Money and Happiness: Income, Wealth and Subjective Well-Being

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Abstract

We examine the complex relationship between money and happiness. We find that both permanent income and wealth are better predictors of life satisfaction than current income and wealth. They matter not only in absolute terms but also in comparative terms. However, their relative impacts differ. The first exerts a comparison effect—the higher the permanent income of the reference group, the lower life satisfaction—the second exerts an information effect—the higher the permanent wealth of the reference group, the higher life satisfaction. We also show that negative transitory shocks to income reduce life satisfaction while transitory shocks to wealth have no effect. Lastly, we analyse the effects of their components and find that not all of them predict life satisfaction: permanent taxes do not matter, while only the value of permanent real estate, financial and business assets do. Finally, we use quantile regression and analyse to what extent our results vary along the well-being distribution, finding the impacts to be larger at lower levels of life satisfaction.

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1 Introduction

Does money matter for happiness? Social scientists addressed this question by exploring the relationship between income and subjective well-being, measured by life satisfaction. One of the main finding in the subjective well-being or happiness literature is that money matters in absolute and relative terms: individuals enjoy being rich and being richer than others (Clark and Oswald 1996, among several others). This latter phenomenon has come to be known in the literature as the *comparison effect*. However, there is also evidence that the relationship between one's own happiness and other's incomes can be positive. Here researchers follow Hirschman's (1973) interpretation and consider that other's income has an *information effect*: the presence of richer individuals signals that there is a possibility for oneself to get richer in the future, which increases own happiness even before any actual enrichment takes place. (See on this point Senik 2004, among others.) *Habituation* refers to the evidence that people adapt to having more income, a phenomenon known as hedonic adaptation (see Lyubomirsky 2010, for an excellent survey).

Money is not only income but also wealth and distinguishing between the two is important. A rich individual can be more satisfied with her own life but she could feel rich either because she earns a lot (she is income rich) and/or because she already has a lot (she is wealth rich). There is a good rationale for considering as indicators of economic well-being both income and wealth. Income, properly measured, is an indicator of an individual's ability to consume within a given time period. Wealth, on the other hand, plays different roles. It generates income, such as capital income and imputed rents. It confers economic security, allowing the individual to be prepared for emergencies and to consume out of wealth in case of negative income shocks caused e.g. by loss of income due to an illness or other hard-to-insure-against risks. It also enables individuals to maintain consumption levels for themselves and their dependents on retirement.

Only a few studies have so far explored the wealth-happiness gradient, not for lack of interest but mainly for scarcity of data. As expected, life satisfaction is positively related to household net wealth (Headey and Wooden 2004). Income and wealth differ in several aspects and conclusions that applied to the relationship between life satisfaction and income may not apply to wealth. An important characteristic of the distribution of wealth is its negative values: debts. Brown et al. (2005) report that unsecured, as opposed to secured, debt reduces psychological well-being, and Keese and Schmitz (2014) find that household debt negatively affects mental well-being. More recently, Brown and Gray (2016) explore the importance of the household's financial position for an individual's well-being. They show that different measures of subjective well-being are positively correlated with wealth and that relative wealth matters. They conclude that information effects generally dominate comparison effects, indicating that an individual's level of subjective well-being is positively influenced by the wealth of others. This suggests that individuals interpret the increase in wealth of the comparison group as a signal for future prospects and not as a source of relative deprivation.

There are at least two additional aspects of the relationship between money and happiness worth exploring: the first is the effect by period of reference, that is, current versus permanent values; the second relates to the components, or factors, of income and wealth. While these types of decompositions appear to be common in the literature analysing wealth, they are typically not explored for income.

The literature discussed so far analysed the relationship between *current* values of income and wealth and subjective well-being. However, current income is the sum of permanent

income and transitory shocks. A similar reasoning holds for wealth. By correlating current income and wealth with subjective well-being, the literature assumed the effect of the permanent value to be equal to that of the transitory shock. To the best of our knowledge, this assumption has not been formally tested in previous work, so our article is the first to formally address this question. The closest articles that we are aware of are those by Mullis (1992) and Boyce et al. (2013). Taking the income in the previous year as reference, Boyce et al. (2013) find in accordance with the loss aversion hypothesis that losses in income have a significantly greater impact on well-being than gains [on this point see also (D'Ambrosio and Frick 2011)]. Boyce et al. (2013) investigate only the impact of changes in current income, do not account for permanent income and do not examine any impact of wealth. Mullis (1992), by contrast, includes household wealth in a measure of economic well-being based on the life cycle/permanent income hypothesis. In his interpretation of the latter, economic well-being depends not only on current income but also on the wealth and future income of an individual. Current and future income are proxied by an individual's permanent income as measured by averaging incomes in prior periods. Their measure of economic well-being is the sum of permanent income and annuitized net worth divided by the poverty level income which captures the economic needs of the household. Using data from the National Longitudinal Survey Mature Male cohort, he shows that the proposed composite index outperforms the current income measure in explaining satisfaction with life.

Using data from the German Socio-Economic Panel, we contribute to the literature by showing for the first time that the predictive powers of permanent income and wealth on future life satisfaction statistically differ from the predictive powers of transitory shocks to the same. As such, the predictive power of a specification accounting separately for permanent as well as transitory income and wealth fits the data better than does a specification that controls only for current income and wealth. The coefficient estimates on permanent income and permanent wealth for future life satisfaction are both positive, statistically significant and of similar magnitude, while the estimates on transitory shocks are mostly statistically insignificant. We then further explore the relationship between permanent income, permanent wealth and life satisfaction. We demonstrate that the interaction between permanent income and permanent wealth is negative, supporting the substitutability between them in terms of raising life satisfaction. The relative effects also differ—permanent income is subject to comparison effects while the permanent wealth of others exerts a positive impact on life satisfaction. We also contribute to the literature by analysing the sub-components of permanent income and wealth and show that they heterogeneously predict future life satisfaction. Finally, we use quantile regression and demonstrate that the unhappiest of our sample are the most sensitive to the level of permanent income and wealth and to transitory shocks.

