Does Happiness Adapt to Poverty? And, Poverty to Happiness?

Sara Ayllón (Universitat de Girona, Spain)

Paper Prepared for the IARIW 33rd General Conference

Rotterdam, the Netherlands, August 24-30, 2014

First Poster Session

Time: Monday, August 25, Late Afternoon

Does happiness adapt to poverty? And, poverty to happiness? *

Sara Ayllón
Department of Economics & EQUALITAS
University of Girona

(VERY) PRELIMINARY (UNFINISHED) VERSION.
PLEASE DO NOT CITE OR QUOTE

Abstract

This paper studies to what extent poverty and psychological well-being can be thought of inputs in a feedback loop by which poverty may exert an influence on unhappiness and, at the same time, past low levels of general satisfaction with life may lead to economic hardship. This interrelationship is studied by means of an econometric strategy with feedback effects using data from the German Socio-Economic Panel (SOEP) for the period between 1992 and 2010. Results indicate that when accounting for high-order dynamics, past poverty experiences do not increase the probability of feeling unhappy which can be interpreted as a certain degree of psychological adaptation to poverty. On the other hand, unhappiness has a (short-lived) positive influence on the probability of being in poverty. Evidence suggests that psychological uneasiness can be added as an explanation to persistent poverty.

JEL classification: I31, D60
Keywords: happiness, poverty, adaptation, state dependence, feedback-effects, Germany

*Correspondance to: C/Universtat de Girona 10, 17071, Girona (Spain). E-mail: sara.ayllon@udg.edu. Tel.: +34 972 418 779, Financial support from the projects ECO2010-21668-C03-02, ECO2013-46516-C4-1-R and XREPP (Direcció General de Recerca) is acknowledged. Data used in this paper was made available by the German Socio-Economic Panel Study (SOEP) at the German Institute for Economic Research (DIW). Any errors or misinterpretations are my own.

1 Introduction

This paper studies to what extent poverty and psychological well-being can be thought of inputs in a feedback loop by which poverty may exert an influence on unhappiness and, at the same time, past low levels of general satisfaction with life may lead to economic hardship. On the one hand, while the mechanisms are still the focus of attention of current research, it has been found that stress, depression, negative affect or dissatisfaction have an influence on economic behaviours that often impede individuals to take the kind of decisions that would help them leaving poverty (Mullainathan and Shafir, 2013). From the small but growing literature on behavioural economics applied to the understanding of poverty, we are learning that poor individuals suffer not only material scarcity but also a scarcity of mental resources (attention, understanding, cognitive capacity) that explains behaviours that would be qualified as "irrational" by standard economic theory (Jäntti, Kanbur, and Pirttilä, 2014a).[1] Moreover, not only behaviour but personality traits may also play a role at explaining poverty —for example, optimistic and agreeable individuals are known to be more likely to find a job or a partner with whom to share income.

On the other hand, it is natural to think that the economic condition of a household, as many other domains in life, influences individuals' life satisfaction. The effect of income on happiness has been studied before (Tella, Haisken-De New, and MacCulloch, 2010) but much less attention has been given to the group of those at the bottom of the income distribution which are considered poor (with the exception of Clark, D'Ambrosio, and Ghislandi, 2014, commented below). While it seems obvious that poverty should necessarily be associated with dissatisfaction, behavioural economics and the tenets of 'Prospect Theory' teach us that individuals' judgements depend on previous experiences and that the past can offset the present because individuals change expectations (Kahneman and Tversky, 1979).[2]

Thus, embended in the analysis of the interrelationship between poverty and subjective well-being, there is the question of adaptation. Happiness scholars have long studied the consequences of certain life events to determine whether human beings are capable to adapt to their new situation and recover their levels of well-being or happiness. Divorce, disability, unemployment, layoffs or factory closings are some of the analysed events. See, among many others, Oswald and Powdthavee (2008), Lucas, Clark, Georgellis, and Diener (2003), Winkelmann and Winkelmann (1998), Clark and Oswald (1994), Clark, Georgellis, and Sanfey (2001) and references within.[3] The literature has concluded in favour of adaptation to most events except unemployment (Clark, D'Ambrosio, and Ghislandi, 2014).

According to Ferrer-i-Carbonell and Van Praag (2008), individuals also adapt to income changes: higher income will not bring much additional happiness because individuals adapt their beliefs about what is satisfactory to their changing circumstances. The result is that income increases will only yield temporary increases in happiness. In the paper, they study the adaptation phenomenon and find that the results depend on the model specification used. They examine possible asymmetries that depend on the direction of the change (income increases vs. income decreases) and conclude that if there is any de-

[1] See the recent special issue 'Poverty, Development and Behavioral Economics' in the *Review of Income and Wealth* of March 2014 edited by Markus Jäntti, Ravi Kanbur and Jukka Pirttilä.

[2] As explained in Jäntti et *al.* (2014) one of the main ingredients of Prospect Theory is reference-dependence by which "welfare depends more on deviations from a reference level than on actual levels" (p.183).

[3] Ferrer-i-Carbonell (2013) contains an excellent literature review.

gree of income adaptation, that is to income decreases. In this paper, I question whether these conclusions still apply when income falls so short as to bring individuals below the poverty line.

