Linking Subjective Wellbeing and Pro-Environmental Behaviour: A Multidimensional Approach

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Abstract

In recent years, policy-makers have taken steps towards acknowledging the importance of mental states when appraising citizens' wellbeing on the one side and the urgent challenge of shifting towards a more ecological society on the other. Previous work has established an encouraging positive link between these two seemingly unrelated notions, subjective wellbeing and pro-environmental behaviour. This chapter offers an overview of the progress made to date and underlines that both subjective wellbeing and pro-environmental behaviour can be structured according to different dimensions that interact in various ways. In this chapter, we empirically investigate some dimensions of both subjective wellbeing and pro-environmental behaviour that have been overlooked so far. To do so, we use newly available data collected by the French National Statistical Institute and study seven dimensions of subjective wellbeing as well as attributions of political responsibility and prioritisation about green policies. In doing so, we move beyond the often unidimensional paradigm which associates subjective wellbeing with life satisfaction and pro-environmental behaviour with consumption. Our multidimensional approach offers new insights into which dimension of subjective wellbeing is most predictive of which pro-environmental behaviour and how happy and unhappy citizens have different attitudes about environmental policies.

Keywords: subjective wellbeing; pro-environmental behaviour; survey; affect; eudaimonia; policy preferences.

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Introduction

Anthropogenic global warming – global warming caused by humans – is one, if not the, main challenge facing humankind today. In 2019, the Intergovernmental Panel on Climate Change (IPCC) estimated that global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate, yielding significantly higher climate-related risks for natural systems (such as biodiversity loss and extinction) as well as human systems (including risks to health, livelihoods, food security, water supply, peace and security, and economic growth) (Masson-Delmotte et al., 2019). These risks are unevenly distributed, yielding strong heterogeneity in who is impacted, how, when, and where. The long-term impacts of global warming, however, are likely to stay for everyone, continuing to cause long-term damages to the climate system.

To avoid overshooting 1.5°C of global warming and its irreversible consequences to nature and humans, it is estimated that anthropogenic CO2 emissions must decline by about 45% from 2010 levels by 2030, reaching net zero at around 2050. This will require – besides technical innovation and adaptation – large-scale transformations in the ways we produce, consume, and live our daily lives. When it comes to individual and household behaviour, for example, it is estimated that changing 17 behaviours in five distinct categories can lower national US carbon emissions by about 7% (Dietz et al., 2009). Although not all pro-environmental behaviours are directly related to reductions in global warming, such behaviours almost always entail positive externalities and thereby indirectly contribute to reducing greenhouse gas emissions, thus benefiting current and future generations. There is a large consensus about the necessity of shifting towards more pro-environmental behaviours. At the same time, large-scale transformations in production and consumption require a renewed focus of policy.

Over the last two decades, the notion of subjective wellbeing as a focus (or even the ultimate goal) of policy has gained traction, at the level of national governments such as France, New Zealand, or the UK but also in international organisations such as the UN or the OECD (see Stiglitz et al. 2009, as well as O'Donnell et al. 2020, Frijters et al. 2020 and Neve et al. 2020 for recent contributions). Can a focus on subjective wellbeing in policy-making contribute to our climate change targets, and to pro-environmental behaviour in particular?

There is reason to believe that the answer is "yes": a focus on subjective wellbeing in policy-making is likely to prioritise policies targeted at (mental) health,

social relationships, and quality employment over private, tangible consumption.[1] Arguably, if subjective wellbeing promotes pro-environmental behaviour, it may be a win-win from a policy perspective, and hence a good argument to focus on subjective wellbeing in policy-making. Yet, even when moving from the macro-level of policy-making to the micro-level of individuals, there is reason to believe that subjective wellbeing may be conducive to pro-environmental behaviour. For example, there is experimental evidence that inducing positive mood and incidental happiness makes people more patient and future-oriented (Ifcher and Zarghamee, 2011; Pyone and Isen, 2018), more time consistent (Lerner et al., 2012), less negative reciprocal (Andrade and Ariely, 2009; Drouvelis and Grosskopf, 2016) and hence more pro-social, including, potentially, towards future generations.

Although previous empirical evidence has established an encouraging link between subjective wellbeing and pro-environmental behaviour, the literature has focused mostly on a specific measure of subjective wellbeing (mostly life satisfaction) and a specific channel of pro-environmental behaviour (mostly consumption). Nevertheless, both subjective wellbeing and pro-environmental behaviour are multidimensional notions, the dimensions of which potentially interact in different ways. Subjective wellbeing includes overall cognitive evaluations of the present (life satisfaction), past (recalled life satisfaction), and future (expected life satisfaction) as well as relative cognitive evaluations (life satisfaction relative to others); affect; and eudaimonia. Pro-environmental behaviour includes not only responsible consumption habits but also political attitudes toward green policies. These distinctions can be crucial to tailor effective policies aimed at raising both subjective wellbeing and pro-environmental behaviour.

To provide a useful road map, this chapter starts with a selective review of the theoretical and empirical evidence on the link between subjective wellbeing and pro-environmental behaviour, an important element of sustainability and an essential component in the transition to net zero. To make progress, we move on to an empirical analysis and study the relationship between different dimensions

[1] It should be noted that, in this line of argument, we adopt the perspective of policy targeted at an average person living in a developed country. There can be substantial returns to subjective wellbeing from private, tangible consumption in less developed countries, or for population groups at the lower end of the income distribution in developed countries, for whom basic needs are not or just met. The relationship between subjective wellbeing and private consumption, or economic growth more generally, is hence context-dependent. Importantly, a focus on subjective wellbeing in policy-making does not run counter to the notion of economic growth; it merely reprioritises policy priorities depending on development levels. For a complete treatise of subjective wellbeing in policy-making, see Frijters and Krekel (2021).

of subjective wellbeing and pro-environmental behaviour systematically. On the one hand, we abandon the equation *subjective wellbeing = life satisfaction*, and look at the effects of seven different dimensions of subjective wellbeing on several types of pro-environmental behaviour. On the other hand, we move beyond consumption as the only channel of pro-environmental behaviour, and study the relationship between subjective wellbeing and heterogeneous preferences in transportation policies. To this end, we analyse recently collected data by the French National Statistical Institute and the CEPREMAP Well-Being Observatory. We match several overlapping sub-samples of a longitudinal cross-section survey and examine a representative sample of the French population from 2016 to 2019. Crucially, this newly available data set offers the possibility to study policy-relevant yet unexplored dimensions of both subjective wellbeing and pro-environmental behaviour.

We contribute to the existing literature in several ways. First, we unpack which subjective wellbeing dimension is most predictive of which pro-environmental behaviour. On top of the subjective wellbeing dimensions recently studied by Laffan (2020), we explore the predictive capacity of self-assessed life satisfaction relative to others (to capture social comparison effects), relative to oneself in the past (to capture memory effects), and relative to oneself in the future (to capture optimism). Second, we shift our focus from the behaviour of (un)happy consumers to that of (un)happy voters. To this end, we study, besides pro-environmental behaviour, attitudes towards policies related to environmental sustainability, including attributions of responsibility (who should act?) and prioritisation (what should be done?).

