data. *Working Paper (SSRN 1658747)*.

Proto, E. and A. Rustichini (2013). A reassessment of the relationship between gdp and life satisfaction. *PloS one 8*(11).

Rabin, M. (1998). Psychology and economics. *Journal of Economic Literature 36*(1), 11–46.

Rick, S. (2011). Losses, gains, and brains: Neuroeconomics can help to answer open questions about loss aversion. *Journal of Consumer Psychology 21*, 453–463.

Rosenblatt-Wisch, R. (2008). Loss aversion in aggregate macroeconomic time series. *European Economic Review 52*(7), 1140–1159.

Sacks, D., B. Stevenson, and J. Wolfers (2012). The new stylized facts about income and subjective well-being. *Emotion 12*(6), 1181–1187.

Sacks, D., B. Stevenson, and J. Wolfers (2013). Growth in subjective well-being and income over time. mimeo.

Schwarz, N. and F. Strack (1999). Reports of subjective well-being: judgmental processes and their methodological implications. In E. D. D. Kahneman and N. Schwarz (Eds.), *Well-Being: The Foundations of Hedonic Psychology*, pp. 61–84. New York: Russell Sage.

Soroka, S. N. (2006). Good news and bad news: Asymmetric responses to economic information. *Journal of Politics 68*(2), 372–385.

Stevenson, B. and J. Wolfers (2008). Economic growth and subjective well-being: Reassessing the easterlin paradox. *Brookings Papers on Economic Activity 39*(1), 1–102.

Stevenson, B. and J. Wolfers (2013). Subjective well-being and income: Is there any evidence of satiation? *The American Economic Review, Papers and Proceedings 101*, 598–604.

Stuckler, D., S. Basu, and M. McKee (2011). Effects of the 2008 financial crisis on health: A first look at the european data. *The Lancet 387*, 124–25.

Tversky, A. and D. Kahneman (1991). Loss aversion in riskless choice: A reference-dependent model. *Quarterly Journal of Economics 106*, 1039–1061.

Vendrik, M. and G. B. Woltjer (2007). Happiness and loss aversion: Is utility concave or convex in relative income? *Journal of Public Economics 91*(7), 1423–1448.

Wiggins, S., P. Whyte, M. Huggins, S. Adam, J. Theilmann, M. Bloch, S. B. Sheps, M. T. Schechter, and M. R. Hayden (1992). The psychological consequences of predictive testing for huntingtons disease. *New England Journal of Medicine 327*(20), 1401–1405.

Wilson, T. D. and D. T. Gilbert (2008). Explaining away: A model of affective adaptation. *Perspectives on Psychological Science 3*(5), 370–386.

Winkelmann, L. and R. Winkelmann (1998). Why are the unemployed so unhappy? *Economica 65*, 1–15.

Wolfers, J. (2003). Is business cycle volatility costly? evidence from surveys of subjective well-being. *International Finance 6*(1), 1–31.

Yellen, J. and G. Akerlof (2006). Stabilization policy: A reconsideration. *Economic Inquiry 44*(1), 1–22.

Table A1: Gallup 2005-2013 - Future Cantril Ladder

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Future Cantril Ladder									
Economic Growth	1.242***		1.235***		1.162***		1.197***		1.135***	
	(0.219)		(0.224)		(0.220)		(0.257)		(0.264)	
Negative Growth		-1.925***		-1.918***		-1.713***		-1.578***		-1.399***
		(0.425)		(0.423)		(0.436)		(0.509)		(0.525)
Positive Growth		0.964***		0.963***		0.942***		1.050***		1.037***
		(0.274)		(0.277)		(0.273)		(0.281)		(0.282)
GDP per capita (log)			0.028	0.010					-0.146	-0.151
			(0.111)	(0.109)					(0.113)	(0.112)
Unemployment Rate					-1.476***	-1.423***			-1.770***	-1.752***
					(0.376)	(0.375)			(0.429)	(0.430)
Inflation Rate							-0.271	-0.248	-0.288	-0.272
							(0.253)	(0.261)	(0.255)	(0.265)
Country and Wave FEs	x	x	x	x	x	x	x	x	x	x
Individual Controls	x	x	x	x	x	x	x	x	x	x
Countries	157	157	157	157	156	156	156	156	155	155
Country-years	967	967	967	967	960	960	962	962	955	955
Individuals	1,074,085	1,074,085	1,074,085	1,074,085	1,066,230	1,066,230	1,066,725	1,066,725	1,058,870	1,058,870
R-squared	0.069	0.069	0.069	0.069	0.070	0.070	0.070	0.070	0.071	0.071

