

Keynote lecture

François-Charles Wolff (Nantes University)

14th NTA Global Meeting, University of Paris Dauphine









NTA at the beginning ... and more recently

NTA nearly 20 years ago ... : Berkeley (2005, 2nd workshop), Honolulu (2006, 3rd) : calculation of consumption and income age profiles



• More recently, interest of NTA researchers in demographic aspects of human wellbeing (Vienna Yearbook of Population Research, 2021)







Keywords of my talk

• Life satisfaction

• Health satisfaction

• Age

• Gender

• Covid pandemic









The Covid pandemic and the value of health for life satisfaction in France

François-Charles Wolff (Nantes University) Joint work with Philippe Tessier (Nantes University)

14th NTA Global Meeting, University of Paris Dauphine









Introduction (1)

- The COVID-19 pandemic has placed health protection issues at the top of many governments' priorities : national lockdowns and social distancing measures
- Research has shown strong public support for these stringent policies (Bol et al., 2021; Sabat et al., 2020)
 - Depending on individuals' standard of living ...
- However, these policies have also had negative effects on various aspects of people's lives, such as income, employment, and social life (Brodeur et al., 2021)
- This has raised the question of the impact of the pandemic on mental health and subjective well-being









- Many studies have examined changes in subjective well-being after the onset of the pandemic.
- Most show relatively small and transient changes since the beginning of the pandemic
 - Aknin et al. (2022b)
 - Depends on the stringency of policy measures (Aknin et al., 2022a; Clark and Lepinteur, 2022; Grimes, 2022; Oberndorfer et al., 2022)
- This paper is not an "additional paper" on the impact of the pandemic on life satisfaction
- \Rightarrow measures of subjective well-being are intended to reflect what is important to individuals











- In France, unexpected increase in emotional well-being after the first lockdown (Recchi et al., 2020)
 - "the vast majority of individuals who are not infected by the virus may be seeing their general health and sense of subjective well-being in a more positive light than they normally would"
- This interpretation suggests that the importance of personal health for SWB may have changed after the onset of the pandemic, especially for those at risk of experiencing health consequences from covid
- Increasing news coverage of the health consequences of the pandemic, combined with highly restrictive policy decisions to protect health, may have contributed to making health more rewarding for life satisfaction for some individuals (Ng and Kang, 2022)
- \Rightarrow The purpose of this paper is to test this hypothesis







Background (1)



- Very few papers investigating the possibility that the pandemic and related policy decisions may change the extent to which health contributes to a good life
 - in England, the correlation between measures of SWB and previous health problems decreased after the pandemic (Bonomi Bezzo et al., 2021)
 - in Spain, higher correlation between perceived physical health and SWB during the lockdown in Spain than before (Fernández-Abascal and Martín-Díaz, 2022)
 - In Singapore, health satisfaction was not associated with life satisfaction during the pandemic (Ng and Kang, 2022)
- Possible changes in values during COVID
 - In 24 countries, increase between early and late 2020 in the proportion of people who felt most concerned about health issues (Lampert et al., 2021)
 - but may be related to societal rather than personal values ...









Background (2)

- Did the correlation between satisfaction with health and satisfaction with life change after the onset of the pandemic ?
- We expect an increase in the correlation between health and life satisfaction for people above a certain age (50 in our setting)
 - positive correlation between an individual's age and the risk of severe health effects from the COVID-19
 - the perception of the risk of serious illness increases with age
- Dos the change (if any) vary between women and men ?
 - women were more likely than men to adopt health protective behaviors during the COVID-19 pandemic











- First cases of COVID-19 in France : end of January 2020
- Repeated calls for lockdowns to limit the spread of the COVID-19 virus in the face of waves of rapidly increasing contamination, along with social distancing measures and an international travel ban
 - a first lockdown was imposed on March 17 and ended (gradually) on May 11, 2020 : very strict
 - non-essential businesses and public services, schools, and most shops were closed, residents were only allowed to leave their homes for basic needs
 - a second lockdown began on October 30 for about 6 weeks
 - a third lockdown took place for one month between April 3 and May 3, 2021
- We associate the pandemic with the period beginning in March 2020 (no data in January and February ...)