Literature review

Most literature has considered how environmental quality (e.g. air pollution) affects subjective wellbeing, most often measured in terms of life satisfaction (van Praag and Baarsma, 2005; Rehdanz and Maddison, 2008; Ambrey and Fleming, 2011; Levinson, 2012; Ferreira et al., 2013; Kopmann and Rehdanz, 2013; Ambrey et al., 2014; Bertram and Rehdanz, 2015; Krekel et al., 2016; Krekel and Zerrahn, 2017; von Möllendorff and Welsch, 2017; Krekel et al., 2021; Bertram et al., 2021). Below, we review a nascent stream of literature, which has looked at the relationship between *pro-environmental behaviour* (including attitudes, but mostly limited to consumption) and subjective wellbeing (including evaluative and affective measures, but rarely analysed jointly).

Pro-environmental behaviour and evaluative wellbeing

Most studies in this vein of research asked whether behaving in a more or less pro-environmental manner has negative or positive welfare consequences; if consequences were positive, this would imply a win-win for the environment and individuals engaging in pro-environmental behaviour.

Several studies documented the positive relationship between pro-environmental behaviour and subjective wellbeing, measured as life satisfaction or eudaimonia. In a 2018 study, for example, Schmitt and co-authors studied the relationship between different pro-environmental behaviours and life satisfaction in Canadian and US samples. Their results show that all but two out of 39 behaviours are predictive of life satisfaction, whereby life satisfaction seems more strongly predicted by behaviours that involve social interaction, are directly observable, and, in particular, involve more direct costs in terms of time, money, and effort. Welsch and Kühling (2018) found a positive relationship between green self-image and life satisfaction across 35 European countries, which seems to be stronger in societies with greater unanimity in pro-environmental attitudes (see also Binder and Blankenberg, 2017). Their results pointed towards the importance of conforming to social norms as a potential mechanism. Other potential mediators of this relationship can be the level of nature-relatedness (Nisbet et al., 2011) and nature connectedness (Martin et al., 2020), the exposure to nature (Whitburn et al., 2018), and the different individual's notion of the "good life" (Binder et al., 2020).

Pro-environmental behaviour and consumer's wellbeing

The fact that pro-environmental behaviour may pose a win-win for the environment and welfare is somewhat of a paradox, at least from the point of view of standard consumer theory. When reducing the consumption of some goods (e.g. energy), by paying more for some other goods (e.g. green products), and by paying attention to some hidden characteristics of the goods (e.g. their origin), the consumer faces "direct costs" in terms of time, money, and effort (Schmitt et al., 2018). Pro-environmental behaviour should thus, in theory, be welfare-reducing, at least for the individual engaging in it.

This paradox seems, at least partly, explicable by differential effects of different dimensions of subjective wellbeing (that is, whether one looks at affect as opposed to eudaimonia) and differential characteristics and types of pro-environmental behaviour (that is, whether one looks at consumption, comfort aspects, or the uncertainty about the ultimate usefulness of a particular behaviour). Venhoeven et

al. (2013) suggested that the association between pro-environmental behaviour and the *eudemonic* dimension of subjective wellbeing is stronger than that with affect, which was also confirmed in a recent meta-analysis by Pritchard et al. (2020). The welfare consequences of pro-environmental behaviour for individuals may thus depend on exactly which dimension of subjective wellbeing one looks at and exactly which characteristic of pro-environmental behaviour is salient (that is, what kind of self-image one has, whether one thinks one can actually make a difference, or whether one feels that one conforms to a social norm, besides disutility aspects such as time, money, and effort).

There is indeed growing evidence for the importance of such behavioural factors in the relationship between pro-environmental behaviour and subjective wellbeing. These range from ego aspects such as green self-image (Welsch et al., 2021) to warm glow effects (Andreoni, 1990; Taufik et al., 2015; Welsch et al., 2021), from the misprediction of welfare consequences of spending time in nature (Nisbet and Zelenski, 2011) or consuming pro-environmentally (Welsch and Kühling, 2010) to reference point effects in consumption, either with oneself in the past or with others (Welsch and Kühling, 2011). While consuming pro-environmentally generally seems to be more related to experiential measures of subjective wellbeing (such as happiness), ego aspects seem to be more related to evaluative measures (such as life satisfaction) (Welsch et al., 2021).

Pro-environmental behaviour and affective wellbeing

The studies mentioned so far have all considered how pro-environmental behaviour predicts subjective wellbeing, holding other factors constant. On the contrary, only a handful of studies have assessed this relationship in reverse, namely how subjective wellbeing predicts pro-environmental behaviour, holding other factors constant. These studies have mostly looked at the predictive power of emotions and mood, rather than of evaluative measures.

Ex-ante, the direct effect of happiness on pro-environmental choices is not clear and probably context-dependent. On the one hand, in experimental settings, inducing positive mood and incidental happiness has been shown to make people more future-oriented (Ifcher and Zarghamee, 2011; Pyone and Isen, 2018), to increase time-consistency in their choices (Lerner et al., 2012) and to reduce negative reciprocity (Riepl et al., 2016), in particular relative to other emotions (Andrade and Ariely, 2009; Drouvelis and Grosskopf, 2016). Positive mood and incidental happiness may thus render people more pro-social, including, potentially, towards future generations. However, on the other hand, happiness as

a specific emotion can also lead to less deliberate cognitive processing, especially in contexts characterised by certainty (Tiedens and Linton, 2001).

Rees et al. (2015) used a lab experiment to show that, when confronted with human-caused as opposed to seemingly natural environmental damages, students report a more guilty conscience and are more likely to sign a pro-environmental petition. Indeed, Bamberg and Möser (2007) found that guilt is positively associated with perceived behavioural control, attitude, and moral norms. Bissing-Olson et al. (2016) measured guilt and pride in an experience-sampling experiment several times during the day over several days, showing that engagement in pro-environmental behaviour is positively associated with pride, negatively with guilt, and that pride predicts subsequent pro-environmental behaviour for people who hold more positive, pro-environmentally prescriptive norms. Schneider et al. (2017) found that anticipated pride as opposed to anticipated guilt from environmental action leads to more action, while Onwezen et al. (2013) found similar effects for both anticipated pride and guilt, suggesting that the effects of emotions on pro-environmental behaviours may depend, besides the specific emotion and pro-environmental behaviour, on treatment and context. Thereby, incidental emotions (that is, emotions unrelated to the decision problem at hand) may matter less than integral emotions (Ibanez et al., 2017), or in some cases even not at all (Lange and Dewitte, 2020).