While the relationship between income and happiness has attracted lots of attention in the literature, the one between happiness and poverty has not. The closest work to this paper is the recent study by Clark, D'Ambrosio, and Ghislandi (2014). The authors analyse the influence of past poverty on the current level of subjective well-being while accounting not only for the incidence of poverty but also its intensity. They show that life satisfaction falls with poverty and that individuals do not adapt to their economic deprivation status independently of the length of their poverty spell. The negative consequences of poverty on life satisfaction persist even if the poverty spell already ended. And, they also show that the levels of subjective well-being are lower if poverty spells are concatenated, indicating a certain preference for income stability (even at so low levels). However, the authors' analysis, while having the advantage of being based on within-subject estimations, is restricted to the first poverty spell observed in the panel and therefore ignores other dynamics.[4]

More importantly, the scarce previous literature has not taken into account the possibility that not only poverty may affect subjective well-being, but that life satisfaction levels can have an influence on the households' economic situation. To my understanding, poverty dynamics and psychological resilience (or lack of it) can be thought of endogenous processes much affected by reverse causality. In this sense, and as explained by Haushofer and Fehr (2014) in their exceptional review, a key feature for the analysis of the relationship between poverty and psychology is the temporal dimension which remains very much unexplored. In this paper, I take up this drawback by jointly modelling poverty and unhappiness while considering up to third-order dynamics. In this first attempt, I estimate a bivariate probit model that controls for state dependence, feedback effects, initial conditions and unobserved heterogeneity.

Much of the research on the link between psychology and poverty, developed by behavioural economists, is based and restricted to laboratory studies or natural experiments (Banerjee and Duflo, 2011). This paper intends to shed some light on the relationship between life satisfaction and poverty with data from a large longitudinal survey that it is representative of a whole nation. Moreover, differently from the growing literature on the topic that mostly refers to low and middle-income countries, I use data from Germany, one of the richest countries in Europe.

My results indicate that when accounting for high-order dynamics, past poverty experiences do not increase the probability of feeling unhappy which I interpret as evidence of psychological adaptation to poverty. Indeed, the probability of unhappiness for those that are persistently poor is not different from the one of those sporadically poor. However, I find a shortly-lived feedback from previous years life satisfaction statuses to poverty. So, psychological uneasiness can be added as an explanation to persistent poverty.

The structure of this paper is as follows. After this introduction, I present the dataset used and some descriptives. Section 3 describes the econometric strategy and Section 4 presents the main results. Last section summarises the findings and proposes new avenues for future research.

[4] A disadvantage of the fixed effects models used by Clark, D'Ambrosio, and Ghislandi (2014) is that they cannot assess the effect of important time-invariant characteristics as sex, education or marital status (if they do not change during the studied period). Also, all the individuals in the sample need to participate at least for five consecutive waves which may arbitrarily select the sample.

2 Data, descriptives and definitions

Data is from the German Socio-Economic Panel (SOEP) which is probably one of the datasets most used in the analysis of subjective well-being in Europe and has the great advantage of having run for a long time now.[5] As in Clark, D'Ambrosio, and Ghislandi (2014), the period of analysis goes from 1992 to 2010. Even if the survey started in 1984, I restrict the sample period to start in 1992 because it is the first wave of data for which information is available for East Germany. On average, individuals in the used sample have participated 12 waves.

Following the recommendations for poverty measurement set by the European Commission, an individual is defined as poor if his equivalent household income is below 60% of the same distribution median (see Atkinson et *al.*, 2002). In my case, the income distribution used refers to post-government income and includes imputed rents. Moreover, I use the modified OECD equivalence scale that gives a weight of 1 to the first adult, of 0.5 to the rest of members over the age of 13 and 0.3 to children under the age of 14. I follow a relative approach to poverty measurement which implies that each year the poverty threshold varies.[6] On average, 12.4% of the sample is considered poor.

The level of well-being or *happiness* is measured in the SOEP data on a 11-point scale (from 0 for individuals with a low level of general satisfaction with life and 10 for those with a high level). The question on 'general satisfaction with life now' is asked to all individuals above the age of 16 but I restricted the analysis to individuals that are 18 or older given that the number of missing values for young people at the age of 17 was abnormally large. Thus, the analysis refers to the adult population in Germany. Note that SOEP data gives the possibility to work with individual answers to the happiness question which offers a great advantage compare to variables that measure well-being at the household level via the answer of a household head or representative (which is then imputed to the rest of household members). This is the case, for example, for well-being measured by perceived financial difficulties (see Ayllón and Fusco, 2014). Having the variable at the individual level allows enough variability within the household and the possibility that poverty affects well-being differently to each household member.

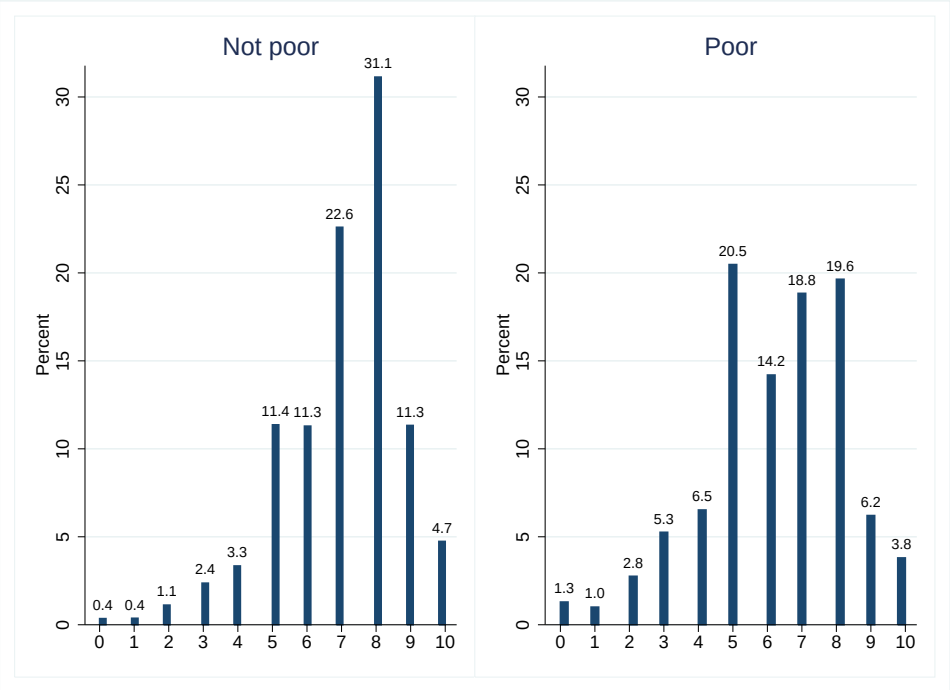
In this first econometric attempt to account for the interrelationship between poverty and happiness, the dichotomization of the well-being variable was required. In this case, and given that the median value is 7 and the mean 6.89, I considered as 'unhappy' individuals with a value below 5 and as 'happy' those with 5 or more. This means that 9.4% of the sample are considered 'unhappy' and the rest 'happy'. The use of this threshold has the advantatge of capturing those truly unsatisfied and allows working with a similar group in size than those considered poor. Robustness checks will be carried out to assess possible differences in the results.