The remainder of the paper is organized as follows. Section 2 presents the data and the measures of permanent income and permanent wealth while the empirical models and the estimation sample are discussed in Sect. 3. The main results are contained in Sects. 4 and 5 concludes.

2 The Data

The empirical analysis makes use of the German Socio-Economic Panel (SOEP), an ongoing panel survey with yearly reinterviews from 1984 onwards (see http://www.diw.de/gsoep).

The wealth measure we use is per capita household net wealth. This information is currently only available in the 2002, 2007 and 2012 survey years of SOEP, and includes owner-occupied property (net), other real estate (net), financial assets, private insurance, business assets, collectibles, and consumer debt. Although the wealth data in SOEP are collected at the individual level, we aggregate wealth across household members and assign a per-capita value to each adult household member. This choice was motivated by the fact that individuals without own wealth also profit from the wealth held by their spouse or other adult household members, as evident from residing in owner-occupied housing. We measure *permanent* wealth in year t as the average per-capita net household wealth between t and $t-5$:

$$PW_t = \left(W_{t-5} + W_t\right)/2 \quad \text{for } t = \{2007; 2012\}.$$

Our income measure is annual post-tax, post-transfer, i.e., disposable household income, defined as the sum of income received by all household members from labour, capital, private sources, plus public transfers and pensions, minus direct taxes and social security contributions. Following Headey and Wooden (2004), we use disposable household income to account for the main effects of government policy in redistributing income. In order to make it comparable over time, income is deflated to 2000 prices, taking also into account purchasing power differences between East and West Germany. In line with our per-capita wealth measure, we account for household needs by dividing income with household size.[1] *Permanent* income is measured as the mean per-capita-adjusted disposable household income over 5 years:

$$PY_t = \sum_{s=0}^{4} Y_{t-s}/5 \quad \text{for } t = \{2007; 2012\}.$$

Current income Y_t and current wealth W_t can be expressed as follow:

$$Y_t = PY_t + \Delta Y_t$$

$$W_t = PW_t + \Delta W_t$$

where ΔY_t and ΔW_t are transitory shocks in income and wealth.

Our dependent variable is well-being, measured as the response on an 11-point scale to a question about life satisfaction. Specifically, SOEP respondents are asked the following question: "In conclusion, we would like to ask you about your satisfaction with your life in general. Please answer according to the following scale: 0 means completely dissatisfied and 10 means completely satisfied: How satisfied are you with your life, all things considered?". We measure life satisfaction in year $t+1$, i.e., in the year following the last income or wealth measurement.

3 Hypotheses, Empirical Models and Estimation Sample

Our aim is to answer four questions about the relationship between economic resources and subjective well-being: (1) Are the predictive powers of permanent income and permanent wealth on future life satisfaction statistically different from the transitory shocks in income

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[1] In an alternative specification, available upon request, we make use of a more standard equivalent income measure using the modified OECD scale instead of the per-capita measure. Regression results shown in the empirical section below are robust with respect to the choice of the two equivalence scales.

and wealth? (2) Are permanent income and permanent wealth substitutes or complements in terms of subjective well-being? (3) Do permanent income and wealth of a given reference group produce a comparison or information effect? (4) What is the predictive power of the different sub-dimensions of permanent income and wealth on future life satisfaction?

To address question (1), we first estimate the two following regression equations using OLS[2]:

$$LS_{it+1} = \alpha_1 Y_{it} + \alpha_2 W_{it} + \alpha_3 X_{it} + \epsilon_{it} \tag{1}$$

$$LS_{it+1} = \beta_1 PY_{it} + \beta_2 \Delta Y_{it} + \beta_3 PW_{it} + \beta_4 \Delta PW_{it} + \beta_5 X_{it} + \mu_{it} \tag{2}$$

where LS_{it+1} is the life satisfaction of the individual i at time $t+1$. Y_{it} and W_{it} are, respectively, current income and wealth at time t of the individual i. PY_{it} and PW_{it} are the permanent income and permanent wealth and ΔY_{it} is equal to the difference between the permanent income (permanent wealth) and current household income (current household wealth). X_{it} is the vector of individual controls. Because we use household measures of income and wealth, we cluster all the standard errors at the household level in the empirical analysis. As we note above, we use life satisfaction in $t+1$ and not in t as the dependent variable to explore the predictive power of PY_{it} and PW_{it} and to reduce the concern of reverse causality. If the predictive powers of PY_{it} and ΔY_{it}, on the one hand, and PW_{it} and ΔW_{it}, on the other, are the same, this implies the following three restrictions:

- $\beta_1 = \beta_2 = \alpha_1$
- $\beta_3 = \beta_4 = \alpha_2$
- The adjusted R^2 of the Eqs. 1 and 2 are of equal magnitude.

To address question (2), we control for permanent income and permanent wealth as well as for the interaction between these two measures as follows:

$$LS_{it+1} = \gamma_1 PY_{it} + \gamma_2 PW_{it} + \gamma_3 (PY_{it} * PW_{it}) + \gamma_4 X_{it} + \eta_{it}. \tag{3}$$

If permanent income and permanent wealth are substitutes (complements), γ_3 should be negative (positive). If γ_3 turns out to be equal to zero, it would mean that the predictive powers of permanent income and permanent wealth are independent of each other.