Pro-environmental behaviour and relative wellbeing

Few studies looked at how *relative* satisfaction – i.e. relative to other people and other epochs – predicts different types of pro-environmental behaviour. Kaida and Kaida (2016) used a mail survey in Stockholm, Sweden, to show that expected future life satisfaction is negatively associated with current pro-environmental behaviour, potentially because more optimistic people may be less motivated to engage in behaviour change. In a previous study in Tsukuba, Japan, Kaida and Kaida (2015) showed the opposite effect for pessimism. Prati et al. (2017) found, using structural equation modelling and a student sample, that social wellbeing (measured in terms of a 33-item summed scale) at baseline predicts subsequent pro-environmental behaviour (measured in terms of energy conservation). To the best of our knowledge, no study has explored the role of perceived changes in well-being, intended as the difference between current and recalled wellbeing.

Pro-environmental behaviour and multidimensional wellbeing

The studies most closely related to ours are Wang and Kang (2018) and Laffan (2020). Wang and Kang (2018) regressed an index of pro-environmental behaviour

on life satisfaction, using the China General Social Survey and estimating OLS as well as IV 2SLS models that exploit unexpected length of sunshine as an instrument. The authors found that life satisfaction has a positive effect on pro-environmental behaviour. Laffan (2020) used the 2014-2015 wave of Natural England's Monitor of Engagement with the Natural Environment data set and five types of pro-environmental behaviour (recycling, buying eco-friendly products, encouraging others to protect the environment, being a member of an environmental or conservation organisation, and volunteering to help care for the environment), which were collapsed into indicators of general and common *versus* uncommon pro-environmental behaviours using multiple correspondence analysis. Four different dimensions of subjective wellbeing (life satisfaction, happiness, anxiety, and feelings of worthwhileness of things in life from the UK Office for National Statistics, the so-called ONS-4, cf. Dolan and Metcalfe, 2012) were then regressed on these indicators alongside controls. The author found that, while both life satisfaction and worthwhileness are positively associated with common *versus* uncommon pro-environmental behaviours in a similar manner (anxiety is strongly negatively associated), worthwhileness is a better predictor of engagement in general pro-environmental behaviour.

Our chapter builds on this previous work. On the one hand, it offers a systematic empirical comparison of the relationship between pro-environmental behaviour and subjective wellbeing in their different dimensions. On the other, it extends this analysis to a new population (French residents), different subjective wellbeing dimensions (relative, on top of absolute subjective wellbeing as well as subjective wellbeing over time, on top of current) and unexplored dimensions of pro-environmental preferences (attributions of political responsibility and policy prioritisation, on top of several types of pro-environmental behaviours).

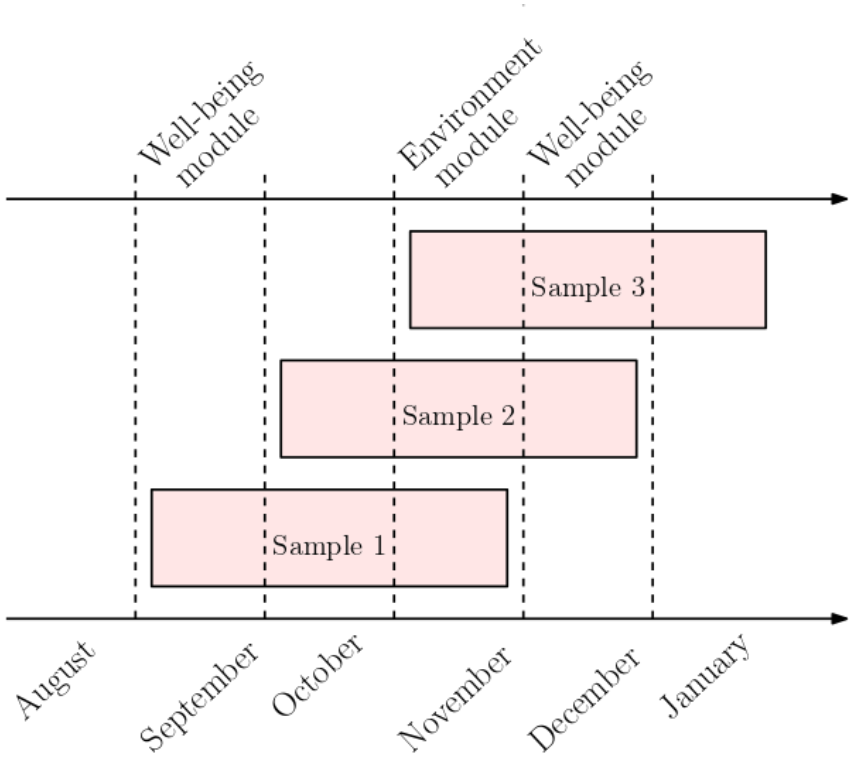
Data and methods

Research Design

For our analysis, we use recently collected data by the French National Statistical Institute. Data were collected within the *Enquête de conjoncture auprès des ménages* (CAMME), the French version of the monthly consumer confidence survey. Each month, the survey interviews a representative sample of the French population via phone. Since 2009, each November, the survey hosts an additional module on the environment ("Environmental habits and opinions"). Since 2016, thanks to a joint effort between the French National Statistical Institute and the CEPREMAP Well-Being Observatory, the survey includes a quarterly module on subjective wellbeing (in March, June, September, and December). The data set is

structured as a longitudinal cross-section with partially overlapping sub-samples. One third of the sample is renewed every month, so that each person is interviewed three times over three consecutive months. Therefore, since 2016, answers from the environmental module can be matched with answers from the subjective wellbeing module, either precedent or subsequent. Figure X.1 offers a visual illustration of the timeline of these overlapping samples.

Figure X.1: Timeline of the survey



Note: Each sub-sample is interviewed three months in a row. The survey hosts a module on the environment in November and a module on subjective wellbeing in September and December.

After the matching process, we end up having observations on 5,733 individuals. Each individual is observed twice (in September and November or in November and December) and replies exactly once to each module. The present chapter is the first study which explores this newly available data set.[2]

Variables and summary statistics

The subjective wellbeing module asks 20 questions about different dimensions of subjective wellbeing, including evaluations, experiences, and eudaimonia. In this chapter, we will focus on seven indicators: (1) general life satisfaction, (2) life

[2] Data are publicly available upon request to the French Data Archive for Social Science. The files we used for our analysis are: lil-1309, lil-1373 lil-1176, and lil-1253.

satisfaction with respect to others, (3) life satisfaction with respect to one's own future, (4) life satisfaction with respect to one's own past, (5) experienced happiness yesterday, (6) experienced depression yesterday, and (7) eudaimonia (feelings of worthwhileness of things in life). Questions are detailed in the appendix (table X.A.1). Table X.1 presents summary statistics.

