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Auteur: Francesco Sarracino (LCSR National Research University Higher School of Economics, Russian Federation & STATEC) and Kelsey J. O'Connor (STATEC)

Economic growth and well-being beyond the Easterlin paradox

Abstract

Recent studies suggest that economic growth and well-being can grow together in the long run in presence of generous social safety nets, increasing social capital and declining income inequality. We put these conditions to a test in an attempt to explain the absence of a relation between economic growth and well-being in Luxembourg. To this aim we apply an error correction model to a panel of 15 Western European countries, and we use the results to predict life satisfaction in Luxembourg between 1991 and 2015. We find that the flat trend of life satisfaction in Luxembourg is likely the result of four forces acting in opposite directions. This suggests that the available list of moderating conditions – although not exhaustive – is a promising starting point to design new policies to durably improve well-being.

Keywords: time-series; subjective well-being; error correction model; life satisfaction; dynamics; inclusive growth.

JEL codes: I31; O11; E6; O21; D60.

1 Introduction

The finding of no long-run relationship between economic growth and subjective well-being is controversial. This result, contradicting a positive cross-sectional relation, came to be known as the Easterlin paradox (Easterlin, 1974). Since, many scholars have contributed with diverging views. There are those who oppose (see e.g. Easterlin et al., 2010; Bruni and Stanca, 2008; Easterlin and Angelescu, 2009; Becchetti et al., 2011; Clark et al., 2014; Easterlin, 2017) and those who support (see e.g. Stevenson and Wolfers, 2008; Deaton, 2008; Sacks et al., 2012; Veenhoven and Vergunst, 2013) economic growth as a way to improve well-being. Beyond the views concerning simply whether or not growth will accompany increasing well-being, some recent evidence suggests the relation depends on social, political, economic, cultural, and institutional conditions: if economic growth is compatible with a cohesive and inclusive society, it is reasonable to expect that well-being will improve (Oishi and Kesebir, 2015; Mikucka et al., 2017; Easterlin, 2013; Ono and Lee, 2013). In contrast, if economic growth leads to loneliness and inequality, well-being may arguably decline.

Although the quest for conditions of "inclusive growth" – a growth that benefits all the members of a society – is still in its infancy, past evidence provides a preliminary explanation of how and when a positive correlation between economic growth and well-being can exist over time. This is important because it can suggest ways to promote well-being. Our aim is to distill the evidence on the conditions affecting the economic growth - well-being gradient, to explain the flat trend of life satisfaction in Luxembourg.

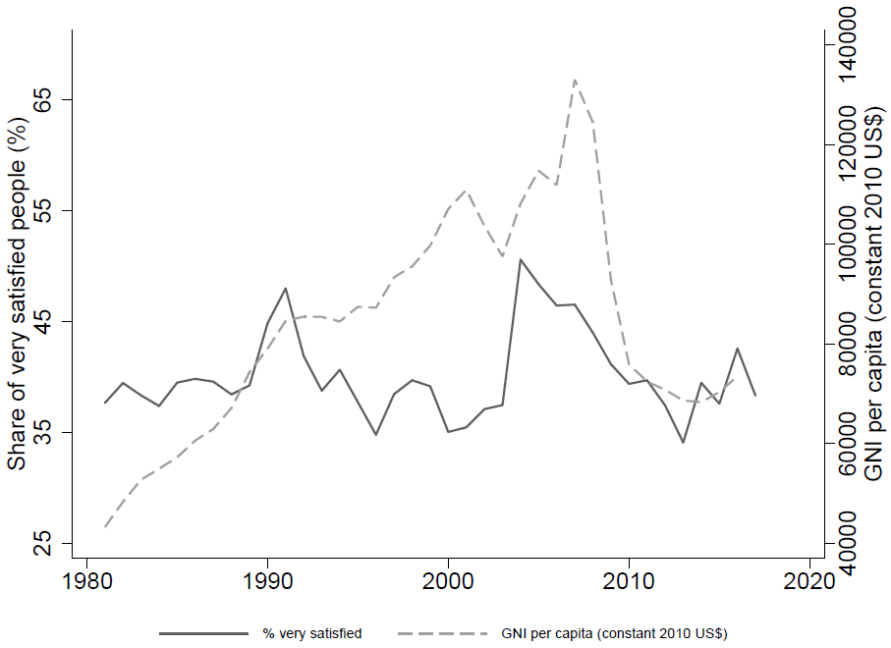
We focus on Luxembourg as an example of the lack of correlation between economic growth and well-being in the long run. Panel 1a in Figure 1 shows that since the early 1980s, Luxembourg experienced substantial economic growth, at least until the economic crisis of 2008. Yet, the share of very satisfied people did not change substantially over time.[3] The economic crisis may explain what happened after 2008, but prior to 2008, it is not clear why economic growth did not improve people's well-being (from a traditional economics perspective).

A possible explanation is that life satisfaction is an unreliable measure. Yet, we have reasons to believe that life satisfaction is reliable based on available data and previous literature. Panel 2b reports the share of very satisfied people according to Eurobarometer (EB), European Values Survey (EVS) and European Quality of Life Survey (EQLS). For the years when the data are jointly available, the three surveys provide a remarkably comparable picture. Moreover, a well-established literature provided evidence supporting the reliability and validity of life satisfaction as a measure of subjective and objective well-being (Blanchflower and Oswald, 2004; Van Reekum et al., 2007; Schimmack et al., 2010; Kahneman and Krueger, 2006; Layard, 2005).

[3] Eurobarometer is the only dataset that provides long time-series about life satisfaction in Luxembourg. The answers to the question are organized on a four point scale. The distribution of this variable over time is remarkably stable with a consistently fat right tail. Hence, our measure of life satisfaction, the share of very satisfied people, is conservative because the trend would be even flatter than observed if we focused on the share of satisfied people.

Figure 1: Share of very satisfied people (Panel A) and real Gross National Income (GNI) per capita (Panel B) in Luxembourg in the period 1981-2015. The samples consist only of native born individuals.

(a) Life satisfaction (Eurobarometer data) and real Gross National Income per capita (World Development Indicators).