To address our question (3), i.e., to assess the impact of relative permanent income and wealth, we follow the literature (Clark and Oswald 1996) and estimate the following equation:

$$LS_{it+1} = \theta_1 PY_{it} + \theta_2 PW_{it} + \theta_3 \overline{PY_{it}} + \theta_4 \overline{PW_{it}} + \theta_5 X_{it} + \zeta_{it} \tag{4}$$

where $\overline{PY_{it}}$ and $\overline{PW_{it}}$ are the permanent income and permanent wealth of the reference group of the individual i at time t, defined as the mean value of the respective distributions in the group of reference of the concerned individual. Two types of effects may be expected. The reference term may exert a negative comparison effect (see Luttmer 2005, for instance) and hence θ_3 and θ_4 should be negative. Alternatively, the permanent income and permanent wealth of the reference group can have a positive impact on LS_{it+1}. In this

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[2] By using linear models, we treat life satisfaction as cardinal. As life satisfaction is measured on an ordinal scale, ordered response models may be more appropriate. We re-estimated all our regressions using ordered logit model and confirm the findings of Ferrer-i-Carbonell and Frijters (2004): our conclusions do not depend upon the estimation method and results of the ordered logit models can be found in the online appendix.

case, $\overline{PY_{it}}$ and $\overline{PW_{it}}$ are seen by the individual as indicator of future prospect and have a positive effect on life satisfaction [adapting Hirshman's (1973), proposal]. It could also be that having better-off individuals around would increase the sense of security and safety of the concerned individual without playing any information role; for example, living in a society with relatively high permanent wealth could have positive externalities in terms of better houses and quality of neighbourhoods.

The definition of the reference group is crucial. We follow Brown and Gray (2016), McBride (2001) and Layard et al. (2010) and define the comparison group based on age (5 years younger and 5 years older), gender and state of residence.[3]

Using Danish data, Clark et al. (2009) show that not only the level of comparison income and wealth matters but also the individual's rank in each distribution. To account for this additional effect, in the last specification we estimate, we include a dummy equal to 1 if own permanent income (wealth) is higher than the average income (wealth) of the reference group.

To tackle question (4), we re-estimate Eq. 2, but drop the shocks and instead include PW_{it} decomposed into the sub-components of wealth—net real estate (as the sum of the net value of owner-occupied property and other real estate), financial assets, private insurance, business assets, collectible and consumer debt. We follow a similar approach for PY_{it} and decomposed it into its sub-components—income from the participation in the labour market, capital income, transfers and taxes.

The estimation sample consists of all adult respondents with valid information on permanent income, permanent wealth and life satisfaction, leaving us with 11,295 observations based on about 8709 individuals over the period 2002 to 2013. Descriptive statistics are shown in Table 1. Since the measures of wealth are available in only three waves (2002, 2007 and 2012), permanent wealth can only be observed at most twice per individual (in 2007 and 2012). Among the 8709 individuals in the estimation sample, only 2586 individuals are observed twice. Average permanent income is 14,306 euros while average permanent wealth is 114,224 euros. Net real estate constitutes most of the value of permanent wealth (averaging 89,553 euros).

4 The Results

4.1 The Permanent Income, Permanent Wealth and Transitory Shocks

The dependent and independent variables have all been standardized to have zero mean and unit variance in all of the regressions. The results in Table 2 are based on Eqs. 1 and 2.[4] The estimates in columns (1) and (2) present separately the predictive powers of current income and permanent income. A 1-SD increase in current income predicts an increase of 0.200-SD in life satisfaction, and an increase of 7037 in permanent income euros (which is 1-SD in current income) predicts an increase of 0.141-SD in life satisfaction (0.122 * (7037/6102)). While these estimates are both highly statistically significant,

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[3] We also used these demographics separately to define the reference group and results remains qualitatively unchanged.

[4] Table A1 in our online appendix [https://doi.org/10.1007/s11205-019-02186-w] shows regression estimates that do not include the controls.

Table 1 Descriptive statistics

	Observations	Mean	SD	Min	Max
Dependent variable					
Life satisfaction (in t + 1)	11,295	6.84	1.78	0	10
Independent variables					
Current income	11,295	14,834.55	7037.57	0	95,703
Permanent income	11,295	14,306.06	6101.87	2592	33,527
Deviation from permanent income	11,295	528.50	3222.15	− 21,086.5	65,260
Gain compared to permanent income	11,295	1253.07	2361.91	0	65,260
Loss compared to permanent income	11,295	724.57	1728.48	0	21,086.5
Comparison income	11,295	14,306.06	1525.952	10,530.93	17,112.59
Permanent labor income	11,295	13,287.43	12,096.97	0	60,620
Permanent capital income	11,295	521.93	1354.57	0	28,717.9
Permanent government income	11,295	5294.18	6150.79	0	39,928.5
Permanent taxes	11,295	4797.48	4488.616	0	28,091.5
Current wealth	11,295	119,595.00	154,989.00	− 468,933.30	1,331,200
Permanent wealth	11,295	114,224.30	135,970.80	− 208,185.40	649,634.30
Deviation from permanent wealth	11,295	5370.74	62,631	− 626,275	861,900
Gain compared to permanent wealth	11,295	19,156.66	43,758.21	0	861,900
Loss compared to permanent wealth	11,295	13,785.92	38,465.96	0	626,275
Comparison wealth	11,295	114,224.30	21,112.4	61,822.83	150,484.3
Permanent value of net real estate	11,295	89,553.30	113,351.70	0	601,500
Permanent value of financial assets	11,295	16,539.14	31,383.69	0	400,000
Permanent value of private insurance	11,295	7869.96	13,156.10	0	190,000
Permanent value of business assets	11,295	3781.98	26,771.85	0	1,565,000
Permanent value of collectible	11,295	753.30	5422.04	0	438,100
Permanent value of consumer debt	11,295	4273.40	22,567.62	0	1,689,000
Socio-demographics					
Female	11,295	0.53	0.50	0	1
Age	11,295	53.46	15.76	22	98
Number of children	11,295	0.43	0.82	0	6
Married	11,295	0.66	0.47	0	1
Single	11,295	0.16	0.36	0	1
Widowed	11,295	0.07	0.26	0	1
Divorced	11,295	0.09	0.28	0	1
Separated	11,295	0.02	0.14	0	1
Years of education	11,295	12.12	2.65	7	18
Health status	11,295	2.75	0.92	1	5
Employed	11,295	0.59	0.49	0	1
East Germany	11,295	0.30	0.46	0	1