As for the relationship between happiness and poverty, Figure 1 shows the histogram for happiness levels according to poverty status and clearly indicates that high levels of happiness are more frequent among individuals that are not poor than among those that are poor. Indeed, a kernel function for happiness levels (Figure 2) also shows that the density for general satisfaction with life among non poor individuals is clearly on the right of the same function among the poor, which indicates higher levels of well-being among

[5]The data used was extracted using the Add-On package PanelWhiz v3.0 (Nov 2010) for Stata. See Haisken-DeNew and Hahn (2010) for a description of PanelWhiz in detail.

[6]Sampling weights are used throughout the poverty analysis so that results are not affected by oversampling of certain groups —for example, immigrants in 1994 and rich households in 2002.

Figure 1: Frequency distribution of happiness levels according to poverty status, adult population in Germany, 1992-2010



Source: Own calculations on SOEP, 1992-2010. Weighted results.

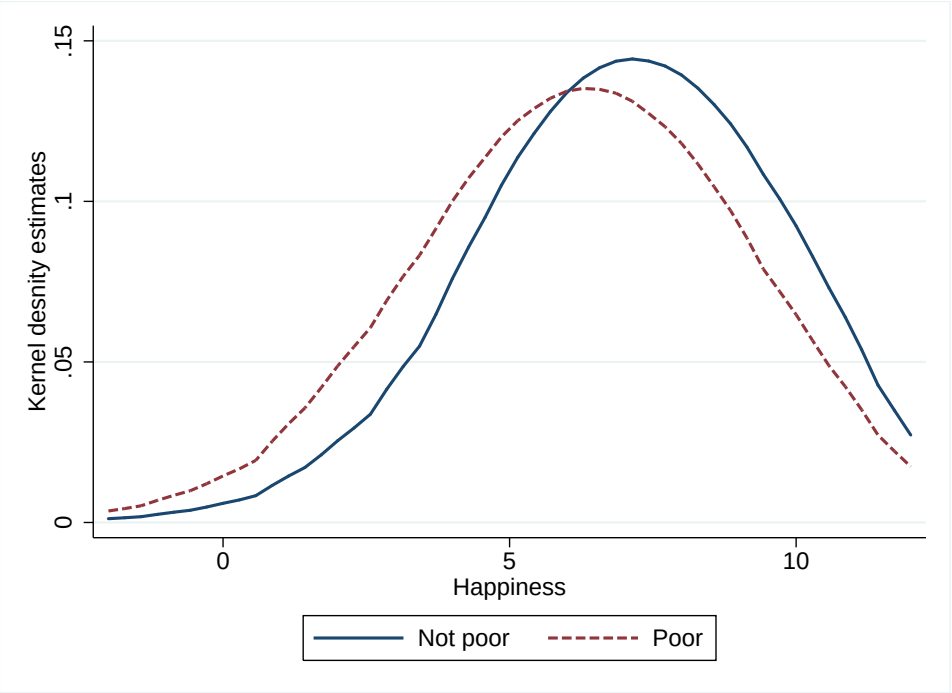
individuals with incomes above the poverty line.

Next descriptives introduce the temporal dimension in the analysis. First graph in Figure 3 compares the average happiness level for individuals neither poor at $t-1$ nor at t to the group of not poor at $t-1$ that enter poverty at t. As shown, the average level of happiness decreases 0.7 points. On the contrary, happiness levels increase when comparing the group of individuals that remain poor to those that manage to escape within a year. The average increase is of 0.4 points. Thus, individuals' level of happiness depends on current and lagged poverty statuses and decreases more when income falls below the poverty line than what it increases when leaving poverty behind.[7] When averaging happiness levels while accounting for the poverty status at t conditional on the status at $t-2$ and at $t-3$, very similar graphs were produced and therefore they are not shown. This means that, at a descriptive level, I do not observe differences in the average level of happiness among poor individuals at t conditional at not being poor at $t-1$, $t-2$ or $t-3$. And the same is true for individuals not poor at t that were in poverty any of the three previous years.

What about the influence of the accummulated number of poverty spells on happiness? Table 1 shows the average level of happiness depending on the total number of years in poverty out of those considered. All the columns indicate that any spell in poverty reduces the individuals' happiness levels. But, it is interesting to note that it is with one year in poverty when average happiness is mostly reduced (independently of the number of previous years considered). As a matter of fact, last columns show that the accummulation