Data (1)



- Use of the CAMME surveys
 - monthly surveys about household financial expectations ("Conjoncture Auprès des Ménages Mensuelle" in French)
 - conducted by the French National Statistical Institute (INSEE)
 - between 1600 and 1800 completed interviews per month
- Three main sets of questions:
 - a socio-demographic module
 - module on the general economic situation (inflation, unemployment, expectations) and purchase intentions
 - rotating "platform" questionnaire
 - Since June 2016, focus on well-being with a quarterly frequency (March, June, September, December)
 - data are available from 2016 to 2021 (23 different months, six-year period)











- Typical single-item questions widely used in national surveys to assess life satisfaction and satisfaction with life domains
 - responses reported on an ordered scale ranging from 0 ("not at all satisfied") to 10 ("completely satisfied")
- Two main questions
 - "Overall, how satisfied are you with your current life?"
 - "How satisfied are you with your health?"
- Other questions
 - "How satisfied are you with your free time, the time you can use as you wish?"
 - "How satisfied are you with your standard of living?"
 - "How satisfied are you with your relationships?"
 - Additional questions on satisfaction with work or satisfaction with relationship at work (not used)









- Sample selection (pooling all cross-sectional samples: N=38,858 obs)
 - drop missing values (1612 observations deleted)
 - Age between 25 and 85 (<25 : N=196, >85 : N=942)
 - Final sample : 35,976 respondents
- Brief description
 - share of women : 52.8%
 - average age : 52.6
 - ~2/3 live in a couple
 - 62.9% have a job
 - average household income ~ 3,000 euros









Descriptive statistics (1)

- Pattern of satisfaction
 - overall life satisfaction : average score = 6.61, standard deviation = 1.73
 - health satisfaction : average score = 6.94, standard deviation = 2.17
- Trends over time









Descriptive statistics (2)



Figure 1. Average life satisfaction 2016-2021, by gender









Descriptive statistics (3)



Figure 2. Average health satisfaction 2016-2021, by gender









Descriptive statistics (4)



Figure 3. Health satisfaction cross-sectional coefficient when explaining life satisfaction, by gender









Descriptive statistics (5)

Table 2. Correlation between life satisfaction and health satisfaction, by age group and gender							
Sample	2016-2021	2016-2019	2020-2021	Difference	Dif-in-dif		
Panel A. All							
Age < 50	0.299	0.304	0.290	-0.014			
Age ≥ 50	0.338	0.328	0.357	0.029	0.043		
Panel A. Men							
Age < 50	0.291	0.288	0.293	0.005			
Age ≥ 50	0.316	0.324	0.301	-0.023	-0.028		
Panel C. Women							
Age < 50	0.306	0.317	0.285	-0.032			
Age ≥ 50	0.354	0.330	0.404	0.074	0.106		

Source: CAMME surveys 2016-2021, authors' calculations.









Descriptive statistics (6)



Figure 4. Health satisfaction coefficient when explaining life satisfaction, by gender and age group





Descriptive statistics (7)





Lemna





Empirical strategy (1)

- Notation: LS_i = life satisfaction of respondent i HS_i = health satisfaction $Age50_i$ = dummy if age \geq 50 $Post_i$ = dummy if time \geq March 2020 (covid period)
- Assumption : LS_i and HS_i are continuous
- Equation of interest (1)

$$\begin{split} LS_{i} &= \alpha_{c} + \alpha_{HS} * HS_{i} + \alpha_{Age50} * Age50_{i} + \alpha_{Post} * Post_{i} + \\ \alpha_{HS,Age50} * HS_{i} * Age50_{i} + \alpha_{HS,Post} * HS_{i} * Post_{i} + \\ \alpha_{Age50,Post} * Age50_{i} * Post_{i} + \delta * HS_{i} * Age50_{i} * Post_{i} + \varepsilon_{i} \end{split}$$

