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Are income poverty and perceptions of financial difficulties dynamically interrelated?

Sara **AYLLÓN** [1]
Alessio **FUSCO** [2]

[1] Universitat de Girona and EQUALITAS, Spain
[2] LISER, Luxembourg

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Are income poverty and perceptions of financial difficulties dynamically interrelated? *

Sara Ayllón[†]

Department of Economics, Universitat de Girona and EQUALITAS, Spain

Alessio Fusco[‡]

Luxembourg Institute of Socio-Economic Research, Luxembourg

Abstract

An individual's economic ill fare can be assessed both *objectively*, looking at one's income with reference to a poverty line, or *subjectively* on the basis of the individual's perceived experience of financial difficulties. Although these are distinct perspectives, income poverty and perceptions of financial difficulties are likely to be interrelated: low income (especially if it persists) is likely to negatively affect perceptions of financial difficulties and, as recently suggested by the behavioral economics literature, (past) subjective sentiment may in return influence individual's income generating ability and poverty status. The aim of this paper is to determine the extent of these dynamic cross-effects between both processes. Using Luxembourg survey data, our main result highlights the existence of a feedback effect from past perceived financial difficulties on current income poverty suggesting that subjective perceptions can have objective effects on an individual's behaviour and outcomes.

[†]Address: C/ Universitat de Girona, 10, 17071 Girona. E-mail: sara.ayllon@udg.edu

[‡]Corresponding author. Address: Campus Belval, Maison des Sciences Humaines, 11, Porte des Sciences L4366, Esch sur Alzette. E-mail: alessio.fusco@liser.lu

1   Introduction

The economic ill fare of an individual can be measured in several ways. The conventional income poverty approach aims at determining *objectively* whether an individual's income falls short of a pre-defined poverty line. Concern about this approach is sometimes expressed for practical reasons, such as measurement error in income (Nicoletti et *al.*, 2011) or difficulties in identifying relevant poverty lines or equivalence scales (Ravallion, 1996). In addition, objective approaches may miss part of the problem. For example, Bourguignon (2006) highlights the following paradox in developed countries: while the presence of an efficient redistributive system contributed to the reduction of (absolute) poverty, a 'feeling' of poverty is still often reported in some population subgroups such as beneficiaries of minimum income guarantee programmes. Receiving social assistance may even amplify this feeling in cases where individuals feel stigmatized. Therefore, the concept of poverty or welfare cannot be reduced to the single criterion of low income. One of the alternatives consists of relying on *subjective* information about the experienced level of financial difficulties to assess an individual's ill fare (Deaton, 2010).

Income-based and perceptions-based approaches aim at measuring financial inadequacy from different angles.[1] Inherent differences at the core of these two approaches suggest that they are clearly distinct concepts. Objective income poverty focuses on the means at the disposal of an individual to achieve a certain level of well-being (Sen, 1979) and is a function of an individual's income and needs. Perceptions of financial difficulties are also a function of an individual's income and needs, but are determined by additional factors such as an individual's spending, other types of resources or needs and aspirations. The concepts of resources and needs used in both approaches are different. While the income-based approach only takes into account the differences in needs arising from differences in household composition and size through an equivalence scale, and may exclude various resources (such as wealth), individuals may keep these other elements in mind when answering subjective questions. Therefore, factors affecting the spending of a household (e.g. a free childcare policy), some of its resources (e.g. assets accumulation), needs (e.g. disability related) or aspirations may alter the perception of financial difficulties, but not necessarily income poverty. What if we consider both concepts simultaneously?

Indeed, despite being distinct concepts highlighting different dimensions of disadvantage, income poverty and perceived financial difficulties are likely to be dynamically interrelated. First, it may seem natural that the current objective situation unveiled by the income poverty approach directly influences an individual's perceptions of their financial difficulties. In addition, the interrelation between both concepts may happen through feedback effects of the past on the present (Biewen, 2009). For instance, an individual's past perceptions of financial difficulties may affect their income-generating abilities, which might then impact on their current poverty status. In turn, the lasting effects of the previous poverty status may affect the current perception of financial difficulties. Therefore, both situations may play

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[1]In relation to perceptions-based approaches, this paper focuses on the topic of financial subjective well-being rather than on broader concepts such as life satisfaction or happiness (van Praag et *al.*, 2003).

a role in the incidence or amplification of the intensity of the other. Our current empirical knowledge about the dynamic interrelation of these two concepts, which requires the joint modelling of both approaches, is limited. The aim of this paper is to determine whether there are dynamic cross-effects between both processes and to contribute to the literature on the effect of subjective variables on objective outcomes.