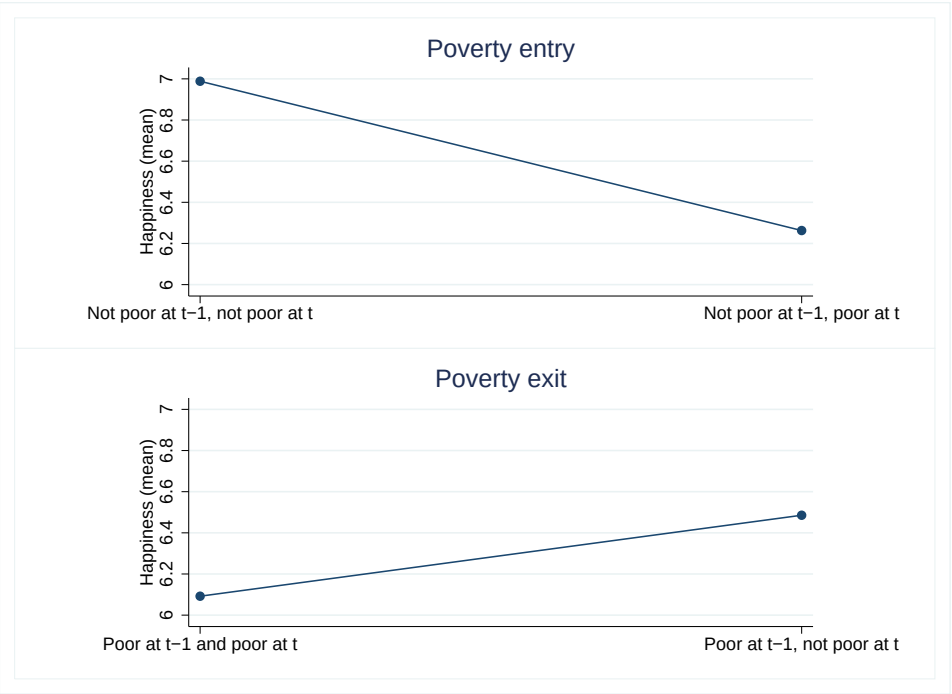
[7]Note that this would conform with one of the tenets of Prospect Theory: "loss aversion" establishes that negative changes have a greater impact on welfare than gains of the same magnitude (see Jäntti et *al.*, 2014a).

Figure 2: Kernel density function for happiness levels according to poverty status, adult population in Germany, 1992-2010



Source: Own calculations on SOEP, 1992-2010. Half-width of 2.

Figure 3: Average level of happiness for individuals that enter poverty and for those that exit it



Source: Own calculations on SOEP, 1992-2010. Adult population in Germany. Weighted results.

of 4 poverty spells out of 4 years considered, only reduces happiness 0.15 points compare to someone that has experienced 3 out of 4. In a similar fashion, living in poverty 3 out of 3 compared to someone that only suffers 2 out of 3, reduces mean happiness by 0.20 points. So, from the descriptive statistics, it would seem than individuals react to more poverty spells by partially adjusting their life satisfaction levels.

Table 1: Average happiness levels according to number of spells in poverty out of previous years considered

	No. of previous years considered							
No. of spells	1 year		2 years		3 years		4 years	
accummulated		*diff.*		*diff.*		*diff.*		*diff.*
0	6,95	-	6,94	-	6,94	-	6,93	-
1	6,23	*-0,72*	6,39	*-0,55*	6,48	*-0,46*	6,53	*-0,40*
2			6,13	*-0,26*	6,25	*-0,23*	6,37	*-0,16*
3					6,05	*-0,20*	6,16	*-0,21*
4							6,01	*-0,15*

Source: Own calculations on SOEP, 1992-2010. Adult population in Germany. Weighted results.

Regarding the influence of happiness on poverty, I do not believe that an immediate effect of low satisfaction with life on economic hardship can be accounted for but rather that past feelings of depression, discourangement or negative affect may have an effect on the current income-generating capacity. Indeed, Table 2 shows that 'unhappy' people at $t-1$ are much more likely to be poor at t than 'happy' individuals. Actually, the headcount ratio more than doubles. Results are very similar when poverty status is conditioned on the level of satisfaction at $t-2$ and at $t-3$ (not shown) with a small reduction on the probability of being poor amongst unhappy people the further we look at the past —meaning that the effect of past low satisfaction levels slightly dilutes with time. The accummulation of periods as an unhappy person also has an effect on poverty: individuals that accummulate 3 out of 3 years with low satisfaction levels have a probability of being poor of 25.8% while it is of 18.5% if 1 out of 3 and, 10.0% if none. In the remainder of the paper, I try to disentangle how much of these relationships are the result of a causal mechanism.

Table 2: Probability of being poor at t depending on the level of (un)happiness at $t-1$

		Poverty status at t		
		Not poor	Poor	Total
Satisfaction with life at $t-1$	Happy	88.9	11.1	100.0
	Unhappy	76.9	23.1	100.0
	Total	87.9	12.1	100.0

Source: Own calculations on SOEP, 1992-2010. Adult population in Germany. Weighted results.

Finally, the explanatory variables in the analysis include gender, age (in logarithms), residency in East or West Germany, number of years in education (in logarithms), marital status (married, divorced/separated, single and widow), labour market status (distinguishing between employed, unemployed, self-employed, disable, inactive), the number of

children between the ages of 0-5, 6-10, 11-14 and the number of teenagers between the ages of 15 and 17, household size, and wave dummies. In total, 357.805 observations are used which belong to 47.045 individuals.

3 Econometric strategy: state dependence, feedback effects and endogeneity

The analysis of the dynamics and the relationship between poverty and happiness, as well as the possible level of adaptation between both phenomena needs to be approached econometrically with a joint model. When doing so, there are multiple issues that one needs to consider but two are of special relevance.

First, it is important to take into account that both happiness and poverty are likely to be affected by a considerable degree of genuine state dependence. That is, past levels of happiness are likely to affect (by themselves) current levels of well-being. And, the same is true for poverty. Normally, such effect is accounted for by including in the right hand side the lagged value of the outcome we are analysing. However, we do not have information on all past experiences because the observation window in any typical survey contains only a certain number of observations. As a result, we are confronted with an initial conditions problem. Moreover, unobserved factors are unlikely to be independent of the initial response. Ignoring such dependence would yield inconsistent estimates.[8]

Second, it is important to take into account that different individuals could vary in their responses because of unobserved covariates. For example, in the case of happiness, unobservables could refer to certain personality traits. This means that covariates are unlikely to be independent of the random intercept (the so-called endogenous covariates problem). Ignoring unobserved heterogeneity would overestimate the importance of state dependence (see, for instance, Biewen, 2009; Weber, 2002).