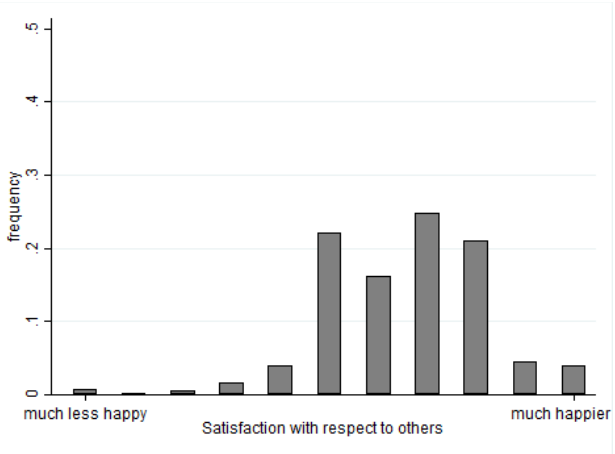
Table X.1: Summary statistics: subjective wellbeing

	N	mean	sd	min	max
life satisfaction	5,703	6.53	1.71	0	10
expected life satisfaction	5,447	5.75	1.99	0	10
recalled life satisfaction	5,682	6.38	1.89	0	10
life satisfaction w.r.t others	5,541	6.53	1.68	0	10
life satisfaction w.r.t future	5,436	0.79	1.50	-8	10
life satisfaction w.r.t past	5,667	0.15	1.55	-10	10
happy yesterday	5,678	6.79	2.20	0	10
not depressed yesterday	5,684	7.93	2.72	0	10
eudaimonia	5,573	7.01	1.96	0	10

Note: N = 18,435. The mean life satisfaction in our sample is 6.53 (with values ranging from 0 to 10), obtained from 5,703 observations. The standard deviation is 1.71.

The first indicator – general life satisfaction – is the gold standard to assess cognitive, evaluative subjective wellbeing. On the contrary, questions on relative, expected, and recalled life satisfaction are much rarer in national and international surveys, but they can be highly informative about relative inter-personal and intra-personal subjective wellbeing. We observe in our data that the vast majority of people think that they are more satisfied with their lives than others (figure X.2).

Figure X.2: Distribution of perceived *inter*-personal satisfactions

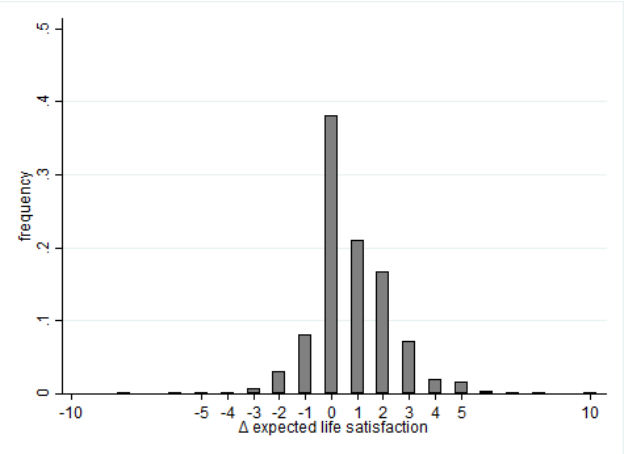


Satisfaction w.r.t. others

This finding is in line with the well-known *above-average bias*: most people think they are better than average on virtually every desirable trait (see e.g. Gilovich, 2008), including happiness (Lykken and Tellegen, 1996). Although several studies have shown the importance of relative comparisons for subjective wellbeing, it is yet unclear to what extent perceived relative subjective wellbeing is associated with (different) behaviour(s). For the purpose of obtaining an indicator of relative life satisfaction with respect to one's own future, we calculate the difference (in scale-point units) between current and expected future life satisfaction of a respondent. We do the same for recalled past life satisfaction.

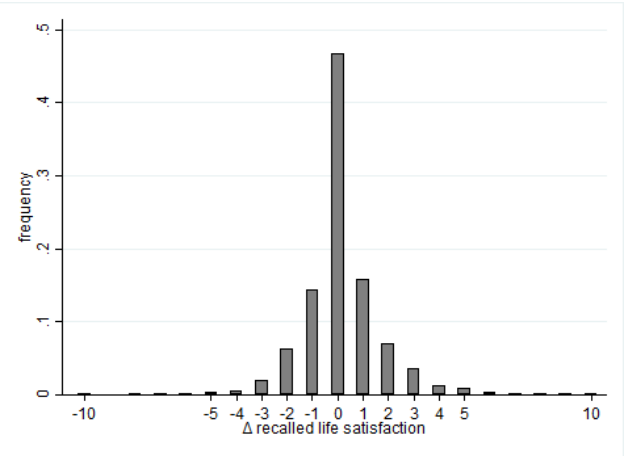
These variables then reflect satisfaction with respect to the future and satisfaction with respect to the past, respectively. They both contain information on the perceived life satisfaction trajectory (ascending or descending) of a respondent, but along different directions of time. Figures X.3a and X.3b sketch the distributions of these indicators: both are positive-skewed, suggesting that expected future and recalled past life satisfaction are not stochastic, and hence can have behavioural implications.

Figure X.3a: Distribution of perceived *intra*-personal satisfactions (future)



Satisfaction w.r.t. the future

Figure X.3b: Distribution of perceived *intra*-personal satisfactions (past)



Satisfaction w.r.t. the past

Questions on recently experienced happiness and depression are typically used as complementary measures. For ease of interpretation, we reverse code "depression yesterday" so that for all variables higher values correspond to higher subjective wellbeing. The last question is aimed at measuring eudaimonia, a dimension that, in spite of its theoretical importance, has received scant empirical attention so far. All questions are answered on a 0-to-10 scale. Indicators (3) and (4) are computed as differences and thus take values within the set (-10,10).

The environmental module is made of 20 questions, too. It seeks to document the spread of different pro-environmental behaviours and opinions about environmental policies. We focus on eight behaviours, specifically: (1) the propensity to buy organic food or (2) eco-labelled products; (3) the attention devoted to purchasing local food, (4) local products, (5) or low-waste products; (6) the propensity to switch off unused electrical devices and (7) to lower the heat or the air conditioning; (8) the means of transport which is usually adopted to go shopping. The first two questions are answered as yes-no, while questions (3) to (7) are reported on an ordered 1-to-4 scale (*never, sometimes, often, always*). Finally, the mode of transport is reported on a list of several options, which we dichotomise as "car / motorbike" *versus* not. Questions are reported in the appendix (Table X.A.2). Table X.2 presents summary statistics.

Table X.2: Summary statistics: Pro-environmental behaviours

	N	mean	sd	min	max
organic	5,661	0.60	0.49	0	1
eco-label	5,165	0.59	0.49	0	1
local food	5,663	2.55	1.13	0	4
local others	5,656	2.18	1.07	0	4
no waste	5,660	2.16	1.04	0	4

switch off	5,665	2.64	1.13	0	4
AC/heat	5,639	2.94	1.06	0	4
car to shop	5,539	0.17	0.38	0	1

Note: N =18,435. 60% of 5,661 respondents went shopping to an organic store during the last month. The standard deviation is 0.49.

On top of their pro-environmental behaviours, people are also asked about their opinions on the political responsibility to protect the environment and about which factor would encourage them the most to use green transportation. Section 4.2 describes these variables in detail.