Table 2 Life satisfaction in t+1 and permanent income and wealth: OLS results

	Life satisfaction in $t+1$									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Current income	0.200*** (0.021)								0.172*** (0.021)	
Permanent income (5 years)		0.122*** (0.011)	0.123*** (0.011)	0.133*** (0.011)						0.114*** (0.012)
Deviation from permanent income			0.031 (0.019)							
Gain compared to permanent income				−0.027 (0.028)						−0.030 (0.027)
Loss compared to permanent income				−0.125*** (0.034)						−0.132*** (0.034)
Current wealth					0.188*** (0.022)				0.144*** (0.023)	
Permanent wealth (over 5 years)						0.086*** (0.009)	0.085*** (0.009)	0.091*** (0.012)		0.065*** (0.012)
Deviation from permanent wealth							0.012 (0.017)			
Gain compared to permanent wealth								−0.011 (0.033)		−0.004 (0.032)
Loss compared to permanent wealth								−0.039 (0.033)		−0.018 (0.033)
Observations	11,295	11,295	11,295	11,295	11,295	11,295	11,295	11,295	11,295	11,295
Adjusted R²	0.221	0.223	0.223	0.224	0.218	0.219	0.219	0.219	0.224	0.227

Standard errors in parentheses are clustered at the household level. The dependent variable and the independent variables presented in this table are standardized. Controls include age, age squared, gender, years of education, marital status, number of children in the household, the labour-force status, self-assessed health, year fixed effects and region fixed effects. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

the specification using permanent income as a predictor has a higher adjusted R^2. The quality of the fit does not increase in column (3) where the transitory shocks to income are also included (insignificant in this specification). The coefficient estimates on permanent income and the transitory shocks (the coefficients β_1 and β_2 in Eq. 2) are statistically significantly different.

The model estimated in column (4) separates between the impact of gains and losses in permanent income as in Boyce et al. (2013). The results suggest losses predict lower levels of life satisfaction in the future while the effect of gains in income is not significant. We may now want to know whether the effect of losses in permanent income is significantly stronger than the effect of gains. We test for the equality of the coefficients via a Wald test and reject the null hypothesis at the 1% level. Keeping permanent income constant, these results indicate that income stability is the situation predicting the highest level of life satisfaction (compared to positive or negative deviations from permanent income). The estimates and the adjusted R^2 in column (1) to (4) demonstrate that the specification with the highest predictive power is the one in column (4), accounting separately for the impact of permanent income as well as for both positive and negative transitory shocks.

We replicate this exercise with wealth in columns (5) to (8). Results are similar to income to the extent that accounting for permanent wealth leads to a specification with a better fit (compared to the specification controlling only for current wealth). However, the impact of deviations from permanent wealth are not significantly different from zero. The key component here seems to be the level of permanent wealth.

Columns (9) and (10), finally, compare the specification including only current income and wealth to the one including the permanent values of income and wealth as well as the deviations from these values. The results in those columns confirm our results: in order to estimate the best predictive model of future life satisfaction, we need to decompose the current values into permanent ones and transitory shocks.[5]

Our results suggest permanent income and wealth have similar (although different size) effects on life satisfaction, but that transitory income and wealth do not.[6] Economists tend to think that we consume mostly based on our permanent income, but in the absence of perfect (or near-perfect) foresight and with imperfect capital markets, income shocks are very likely to affect consumption and well-being. Interestingly, income losses reduce well-being while gains do not increase it. Wealth may well be different. A shock to wealth may reflect issues that do not relate to changes in well-being in the short-run, such as (for owner-occupiers) short-run fluctuations in the value of real estate. While such changes may have an effect in the longer-run, short-run fluctuations in the value of assets may well fail to affect consumption and well-being.

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[5] One may worry that the difference in adjusted in R^2 between columns (9) and (10) is too small to be statistically significant. To formally test whether the model with permanent and transitory income and wealth has a better predictive power than the model with actual income and wealth, we follow Wooldridge (2010) and perform a Vuong closeness test for non-nested models (Vuong 1989). The Vuong closeness test confirms that the predictive power of the former model is statistically higher (at the 1% level) than the latter model.

[6] To the extent measurement errors are non-permanent, our transitory shocks will reflect both true income shocks and measurement errors. Our results may thus be downward-biased; as we have more current income than wealth measurements, measurement noise in wealth could be greater relative to signal than for income, we might find transitory income matters but wealth not. It is, unfortunately, very difficult to think of a valid instrument – one that is uncorrelated with measurement errors and life satisfaction but is correlated with true transitory wealth shocks – that would allow us to address this.