In this first attempt, I choose to dichotomize the well-being variable so that the results will be the outcome of a bivariate probit. As explained by Wilde (2000), the simple introduction of a varying exogenous regressor in a system of multiple equation probit models with endogenous dummy regressors ensures identification and this is crucial given the lack of exclusion restritions in the dataset.[9] As explained above, I define as unhappy an individual that responds to the survey question that his level of well-being is 5 or below.

Let $h_{it} = 1$ if an individual i is unhappy at t and $h_{it} = 0$ if he is not. Let $p_{it} = 1$ if i is poor at t and $= 0$ otherwise. The model can be specified as,

$$h_{it} = \mathbf{I}(x'_{it}\beta_1 + \gamma_1 h_{it-1} + \delta_1 p_{it-1} + \alpha_{1i} + u_{1it} > 0) \quad (1)$$

$$p_{it} = \mathbf{I}(x'_{it}\beta_2 + \gamma_2 h_{it-1} + \delta_2 p_{it-1} + \alpha_{2i} + u_{2it} > 0) \quad (2)$$

where $i = 1, 2, ..., N$ refers to adult individuals and $t = 2, ...T$ are the number of periods under study. x_{it} are the observed explanatory variables; h_{it-1} is an indicator for the individual level of unhappiness in the previous wave and γ_1 is the parameter for state dependence in well-being to be estimated. Similarly, p_{it-1} is an indicator for the poverty

[8] See Hsiao (1986), Wooldridge (2005), Chay and Hyslop (2001) and Skrondal and Rabe-Hesketh (2014) for a review of the different strategies that have dealt with the initial conditions problem.

[9] Wilde (2000) explains that the classical identification problem does not exist in the case of linear simultaneous equation systems but rather problems may arise if there is too little variation in the data. This is an issue that I will address in future versions of this paper.

status so that δ_1 captures the feedback effect from last year poverty experience on current unhappiness. Following the same structure, in the poverty equation, δ_2 informs about the degree of state dependence in poverty and γ_2 about the influence of last year's level of happiness on current poverty. I expect all the mentioned coefficients to be positive.

The idiosyncratic error terms (u_1, u_2) are assumed to be independent over time and jointly normally distributed with zero mean and unit variance and correlation ρ_u while random effects (α_1, α_2) are assumed jointly normally distributed with variances σ_1^2 and σ_2^2 and correlation ρ_α. I expect ρ_α to be positive indicating that unobservables that make someone more likely to be unhappy make him more likely to be poor —for example, pesimism.

Moreover, and in order to assess the question of adaptation between both phenomena, I introduce the lagged values of the outcome variables up to a third-order. For example, in the case of the feedback from past poverty experiences on the level of life satisfaction, if we observe no influence or a decreasing effect of past poverty statuses, we could assert a certain level of adaptation since the negative consequences of living below the poverty line would not seem to affect current subjective well-being. This strategy is useful also to understand how far in the past the feelings of dissatisfaction may have an influence on an individual's income-generating capacity. In order to exploit even further the dynamics involved with the poverty experiences, similar regressions are estimated but instead of using lagged values, I account for the accummulation and concatenation of poverty spells.

Furthermore, one needs to consider that in the present context, current poverty could have an immediate impact on the current level of dissatisfaction. It is natural to think that individuals observe whether they are suffering or not economic hardship which can have a strong influence on satisfaction levels at the very same moment. In order to account for this possibility, some of the specifications include p_{it} in the happiness equation. Instead, I do not believe that feeling dissatisfied at t can have an immediate impact on the poverty status at t. Rather, the psychological process behind dissatisfaction is likely to require some time before it affects household income.

When an immediate effect from poverty on satisfaction is allowed, the model is specified as follows:

$$h_{it} = \mathbf{I}(x'_{it}\beta_1 + \iota_1 p_{it} + \gamma_1 h_{it-1} + \delta_1 p_{it-1} + \alpha_{1i} + u_{1it} > 0) \tag{3}$$

$$p_{it} = \mathbf{I}(x'_{it}\beta_2 + \gamma_2 h_{it-1} + \delta_2 p_{it-1} + \alpha_{2i} + u_{2it} > 0) \tag{4}$$

being ι_1 the parameter that will capture the influence of poverty at time t on happiness at the same period. The rest of assumptions are the same than above.

Finally, I follow Wooldridge (2005) in the treatment of initial conditions, I find the density of the dependent variables from $t = 2, ..., T$ conditional on the initial condition and the explanatory variables — instead of $t = 1, 2, ..., T$. This implies the need to specify the density of the unobserved specific effects conditional on the dependent variables at $t = 1$. I define:

$$\alpha_{1i} = \nu_1 + \lambda_1 h_{i1} + \eta'_1 \overline{x_i} + \kappa_{1i} \tag{5}$$

$$\alpha_{2i} = \nu_2 + \lambda_2 p_{i1} + \eta'_2 \overline{x_i} + \kappa_{2i} \tag{6}$$

by which, unobserved heterogeneity is estimated conditional to the initial conditions and the average of the time-varying explanatory variables.[10] In order to get consistent es-

[10] As in Stewart (2007), I include the average of all the model time-varying covariates except for feedback effects and year dummies.

timates, κ_{1i} and κ_{2i} are integrated out using Gauss-Hermite quadrature with 12 points while assuming it follows a normal distribution with zero mean and $\sigma^2_{\kappa_i}$ variance.

4 Empirical results

Table 3 shows the results for the bivariate probit models that jointly estimate unhappiness and poverty. Each column is the outcome of a regression and I consider up to third order dynamics. First three columns show the results when only past poverty experiences are allowed to influence the current level of satisfaction while the rest of columns present the results when also P_t influences H_t.