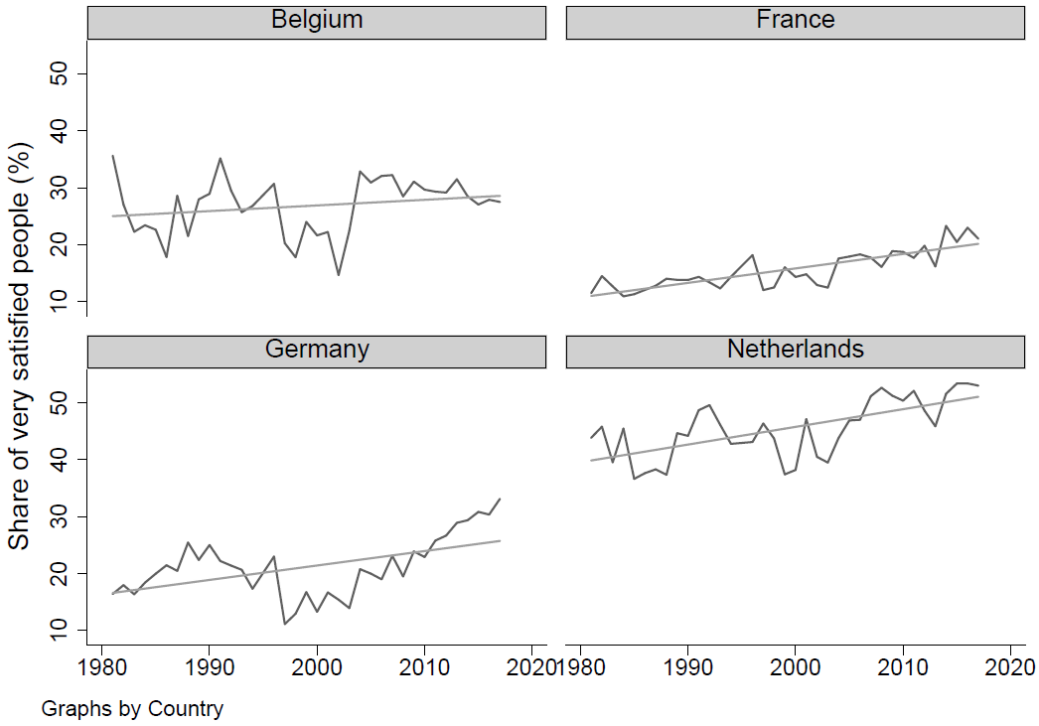


(b) Life satisfaction in Luxembourg. For the years when three different data-set are jointly available, they provide comparable information.

Note: We restrict our analysis on natives only to ensure the comparability of data on life satisfaction over time. Eurobarometer data collected before 1994 provided data on nationals only, and after 1994 they included information on immigrants from other European countries. We discuss this issue in more detail in section Data.
Source: Eurobarometer, European Values Study, European Quality of Life Survey data, and World Development Indicators, own elaboration.

Another possible explanation is that the trends of life satisfaction are always flat - at least among the richest and most developed countries in the world. However, the evidence does not support this view. Figure 2 shows the trends of the share of very satisfied people in Belgium, France, Germany and the Netherlands, i.e. a set of Western European countries which are close to Luxembourg. The picture shows that the trends of life satisfaction are not always flat: although average levels may differ, the trends in France and Netherlands are monotonically positive, whereas the trend is rather flat in Belgium and it follows a 'J' curve in Germany. This is consistent with previous studies (Sarracino, 2012).

Figure 2: Trends of the share of very satisfied people in a sample of Western European countries.



Source: Eurobarometer data, own elaboration.

In sum, the flat trend of life satisfaction in Luxembourg does not have a simple explanation. We posit that economic growth and life satisfaction did not grow together because four factors acted in opposite directions for well-being, namely increasing social capital and social expenditures – which are expected to have a positive impact on well-being – and increasing income inequality and unemployment – which, on the other hand, could have a negative impact.

Unfortunately, we do not have micro data providing long time-series for Luxembourg: the European Value Study includes individual data collected in 1999 and 2008, the European Social Survey was administered in 2002 and 2004, and the European Quality of Life Survey provides data every four years since 2003. Thus, we adopt a macro-economic perspective. Specifically, we apply an error correction model to a panel of 15 Western European countries to explain

country-year levels of life satisfaction using the set of potential explanatory factors identified in previous literature. The results are then used to predict life satisfaction and to assess whether and to what extent the explanatory factors explain the trend of life satisfaction in Luxembourg.

We build our argument in two steps: in section 2 we review the literature on the Easterlin paradox and on the factors moderating the relationship between economic growth and well-being. Subsequently, we apply a time-series approach (section 3) to a macro data-set consisting of 15 Western European countries (section 4). Section 5 illustrates the results of the model, which we use to predict and explain the trend of life satisfaction in Luxembourg. The last section concludes.

2 The Easterlin paradox and moderating factors

The debate on subjective well-being gained special attention in part because it concerns an important question: to what extent do modern societies benefit from economic growth? For years this question has divided social scientists among: those who claim that contemporary societies should not expect significant improvements in subjective well-being from economic growth (Easterlin, 1974); those who argue that economic growth and increasing subjective well-being are associated over time (see e.g. Stevenson and Wolfers, 2008; Deaton, 2008; Sacks et al., 2012; Veenhoven and Vergunst, 2013); those who point out that whether a relationship exists depends on the set of countries considered (developed and developing countries vs. transition countries) or the period of time, i.e. economic growth and the trends of well-being correlate in the short run, but such correlation disappears in the long run (Easterlin and Angelescu, 2009; Becchetti et al., 2011; Easterlin et al., 2010; Clark et al., 2014; De Neve et al., 2018; Bartolini and Sarracino, 2014); and those who claim that even if the trends of subjective well-being and economic growth are statistically related, the magnitude is too small for growth to have a meaningful impact (Beja, 2014). Recently, some scholars argued that the question is not *whether*, but *when* – under what conditions – economic growth correlates with increasing subjective well-being (Oishi and Kesebir, 2015; Mikucka et al., 2017). The literature identified three factors which plausibly affect the relation between economic growth and well-being over time: income inequality (Oishi and Kesebir, 2015; Mikucka et al., 2017), social capital (Uhlaner, 1989; Helliwell, 2003, 2008; Bartolini et al., 2013; Clark et al., 2014), and social policy (Easterlin, 2013; Ono and Lee, 2016).

Concerning income inequality, the evidence about the cross-sectional relationship with well-being is mixed (e.g. Alesina et al., 2004; Clark and D'Ambrosio, 2015). These contradictions may arise because the relationship between inequality and well-being depends on a country's level of development (Jiang et al., 2012; Iniguez-Montiel, 2014). However, previous studies found that *increasing* income inequality is consistently negatively related to well-being (Bartolini and Sarracino, 2015; Oishi and Kesebir, 2015; Mikucka et al., 2017). By widening the possibilities to establish social comparisons, growing income inequality undermines the positive effect of income growth for well-being. Raising income inequality can also undermine well-being by reducing feelings of fairness and trust in others (Oishi et al., 2011) or by weakening social linkages and feelings of cooperation (Graham and Felton, 2006; Oishi et al., 2011).

Social capital is defined by the OECD (2001) as "networks together with shared norms, values and understandings that facilitate co-operation within or among groups". A well-established literature shows that social capital correlates positively with subjective well-being at both the individual (Helliwell et al., 2017; Clark et al., 2014; Becchetti et al., 2009) and

aggregate level, over time within countries (Bartolini et al., 2013; Bartolini and Sarracino, 2015; Brockmann et al., 2009; Easterlin et al., 2012) and in country panels (Bartolini and Sarracino, 2014). Helliwell and Aknin (2018) discuss in detail the relationship between social capital and subjective well-being.