• Inclusion of controls:
$$LS_i = \cdots + X\beta + \varepsilon_i$$







Empirical strategy (2)

• Parameter of interest δ is a triple difference

$$\delta = \begin{cases} (E[LS|HS = hs + 1, Age50 = 1, Post = 1] - E[LS|HS = hs + 1, Age50 = 1, Post = 0]) - \\ (E[LS|HS = hs + 1, Age50 = 0, Post = 1] - E[LS|HS = hs + 1, Age50 = 0, Post = 1]) \end{cases} - \\ \begin{cases} (E[LS|HS = hs, Age50 = 1, Post = 1] - E[LS|HS = hs, Age50 = 1, Post = 0]) - \\ (E[LS|HS = hs, Age50 = 0, Post = 1] - E[LS|HS = hs, Age50 = 0, Post = 0]) \end{cases} \end{cases}$$

- Estimation of (1) using OLS assuming that LS_i and HS_i are continuous ... but ordered indicators
 - use of ordered discrete choice models
- But interpretation of satisfaction measures as cardinal or ordinal is challenged (Ferrer-i-Carbonell and Frijters 2004, Schröder and Yitzhaki, 2017), and the focus is on an interaction term in a non-linear model









- Non-linear DID : the treatment effect is not a cross difference, but a difference between two cross differences
 - Ai and Norton (2003), Norton et al. (2004), Greene(2010), Puhani (2012)
- Smoothing procedure
 - Machado and Santos Silva (2005) : conditional quantiles for count
 - use of jittering (Stevens, 1950, BMK)
- Construction of smoothed indicators of satisfaction S^k :
 - draw τ^k from U(0,1)
 - the smoothed indicator is $\tilde{S}^k = S^k + \tau^k$









Empirical strategy (4)

• Estimation of :

$$\begin{split} \widetilde{LS}_{i} &= \alpha_{c} + \alpha_{\widetilde{HS}} * \widetilde{HS}_{i} + \alpha_{Age50} * Age50_{i} + \alpha_{Post} * Post_{i} + \\ \alpha_{\widetilde{HS},Age50} * \widetilde{HS}_{i} * Age50_{i} + \alpha_{\widetilde{HS},Post} * \widetilde{HS}_{i} * Post_{i} + \\ \alpha_{Age50,Post} * Age50_{i} * Post_{i} + \delta * \widetilde{HS}_{i} * Age50_{i} * Post_{i} + X\beta + \varepsilon_{i} \end{split}$$

• Using
$$\widetilde{LS}_i = \widetilde{X}_i \theta + \xi_i$$
, estimation of θ using OLS: $\hat{\theta} = (\widetilde{X}'\widetilde{X})^{-1} (\widetilde{X}'\widetilde{LS})$

• The estimation of θ depends on both the sample information and the different draws from the uniform distribution, so definition of an average OLS-jittering estimator :

- considering a set of draw $d = \{\tau_d^k\}$, the average OLS-jittering estimator $\hat{\theta}_d^a$ is

$$\hat{\theta}_d^a = \frac{1}{\mathcal{D}} \sum_d \hat{\theta}_d$$

250 draws to compute the average-jittering estimator









Empirical strategy (5)