Finally, the data set contains a set of standard socio-demographic characteristics of respondents, including age, sex, education level, job status (employed, unemployed, inactive, student, retired), the category of a respondent's occupation (managers, intermediate, clerks, workers), income, the living situation (whether living as a couple), the region of residence, and the size of the unit of residence. Table X.3 presents summary statistics.

Table X.3: Summary statistics: Socio-demographic characteristics

	N	mean	sd	min	max
age	5,733	57.2	15.8	18	97
male	5,733	0.48	0.49	0	1
no diploma	5,733	0.29	0.45	0	1
high school	5,733	0.18	0.38	0	1
undergraduate	5,733	0.22	0.41	0	1
graduate	5,733	0.13	0.34	0	1
log(income)	4,888	7.79	0.59	5.15	9.74

Models

We seek to answer the following question: on average and everything else equal, are people who report higher subjective wellbeing more likely to adopt a particular pro-environmental behaviour? To answer this question, we adopt a multiple regression framework in which we regress each of the eight types of pro-environmental behaviour on a different measure of subjective wellbeing, controlling for the socio-demographic characteristics of respondents. For ease of interpretation of marginal effects, we use a linear model, but results are similar if a non-linear model is used (probit or ordered probit, depending on the outcome).

We estimate a regression of the following form:

$$y_{it} = \alpha x_{it} + Z_{it}\beta + \gamma \tau_t + \varepsilon_{it} \qquad (1)$$

where y_{it} is the relative frequency with which respondent i adopts pro-environmental behaviour y in year t; x_{it} is an individual-specific measure of subjective wellbeing; Z_{it} is a set of socio-demographic characteristics of respondents as controls; τ_t captures year fixed effects; $_{it}$ is the normally-distributed error term. In our analysis, we systematically change the content of y_{it} and x_{it} to study the relationship between different dimensions of both pro-environmental behaviour and subjective wellbeing.

By controlling for socio-demographic characteristics, we aim to look at the predictive effect of subjective wellbeing on pro-environmental behaviour over and beyond these characteristics. For example, by controlling for income, we make sure that any potential, positive association between subjective wellbeing and pro-environmental behaviour is not merely driven by the fact that respondents who have a higher income can financially afford to consume more pro-environmentally, both of which is positively associated with subjective wellbeing. In other words, we are estimating the predictive power of subjective wellbeing on pro-environmental behaviour net of such socio-demographic differences.

Results and discussion

Subjective wellbeing and pro-environmental behaviour

Table X.4 presents estimates where x_{it} is life satisfaction. The eight columns refer to different specifications where only the dependent variable y_{it} changes.

Table X.4: Regression of several pro-environmental behaviours on life satisfaction

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	organic	ecolabel	local food	local others	no waste	switch off	AC/heat	car to shop
life satisfaction	0.0130***	0.0190***	0.0452***	0.0060	0.0275***	0.0123	0.0103	0.0032
	(0.0047)	(0.0047)	(0.0112)	(0.0107)	(0.0103)	(0.0111)	(0.0108)	(0.0034)
age	0.0080**	0.0147***	0.0233***	0.0379***	0.0167**	0.0286***	0.0190***	-0.0040
	(0.0032)	(0.0033)	(0.0076)	(0.0068)	(0.0069)	(0.0079)	(0.0072)	(0.0025)
age^2	-0.0001**	-0.0001***	-0.0002**	-0.0002***	-0.0001**	-0.0002***	-0.0002***	0.0000*
	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)
log(income)	0.0856***	0.0629***	0.1184***	0.0580	-0.1123***	-0.1555***	0.0107	-0.0598***
	(0.0188)	(0.0187)	(0.0440)	(0.0429)	(0.0392)	(0.0444)	(0.0424)	(0.0143)
year 2017	0.0302	-0.0020	0.0743	-0.0475	0.0311	0.1174**	0.0961**	-0.0124
	(0.0208)	(0.0208)	(0.0490)	(0.0454)	(0.0453)	(0.0488)	(0.0461)	(0.0144)
year 2018	0.0709***	0.0012	0.1206**	-0.0814*	0.0923**	0.0623	0.1246***	0.0005
	(0.0208)	(0.0212)	(0.0491)	(0.0458)	(0.0461)	(0.0487)	(0.0462)	(0.0146)
year 2019	0.0963***	0.0374*	0.1981***	-0.1205***	0.1685***	0.0018	0.1245***	0.0138
	(0.0202)	(0.0205)	(0.0473)	(0.0444)	(0.0447)	(0.0472)	(0.0454)	(0.0150)
N	4231	4231	4231	4231	4231	4231	4231	4231
Adjusted R^2	0.091	0.060	0.058	0.064	0.024	0.022	0.020	0.191

Note: standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The regressions include a constant and controls for job characteristics (type and position), size of the unit of residence (rural, small city, big city, Paris), and region fixed effects.

In line with previous studies (see Wang and Kang 2018 and Laffan 2020 but also Kaida and Kaida 2016 and Prati et al. 2017, for example), life satisfaction predicts the adoption of several pro-environmental behaviours, and importantly, this holds net of socio-demographic differences. A one-point increase in life satisfaction is associated with a 2% increase in the likelihood of buying organic or eco-labelled products (columns 1 and 2). Higher life satisfaction is also associated with higher attention paid at purchasing local food and low-waste products (columns 3 and 5). However, we find no significant association with energy consumption or transportation habits, which seem to be predicted mostly by age and sex (energy) and income and living as a couple (transportation).

Before moving on to the different subjective wellbeing dimensions, let us first discuss associations between socio-demographic characteristics and different pro-environmental behaviours. Age is generally associated with more pro-environmental behaviours (in a concave fashion) and so is education (in a convex fashion). Men tend to be less attentive to the environment than women are, while income intervenes in opposite ways: richer people are more prone to buying eco-responsible products (which are typically more expensive) but are less attentive to saving energy.[3] Finally, the dummy variables for survey years suggest an encouraging trend: in 2019, several pro-environmental behaviours were significantly more common than three years before.

Tables X.5 to X.7 present regression results where the regressor x_{it} is systematically changed. For the sake of parsimony, in these tables, we omit the estimated coefficients of the socio-demographic controls (they are quite similar to the ones presented in table X.4).

[3] Because of space constraints, estimates associated with gender and education level are not displayed in the table.