Table 3 Life satisfaction in $t+1$ and permanent income and wealth: OLS results

	Life satisfaction in $t+1$			
	(1)	(2)	(3)	(4)
Permanent income (5 years)	0.122***		0.103***	0.106***
	(0.011)		(0.011)	(0.011)
Permanent wealth (over 5 years)		0.086***	0.061***	0.065***
		(0.009)	(0.010)	(0.010)
Permanent income * permanent wealth				−0.014*
				(0.008)
Observations	11,295	11,295	11,295	11,295
Adjusted R^2	0.223	0.219	0.226	0.226

Standard errors in parentheses are clustered at the household level. The dependent variable and the independent variables presented in this table are standardized. Controls include age, age squared, gender, years of education, marital status, number of children in the household, the labour-force status, self-assessed health, year fixed effects and region fixed effects. $^*p<0.1$, $^{**}p<0.05$, $^{***}p<0.01$

One interesting observation concerns the comparison of the point estimates on current income and wealth compared to those that distinguish between permanent and transitory variables—compare columns (1) and (5) with e.g. columns (3) and (7) in Table 2. The point estimates on current values are substantially greater than the sum of those on permanent and transitory—in the case of wealth, by a factor of 2. If transitory income (wealth) were uncorrelated with permanent income (wealth), as in classical measurement error models, the coefficient on current income (wealth) should roughly equal the weighted sum of those on permanent and transitory income (wealth). Now the transitory deviations likely depend on the level of permanent income or wealth in such a way that current values overestimate the effect of changes in permanent income or wealth. That the relationship between permanent and transitory terms may be quite complex is lent some support from the finding that transitory losses (of income), not gains, affect life satisfaction.

4.2 Permanent Income and Permanent Wealth: Complements or Substitutes?

Columns (1) and (2) of Table 3 repeat for comparison columns (2) and (6) of Table 2: permanent income and permanent wealth significantly predict future life satisfaction. Controlling for both of these two variables in the same regression in column (3) does not affect this result. Equation 3 is estimated in column (4). The estimated coefficient on the interaction between permanent income and permanent wealth is negative (albeit only marginally significant). This means that the positive effect of permanent wealth (income) is lower when the level of permanent income (wealth) is higher. Permanent wealth and permanent income are then substitutes.

Table 4 Life satisfaction in t + 1 and relative permanent income and wealth: OLS results

	Life satisfaction in $t+1$				
	(1)	(2)	(3)	(4)	(5)
Permanent income (5 years)	0.120***	0.118***			0.101***
	(0.012)	(0.017)			(0.018)
Comparison income	−0.052***	−0.051***			−0.040***
	(0.017)	(0.017)			(0.012)
More than comparison income		0.009			0.003
		(0.026)			(0.024)
Permanent wealth (over 5 years)			0.078***	0.055***	0.037**
			(0.010)	(0.016)	(0.016)
Comparison wealth			0.053***	0.056***	0.051***
			(0.013)	(0.013)	(0.012)
More than comparison wealth				0.061*	0.050*
				(0.031)	(0.028)
Observations	11,295	11,295	11,295	11,295	11,295
Adjusted R^2	0.215	0.215	0.212	0.212	0.219

Standard errors in parentheses are clustered at the (age group*gender*region) level. The dependent variable and the independent variables presented in this table are standardized. Controls include age, age squared, gender, years of education, marital status, number of children in the household, the labour-force status, self-assessed health, year fixed effects and region fixed effects. *$p<0.1$, **$p<0.05$, ***$p<0.01$

4.3 Relative Permanent Income and Relative Permanent Wealth: Comparison Effect or Information Effect or Else?

Table 4 presents the estimates of Eq. 4 and addresses the question of the impact of comparisons regarding the permanent component of income and wealth. According to the results in columns (1) and (2), the higher the permanent income of the reference group, the lower is future life satisfaction. We interpret this finding as supporting the presence of a comparison effect. The coefficient estimate on the dummy indicating whether own permanent income is above the comparison income is not significant. According to the results in columns (3) and (4), the higher the level of comparison wealth, the higher is the level of life satisfaction, indicating that the information effect dominates when estimating the impact of permanent wealth of the reference group. This result is in line with the Australian evidence of Brown and Gray (2016).

An additional interpretation of this finding relies on the positive externalities produced by richer individuals in terms of the quality of the neighbourhood and its sense of safety and security, which could lead an individual to have a higher evaluation of her own life satisfaction when living with richer peers. In addition, as revealed in column (4), adding a measure of rank in the permanent wealth distribution also yields a significant and positive coefficient estimate, suggesting that the individual still enjoys having more than

Table 5 Life satisfaction in t+1 and the composition of permanent wealth: OLS results

	Life satisfaction in $t+1$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Permanent income	0.122***					0.100***	0.103***	
	(0.011)					(0.011)	(0.011)	
Permanent labour income		0.132***	0.089*					0.080*
		(0.048)	(0.048)					(0.047)
Permanent capital income		0.022**	0.002					−0.000
		(0.010)	(0.011)					(0.11)
Permanent government income		0.117***	0.094***					0.091***
		(0.020)	(0.020)					(0.020)
Permanent taxes		−0.010	−0.034					−0.040
		(0.040)	(0.039)					(0.039)
Permanent wealth			0.067***	0.086***			0.061***	
			(0.010)	(0.009)			(0.010)	
Permanent net real estate					0.052***	0.042***		0.044***
					(0.010)	(0.010)		(0.010)
Permanent financial assets					0.084***	0.048**		0.055***
					(0.019)	(0.019)		(0.020)
Permanent private insurance					0.039***	0.021*		0.023**
					(0.011)	(0.011)		(0.011)
Permanent business assets					0.086**	0.084**		0.102***
					(0.043)	(0.041)		(0.041)
Permanent collectibles					0.006	0.000		0.002
					(0.010)	(0.008)		(0.008)
Permanent credit debt					−0.024**	−0.023*		−0.025**
					(0.010)	(0.010)		(0.010)
Observations	11,295	11,295	11,295	11,295	11,295	11,295	11,295	11,295
Adjusted R^2	0.225	0.225	0.228	0.221	0.222	0.228	0.227	0.229