The experience of countries that transitioned from communist economic systems illustrate the importance of social safety nets for well-being (Ono and Lee, 2013). Survey data consistently indicate that people in European post-communist countries are among the least satisfied people in Europe. Moreover, after the transition, average life satisfaction declined. The loss of jobs and the deterioration of safety nets are among the causes that explain this decline. The communist regime provided people with jobs, basic income, health insurance, education, and other benefits. The transition to market capitalism was accompanied by widespread corruption and the collapse of the social insurance system, which invariably led to greater inequality and lower well-being. In recent years life satisfaction recovered, but it took more than ten years and required an increase in GDP per capita averaging about 25 percent above the 1990s value (Easterlin, 2009, p. 142).[4]

In China, life satisfaction exhibited a similar pattern of collapse and recovery following the transition, all the while growing at an average annual rate of more than 9.0%. Brockmann et al. (2009), Easterlin et al. (2012), Easterlin et al. (2017) and Bartolini and Sarracino (2015) discuss possible explanations for these startling facts. Each work partially attributes the decline in life satisfaction to increased social comparisons, especially facilitated by rising income inequality. Bartolini and Sarracino (2015) document the importance of social capital, estimating that nearly 19.0% of the well-being loss in China is related to a decrease in social capital. Easterlin et al. (2012) and Easterlin et al. (2017) instead emphasize the role of rising unemployment[5], which was inversely related to life satisfaction over the full cycle from 1990 to 2010 (while inequality, in contrast, rose throughout the period). And, like in the European transition countries, with unemployment came not only income losses, but also the elimination of social benefits. The loss of these benefits arguably significantly exacerbated the effects of unemployment. Social safety nets are positively related to life satisfaction in general (Di Tella et al., 2003; Rothstein, 2010; Pacek and Radcliff, 2008; Boarini et al., 2013; Easterlin, 2013; Ono and Lee, 2016; O'Connor, 2017), not just in transition economies, and the association is not limited to those directly affected (e.g., unemployed) (Carr and Chung, 2014). In sum, the decline in Chinese well-being can be explained by (1) increasing income inequality which facilitated increasing social comparisons, (2) declining social capital, and (3) increasing unemployment accompanied by a severely reduced social safety net. The recent recovery appears to be driven by improvements in trust, employment, and the social safety net (Easterlin et al., 2017).

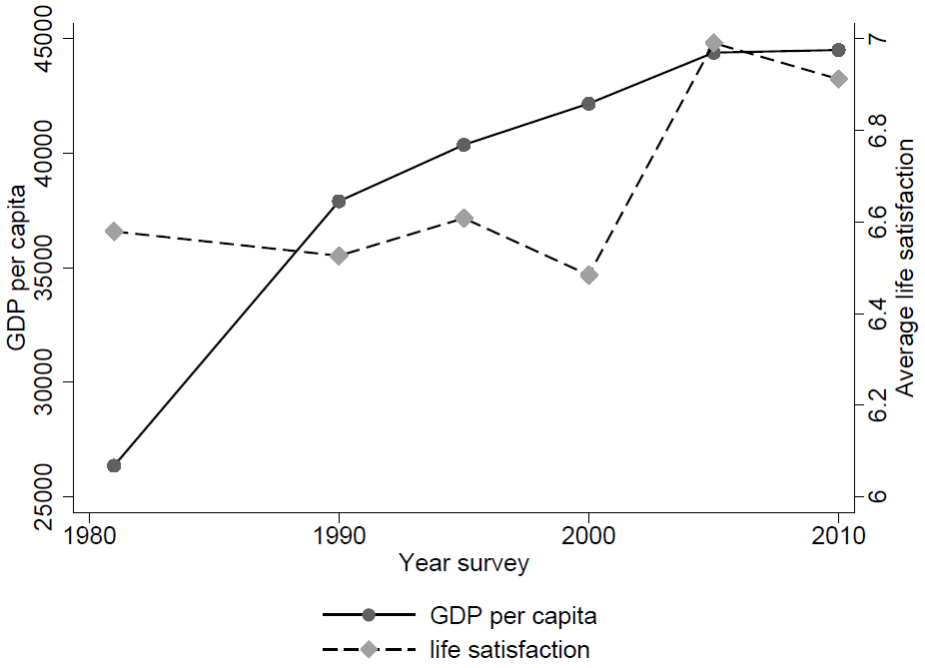
Previous studies investigating the Easterlin paradox and its moderating factors focused mainly on cross-country studies or on countries providing "negative" examples, i.e. countries in which economic growth and increasing well-being do not go together. The case of Japan stands out as a "positive" example: a country where economic reforms in the early 1990s shifted the country from a pattern of rampant economic growth and stagnant well-being, to one of

[4] It is possible that asymmetric responses to economic collapse and positive income growth could explain why life satisfaction did not fully recover at the same time as GDP (e.g., from loss aversion De Neve et al., 2018), but that is insufficient to explain the pattern in China as discussed in the next paragraph.

[5] Due to government restructuring of state-owned enterprises and large rural to urban migration associated with relaxed internal migration laws.

moderate growth and increasing well-being (see figure 3). The question then becomes: what made this change possible?

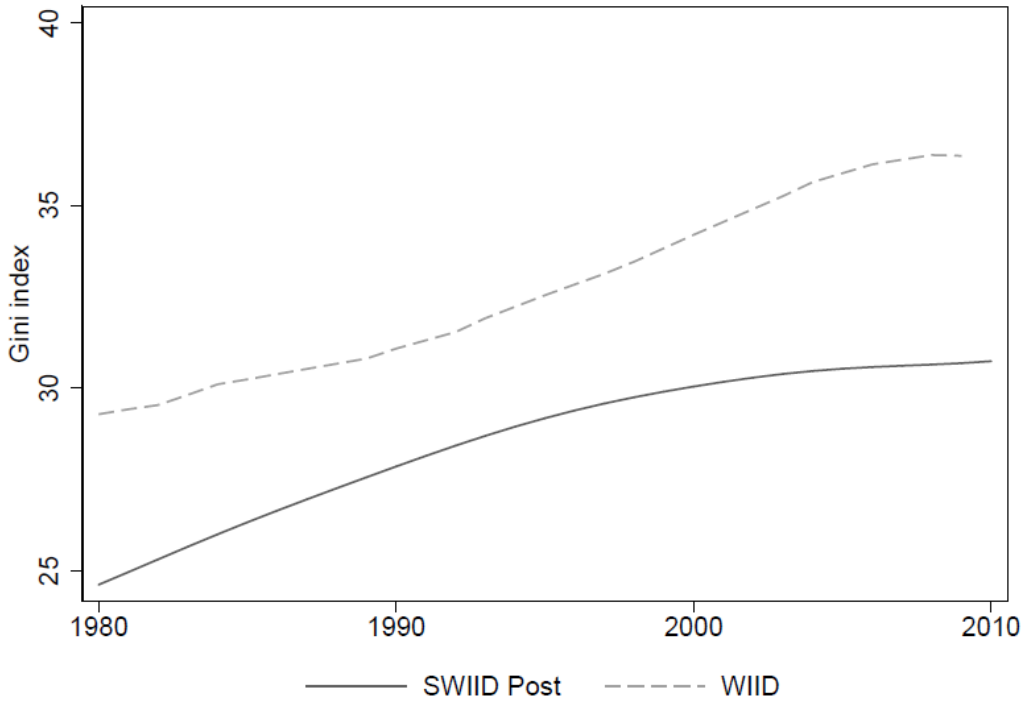
Figure 3: Trends of life satisfaction and GDP per capita (constant 2010 US$) in Japan between 1981 and 2010.