Table X.5: Regression of several pro-environmental behaviours on relative satisfaction

	(1) organic	(2) ecolabel	(3) local food	(4) local others	(5) no waste	(6) switch off	(7) AC/heat	(8) car to shop
satisfaction w.r.t others	0.0070	0.0140***	0.0364***	0.0098	0.0230**	0.0181	0.0271**	0.0031
	(0.0048)	(0.0049)	(0.0113)	(0.0110)	(0.0106)	(0.0114)	(0.0112)	(0.0035)
N	4136	4136	4136	4136	4136	4136	4136	4136
Adjusted R^2	0.090	0.058	0.058	0.066	0.022	0.023	0.019	0.193
satisfaction w.r.t the past	0.0095**	0.0061	0.0065	-0.0074	0.0088	0.0108	-0.0151	-0.0057*
	(0.0048)	(0.0048)	(0.0117)	(0.0110)	(0.0106)	(0.0115)	(0.0107)	(0.0034)
N	4211	4211	4211	4211	4211	4211	4211	4211
Adjusted R^2	0.090	0.056	0.054	0.064	0.022	0.022	0.020	0.191
satisfaction w.r.t the future	0.0017	0.0042	0.0092	0.0161	0.0034	0.0026	-0.0014	-0.0019
	(0.0049)	(0.0050)	(0.0120)	(0.0112)	(0.0112)	(0.0120)	(0.0111)	(0.0035)
N	4077	4077	4077	4077	4077	4077	4077	4077
Adjusted R^2	0.089	0.054	0.056	0.066	0.023	0.023	0.017	0.195
controls	yes	yes	yes	yes	yes	yes	yes	yes
time f.e.	yes	yes	yes	yes	yes	yes	yes	yes
regional f.e.	yes	yes	yes	yes	yes	yes	yes	yes

Note: standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The regressions include a constant and controls for age, age^2, sex, education, marital status, log(income), job characteristics (type and position), size of the unit of residence (rural, small city, big city, Paris), year fixed effects, and region fixed effects.

Table X.6: Regression of several pro-environmental behaviours on experiential subjective wellbeing

	(1) organic	(2) ecolabel	(3) local food	(4) local others	(5) no waste	(6) switch off	(7) AC/heat	(8) car to shop
happy	0.0089***	0.0085**	0.0272***	0.0076	0.0222***	0.0100	0.0109	0.0004
	(0.0034)	(0.0034)	(0.0081)	(0.0077)	(0.0076)	(0.0082)	(0.0078)	(0.0026)
N	4223	4223	4223	4223	4223	4223	4223	4223
Adjusted R^2	0.090	0.057	0.056	0.065	0.024	0.022	0.020	0.190
depressed	-0.0004	-0.0037	0.0026	-0.0155**	-0.0041	-0.0079	-0.0048	-0.0019
	(0.0027)	(0.0027)	(0.0064)	(0.0062)	(0.0060)	(0.0065)	(0.0061)	(0.0020)
N	4223	4223	4223	4223	4223	4223	4223	4223
Adjusted R^2	0.088	0.056	0.054	0.066	0.022	0.022	0.019	0.192
controls	yes	yes	yes	yes	yes	yes	yes	yes
time f.e.	yes	yes	yes	yes	yes	yes	yes	yes
regional f.e.	yes	yes	yes	yes	yes	yes	yes	yes

Note: standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The regressions include a constant and controls for age, age^2, sex, education, marital status, log(income), job characteristics (type and position), size of the unit of residence (rural, small city, big city, Paris), year fixed effects, and region fixed effects.

Table X.7: Regression of several pro-environmental behaviours on eudaimonia

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	organic	ecolabel	local food	local others	no waste	switch off	AC/heat	car to shop
eudaimonia	0.0121***	0.0186***	0.0563***	0.0307***	0.0457***	0.0225**	0.0368***	0.0049
	(0.0040)	(0.0040)	(0.0094)	(0.0089)	(0.0086)	(0.0095)	(0.0092)	(0.0030)
N	4163	4163	4163	4163	4163	4163	4163	4163
Adjusted R^2	0.091	0.060	0.063	0.068	0.030	0.023	0.025	0.194
controls	yes	yes	yes	yes	yes	yes	yes	yes
time f.e.	yes	yes	yes	yes	yes	yes	yes	yes
regional f.e.	yes	yes	yes	yes	yes	yes	yes	yes

Note: standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The regressions include a constant and controls for age, age^2, sex, education, marital status, log(income), job characteristics (type and position), size of the unit of residence (rural, small city, big city, Paris), year fixed effects, and region fixed effects.

Table X.5 studies the predictive power of relative comparisons and temporal dynamics in life satisfaction. Satisfaction with respect to others (panel 1) is positively correlated with some behaviours, including AC/heat saving, but its overall predictive power is more limited than life satisfaction in general. One might have expected that the perception of doing better in life than others might incentivise people to take on more responsibility towards the environment. Contrary to our expectations, the indicators of perceived life satisfaction with respect to one's own past (panel 2) and with respect to one's own future (panel 3) perform poorly. The finding that expectations about life satisfaction in the future (often used as a proxy for optimism) do not feature negatively for current levels of pro-environmental behaviour stands in contrast to Kaida and Kaida (2016), who find that a more optimistic outlook depresses pro-environmentalism in the present, and by the same token, in contrast to Kaida and Kaida (2015) who find the opposite for pessimism. These differences may, however, also be due to different operationalisations and scales used in these studies.

Table X.6 looks at experiential subjective wellbeing. Although variations in happiness levels significantly predict variations in some pro-environmental behaviours (panel 1), the magnitude of the effect of a one-point variation is systematically smaller than for life satisfaction (the coefficients are comparable since both variables are measured on a 0-to-10 scale). Feelings of depression (panel 2) do not predict pro-environmental behaviour. Overall, none of the measures of experiential subjective wellbeing outperforms life satisfaction, which may point towards green self-image or life-style as a major mediator in the relationship between pro-environmental behaviour and wellbeing (see Binder and Blankenberg (2017) and Welsch et al. (2021), for example). Given our research design, it may, however, be more difficult to capture more short-term, warm-glow effects from consuming pro-environmentally as documented elsewhere (Andreoni, 1990; Taufik et al., 2015; Welsch et al., 2021).

Eudaimonia, instead, turns out to be the best predictor of pro-environmental behaviour, in line with Venhoeven et al. (2013); Pritchard et al. (2020) and recent findings by Laffan (2020). Table X.7 presents the estimated coefficients. The adjusted R^2 shows that the explanatory power of a model including eudaimonia is systematically higher than the preceding models. Variations in eudaimonia are positively associated not only with sustainable consumption choices but also with saving energy. The magnitude of the marginal effects are, however, small: for instance, a movement all the way up the scale from 0 to 10 is associated with an upward shift of only 0.03 standard deviations in the variable AC/heat.

A null result which is worth some discussion is the inability of any of the aforementioned subjective wellbeing dimensions to predict transportation habits.

On the one hand, commuting to work depends on factors which are often hard to change. On the other, we could expect that the choice of *how* to go shopping is relatively flexible in non-rural areas. In spite of this conjecture, we find no evidence of a statistical association between subjective wellbeing measures and going shopping by car or motorbike. This result suggests that one should be cautious when aggregating green transportation choices into a general index of pro-environmental behaviour.

Although the specification of our model suggests a flow from subjective wellbeing to pro-environmental behaviour, this analysis cannot make any claims of causality. It lacks an identification strategy which would allow to precisely isolate only one direction of the causal channel. Future research should focus on this aspect, which is vital for policymaking aimed at raising both pro-environmental behaviour and subjective wellbeing.