Standard errors in parentheses are clustered at the household level. The dependent variable and the independent variables presented in this table are standardized. Controls include age, age squared, gender, years of education, marital status, number of children in the household, the labour-force status, self-assessed health, year fixed effects and region fixed effects. $^*p<0.1$, $^{**}p<0.05$, $^{***}p<0.01$

others. Controlling for all the independent variables in column (5) does not change our conclusions: the average income of the reference group has a negative impact on future life satisfaction, while an increase in the level of comparison permanent wealth and a higher position in the distribution of permanent wealth both predict significant increases in future happiness.[7] These findings are similar to Clark et al. (2009): although a wealthier reference

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[7] We replicated our analysis using other measures of rank (quartiles and deciles) and the results remain qualitatively the same.

group appears to be welcome, being at the top of the distribution also matters. Finally, the total effect of an increase of one standard deviation in own and relative permanent wealth is significantly higher than an increase of the same magnitude in own and relative permanent income for individuals with relatively high positions in the wealth distribution (the difference turns out to be non-statistically different from zero for individuals with relatively low positions in the wealth distribution).

4.4 The Different Components of Permanent Income and Wealth

In Table 5, we decompose our measure of permanent income and wealth to explore the predictive power of each of their respective dimensions. In column (1), we only report the predictive power of permanent income (positive and significantly different from zero). We then decompose the permanent income into its four components (labour income, capital income, government income and taxes) and show in column (2) that labour, capital and government income significantly predict future life satisfaction. Controlling for permanent wealth in column (3) reduces the predictive power of all the components of permanent income. The value of permanent capital income becomes even statistically not different from zero. This finding suggests that capital income does not have influence on future life satisfaction *per se* but it was probably capturing wealth effects in column (2). To examine which components account for the predictive power of permanent wealth, reported in column (4), we decompose it into permanent net real estate, financial assets, private insurance, business assets, collectibles and credit debt. The results, shown in column (5), suggest that most of the components of wealth are statistically significant predictors of future life satisfaction. However, including the value of permanent income as an additional control in column (6) reduces the predictive power of the components of permanent wealth and now only permanent net real estate, financial assets and business assets remain statistically significant (at the 5% level or lower). Pairwise Wald tests confirm that the three coefficients are of similar size. This implies that an increase of one standard deviation in the value of permanent real estate is equal to an increase of one standard deviation in the value of permanent business assets or permanent financial assets. A reduction in the value of permanent consumer debt also predicts a significant increase in future life satisfaction. In column (8), we control for all of the components of permanent income and wealth in the same regression to identify the best predictors of future life satisfaction and results remains similar.[8] We report in column (7) the estimates when we only control for permanent income and wealth for comparison purposes. The adjusted R^2 suggest that the quality of the fit is higher when we account separately for all the components of permanent income and wealth.[9]

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[8] We also estimate the effects of gains and losses in the different components of income and wealth and find that only losses in capital income, in government income and in debt are significant predictors of future life satisfaction. Results (not reported for brevity) are available upon request.

[9] We performed a Vuong closeness test and confirm that the predictive power of the specification in the column (8) is significantly higher at the 1% level than the predictive power of the specification in the column (7).

4.5 Controlling for the Influence of Time Invariant Heterogeneity

While we reduce the concern reverse causality by using life satisfaction in year $t+1$ as the dependent variable, the estimates presented above may still be inconsistent because of the influence of omitted, unobserved variables. With a panel such as SOEP, one intuitive way to control for the influence of time-invariant unobserved heterogeneity would be to include individual fixed effects. However, the number of individuals observed twice in our estimation sample is relatively low: only 2586 individuals out of 8709. Moreover, permanent income and wealth are, conceptually, time invariant. Using the mean of the past values of current income and wealth as empirical proxies for permanent income and wealth leaves room for individual variation over time but such within-individual variance in permanent income and wealth in our estimation sample (not reported) remains very limited, preventing us from estimating an individual-level fixed-effects model.

An alternative strategy to control for the influence of time-invariant heterogeneity is to estimate a model controlling for life satisfaction at t. This can be considered as a Granger test for causality; the intuition of this value-added model is that the influence of any vector of time-invariant omitted variables Z that predicts both permanent wealth and income at t and life satisfaction at $t+1$ will be picked up by life satisfaction at t. While this test does not rule out all concerns of endogeneity and is, specifically, not intended to be interpreted causally, it allows controlling for the influence of unobserved time invariant factors influencing both our independent variables and life satisfaction.