Note: Life satisfaction data are from the WVS, whereas GDP figures, presented in real dollars with base year set to 2010, are issued from the World Development Indicators of the World Bank. The trends in life satisfaction from WVS are roughly consistent with those issued from other sources.
Source: Sarracino et al. (2019).

By the end of the 1980s, Japan was in the middle of two crisis: on one side, the demographic crisis; on the other, the decline in the viability of the traditional and corporate social safety net. Greater urbanization and industrialization, along with economic stagnation and international competition, put pressure on the scheme of social safety nets which traditionally relied on intergenerational support and on generous benefits for the employees of large corporations. For instance, the share of three-generation-family households went from 54 percent in 1975 to 13 percent in 2013 (Ministry of Health, Labour and Welfare, 2014), whereas the share of elderly people living alone nearly doubled. At the same time, economic conditions forced companies to limit the benefits granted to their employees, and in particular to newly hired personnel. Moreover, the likelihood of lifetime employment declined (Ono, 2010). The share of workers in nonstandard employment more than doubled from 15 to 38 percent between 1984 and 2016 (Ministry of Health, Labour and Welfare, 2014). Consequently, the population in need of social protection greatly expanded during the 1990s, as well as income inequality (see figure 4).

Figure 4: Evolution of the Gini index of income in Japan.

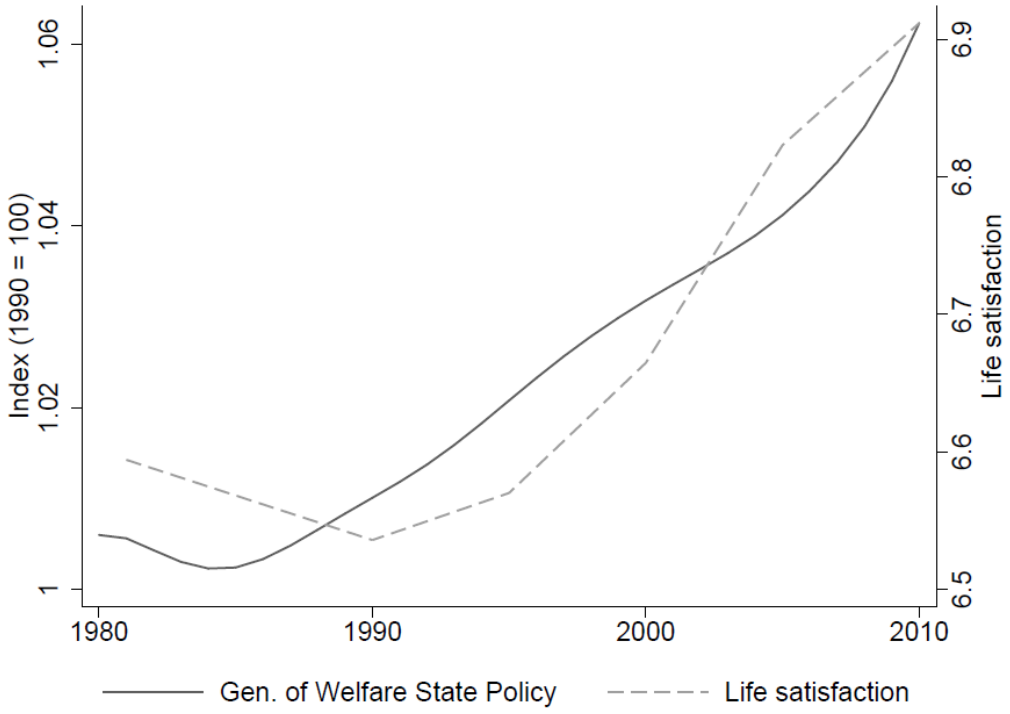


Note: Lowess smoothed curves. The two lines in the chart refer to measures of Gini issued from two different sources of data: the Standardized World Income Inequality Database, and the World Income Inequality Database. Together, the two series of data provide consistent evidence that income inequality in Japan increased since 1980.
Source: Solt (2016) and UNU-WIDER (2018).

To face these challenges the government introduced a state-sponsored social support system to share social risk equitably by the society (Horioka and Kanda, 2010). A number of policies targeting elderly people, as well as work-family policies were introduced in the mid-1990s with the aim of improving the living and health conditions of elderly people, alleviating the costs of having children, and facilitating women access to the job-market. Figure 5 shows the trend of welfare state generosity in Japan (Scruggs et al., 2017).

In the years following the policy reforms that introduced a state-sponsored social safety net in Japan, people's satisfaction with life increased, and in particular the satisfaction of people in the targeted groups. By 2010, aging was associated less negatively to life satisfaction than in 1990, i.e. before the introduction of the reforms; average health improved; trust in others and social participation of elderly people nearly doubled; single people reported higher life satisfaction than previously. All this happened while the economy grew, although at a lower pace compared to the previous period.

Figure 5: Average life satisfaction and Generosity of Welfare State (Japan 1981-2010).



Note: Lowess smoothed curves.
Source: Sarracino et al. (2019).

2.1 Our contribution

Available studies indicate that: i. social capital, social safety nets, and income inequality affect the relationship between economic growth and well-being over time; ii. policy-makers can adopt policies to promote well-being in the long run. Our aim is to assess whether the factors discussed above can help explain the flat trend of life satisfaction in Luxembourg. This test is important to evaluate the reliability of available knowledge about the conditions to promote well-being in the long run, and to identify possible areas of intervention for policy-makers. Additionally, in present work we extend the list of moderating conditions to include unemployment. It is well established that unemployment is one of the major causes of ill-being. Thus it is possible that the changes in unemployment contribute to explaining the trend of life satisfaction.

3 Method

We use an error correction model (ECM) to analyze the factors that contribute to life satisfaction in the long-run. The main reason is that ECMs allows us to estimate consistent long-run relations between the explanatory variables and dependent variable. Additional reasons are more technical. First, explanatory variables in levels (e.g., GDP pc) often exhibit unit root properties, which could lead to the estimation of spurious relations (Engle and Granger, 1987). First-differencing the variables can be used to address such spurious relations, but first-differencing limits the interpretation of the results to short-run changes. ECMs separately estimate the short- and long-run relations to avoid spurious relations (under certain conditions

discussed below). Also, the estimated long-run relations, referred to as long-run effects in the time-series literature, are consistent in the presence of short-run reverse causality (Chudik and Pesaran, 2015; Pesaran, 2015).