Subjective wellbeing and sustainable policies

In the previous section, we documented a positive association between some dimensions of subjective wellbeing (in particular, general life satisfaction and eudaimonia) and different types of pro-environmental behaviours (in particular, responsible consumption habits). The analysis of pro-environmental behaviour places the consumer at the centre of the ecological transition. Yet, governments play a substantial role as well and, in a democracy, their political choices will be largely determined by citizens preferences. In this section, we adopt a more policy-oriented perspective and explore how subjective wellbeing relates to preferences for different types of sustainable policies. First, we document that French citizens consider public authorities as the main actor for environmental protection. We then move on to a case study of transportation policies, and investigate how opinions of happy and unhappy citizens can diverge. In this section, we limit our analysis to one subjective wellbeing dimension (general life satisfaction).

Table X.8 compares the distribution of answers to the question “Who do you think should act primarily for the protection of the environment?”, conditional on life satisfaction being very low (1-4), medium-low (5-6), medium-high (7-8), or very high (9-10). The last column of the table confirms the perceived importance of public policies: most people (52.3%) think that it is primarily public authorities’ responsibility to act on environmental protection, ahead of households (20.0%) and companies (27.7%).

Table X.8: Responsibilities about environmental protection and life satisfaction

	Life satisfaction

	very low	medium-low	medium-high	very high	Total
Public authorities	55.1%	54.0%	51.0%	50.6%	52.3%
Households	18.1%	17.6%	21.6%	22.7%	20.0%
Companies	26.8%	28.4%	27.5%	26.6%	27.7%
N	481	1,882	2,753	409	5,525

Note: Cross-tabulation of the responses to the question "Who do you think should act primarily for the protection of the environment?" and "Overall, how satisfied are you with your life nowadays?". Very low = 0-4; medium-low = 5-6; medium-high = 7-8; very high = 9-10. Among the 481 people reporting very low life satisfaction, 55.1% answer that public authorities are the ones that should act primarily for the protection of the environment. Among the 409 people reporting very high life satisfaction, 50.6% give this same answer

The cross-tabulation allows us to investigate if opinions about political responsibilities on environmental protection change across life satisfaction levels. *Ex-ante* differential opinions between happy and unhappy citizens, if any, are non-trivial. On the one hand, public opinion research has shown that happier people tend to have higher trust in institutions, so that they might think that *public authorities* should be the main actor of a green transition. On the other, psychological research has shown that happier people tend to have a stronger internal locus of control (i.e. they believe they have control over events, as opposed to events being imposed on them), which implies that they might feel that *households* are the ones who have the power to change things. Table X.8 offers (slight) descriptive support to the second hypothesis. As life satisfaction increases, the table shows a progressive shift of attributed responsibilities from public authorities to households. Specifically, 23% of people with high general life satisfaction thinks that it is primarily citizens' responsibility to take action to protect the environment, while only 18% of people with low current and expected life satisfaction hold the same opinion. Instead, the fraction of citizens pointing out at companies' responsibilities is stable, around 1/4 of the sample.

If most people count on public authorities, which policies should be enacted? For illustrative purposes, we now zoom in on transportation policies, which are particularly interesting for two reasons: (1) In May 2020 (thus, after our survey), the French government introduced a Mobility Plan which covers expenses related to sustainable commuting up to 400e. For instance, the plan covers the purchase of a bike or an electric scooter. Who will benefit more from it? (2) It is well-known that people who usually walk or bike in their daily commutes are more satisfied with their lives (Olsson et al., 2012; Lancée et al., 2017; Wild and Woodward, 2019), but the direction of causality is unclear. In this respect, looking at the propensity of non-bikers to endorse pro-biker policies can help disentangle causality.

We study answers to the following question: "As for your daily travels (work, study, leisure, shopping), which factor would encourage you the most to decrease

the use of you car / motorbike / scooter?". Figure X.4 presents the distributions of the answers. When asked what is the best policy to diminish the usage of cars, about one third of respondents suggest enhancing public transport and another third says that none of the proposed measures would be effective.

Figure X.5 shows that the minority of respondents (10%) who suggest to improve bike infrastructures are significantly more satisfied with their lives than the rest of the population. This could be entirely driven by the sub-population of bikers, who, at the same time, is more satisfied with their life and wishes to improve their infrastructure. Yet, this difference in life satisfaction also holds among people who report that they do not use bikes for their daily commuting or to go shopping. Of course, respondents' age and the size of the urban area are likely to be correlated both with their life satisfaction and with their propensity to use a bike. We can control for these factors by regressing life satisfaction on the standard set of socio-demographic characteristics and calculating the residuals. Thereby, the vector of residual life satisfaction is, by construction, orthogonal to these characteristics of respondents. When we compare conditional average residual life satisfaction (figure X.6), we notice that people who ask to primarily improve bike infrastructure in order to reduce the usage of car are still more satisfied with their lives, everything else equal, even if *they do not usually use a bike*. This conditional correlation suggests two things: (1) policies which endorse bike usage are more likely to benefit people who are already more satisfied with their lives and (2) people who are more satisfied with their lives have a higher propensity for bike usage, everything else equal.