We re-run all the regressions of this article using this approach, with Table 6 reporting the regressions corresponding to those with results in Table 2. The magnitude of all the coefficients is lower in Table 6 but they remain statistically significant; this means that time-invariant heterogeneity partially accounts for the estimates in Table 2. Nevertheless, the results remain qualitatively similar: the model with the best predictive power is the one accounting separately for the impact of permanent income and wealth with only loss in income associated with a negative and significant estimate; see column (10) of Table 6. Re-estimating all of the remaining regressions results in qualitatively unchanged findings (results are available upon request).[10]

4.6 Heterogeneity in the Relationship Between Permanent Income, Permanent Wealth and Life Satisfaction

This article focused so far on the average effect of permanent income and permanent wealth on life satisfaction by employing multivariate regressions that focus on the conditional mean of the dependent variable. The focus on the average effect neglects potential heterogeneity in their impact across the distribution of life satisfaction. Binder and Coad (2015) use conditional quantile regressions and find that the impact of unemployment on subjective well-being is lower for individuals with high life satisfaction. We follow their approach and also estimate our regression equations using conditional quantile regressions (estimating standard errors using bootstrapping).

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[10] Using OLS without individual fixed effects raises the question of interpersonal comparability. But the systematic prediction of future outcomes by current subjective well-being scores using cross-section data show that they may be considered as interpersonally comparable (see Clark 2001 and Freeman 1978, for example, and De Neve et al. 2013, for a recent summary).

Table 6 Life satisfaction in t+1 and permanent income and wealth: OLS results (value added model)

	Life satisfaction in t+1									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Current income	0.074*** (0.017)								0.061*** (0.017)	
Permanent income (5 years)		0.048*** (0.009)	0.048*** (0.009)	0.053*** (0.009)						0.043*** (0.010)
Deviation from permanent income			0.004 (0.016)							
Gain compared to permanent income				−0.023 (0.023)						−0.022 (0.022)
Loss compared to permanent income				−0.048* (0.029)						−0.052* (0.029)
Current wealth					0.086*** (0.019)				0.072*** (0.019)	
Permanent wealth (over 5 years)						0.045*** (0.008)	0.046*** (0.008)	0.049*** (0.010)		0.039*** (0.010)
Deviation from permanent wealth							−0.018 (0.015)			
Gain compared to permanent wealth								−0.030 (0.028)		−0.026 (0.028)
Loss compared to permanent wealth								0.005 (0.028)		0.012 (0.029)
Life satisfaction in t	0.518*** (0.011)	0.517*** (0.011)	0.517*** (0.011)	0.517*** (0.011)	0.520*** (0.011)	0.520*** (0.011)	0.520*** (0.011)	0.520*** (0.011)	0.517*** (0.011)	0.515*** (0.011)
Observations	11,295	11,295	11,295	11,295	11,295	11,295	11,295	11,295	11,295	11,295
Adjusted R²	0.407	0.408	0.408	0.408	0.407	0.408	0.408	0.408	0.408	0.409

Standard errors in parentheses are clustered at the household level. The dependent variable and the independent variables presented in this table are standardized. Controls include age, age squared, gender, years of education, marital status, number of children in the household, the labour-force status, self-assessed health, year fixed effects and region fixed effects. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$
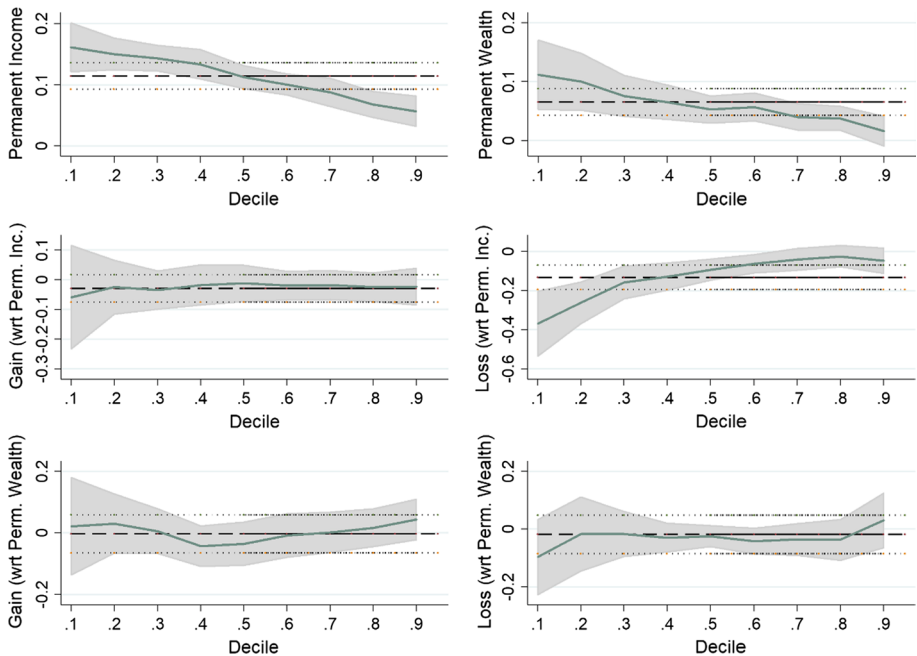
Fig. 1 The permanent income and permanent wealth effects over the decile thresholds of life satisfaction. *Notes* The green lines in this graph show the estimated life-satisfaction coefficient at the nine different decile thresholds, and the grey area the associated 95% confidence intervals. The horizontal lines are the average effects in the whole sample from Table 2, column 10 (with its associated confidence interval). (Color figure online)

Figure 1 shows the average predictive powers of permanent income, permanent wealth and deviations from permanent income and from permanent wealth along with their predictive powers across different life-satisfaction deciles. The predictive power of permanent income and permanent wealth is always positive but it converges towards zero over the life-satisfaction deciles. The estimate of permanent income at the top decile even turns out to be insignificant. The effect of a transitory loss in income is negative and significant only for the six first life-satisfaction decile thresholds. The effects of the other transitory shocks per life-satisfaction deciles are not significantly different from their respective average predictive power. We also re-restimate the regression equations shown in in Tables 3, 4 and 5; the estimates for the life-satisfaction deciles (not reported) are virtually the same as the average estimates. A noticeable exception is the effect of the value of permanent real estate: it is higher for the unhappiest than is the average effect and is close to zero for the happiest.