The channels through which perceived financial difficulties may affect future income poverty may be found in the recent and growing literature on the behavioural economics approach to poverty (Bertrand et *al.*, 2004; Duflo, 2006). Departing from the standard neoclassical approach, the behavioural approach to poverty suggests that "poverty changes the set of options available to individuals. Poverty thus affects behaviour, even if the decision maker is 'neo-classical': unboundedly rational, forward looking, and internally consistent. The homo economicus at the core of neo-classical economics ('calculating, unemotional maximizer' [...]) would behave differently if he was poor than if he was rich" (Duflo, 2006, pg. 367). Recent findings about the negative effect of *scarcity*, defined as *having less than what you feel you need*, on cognitive abilities, executive control and decision-making process provide credible channels through which subjective perceptions may affect the objective situation of individuals (Mullainathan and Shafir, 2013, Haushofer and Fehr, 2014). The latter is a result also highlighted by De Neve et *al.* (2013, pg. 70) who report that "existing scientific evidence indicates that subjective well-being has an objective impact across a broad range of behavioural traits and life outcomes, and does not simply follow from them. In fact, we observe the existence of a *dynamic* relationship between happiness and other important aspects of our lives with effects running in both directions" (see also De Neve and Oswald, 2012).[2] Our paper contributes to this literature by assessing whether perceptions of financial 'scarcity' may affect the objective situation of income poverty experienced by individuals.

Our empirical illustration is based on Luxembourg data. Following the development of the financial sector since the middle of the 1980s, Luxembourg became one of the world richest countries in terms of GDP per capita (Fusco et *al.*, 2014). It may then appear surprising to devote efforts to studying financial difficulties in this country. However, it can also be argued that subjective approaches bring valuable information that can be relevant precisely in rich countries such as Luxembourg, given that they are likely to capture the feeling of social exclusion referred to by Bourguignon (2006). In addition, individuals living in rich countries may have higher aspirations due to a higher reference point determined by social comparisons (Stutzer, 2004). Genicot and Ray (2014) demonstrate how unmet aspirations, and therefore perceived financial difficulties, may generate frustration and induce lower

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[2]In the same vein, Cobb-Clark et *al.* (2013) show how the locus of control affects savings and wealth accumulation, which can affect future income and poverty status. Other channels exist such as loss of motivation, stigma or negative effects of financial difficulties on psychological health (Rojas, 2011 or Taylor et *al.*, 2011).

investments.[3] This lower investment can influence an individual's future income which constitutes another possible explanation for the feedback effect.

As well established in the literature, both income poverty (see among others Cappellari and Jenkins, 2004, Jenkins, 2013) and perceived financial difficulties (Pudney, 2008, Kaya, 2014) are affected by a considerable degree of state dependence. This concept refers to the question as to whether a process is autoregressive, that is, in our case, the extent to which being poor in a given moment increases *by itself* the probability of being poor in the future (Heckman, 2001, Skrondal and Rabe-Hesketh, 2014).[4] Regarding income poverty, this empirical regularity can be explained by the fact that experiencing poverty may modify individuals' preferences, constraints or ability that will increase their risk of being income poor in the future compared to an identical individual that did not experience poverty in the first place. The mechanisms driving such a genuine effect are, among others, demoralization, depreciation of human capital or potential health problems (see, for example, Biewen, 2009). In the case of subjective variables, in addition to the same genuine effect from the past on the present, state dependence can also be related to the idea of inertia of perceptions, that is the time necessary for perceptions to adjust to change in circumstances (see Bottan and Perez Truglia, 2011, Wunder, 2012).[5] Therefore, modelling state dependence is crucial to avoid the potential bias that estimating static models would yield and to obtain unbiased estimates of the feedback effects.

The estimation of dynamic joint models controlling for state dependence, unobserved heterogeneity and initial conditions (Devicienti and Poggi, 2011) are utilised to answer the posed research question and determine whether both concepts are characterized by dynamic cross-effects. We consider different modelling assumptions of the subjective variable to assess the robustness of our findings. In particular, the results obtained when dichotomozing the subjective variable are compared against those based on the ordinal variable. Our main results highlight the existence of a feedback effect from past perceived financial difficulties on income poverty. This result is robust to various specifications and poverty lines. In line with the recent findings of the behavioural approach of poverty, this suggests that psychological mechanisms should not be overlooked when it comes to designing anti-poverty poli-

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[3]Genicot and Ray (2014, pg. 1) argue that "'best aspirations are those that lie at a moderate distance from the individual's current economic situation standards, large enough to incentivize but not so large as to induce frustration. [...] The argument captures both encouragement and frustration, and on its own can be used to create an aspirations-based theory of poverty traps."