- Variance-covariance matrix of $\hat{\theta}_d^a$ is $E[(\hat{\theta}^a \theta^a)(\hat{\theta}^a \theta^a)']$ with $\theta_d^a = \frac{1}{D}\sum_d \theta_d$ and $\hat{\theta}_d^a \theta_d^a = \frac{1}{D}\sum_d (\hat{\theta}_d \theta_d)$.
- The OLS-jittering estimator $\hat{\theta}_d$ is $\hat{\theta}_d = (\tilde{X}'_d \tilde{X}_d)^{-1} (\tilde{X}'_d \tilde{L} \tilde{S}_d)$. - Let $\hat{\theta}_d = (\tilde{X}'_d \tilde{X}_d)^{-1} (\tilde{X}'_d (\tilde{X}_d \theta + \xi_d))$ so that $(\hat{\theta}_d - \theta_d) = (\tilde{X}'_d \tilde{X}_d)^{-1} (\tilde{X}'_d \xi_d)$ - It follows that $E[(\hat{\theta}^a - \theta^a)(\hat{\theta}^a - \theta^a)'] = E[(\frac{1}{D} \sum_d ((\tilde{X}'_d \tilde{X}_d)^{-1} (\tilde{X}'_d \xi_d)))(\frac{1}{D} \sum_d ((\tilde{X}'_d \tilde{X}_d)^{-1} (\tilde{X}'_d \xi_d)))']$
- After some manipulation $E[(\hat{\theta}^a \theta^a)(\hat{\theta}^a \theta^a)'] = \frac{1}{D^2} \sum_d \sum_d \left((\tilde{X}'_d \tilde{X}_d)^{-1} \sigma^2_{dd} (\tilde{X}'_d \tilde{X}_d) \right)$









Results (1)

- Results
 - Estimation of the triple difference regression using the average OLS-jittering estimator









Results (2)

	Table 3. Estim	ates of life s	atisfaction			
Variables	All		Men		Women	
	coef	t-value	Coef	t-value	Coef	t-value
Panel A. Without control variables						
Health satisfaction	0.233***	(27.30)	0.226***	(18.15)	0.238***	(20.36)
Age ≥50	-0.304***	(-3.72)	-0.247**	(-2.06)	-0.349***	(-3.13)
2020-2021	0.083	(0.73)	-0.073	(-0.45)	0.230	(1.43)
Health satisfaction x Age ≥50	0.023**	(2.20)	0.026*	(1.70)	0.019	(1.33)
Health satisfaction x 2020-2021	0.003	(0.19)	0.022	(1.10)	-0.016	(-0.81)
Age ≥50 x 2020-2021	-0.240*	(-1.75)	0.247	(1.26)	-0.692***	(-3.60)
Health satisfaction x Age ≥50 x 2020-2021	0.029*	(1.66)	-0.034	(-1.40)	0.087***	(3.57)
Constant	5.435***	(78.73)	5.499***	(54.19)	5.383***	(57.23)
Control variables	NO		NO		NO	
R ²	0.110		0.096		0.123	
Number of observations	35976		17840		18136	

- .. . 6116and of a still









Results (3)

Panel B. With control variables						
Health satisfaction	0.204***	(24.61)	0.198***	(16.33)	0.209***	(18.35)
Age ≥50	-0.294***	(-3.63)	-0.306***	(-2.58)	-0.272**	(-2.45)
2020-2021	0.047	(0.43)	-0.136	(-0.87)	0.231	(1.48)
Health satisfaction x Age ≥50	0.033***	(3.30)	0.036**	(2.43)	0.030**	(2.16)
Health satisfaction x 2020-2021	0.007	(0.48)	0.029	(1.51)	-0.015	(-0.80)
Age ≥50 x 2020-2021	-0.170	(-1.28)	0.280	(1.48)	-0.602***	(-3.23)
Health satisfaction x Age ≥50 x 2020-2021	0.021	(1.26)	-0.037	(-1.57)	0.077***	(3.26)
Constant	4.767***	(54.34)	4.627***	(33.45)	4.767***	(40.88)
Control variables	YES		YES		YES	
R ²	0.166		0.155		0.174	
Number of observations	35976		17840		18136	









Results (4)