Robust standard errors in parentheses, adjusted for clustering at the country-year level. Future Cantril Ladder scores, which are standardised (mean=0, SD=1), are responses to the following: *"Please imagine a ladder with steps numbered from zero at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step do you think you will stand about five years from now?"*. Country fixed effects and survey wave dummies are included in all models. All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: The role of household consumption

	Gallup		Eurobarometer	
	(1)	(2)	(3)	(4)
	Cantril ladder		Life Satisfaction	
Economic Growth	0.613***		1.527***	
	(0.218)		(0.486)	
Negative Growth		-1.432***		-5.003***
		(0.460)		(1.366)
Positive Growth		0.332		0.399
		(0.227)		(0.464)
HH consumption growth	-0.054	-0.081	1.120**	0.844*
	(0.092)	(0.093)	(0.503)	(0.465)
Country and Wave FEs	x	x	x	x
Individual Controls	x	x	x	x
Countries	131	131	15	15
Country-years	801	801	508	508
Individuals	974,778	974,778	1,092,999	1,092,999
R-squared	0.035	0.035	0.030	0.031

Robust standard errors in parentheses, adjusted for clustering at the country-year level. All outcomes variables are standardised (mean=0, SD=1). All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Country fixed effects and survey wave dummies are included in all models. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: The role of economic expectations

	Gallup		Eurobarometer	
	(1)	(2)	(3)	(4)
	Cantril ladder		Life Satisfaction	
Economic Growth	0.204		2.393***	
	(0.152)		(0.520)	
Negative Growth		-0.783**		-4.244***
		(0.311)		(1.148)
Positive Growth		-0.059		0.274
		(0.192)		(0.687)
Economic Expectations:	0.135***	0.135***	0.097***	0.098***
Better (vs. same)	(0.006)	(0.006)	(0.008)	(0.008)
Economic Expectations:	-0.159***	-0.158***	-0.146***	-0.146***
Worse (vs. same)	(0.006)	(0.006)	(0.009)	(0.009)
Country and Wave FEs	x	x	x	x
Individual Controls	x	x	x	x
Countries	152	152	15	15
Country-years	825	825	180	180
Individuals	957,023	957,023	385,738	385,738
R-squared	0.052	0.052	0.048	0.049

Robust standard errors in parentheses, adjusted for clustering at the country-year level. All outcomes variables are standardised (mean=0, SD=1). All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Country fixed effects and survey wave dummies are included in all models. Gallup data covers 2005-2013, Eurobarometer 2002-2013. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