Before presenting the ECM, we begin with our assumed data generating process, represented by Equation 1. LS_{it} represents life satisfaction for country i at time t, the vector $X_{i,t}$ includes the explanatory variables, and fixed country characteristics are represented by μ_i.

$$LS_{it} = \rho_i \cdot LS_{i,t-1} + \beta'_{i0} \cdot X_{i,t} + \beta'_{i1} \cdot X_{i,t-1} + \mu_i + \varepsilon_{it} \quad (1)$$

The error correction form is the reparameterization of Equation 1 given by Equation 2.

$$\Delta LS_{it} = \Phi_i \cdot (LS_{i,t-1} - \theta'_i \cdot X_{i,t}) + \gamma'_i \cdot \Delta X_{i,t-1} + \mu_i + \varepsilon_{it} \quad (2)$$

where $\Phi_i = (\rho_i - 1)$; $\theta'_i = (\beta'_{i0} + \beta'_{i1}) / (1 - \rho_i)$ and $\gamma' = -\beta'_{i1}$

The short-run relations are captured by γ and the long-run effects by θ. With a large change in $\mathbf{X_{i,t}}$, the response in the $LS_{i,t}$ might overshoot the long-run equilibrium relationship. When this happens, the error correction term, Φ, serves to bring the relationship back to the long-run one.

For an error correction parameterization to be appropriate, (1) the error correction term should be statistically significant, negative, but greater than negative two, and (2) there must be a long-run cointegrating relationship between the level variables. Condition 2 is necessary for the term ($LS_{i,t-1}$ - $\theta'_i \cdot \mathbf{X_{i,t}}$) to be stationary, which is necessary for the error term to be stationary when Φ is statistically significant. Condition 1 is tested directly in the regression analysis. To check condition 2 we test the regression residuals for stationarity using panel unit root tests (Fisher type augmented Dickey Fuller tests). The results indicate that the residuals are indeed stationary and condition 2 is met.

We adjust Equation 2 to develop our final specification (presented below). Notice the coefficients are indexed by i in Equation 2, indicating that they are allowed to vary across countries. We allow the short-run relations to be heterogeneous in order to capture flexibly any reverse causality. However, in our final specification we assume the long-run effects (θ) are common across countries. Without this assumption, we could not simultaneously assess each of the factors discussed in Section 2 that may explain the trend of life satisfaction in Luxembourg. This specification is referred to as a pooled mean group model (PMG).

In our final specification, we address two further issues: cross-sectional dependence and lag order for serial correlation. Cross-sectional dependence occurs when there is omitted correlation across countries. A commonly correlated effect, such as the impact of European Union policies, can be a source of cross-sectional dependence. To address cross-sectional dependence we add to equation 2 cross-sectional means of both the dependent and independent variables (as suggested by Chudik and Pesaran (2015)). This approach is similar to adding year dummies, but has some advantages: adding year dummies greatly increases the number of controls, and cross-sectional means allow the commonly correlated effect to affect each country through multiple channels and to different degrees according to their different variable values. Cross-sectional means are also included among short-run variables in the PMG model, meaning their coefficients vary across countries. Concerning lags, we chose one lag in levels (as specified in

equation 1) because the full model did not converge when using additional lags. However, we ran regressions using one explanatory variable at a time including up to six lags (in levels). Generally the long-run effects maintain significance and direction and the magnitudes are larger when including additional lags, suggesting our estimates represent lower bounds. The exception is for social expenditures, which is insignificant (presented with the Results).

Our final specification is presented as Equation 3.

$$\Delta LS_{it} = \Phi_i \cdot (LS_{i,t-1} - \theta' \cdot X_{i,t}) + \gamma'_i \cdot \Delta X_{i,t-1} + \varphi_i \overline{LS}_t + \delta_i \bar{X}_t + \mu_i + \varepsilon_{it} \qquad (3)$$

4 Data

Individual life satisfaction data are from repeated cross-sectional Eurobarometer (EB) surveys (European Commission, 2018). Life satisfaction is measured on a scale from 1 to 4 using the responses to the question, "On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead?". This question was first asked in 1973 in seven countries and continues today for more than the present 28 EU countries. In each year, multiple surveys are conducted that ask about life satisfaction. Annual observations of life satisfaction were constructed in each country as the weighted proportion of native-born individuals reporting the top response category, "very satisfied". Foreign-born individuals were necessarily excluded, because prior to 1994, the Eurobarometer target population only included native-born individuals, and in 1994, the target population expanded but still excluded individuals born in non-EU countries (Schmitt et al., 2009, p. 56).

The explanatory variables include the natural log of real Gross National Income per capita (GNI), unemployment rate, the Gini coefficient of income, social expenditures, and trust in others. GNI and unemployment data (national estimate) are from the World Development Indicators (WDI) (World Bank, 2018). We use the Gini coefficient of inequality in equivalent household disposable (post-tax, post-transfer) income from the Standardized World Income Inequality Database (Solt, 2016).[6]

Data for social expenditures per capita are available every five years from 1980-2015 and 2016 from the OECD Social Expenditures Database (OECD, 2019). The variable includes all public social expenditures on active labour market programmes, family, health, housing, incapacity related, old age, other social policy areas, survivors, and unemployment. We adjusted the variable to more closely represent the generosity of the welfare state policy. Conceptually subjective well-being relates to the generosity of policies not to expenditures; that is because social expenditures increase mechanically when people retire or when unemployment increases. Indeed O'Connor (2017) finds, social expenditures relate to subjective well-being, but the relation becomes statistically insignificant when excluding a control for the old age dependency ratio. In the present analysis, we could also include the old age dependency ratio, but given the small number of degrees of freedom, we chose instead to partial out the old age dependency ratio and also the unemployment rate. Specifically, we used

[6] The SWIID provides the longest, most complete, and comparable 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 ease cross-sectional comparability and to impute missing data. For these reasons some scholars have expressed criticism towards the SWIID (Jenkins, 2015). However, we find that in our case, figures from SWIID positively and significantly correlate with data from WIID and the World Inequality Database (WID) in the years and countries when the three data sources are jointly available.

the residuals from a regression of social expenditures on the old age dependency ratio and unemployment rate. We then use linear interpolation to facilitate annual analysis.

Trust in others is based on responses to the question, "Generally speaking, would you say that most people can be trusted, or that you could not be too careful in dealing with people?" Individual responses are obtained from Eurobarometer surveys in the years 1986, 2004, 2009, 2010, and 2014. These responses are then aggregated at the country level for each year as the portion of people feeling most people can be trusted. However, comparison over time is limited by differences in the response scales. The largest change occurred beginning in 2009, when the scale went from two discrete choices to a scale ranging from 1 to 10. In order to produce annual estimates and account for the change in scale, we impute trust in the following steps:

1. The weighted percentage of people stating most people can be trusted is calculated by country year. For the years 2009, 2010, and 2014 responses 7-10 are recorded as most people can be trusted;
2. These scores are de-meaned by subtracting the average level of trust within a country over the years 1986 and 2004 (the years based on the previous response scale);
3. The de-meaned trust values are then linearly interpolated and extrapolated over the sample period with an exception – trust is not extrapolated to the years before 2004 if it is unobserved in 1986;
4. Additional data from the World Values Survey (WVS, 2014) and European Values Study (EVS, 2011) is used to provide additional information on trust. The two surveys provide dichotomous answers to a question asking respondents whether people can be trusted. As in step 1, the answers are de-meaned (within country) and extrapolated;
5. To remove the effect of the change in scale that occurred from 2004 to 2009, EB trust from step 3 is regressed on EVS/WVS trust from step 4, a dummy variable demarking the period post-2004, a quadratic trend, and interactions between EVS/WVS trust and both the dummy and trend. Trust is predicted after excluding the impact from the interaction between post-2004 and EVS/WVS trust; and
6. Last, the country means from step 2 were added back to obtain our final prediction of trust.