Panel C. With control variables including income							
Health satisfaction	0.197***	(22.88)	0.189***	(14.96)	0.203***	(17.19)	
Age ≥50	-0.307***	(-3.62)	-0.364***	(-2.92)	-0.260**	(-2.25)	
2020-2021	0.073	(0.63)	-0.079	(-0.48)	0.207	(1.29)	
Health satisfaction x Age ≥50	0.025**	(2.36)	0.030*	(1.94)	0.020	(1.42)	
Health satisfaction x 2020-2021	0.003	(0.22)	0.019	(0.96)	-0.011	(-0.54)	
Age ≥50 x 2020-2021	-0.254*	(-1.82)	0.180	(0.90)	-0.646***	(-3.33)	
Health satisfaction x Age ≥50 x 2020-2021	0.033*	(1.87)	-0.023	(-0.92)	0.084***	(3.40)	
Constant	4.990***	(53.83)	4.796***	(32.73)	5.070***	(41.27)	
Control variables							
R ²	0.179		0.173		0.185		
Number of observations	30814		15164		15650		







Results (5)



- Other effects
 - no difference in the average LS by gender
 - living in a couple and having children ≤14 positively correlated with LS
 - LS increases strongly with education
 - compared to other inactive people, LS higher among those who have a job or are retired, but lower among unemployed
 - income is very strongly and positively correlated with LS
 - gender-specific regressions : very similar results, except for the relation between employment and LS
 - Positive correlation for men (0.363 and t=4.15)
 - Insignificant for women









Robustness (1)

- Robustness
 - estimators
 - role of age in life satisfaction
 - age threshold
 - unobserved heterogeneity (no panel here ...)









Robustness (2)

- Comparison of estimators
 - ordered Probit
 - OLS
 - average OLS-jittering







Robustness (3)





Figure 5. Triple difference estimates and comparison of estimation methods









Robustness (4)

- Relationship between age and life satisfaction
 - here comparison using <50 versus ≥50</p>
 - but usually U-shaped relationship between age and life satisfaction (decrease from the early adulthood, minimum around age 50, increase after (Blanchflower, 2021)
- Inclusion of additional age trends : no impact









Robustness (5)



Figure B1. Average life satisfaction and age, by gender

Source: CAMME surveys 2016-2021, authors' calculations.









Robustness (6)

- Value of the age threshold
 - − triple difference using <50 versus ≥ 50
 - replication with various age thresholds
 - still using the average OLS-jittering estimator









Robustness (7)













- Role of unobserved heterogeneity
 - unobservable confounder \tilde{C}_i
 - $-\widetilde{LS}_{i} = \boldsymbol{\gamma} * \widetilde{\boldsymbol{C}}_{i} + \dots + \delta * \widetilde{HS}_{i} * Age50_{i} * Post_{i} + \dots X\beta + \varepsilon_{i}$
- Simulation of the values of \tilde{C} by distinguishing two groups
 - first group : women <50 over the entire period and women ≥50 in the pre-covid period
 - second group : women ≥50 in the post-covid period
 - \tilde{C} is drawn from $N(0; \sigma^2)$ in group 1, \tilde{C} is drawn from $N(\mu; \sigma^2)$ with $\mu \ge 0$ in group 2
 - \Rightarrow idea : generate systematic differences between the two groups based on $E[\tilde{C}]$









Robustness (9)

- Selection of values
 - μ between 0 and 2 (step of 0.05)
 - $\mu=0$: average confounder similar between the two groups
 - γ between -1 and 1 (step of 0.05)
 - highest estimated coef = 0.83 (postgraduate education), lowest coef = -0.65 (unemployment)
 - $\Rightarrow \gamma$ close to either -1 or 1 : the confounder has a larger effect than the most influential variable









Robustness (10)