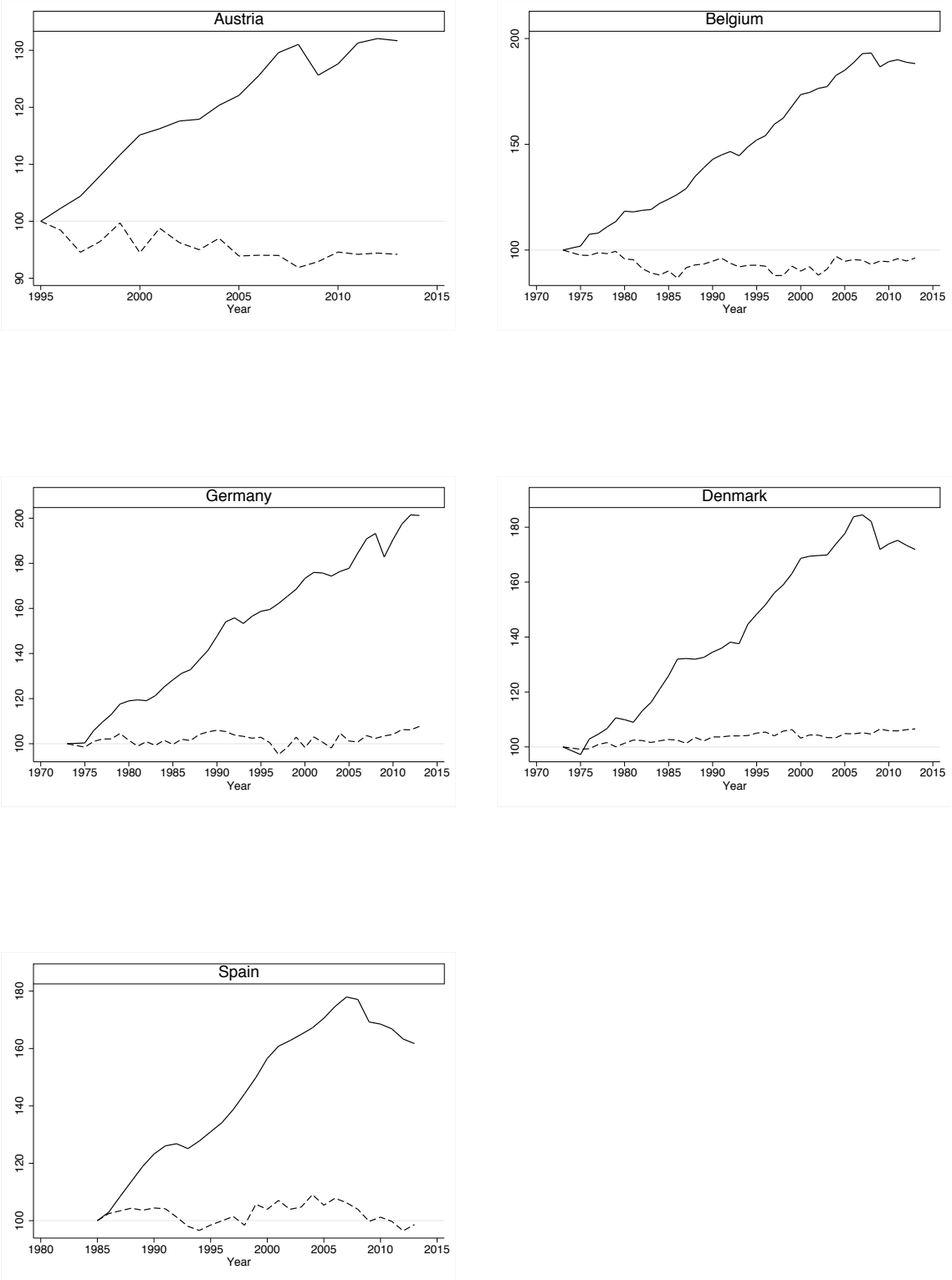
Table A4: BRFSS 2005-2010 - Addition of one quarter lagged growth

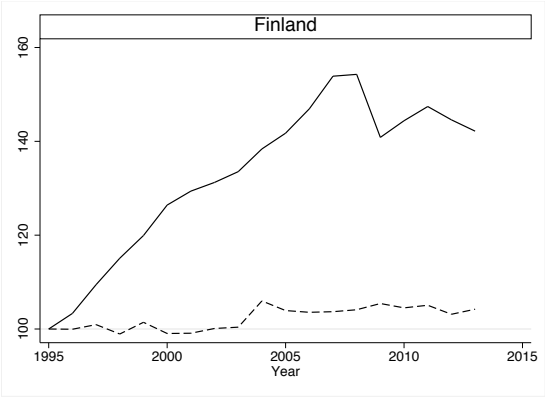
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	"In general, how satisfied are you with your life?"									
Economic Growth	0.437***		0.413***		0.400***		0.434***		0.384***	
	(0.062)		(0.065)		(0.062)		(0.061)		(0.062)	
Negative Growth		-0.420***		-0.415***		-0.380***		-0.451***		-0.428***
		(0.126)		(0.131)		(0.123)		(0.131)		(0.129)
Positive Growth		0.286**		0.230*		0.270**		0.203		0.119
		(0.131)		(0.138)		(0.127)		(0.134)		(0.137)
Economic Growth (-1Q)	0.252***		0.227***		0.208***		0.260***		0.226***	
	(0.060)		(0.065)		(0.062)		(0.062)		(0.063)	
Negative Growth (-1Q)		-0.506***		-0.478***		-0.445***		-0.542***		-0.495***
		(0.106)		(0.107)		(0.099)		(0.112)		(0.104)
Positive Growth (-1Q)		-0.030		-0.054		-0.051		-0.018		-0.035
		(0.161)		(0.175)		(0.156)		(0.164)		(0.162)
GDP per capita (log)			0.064**	0.069**					-0.001	0.006
			(0.032)	(0.033)					(0.033)	(0.036)
Unemployment Rate					-0.169***	-0.159***			-0.190***	-0.184***
					(0.055)	(0.054)			(0.061)	(0.061)
Inflation Rate							-0.069	-0.190	-0.205*	-0.332***
							(0.115)	(0.118)	(0.114)	(0.117)
State and Season FEs	x	x	x	x	x	x	x	x	x	x
Individual Controls	x	x	x	x	x	x	x	x	x	x
States	51	51	51	51	51	51	51	51	51	51
State-quarters	1233	1233	1233	1233	1233	1233	1233	1233	1233	1233
Individuals	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476	2,260,476
R-squared	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062