We know that the determinants of life satisfaction also differ according to individual characteristics. Fugl-Meyer et al. (2002) shows that the causes of happiness are different for men and women while the income gradient is stronger in poorer areas. We account for these different sources of heterogeneity by splitting our estimation sample by gender and between West and East Germany. Columns (1), (3), (5) and (7) in Table 7 show the

Table 7 Life satisfaction in t+1 and permanent income and wealth: OLS results

| | Life satisfaction in $t+1$ | | | | | | | |
| | Males | | Females | | West Germany | | East Germany | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Current income	0.165***		0.182***		0.135***		0.312***	
	(0.032)		(0.029)		(0.024)		(0.041)	
Permanent income (5 years)		0.113***		0.116***		0.095***		0.174***
		(0.017)		(0.016)		(0.013)		(0.024)
Gain compared to permanent income		−0.040		−0.015		−0.040		0.042
		(0.042)		(0.034)		(0.030)		(0.047)
Loss compared to permanent income		−0.126***		−0.138***		−0.114***		−0.213***
		(0.049)		(0.049)		(0.039)		(0.071)
Current wealth	0.129***		0.153***		0.129***		0.204***	
	(0.032)		(0.031)		(0.025)		(0.051)	
Permanent wealth (over 5 years)		0.072***		0.058***		0.057***		0.122***
		(0.017)		(0.017)		(0.014)		(0.028)
Gain compared to permanent wealth		−0.054		0.043		−0.000		−0.055
		(0.046)		(0.047)		(0.037)		(0.064)
Loss compared to permanent wealth		−0.017		−0.020		−0.028		0.047
		(0.050)		(0.045)		(0.037)		(0.084)
Observations		5336		5959		7890		3405
Pseudo R^2	0.254	0.257	0.199	0.200	0.219	0.221	0.216	0.219

Standard errors in parentheses are clustered at the household level. The dependent variable and the independent variables presented in this table are standardized. Controls include age, age squared, gender, years of education, marital status, number of children in the household, the labour-force status, self-assessed health, year fixed effects and region fixed effects. * $p<0.1$, ** $p<0.05$, *** $p<0.01$

predictive power of actual income and wealth for each sub-groups while the other columns report the predictive power of permanent income and wealth as well as their transitory values.

Our analysis does not reveal significant differences between men and women. However, the predictive power of the income and wealth variables is almost always bigger in East compared to West Germany. This is consistent with the literature showing that current income has a stronger impact in lower income countries (see Clark et al. 2008, for a literature review). We also estimate for each subgroup the equations reported in Tables 3, 4 and 5, available upon request. While we find no significant differences between men and women, we do find that the effects detected in Table 5 are in general stronger for East Germany. We do not find any difference between West and East Germany when estimating the equations reported in Tables 3 and 4.[11]

5 Conclusion

Most of the earlier research on the relationship between income and subjective well-being does not treat current income as the sum of permanent income and a transitory shock. Thus, they implicitly assume that the impacts of permanent income and transitory shocks on subjective well-being are the same. The roles of current wealth and permanent wealth have also so far received scant attention in the literature.

We show, first, that specifications using both permanent income and permanent wealth and measures of transitory shocks are better predictors of future life satisfaction than specifications that only control for the current values of income and wealth. We also find that deviations from permanent income are detrimental to life satisfaction and that stability of permanent income is associated with the highest level of well-being. Deviations from permanent wealth are not significantly correlated with life satisfaction. This set of results contradicts the (implicit) assumption made in the literature so far because we demonstrated that permanent income and wealth and deviations from them have significantly different predictive powers.

Our findings suggest that current income and wealth may overpredict life satisfaction relative to permanent income and wealth. Moreover, income shocks, at least, affect well-being asymmetrically in that only losses appear to matter. In light of our findings, public policies aimed at providing support for increasing long-run income and wealth and protection against transitory income losses would appear to best support subjective well-being.

We also provide evidence supporting substitutability between permanent income and wealth in terms of life satisfaction. However, the impact of permanent income and permanent wealth of the reference group differ: the first exerts a comparison effect while the latter produces an information effect. These findings suggest that supporting increases in long-run wealth rather than in income may be even more efficient in terms of well-being.

Finally, we contribute to the literature by splitting permanent income and wealth into their sub-components. Our results suggest that not all types of wealth are statistically significant predictors of life satisfaction. Only the value of permanent net real estate, financial and business assets predict higher level of happiness in the future. The value of the

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[11] We also explored heterogeneity with respect to sociodemographic characteristics such as age, education and level of income and wealth but failed to identify results significantly different. We also estimated separately our regressions for the wave "2007" and "2012" to account for potential differences due to the economic crisis of 2008 but results remain stable before and after the crisis.

permanent consumer debt is also negatively correlated with life satisfaction. Public policies aiming at encouraging the accumulation of wealth should focus on real estate, financial and business assets, if increasing life satisfaction is a goal of public policy.

While the reader should be aware of the limitations of this paper (measurement errors and endogeneity issues *in primis*), we here provide evidence that the effect of economic resources on individual well-being goes largely beyond income. Further investigations in this direction seems to us a promising research area.

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