Figure X.4: Distribution of endorsed policies

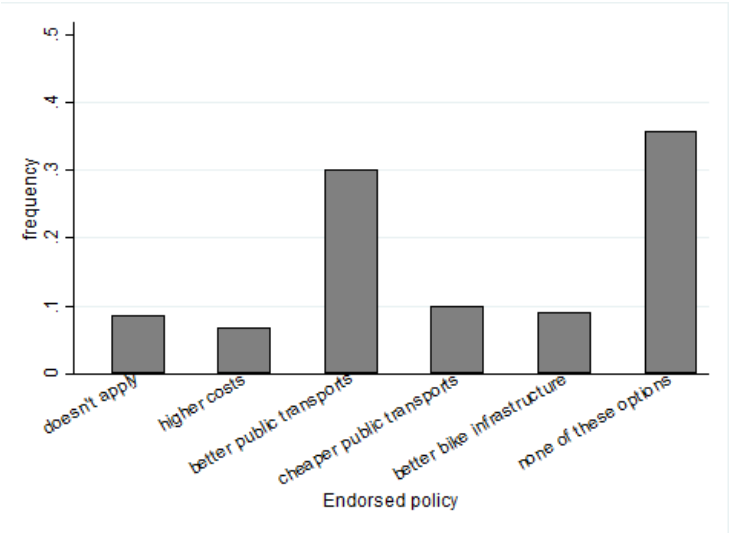


Figure X.5: Life satisfaction, by endorsed policy

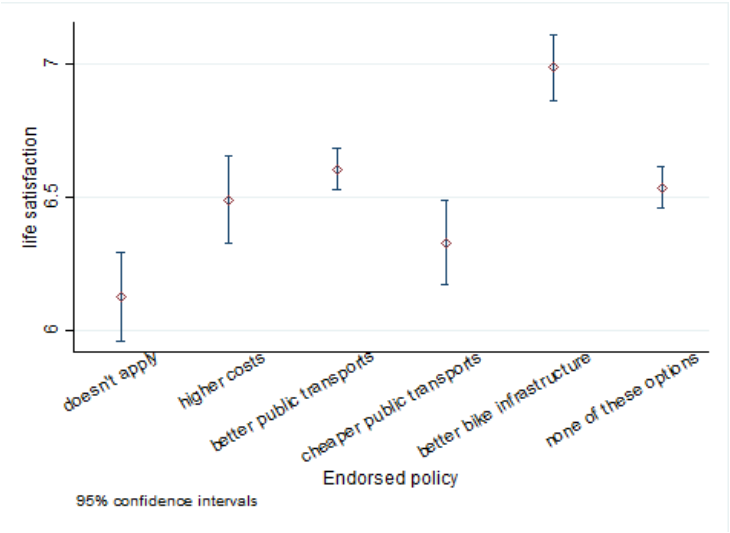
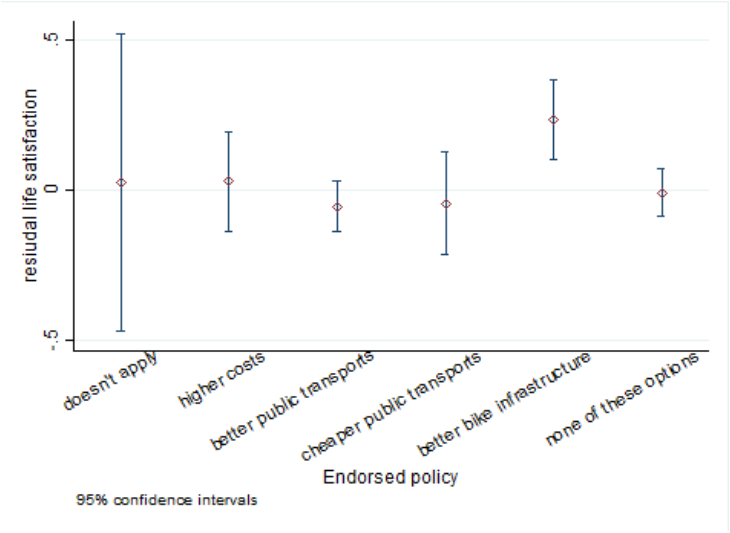


Figure X.6: Residual life satisfaction, by endorsed policy



A word of caution is needed. This correlational analysis cannot make causal claims. Our analysis is exploratory in nature and can only offer suggestive evidence. However, it offers descriptive evidence on differential preferences for sustainable policies about a topic – public transport – which contributes to over 60% of nitrogen dioxide emissions and 14% of PM_{10} pollution in France.[4]

Conclusion

This chapter contributed to unpacking the relationship between pro-environmental behaviour and subjective wellbeing. It started with a critical review of the theoretical

[4] Official estimates by the French governments are published here: https://www.ecologie.gouv.fr/pollution-lair-origines-situation-et-impacts.

and empirical evidence on whether, how, when, and why subjective wellbeing may be linked to pro-environmental behaviour, and *vice versa*. Both pro-environmental behaviour and subjective wellbeing are complex, rich notions which can be structured according to different dimensions. We showed that the literature has focused mostly on how a specific dimension of subjective wellbeing (mostly life satisfaction) correlates with general indices of pro-environmental behaviours or single behaviours in isolation. Some important subjective wellbeing dimensions (such as eudaimonia or inter-temporal and inter-personal life satisfaction) and some relevant individual attitudes (policy priorities) have received scant or no attention so far. Thanks to a newly available data set, surveying a representative sample of the French population over four years, this chapter conducted a systematic comparison of these dimensions.

Our results confirm the well-established positive correlation between pro-environmental behaviour and subjective wellbeing (conditional on a range of socio-demographic characteristics). Our multidimensional approach offers insights into which dimensions of subjective wellbeing are most predictive of which pro-environmental behaviours. While shopping habits seem to be strongly subjective-wellbeing-dependent, transportation habits turn out to be hardly predictable by any subjective wellbeing dimension (even if the transportation habit is not measured as commuting to work). Contrary to our expectations, inter-temporal and inter-personal measures of life satisfaction are *not* powerful predictors of green habits, a result that stands in contrast to Kaida and Kaida (2015, 2016). Instead, a highly perceived sense of purpose in life is the best predictor of many pro-environmental behaviours (as recently noticed by Laffan, 2020).

In this chapter, we also attempted to predict asymmetric welfare effects of a sustainable policy recently introduced by the French government. We show that this policy (which financially incentivises commuting by bike or electric scooter) is more likely to benefit people who *already* report a high level of life satisfaction. Indeed, we uncover a positive correlation between propensity to endorse pro-biker policies and life satisfaction, even among daily car users and conditional on socio-demographic characteristics. This exploratory analysis invites policy-makers to take into consideration differential preferences among groups of happy and unhappy citizens. Moreover, it helps to better understand the specific mechanisms for why bikers tend to be relatively happier: they seem to be bikers because they are happier, and not only the other way round.

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Appendix

Table X.A.1: Wellbeing indicators

Indicator	Question
General life satisfaction	Overall, how satisfied are you with your life nowadays?
Expected life satisfaction	When you think at next years, are you satisfied with this perspective?
Recalled life satisfaction	And when you think at last year, where would you place yourself on a scale from 0 to 10?
Life satisfaction with respect to others	And when you compare yourself to other people living in France in general, how do you feel on a scale from 0 to 10?
Happiness yesterday	Yesterday, did you feel happy?
Depression yesterday	Yesterday, did you feel depressed?
Eudaimonia	Do you feel that what you do in your life is meaningful, worthwhile?

Table X.A.2: Pro-environmental behaviours

Indicator	Question
Organic	During the last month, have you (or a member of your household) purchased either in an organic shop or organic products from the supermarket?
Eco-label	During the last month, have you (or a member of your household) purchased one or more eco-labelled product(s)?
Local food	When you buy food items, do you pay attention to the distance covered for their transportation (their geographical origin)?
Local others	When you buy non-food items, do you pay attention to the place where they were produced (their geographical origin)?
No waste	When you buy some products, do you pay attention to how much waste it implies?
Switch off	At home, do you sometimes switch off the electronic devices which are in stand by mode?
AC/heat	At home, do you sometimes lower the heating or the air conditioning to save your energy consumption?
Car to shop	Typically, which of the following means of transport do you use to go shopping?

Figure Captions

Figure X.1: Timeline of the survey
Note: Each sub-sample is interviewed three months in a row. The survey hosts a module on the environment in November and a module on subjective wellbeing in September and December.

Figure X.2a: Distribution of perceived intra-personal satisfactions (future)
Satisfaction w.r.t. the future

Figure X.2b: Distribution of perceived intra-personal satisfactions (past)
Satisfaction w.r.t. the past

Figure X.3: Distribution of perceived inter-personal satisfactions
Satisfaction w.r.t. others

Figure X.4: Distribution of endorsed policies

Figure X.5: Life satisfaction, by endorsed policy

Figure X.6: Residual life satisfaction, by endorsed policy