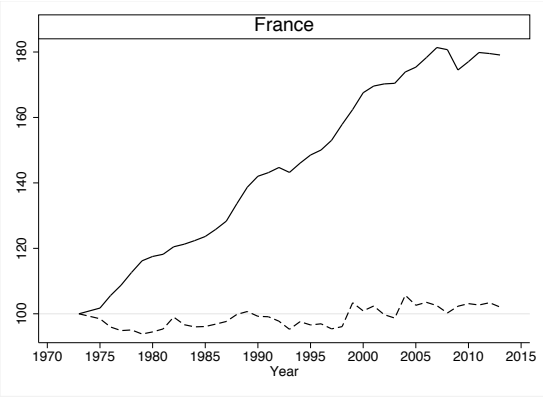
Robust standard errors in parentheses, adjusted for clustering at the state-quarter level. Life satisfaction responses are standardised (mean=0, SD=1). State fixed effects and season dummies are included in all models. Economic growth refers to the quarter-on-quarter growth rate; -1Q refers to a one quarter lag of this rate. All regressions include individual-level controls: age, age-squared, education level, gender, marital status. Negative and Positive Growth terms are splines, such that negative (positive) growth is equal to the absolute value of the growth rate when it is negative (positive) and zero otherwise.

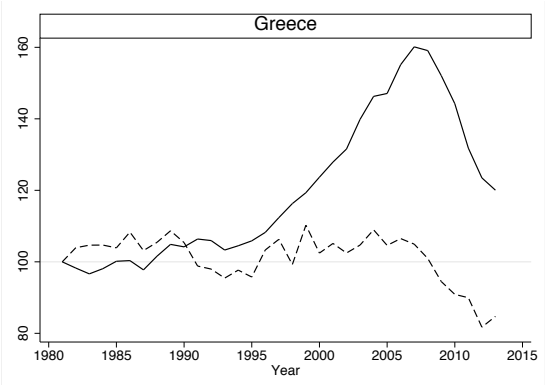
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

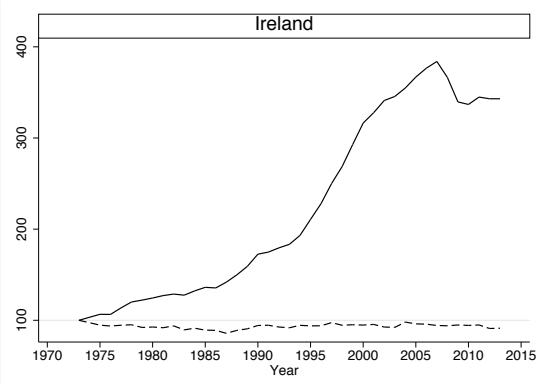
Figure A1: Eurobarometer: National income and life satisfaction in the EU-15.