First rows indicate that the individual level of satisfaction is affected by a considerable degree of genuine state dependence, in the sense that, feeling unhappy in previous years influences *by itself* the probability of having the same feeling at the current period. The coefficients for the lagged variables indicate that, at least, state dependence in happiness can be thought of a third-order dynamic process. Accounting for the initial condition is also important with the coefficients for h_0 being significant at 99% confidence level in all the regressions. However, note that the coefficient becomes smaller as we account for higher order dynamics indicating that past experiences are (only partially) summarised in the initial condition. Last columns of the table show that the inclusion of current poverty in the regression makes no difference to the results for unhappiness state dependence.

Next, I consider the influence of poverty experiences on the current level of unhappiness. When P_t is not allowed to influence H_t, and considering only first-order dynamics, it would seem that there is a positive feedback from the previous year poverty experience that increases the likelihood that someone feels unhappy, even if the coefficient is rather small. However, the inclusion of higher order dynamics indicates that such an influence is not present. Past poverty experiences (up to three years ago) do not increase the probability of feeling unhappy. Results are even clearer if we account fot the poverty status at t: current poverty has a positive and highly significant influence on unhappiness but not past experiences of it. So, if adaptation to poverty is understood as the lack of influence of past poverty on happiness, then these findings show that it is the case. Individual level of satisfaction is not affected by previous poverty experiences lived up to three years ago.

However, the results for the initial condition indicate that this adaptation may be partial as P_0 is positive and significant in all the specifications (except the last one). At this point, it is important to remember that P_0 is part of the time-invariant individual-specific random effect thus it may be capturing factors (such as background) that make an individual more likely to be initially poor that explain his level of dissatisfaction. Again, as I account for higher-order dynamics, the initial condition coefficient becomes smaller and not statistically significant.

In short, the results indicate that happiness adapts to poverty because past poverty experiences do not exert any influence on the current level of satisfaction when accouting for order dynamics higher than one. The effect of poverty on happiness (if any) has to be traced back to the initial condition which accounts for a time-invariant positive influence of poverty on unhappiness (that basically reflects that poor people are more likely to be unhappy, as observed in the descriptics section of this paper). As expected, it is the current poverty status that is most associated with unhappiness.

Results relative to the poverty equation indicate that economic hardship is highly affected by genuine state dependence. This is already a well-known result in the literature. See, Cappellari and Jenkins (2004) for the United Kingdom, Biewen (2009) for Germany,

Table 3: Results for the bivariate probit model on unhappiness and poverty when accounting for lags (up to third-order)

				Including P_{it}		
	first order	second order	third order	first order	second order	third order
Happiness equation						
H_{t-1}	0,599***	0,662***	0,728***	0,595***	0,659***	0,724***
H_{t-2}		0,416***	0,490***		0,414***	0,488***
H_{t-3}			0,283***			0,282***
H_0	0,858***	0,672***	0,520***	0,855***	0,671***	0,520***
P_t				0,146***	0,150***	0,155***
P_{t-1}	0,033***	0,015	0,029	0,004	-0,01	0,003
P_{t-2}		0,026	0,027		0,019	0,019
P_{t-3}			-0,002			-0,002
P_0	0,095***	0,072***	0,046***	0,061***	0,042**	0,019
Poverty equation						
P_{t-1}	1,049***	1,068***	1,083***	1,051***	1,068***	1,083***
P_{t-2}		0,560***	0,545***		0,561***	0,545***
P_{t-3}			0,347***			0,347***
P_0	0,937***	0,595***	0,424***	0,934***	0,593***	0,422***
H_{t-1}	0,165***	0,155***	0,167***	0,185***	0,179***	0,195***
H_{t-2}		0,031	0,032		0,051***	0,053***
H_{t-3}			0,004			0,023
H_0	0,098***	0,058***	0,020	0,089***	0,043	0,000
σ_1	0,731***	0,617***	0,496***	0,730***	0,615***	0,495***
σ_2	0,752***	0,565***	0,480***	0,748***	0,563***	0,477***
ρ	0,204***	0,220***	0,216***	0,151***	0,139***	0,092**
N	283889	245891	213369	283889	245891	213369
Individuals	36646	31707	28916	36646	31707	28916

Source: Own calculations on SOEP, 1992-2010. Adult population in Germany. *** indicates statistically significant at 1%; ** at 5% and * at 10%.

Devicienti and Poggi (2011) for Italy, Fusco and Islam (2012) for Luxembourg or Ayllón (2013) for Spain. Morever, the results indicate that poverty dynamics can be accounted for (at least) at the third order. As in the happiness equation, the coefficient for the initial condition does a fair job at (partially) summarising the effect of past poverty experiences.[11]

Next, on the possible feedback of the level of dissatisfaction on poverty, results indicate that such an effect exists but it is limited in terms of time. Having been unhappy in the previous year, increases the probability of current poverty. The feelings of desmotivation, depression or discouragement have consequences on economic well-being that at the most last for two years. Moreover, the initial condition coefficient is not statistically significant when higher order dynamics are accounted for. So, poverty does not adapt to happiness in the short-run but it does in the long-run since individuals that were unhappy three years ago are not more likely to be poor at the current period. These results are new to the literature in the sense of offering a short-lived psychological explanation to monetary poverty.

Last rows detail the results relative to the standard deviation of the random effects and the correlation between them. As shown, accounting for unobserved heterogeneity is highly significant and the positive sign for ρ indicates that unobservables that make someone more likely to be unhappy also make him more likely to be poor. An intuitive example could be that of a person who is less employable in the labour market because he shows signs of depression which make him also monetary poor. Note, however, that the inclusion of higher order dynamics and the current effect reduce the importance of unobserved heterogeneity and the correlation between random effects. This means that, as a matter of fact, ignoring higher-order dynamics when modelling poverty and happiness, may bring us to attribute importance to unobserved heterogeneity when it should be actually attrituted to the dynamics of the process we are analysing.[12]

Accummulation / concatenation of poverty spells. One possible drawback of previous results for the analysis of poverty on dissatisfaction is the fact that the lagged poverty statuses only inform of possible past sporadic spells in poverty but they do not tell if the accummulation and/or concatenation of poverty spells could be important to explain unhappiness.