Our sample of countries includes the first fifteen European Union member states (EU15) because only these countries have suitably long enough series to be included. The period of analysis includes the years 1991 – 2016. Our sample for regression analysis begins in 1991 to ensure there were at least ten countries observed in each year. Prior to 1991 data for fewer countries were available when including lags. It is important to use as many countries as possible because the analysis includes cross-sectional means in each period. We would prefer to begin the sample with more than ten countries, but data for all 15 countries are not available until 1995, and with lags, that would significantly reduce the time dimension. Table 1 presents the sample characteristics and average variable values for each country.

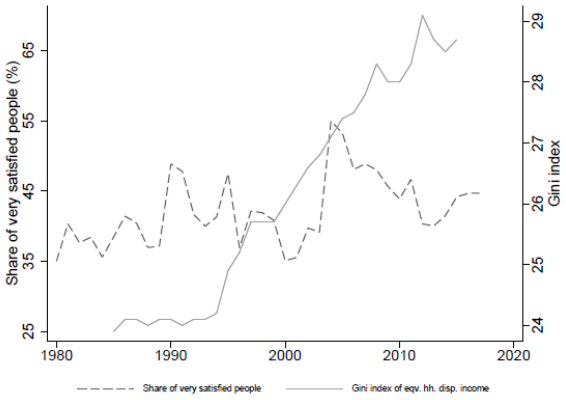
Table 1: Descriptive statistics

Country	First year	Last year	Life satisfaction (% very happy)	Gross National Income ln(US$ per capita)	Gini index (0 - 100)	Unemployment rate (%)	Trust (% can be trusted)	Adj. Social Expenditures ln(US$ per capita)
Austria	2001	2016	23.95	10.74	27.58	5.10	47.78	0.42
Belgium	1991	2016	27.35	10.62	25.75	7.99	35.10	0.16
Denmark	1991	2016	65.82	10.92	23.85	6.16	78.45	0.51
Finland	2001	2016	33.11	10.73	25.37	8.63	70.02	0.27
France	1991	2015	15.90	10.57	28.69	9.83	29.14	0.15
Germany	1991	2015	17.85	10.57	27.38	7.86	45.06	0.13
Greece	1991	2016	8.29	10.07	33.58	12.98	37.04	-0.67
Ireland	1991	2016	36.02	10.51	31.13	9.48	37.67	-0.22
Italy	1991	2015	11.41	10.45	32.99	9.83	30.93	-0.07
Luxembourg	1991	2015	43.39	11.25	26.67	3.80	35.68	0.89
Netherlands	1991	2016	47.47	10.73	26.14	4.96	64.32	0.17
Portugal	1992	2015	4.01	9.93	34.03	8.03	31.60	-0.73
Spain	1992	2016	18.17	10.24	32.93	17.38	35.53	-0.44
Sweden	2001	2016	46.83	10.86	25.20	6.77	71.07	0.40
United Kingdom	1991	2016	35.30	10.49	33.83	6.74	44.17	-0.24
Sample average			28.76	10.57	29.22	8.48	45.06	0.02

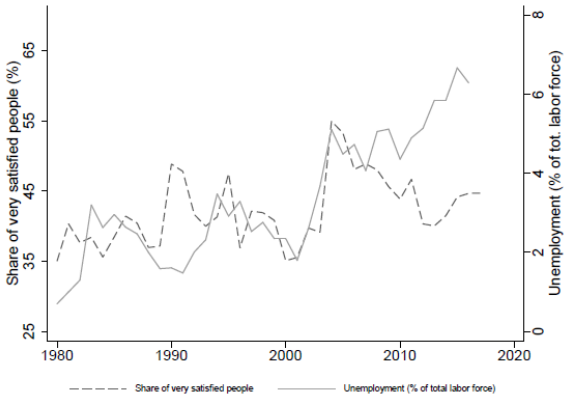
5 Results

Simple descriptive statistics suggest that income inequality, unemployment, social trust and social expenditures increased in Luxembourg since the early 1980s. Panel 6a in Figure 6 shows that income inequality increased by about 5 points, from 23.9 to 28.7, between 1985 and 2015. Similarly, Panel 6b indicates that unemployment as a percent of total labor force was 0.7% in 1980 and 6.7% in 2015, a nearly 9 fold increase in 35 years. According to previous literature, we should expect that such increases hindered life satisfaction, probably overcoming the positive contribution of economic growth expected from traditional economic theory.

Figure 6: Increasing income inequality (Panel A) and unemployment (Panel B) in Luxembourg.



(a) Gini index of equivalent household disposable income.

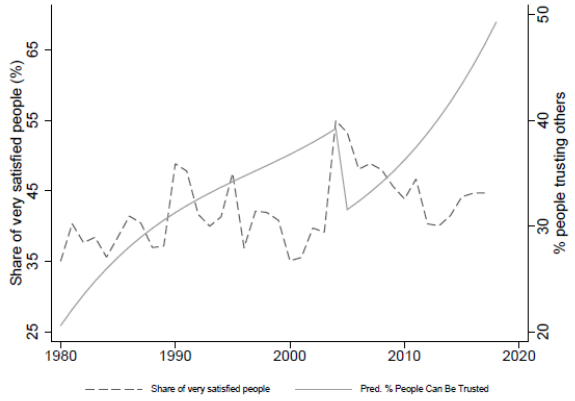


(b) Unemployment as a percentage of total labor Force.

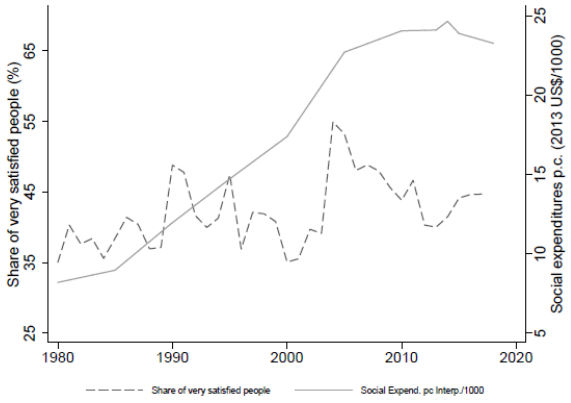
Source: authors' own elaboration.

The increases in social trust and social expenditures, on the other hand, are expected to have positively contributed to life satisfaction. Since 1980 the share of people who feel that others can be trusted nearly doubled (see Panel 7a in Figure 7), whereas social expenditures rose from 8,190 US$ per capita (base year 2013) in 1980 to 23,880 in 2015, i.e. a nearly 3 fold increase (Panel 7b). It is possible that the effects on life satisfaction of increasing income inequality and unemployment, on one side, and increasing social trust and expenditures, on the other, off-set each other. To test this hypothesis formally, we turn to the results of the error correction model.

Figure 7: Increasing social trust (Panel A) and social expenditures (Panel B) in Luxembourg.