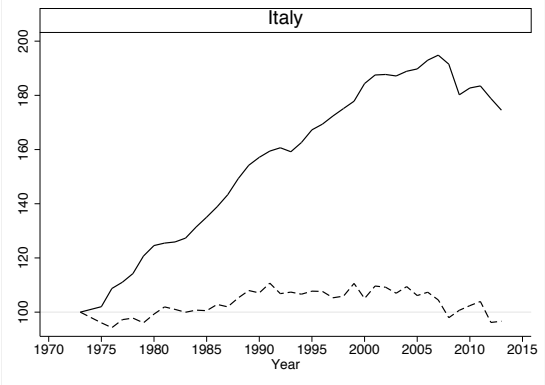




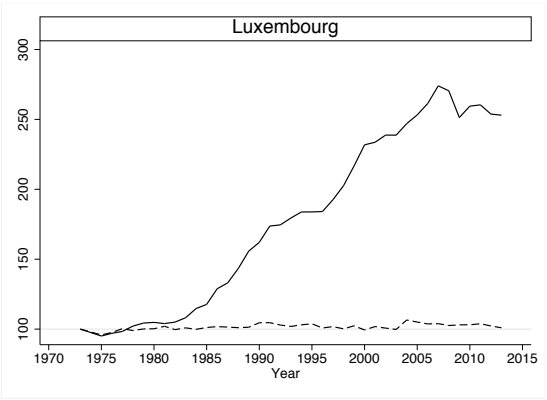


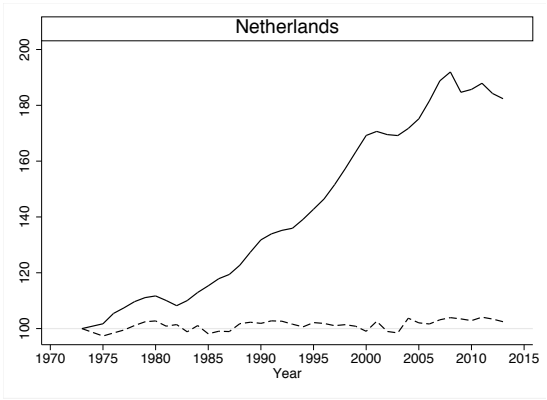


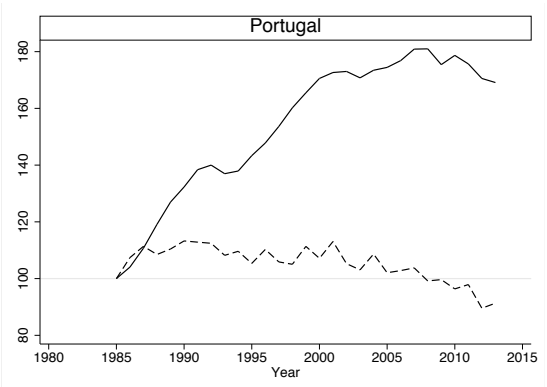


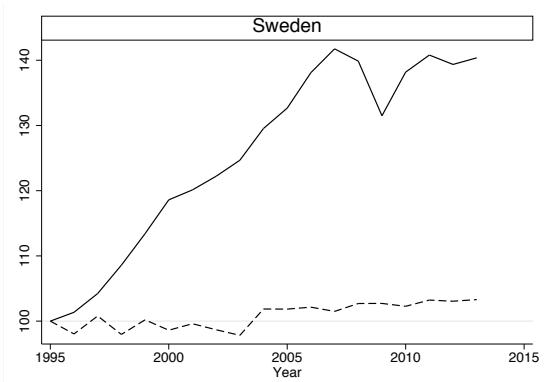


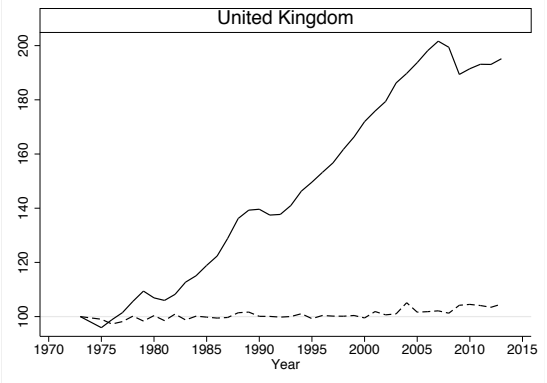
— — — Subjective Well-being ———— Real GDP per capita











— — — Subjective Well-being ———— Real GDP per capita