Table 4 shows the results when we consider the possible accummulation of poverty spells during the previous two and three years. The coefficients for first-order dynamics already commented are included for comparative purposes. As in the previous table, results in the first columns detail coefficients when current poverty is not included in the specification and the rest of columns when it is.

As shown in the second and third columns, while possible sporadic spells in poverty were not associated with unhappiness, the accummulation of poverty spells is. An individual is unhappier at time t if he has been poor during both $t-1$ and $t-2$ (at 90% confidence level) compared to an individual that was never poor. If the accummulation of poverty spells is greater, 3 out of 3, the probability of dissatisfaction is even higher

[11] This is an important result to take into account when one is working with a dataset much shorter than the SOEP —for example, the European Union - Survey on Income and Living Conditions (EU-SILC). The results in the current paper highlight the importance of taking into account initial conditions when the panel contains so few waves that higher order dynamics cannot be considered.

[12] Moreover, accounting for fourth and fifth order dynamics indicated that the correlation between individual-specific effects was no longer statistically significant pointing to the fact that a joint model is no longer necessary. However, questions about the representativiness of the sample arise.

(and significant at 95%). However, in order to understand if an individual that has been poor during three consecutive periods has adapted his levels of satisfaction to his economic situation, we need to compare him with someone that has been poor for only 1 or 2 periods. If the persistently poor has a significantly higher probability of unhappiness, it means that the individual has not managed to adapt to his poverty status. Simple Wald test indicate that this is not the case: the probability of unhappiness for those that were persistently poor is not significantly different from those that were sporadically poor. Phrased in other words, more years in poverty yield a similar probability of unhappiness than fewer years thus, we can talk of a certain degree of adaptation for those persistently poor. The final column shows that when considering current poverty and higher-order dynamics, past experiences in poverty have no explanatory power on unhappiness and only the current level of poverty matters.

It is interesting to note also the coefficients in the poverty equation: the greater the number of accummulated spells in poverty, the higher the degree of poverty genuine state dependence. As for the rest of results, similar conclusions than from Table 3 can be drawn. I have also run the same specifications while considering the importance of concatenated poverty spells on unhappiness at the second and third-order dynamics. This means that I included dummies in the specification that indicated whether the individual suffered one, two or three poverty spells and when. None of these coefficients was statistically significant to explain unhappiness —except for the already commented accummulation of three poverty spells in the regression that does not account for current poverty.[13] Again, no influence of past poverty experiences is found to determine the level of happiness when second and third order dynamics are accounted for except for those at the initial period (and only if not considering the effect of current poverty on happiness).

5 Conclusions

This paper studies to what extent poverty and psychological well-being can be thought of inputs in a feedback loop by which poverty affects and is affected by unhappiness. Results are the outcome of a bivariate probit model that jointly estimates life satisfaction and poverty statuses while accounting for state dependence and feedback effects up to third-order, initial conditions and unobserved heterogeneity. The empirical analysis is based on data from the German Socio-Economic Panel (SOEP) and refers to the adult population for the period between 1992-2010.

Results have indicated that happiness is affected by a considerable degree of genuine state dependence by which being unhappy influences *by itself* the probability of being dissatisfied again in the future (even when controlling for time-invariant unobserved characteristics as personality). The same is true for poverty. Indeed, state dependence in both phenomena can be thought of scarring processes (at least) up to third-order dynamics.

As for the influence of poverty on the level of life satisfaction, I find that when accounting for high-order dynamics, past poverty experiences do not increase the probability of feeling unhappy. So, if the adaptation process is understood as the lack of influence of poverty on unhappiness, results indicate that it is the case. The small effect of poverty on life satisfaction (if any) has to be traced back to the initial condition. A similar analysis while considering the accummulation and concatenation of past poverty spells indicates that the probability of unhappiness for those that were persistently poor is not

[13]The results are available from the author upon request.

Table 4: Results for the bivariate probit model on unhappiness and poverty when accounting for accummulation and concatenation of poverty spells (up to three)

				Including P_t		
	1 past spell	2 past spells	3 past spells	1 past spell	2 past spells	3 past spells
Happiness equation						
H_{t-1}	0,599***	0,662***	0,728***	0,595***	0,659***	0,724***
H_{t-2}		0,416***	0,491***		0,414***	0,489***
H_{t-3}			0,283***			0,282***
H_0	0,858***	0,672***	0,520***	0,855***	0.670***	0,519***
P_t				0,146***	0,150***	0,158***
1 spell	0,033***	0,026	0,012	0,004	0,015	0,010
2 spells		0,041*	0,038		0,006	0,018
3 spells			0,059**			0,024
P0	0,095***	0,071***	0,042**	0,061***	0,042**	0,016
Poverty equation						
1 spell	1,049***	0,913***	0,864***	1,051***	0,914***	0,865***
2 spells		1,596***	1,328***		1,597***	1,328***
3 spells			1,909***			1,910***
P_0	0,937***	0,561***	0,378***	0,934***	0,559***	0,375***
H_{t-1}	0,165***	0,164***	0,183***	0,185***	0,189***	0,214***
H_{t-2}		0,029	0,041**		0,049***	0,065***
H_{t-3}			-0,003			0,016
H_0	0,098***	0,055**	0,015	0,089***	0,040	-0,006
σ_1	0,731***	0,617***	0,496***	0,730***	0,615***	0,495***
σ_2	0,752***	0,578***	0,526***	0,748***	0,575***	0,532***
ρ_{12}	0,204***	0,214***	0,201***	0,151***	0,132***	0,074**
N	283,889	245891	213369	283,889	245891	213369
Individuals	36,646	31707	28916	36,646	31707	28916

Source: Own calculations on SOEP, 1992-2010. Adult population in Germany. *** indicates statistically significant at 1%; ** at 5% and * at 10%.

significantly different from those that were sporadically poor.