(a) Share of people declaring that others can be trusted..



(b) Social expenditures per capita.

Source: authors' own elaboration.

Table 2 presents the results of the error correction model. The first five rows present the long-run relations corresponding to the θ in equation 4; ECT corresponds to the Φ; the middle rows present the short-run-change relations corresponding to the γs, and the final rows the cross-sectional means of life satisfaction and the independent variables in levels. The first five columns use one explanatory variable at a time, column 6 reports the results from the model including each explanatory variable, and 7, standardized coefficients of the long-run effects from the full model.

Table 2: Results from the ECM model applied to the panel of 15 Western European countries (1991 - 2016).

	Δ Life Satisfaction						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Long Run Effects							Standardized
GNI	38.274***					10.648*	0.259*
	(3.990)					(6.004)	(6.004)
Gini		0.526**				0.734***	0.190***
		(0.249)				(0.231)	(0.231)
Unemployment rate			-0.437***			-0.572***	-0.181***
			(0.058)			(0.134)	(0.134)
Trust in others				0.175**		0.494***	0.570***
				(0.082)		(0.046)	(0.046)
Social expenditures					19.689***	0.695	0.023
					(3.449)	(3.101)	(3.101)
Coefficients							
ECT	-0.745***	-0.741***	-0.693***	-0.610***	-0.770***	-1.036***	
	(0.049)	(0.062)	(0.061)	(0.075)	(0.043)	(0.090)	
Δ GNI	-6.238					8.324	
	(9.132)					(12.123)	
Δ Gini		-0.424				0.441	
		(0.538)				(1.183)	
Δ Unemployment rate			0.085			0.202	
			(0.212)			(0.309)	
Δ Trust in others				0.162***		-0.170	
				(0.060)		(0.171)	
Δ Social expenditures					5.943	-15.673	
					(16.668)	(28.448)	
Mean Life Satisfaction	0.955***	0.869***	0.860***	0.868***	0.926***	0.984***	
	(0.139)	(0.140)	(0.137)	(0.149)	(0.123)	(0.169)	
Mean GNI	-30.443***					-27.442*	
	(5.410)					(16.434)	
Mean Gini		-0.475				-2.541***	
		(0.923)				(0.877)	
Mean Unemployment rate			0.352***			0.319	
			(0.131)			(0.291)	
Mean Trust in others				-0.118		-0.399*	
				(0.124)		(0.232)	
Mean Social expenditures					-15.231***	15.418	
					(4.621)	(11.047)	
Constant	14.287	-2.074	-5.714**	-5.191	-5.112	222.303	
	(63.727)	(25.398)	(2.846)	(6.063)	(3.342)	(173.954)	
N	353	353	353	353	353	353	

Note: Long-run effects correspond to θ in equation 4 and ECT corresponds with the mean of estimated Φ_i (over all sample countries). Other coefficients represent the means of estimated of γ_i, φ_i, and δ_i in equation 4. GNI is per capita and transformed in natural logarithms. Social expenditures are per capita, adjusted and transformed in natural logarithms. Trust is partially imputed. For more details, please refer to Section 4. Standard errors in parentheses. * p < 0.10, ** p < 0.05, *** P< 0.01

The long-run effects generally correspond with our expectations, with the exception of the Gini coefficient, which is statistically significant and positive. Permanent increases in GNI pc, income inequality, social trust, and adjusted social expenditures are positively related to life satisfaction in the long run, and unemployment, negatively.[7] The long-run effects are generally consistent between the reduced models (cols. 1-5) and the full model (col. 6). The magnitudes

[7] We use the word permanent to distinguish the changes in levels that trigger the long-run effects from annual deviations associated with short-run differences in life satisfaction.

and significance of GNI pc and social expenditures are reduced. Indeed social expenditures are no longer statistically significant. This finding is surprising in light of the positive relations found in cross-sectional evidence; however, insignificance could be due to multicollinearity and low statistical power (recall adjusted social expenditures are positive and significant in column 5). The magnitudes of the other variables (Gini, unemployment rate, and trust) increase in size. Across variables, trust has the largest standardized coefficient. The coefficient of trust in others is more than two times bigger than the one of GNI and nearly three times larger than the one of inequality or unemployment (in absolute terms). This indicates that trust in others is the strongest correlate of the changes of life satisfaction in the long run among the considered variables. The magnitude, however, is small: a one standard deviation difference in trust is related to 0.6 percentage point greater life satisfaction. The standard deviation of life satisfaction over the full sample is 17.5 percentage points.

It is surprising that the Gini coefficient is positively related to life satisfaction, however, as mentioned in the literature section, positive relations have been obtained in cross-sectional studies. The Hirschman tunnel effect could explain the relation – increasing income of a few, leading to greater inequality, may signal that the incomes of everyone are increasing, thereby raising subjective well-being. Future research should focus further on inequality and revaluate it in a time-series context.