- Three different values of σ^2 - $\sigma^2 = 1$, $\sigma^2 = 2$ and $\sigma^2 = 3$.
- Jittering procedure
 - 250 draws
 - set of 1,260,750 simulations that vary according to the values of : σ^2 (3 cases), μ (41 cases), γ (41 cases) and draws on the simulated values of \widehat{LS}_i et \widehat{HS}_i (n=250)
- Outcome
 - for each value of σ^2 , plot the estimated coef. $\hat{\delta}$
 - Recall that the point estimate of $\hat{\delta}$ was 0.077 with a s.e. of 0.024
 - lower bound of the 95% CI : 0.030
 - so values of $\hat{\delta}_s$ into three groups: <0, 0-0.030, above 0.030</p>







Robustness (11)





Figure 7. Triple difference estimates for women and sensitivity to confounders

Nantes Université

Lemna





Discussion (1)

- Has the pandemic made personal health a more influential determinant of life satisfaction ?
 - we expect this to be the case for aging individuals and to be more pronounced for women than for men
 - the answer is YES
- The pandemic has changed the relative importance of health (picked up by health satisfaction)
 - somewhat easy to understand
 - see for instance Google Trends













Figure C1. Google Trends for health, covid, pandemic and vaccination



Lemna







- Is the mechanism relevant ?
 - comparison in changes in the importance of health for life satisfaction with possible changes in the importance of other domains of life that may have been affected by the pandemic
 - four domains of life (work being excluded) : health, standard of living, relationships with relatives, and leisure time.
 - estimation of the LS equation with each life domain as covariate













Figure 8. Triple differences estimates by domain of satisfaction



Lemna







- Need to distinguish between men and women when analyzing the potential consequences of the COVID-19 pandemic on LS
 - importance of looking beyond changes in LS levels to consider changes in what makes a good life as a result of major life events such as those experienced since the onset of the pandemic
- Assuming that individuals behave, at least in part, to promote the elements that most contribute to their life satisfaction, the gender gap is consistent with research showing that women are more likely than men to engage in protective behaviors and healthy habits in the face of the outbreak
- Also consistent with studies showing :
 - that a greater proportion of women than men express fear and anxiety related to COVID-19, particularly in Europe (Metin et al., 2022)
 - that the influence of health on life satisfaction is mediated by social relationships (Lamu and Olsen, 2018)
 - In our study, the importance of health for life satisfaction increased in a period of downgraded social relationships as a result of lockdown social distancing policies.









Discussion (6)

- Does the increased importance of health in SWB have lasting effects ?
 - More disaggregated time representation (6 months period)
 - Estimation of (with T_{ym} a semester dummy, and 2016 the reference year)

$$\begin{split} \widetilde{LS}_{i} &= \alpha_{c} + \alpha_{\widetilde{HS}} * \widetilde{HS}_{i} + \alpha_{Age50} * Age50_{i} + \sum \alpha_{ym} * T_{ym} + \alpha_{\widetilde{HS},Age50} * \widetilde{HS}_{i} * Age50_{i} + \\ &\sum \alpha_{\widetilde{HS},ym} * \widetilde{HS}_{i} * T_{ym} + \sum \alpha_{Age50,ym} * Age50_{i} * T_{ym} + \sum \delta_{ym} * \widetilde{HS}_{i} * Age50_{i} * T_{ym} \\ &+ X\beta + \varepsilon_{i} \end{split}$$









Discussion (7)



Figure 9. Triple difference estimates by semester between 2019 and 2021







Conclusion



- Use of repeated cross-sectional data from France to study the relationship between life and health satisfaction
- Results
 - [simple smoothing procedure with ordered outcomes and interaction terms]
 - the pandemic has increased the importance of health for the life satisfaction of aging individuals (≥50), but only for women
 - the change in the correlation between HS and LS seems transitory : it disappears in the second half of 2021
- Implications and future work
 - life priorities may not have changed radically since the onset of the pandemic (but no inclusion of labor vs leisure trade-off here)
 - closer look at "what makes" life satisfaction and how age affects the "weight" of the various satisfaction domains (smooth varying coefficient regressions)









Thanks to the NTA family for attention !