Results confirm the existence of a feedback from previous years life satisfaction status to poverty though limited in terms of time (at the most two previous years depending on the specification used). This is a new result in the literature: past feelings of depression, dissatisfaction or negative affect have an influence on current poverty statuses so that psychological uneasiness can be added as an explanation to persistent poverty. Moreover, the positive sign of ρ indicates that unobservables that make someone more likely to be unhappy also make him more likely to be poor.

Much research needs to be done. A better and more complete understanding of the mechanisms that are behind the short-lived relationship between poverty and unhappiness can lead to a better design of policies that either target poverty, social distress or individual behaviour. Moreover, the fact that poor individuals may adapt their happiness levels to their economic situation does not mean that social policy should worry less about their situation — adaptation to poverty is (simply) not ethically desirable.

References

Atkinson, T., B. Cantillon, E. Marlier, and B. Nolan (2002): *Social Indicators: The EU and Social Exclusion*. Oxford University Press, Oxford.

Ayllón, S. (2013): "Understanding poverty persistence in Spain," *SERIES - Journal of the Spanish Economic Association*, 42(2), 201–233.

Ayllón, S., and A. Fusco (2014): "Are Income Poverty and Perceptions of Financial Difficulties Dynamically Interrelated?," Discussion paper.

Banerjee, A. V., and E. Duflo (2011): *Poor Economics. A Radical Rethinking of the Way to Fight Global Poverty*. PublicAffairs.

Biewen, M. (2009): "Measuring state dependence in individual poverty histories when there is feedback to employment status and household composition," *Journal of Applied Econometrics*, 24(7), 1095–1116.

Cappellari, L., and S. P. Jenkins (2004): "Modelling low income transitions," *Journal of Applied Econometrics*, 19(5), 593–610.

Chay, K. Y., and D. Hyslop (2001): "Identification and estimation of dynamic binary response panel data models: Empirical evidence using alternative approaches," Discussion paper.

Clark, A., C. D'Ambrosio, and S. Ghislandi (2014): "Adaptation to Poverty in Long-Run Panel Data," Paris School of Economics Working paper 2014-01.

Clark, A. E., Y. Georgellis, and P. Sanfey (2001): "Scarring: the psychological impact of past unemployment," *Economica*, 68, 221–241.

Clark, A. E., and A. J. Oswald (1994): "Unhappiness and Unemployment," *Economic Journal*, 104(424), 648–59.

Devicienti, F., and A. Poggi (2011): "Poverty and social exclusion: two sides of the same coin or dynamically interrelated processes?," *Applied Economics*, 43(25), 3549–3571.

Ferrer-i-Carbonell, A. (2013): "Happiness Economics," *SERIES - Journal of the Spanish Economic Association*, 4, 35–60.

Ferrer-i-Carbonell, A., and B. M. S. Van Praag (2008): "Do People Adapt to Changes in Income and Other Circumstances? The discussion is not finished yet," Discussion paper, Institut d'Analisi Economica.

Fusco, A., and N. Islam (2012): "Understanding the drivers of low income transitions in Luxembourg," *Research on Economic Inequality*, 20, 367–391.

Haisken-DeNew, J. P., and M. H. Hahn (2010): "PanelWhiz: Efficient Data Extraction of Complex Panel Data Sets An Example Using the German SOEP," *Journal of Applied Social Science Studies*, 130(4), 643–654.

Haushofer, J., and E. Fehr (2014): "On the Psychology of Poverty," *Science*, 344(6186), 862–867.

Hsiao, C. (1986): *Analysis of panel data*. Cambridge University Press.

Jäntti, M., R. Kanbur, M. Nyyssölä, and J. Pirttilä (2014): "Poverty and Welfare Measurement on the Basis of Prospect Theory," *Review of Income and Wealth*, 60(1), 182–205.

Jäntti, M., R. Kanbur, and J. Pirttilä (2014): "Poverty, Development, and Behavioral Economics," *Review of Income and Wealth*, 60(1), 1–6.

Kahneman, D., and A. Tversky (1979): "Prospect Theory: An Analysis of Decision under Risk," *Econometrica*, 47(2), 263–292.

Lucas, R., A. E. Clark, Y. Georgellis, and E. Diener (2003): "Reexamining adaptation and the set point level of happiness: Reactions to changes in marital status," *Journal of Personality and Social Psychology*, 84(3), 527–539.

Mullainathan, S., and E. Shafir (2013): *Scarcity. Why having too little means so much*. Allen Lane, Penguin Books.

Oswald, A. J., and N. Powdthavee (2008): "Does happiness adapt? A longitudinal study of disability with implications for economists and judges," *Journal of Public Economics*, 92(56), 1061 – 1077.

Skrondal, A., and S. Rabe-Hesketh (2014): "Handling initial conditions and endogenous covariates in dynamic/transition models for binary data with unobserved heterogeneity," *Journal of the Royal Statistical Society: Series C (Applied Statistics)*, 63, 211–237.

Stewart, M. B. (2007): "The interrelated dynamics of unemployment and low-wage employment," *Journal of Applied Econometrics*, 22(3), 511–531.

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

Weber, A. (2002): "State dependence and wage dynamics. A heterogeneous Markov chain model for wage mobility in Austria," Economic Series 114, Institute for Advanced Studies (Vienna).

Wilde, J. (2000): "Identification of multiple equation probit models with endogenous dummy regressors," *Economics Letters*, 69(3), 309–312.

Winkelmann, L., and R. Winkelmann (1998): "Why Are the Unemployed So Unhappy?Evidence from Panel Data," *Economica*, 65(257), 1–15.

Wooldridge, J. M. (2005): "Simple solutions to the initial conditions problem in dynamic, non linear panel data models with unobserved heterogeneity," *Journal of Applied Econometrics*, 20(1), 39–54.