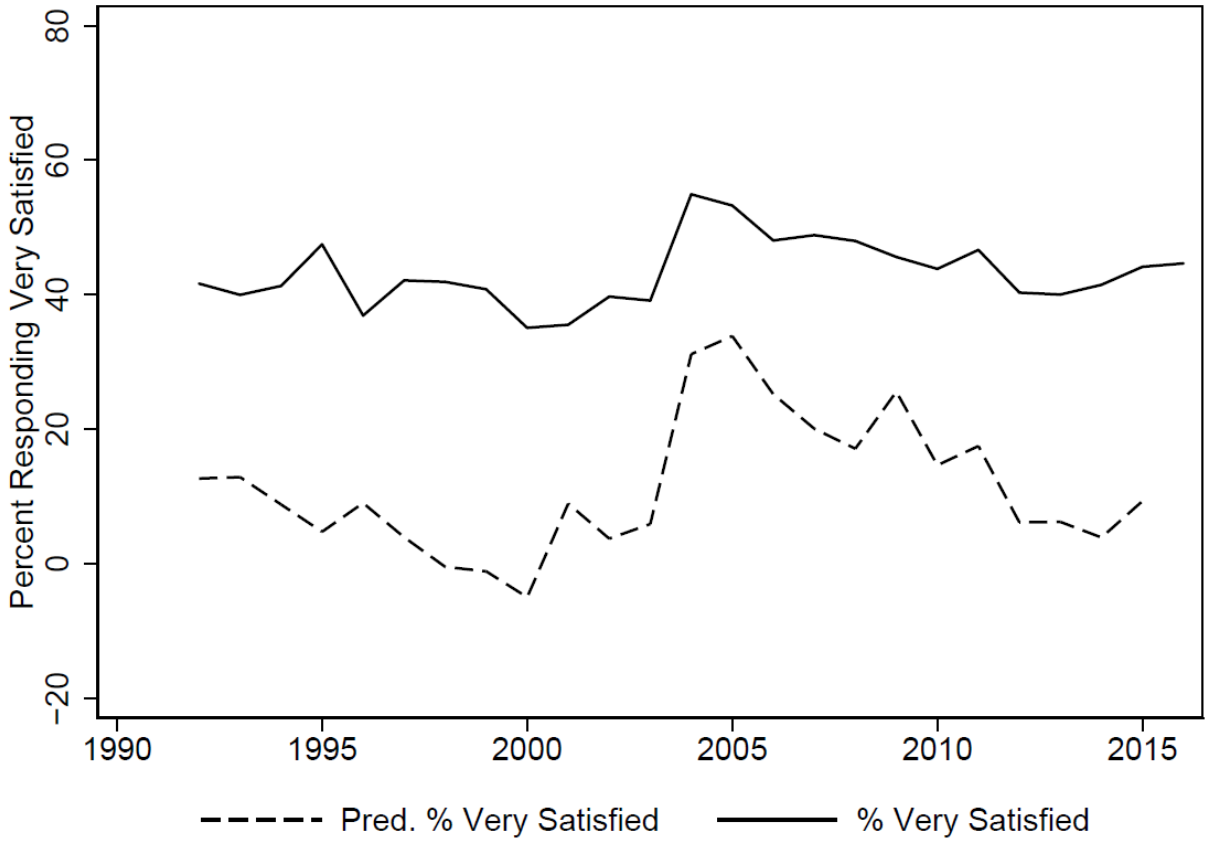
Part of the overall trend in life satisfaction is captured by the cross-sectional means. As controls their coefficients should not be interpreted as if they provide economic meaning, especially because the means are calculated on a small number of countries. Additionally, the coefficients on means do not apply in a ceteris paribus manner. For clarity, we provide an example calculation using GNI. To calculate the relation of long-run GNI growth in all countries, the long-run effect of GNI should be added to the long-run relation for Mean GNI. The latter needs to be calculated, because although the table displays the long-run effects of GNI (in an individual country), the raw coefficients are displayed for the cross-sectional means. The long-run relation for Mean GNI is calculated as the negative of the coefficient divided by the ECT, i.e., for column 6: $-\delta/\Phi = -1 * -27.44/(-1.04) = -26.49$. Thus, based on the estimates in column 6, GNI growth in all countries is associated with a decrease in life satisfaction, i.e., $10.65 - 26.49 = -15.84$. As an example, three percent growth is associated with a decrease in life satisfaction of 0.48 percentage points per year ($-0.48 = 0.03 * -15.84$). This suggests that GNI positively affects life satisfaction in a particular country only if it grows at a greater rate than in the other countries: to break even, the GNI change in a country needs to be $26.49/10.65 = 2.49$ times the average change across countries. For mean life satisfaction, the long-run relation is $-1 * 0.98/-1.04 = 0.95$, but like the other cross-sectional means, economic meaning should not be applied to the coefficient. If life satisfaction increases in one country, then life satisfaction will increase in the other countries by nearly one fifteenth of that increase (from column 6, 1/15 * 0.95).

Short-run variation in various factors has theoretically distinct impacts on life satisfaction compared to permanent increases, especially for income as illustrated in Bartolini and Sarracino (2014). For instance, we would expect short run changes in unemployment to be significantly (and negatively) correlated to the changes of life satisfaction. However, the present study cannot comment on the short-run relations. The short-run variation is not independent and the relations are generally statistically insignificant.

Perhaps the most intuitive way to illustrate our results is to use the model's prediction of life satisfaction, which includes the impacts of each variable and their interdependencies. Figure

8 presents the prediction and observed share of very satisfied people in Luxembourg, based on the estimates presented in table 1, column 6. From this figure, it is clear the model has high predictive power. Indeed, predicted and observed life satisfaction are strongly correlated at 84% (significant at 1%). The model does not get the level of life satisfaction right, but the short-run changes and long-run trend match well. The difference in level is due to a strong error correction term being applied to a relatively high level of life satisfaction (Luxembourg averages 43.4 compared to 28.8 in all countries), which brings the predicted level of life satisfaction in Luxembourg toward the average. Although we included country fixed effects in the model, they are treated as short-run deviations that are counterbalanced by the error correction term. The results indicate that the flat trend of life satisfaction in Luxembourg is due, at least in part, to offsetting influces of increases in: GNI per capita, income inequaltiy, unemployment, social trust, and social expenditures.

Figure 8: Predicted life satisfaction Vs. observed data.



Source: authors' own elaboration.

6 Conclusions

Previous literature suggests that the relationship between well-being and economic growth depends on a set of conditions: if economic growth is accompanied by extensive social safety nets, high social capital, and low income inequality, than it is likely to be associated with

increasing well-being. In this article we test this view. In particular, we check whether the flat trend of life satisfaction in Luxembourg, despite a growing economy, can be explained by the conditions identified in previous literature.

Between 1980 and 2008 – the year of the economic crisis – the Gross National Income per capita in Luxembourg grew by 6.35% yearly, while the share of very satisfied people remained constant at about 35%. If the evidence from previous studies is correct, we should expect that the conditions mentioned above have a zero net effect on life satisfaction. Unfortunately, the lack of long time-series of micro data prevents a micro-economic analysis in Luxembourg. We thus adopt a macro-economic perspective, and we apply an error correction model to a panel of 15 Western European countries to predict life satisfaction in Luxembourg on the basis of a known set of explanatory factors. These are: income inequality, unemployment, social expenditures, and trust in others – a commonly used proxy of social capital.

We find the factors explain the flat trend of life satisfaction in Luxembourg reasonably well and broadly consistently with expectations. Increases in unemployment partially offset the positive influences of increasing social trust and economic growth. On the contrary, increases in income inequality apparently positively affected life satisfaction, and social expenditures, did not have the statistically robust impact on well-being that we expected. Across factors, the single most impactful is trust in others. Standardized coefficients indicate that the long-run effect of trust is nearly twice the effect of economic growth. We also found that the cross-sectional mean of GNI per capita attracts a significant and negative coefficient. However, this relation should not be interpreted with much economic meaning. Cross-sectional means are included in the regressions solely to control bias due to cross-country correlations, such as from the impact of European Union policies. If one were to interpret the relation for the cross-sectional mean of GNI, it would imply that mean GNI offsets the positive effects of idiosyncratic GNI – indeed when each country grows at a similar pace, the total effect on well-being would be negative. This finding is reminiscent of a "social comparisons" effect, but this time across countries. As far as we know, this is the first time that such evidence has been documented in a panel of countries. As more data become available, this relation should be assessed further.

Our findings should be viewed with caution. They are based on the best available data, but several assumptions were necessary to develop the long time series. In particular, social trust is adjusted to improve comparability over time and social expenditures is adjusted to obtain a better proxy for social safety nets. Moreover, the sample size limits the degrees of freedom and our ability to include additional control variables and time lags. Our results reflect a preliminary assessment that could change with new data or methods. Indeed, the availability of a new wave of data from the European Value Study will soon allow us to perform a micro analysis covering the period 1999-2019, and therefore to gain a more refined knowledge about what happened to life satisfaction in Luxembourg.

Nonetheless, we believe our results are encouraging. They support the view that the quality of growth matters for well-being. The quest to determine the conditions that characterize this "quality" is still in its infancy, but we have a promising starting point. Further assessment is necessary, but it is plausible that jointly considering economic growth, social safety nets, social capital, unemployment, and income inequality is the best route to promote a lasting well-being.

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