[4]State dependence and feedback effects refer in fact to two behavioural effects involving the impact of the past on the present. In the case of happiness, Bottan and Perez Truglia (2011) make the distinction between two channels of habituation: *general habituation* (or satisfaction treadmill) refers to genuine state dependence while *specific habituation* (or hedonic treadmill) refers to habituation to specific lagged effects of life events. For an analysis of the adaptation of happiness to poverty see Clark et *al.* (2015).

[5]According to Fusco (2013), full inertia occurs if current perceptions do not adjust to changes in circumstances and are completely determined by past perceptions. If this is the case, perceptions might not be good indicators of current well-being. By contrast, full adjustment means that current perceptions are not affected by previous perceptions, and changes in perceptions can be fully ascribed to changes in circumstances; perceptions can then be considered a good indicator of current well-being. The true situation usually lies in between these two extreme cases, and is ultimately an empirical question.

cies (Amir et *al.*, 2005). In addition, a feedback effect from past income poverty on current perceived financial difficulties was also found when perceived financial difficulties was modelled as an ordinal variable, but not when it was modelled as a binary variable. Both processes were also found to be affected by a considerable degree of state dependence, as commonly shown in existing literature. Finally, the highly significant cross-equation correlation validates our modelling strategy.

The paper is organized as follows. Section 2 presents the data extracted from the Luxembourg Socio-Economic Panel (PSELL3) for the years 2003 to 2011 as well as some descriptive statistics. The methodology applied is presented in Section 3 while Section 4 contains the results. Finally, Section 5 concludes.

2   Data, definitions and descriptives

The Luxembourg Socio-Economic Panel "Liewen zu Lëtzebuerg" (PSELL3) is the Luxembourgish component of the European Union-Statistics on Income and Living Conditions (EU-SILC). This survey has been running since 2003 and contains repeated annual information about residents' incomes, living conditions and other personal and household characteristics. Following the same individuals over time makes it possible to track whether changes in (objective and subjective) economic well-being are associated with changes in household circumstances or labour market situations. In this paper, we use the nine waves of the PSELL3 data covering the years 2003 to 2011.

Perceived Financial Difficulties (FD) are captured through the answers to the following question: "A household may have different sources of income and more than one household member may contribute to it. Thinking of your household's total income, is your household able to make ends meet, namely, to pay for its usual necessary expenses?". The possible answers were recoded in the following way: "0. Very easily; 1. Easily; 2. Fairly easily; 3. With some difficulty; 4. With difficulty; 5. With great difficulty".[6] We assume that each household has the same interpretation of each modality. We attributed this household level variable to each of the household members as it is typically done in the income poverty literature and also by other authors (Devicienti and Gualtieri, 2007). Following the standard European Union practice, individuals are considered income poor if they belong to a household whose equivalent income is lower than 60% of the median equivalised income, using the modified OECD scale. Robustness checks were also implemented using alternative thresholds. It is important to note that in EU-SILC, the income reference period corresponds to the previous calendar year (Debels and Vandecasteele, 2008). In our case, this problem is mitigated by the fact that in our estimation sample, most of the interviews are carried out by April of the survey year.[7]

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[6]Note also that Taylor (2011) and Taylor et *al.* (2011) use this question as a dimension of financial capability, while others use it as a proxy of subjective poverty (Devicienti and Gualtieri, 2007). The concept of financial capability is studied in-depth in a special issue of the *Journal of Economic Psychology* (see Hoelzl and Kapteyn, 2011).

[7]Nevertheless, a robustness check will be carried out to assess whether this mismatch has an effect on our main result.

We focus on the adult population aged between 20 and 59 within the period covered by the data. Students, military and pensioners are excluded from the analysis because these population subgroups are very specific and concern about the reliability of their answers regarding perceived financial difficulties is sometimes expressed. For example, elderly people are usually found to underestimate the financial difficulties they are confronted to and to consider their income as adequate, even when this income is in fact very low (Stoller and Stoller, 2003, Litwin and Sapir, 2009).

[INSERT TABLE 1]

Table 1 shows the distribution of perceived financial inadequacy and the poverty rate for the studied sample per year. In Luxembourg, a large proportion of individuals find it 'easy' to make ends meet (on average 36%) or 'fairly easy' (31%).[8] Only about 10% answered that they can make ends meet 'very easily'. Moreover, note that a sizeable group of nearly 8% of the individuals declared making ends meet 'with difficulty' or 'with great difficulty' and about 15% 'with some difficulty'. From this point, we will consider that individuals are in financial difficulties if they answer 'with difficulty' or 'with great difficulty' to the aforementioned question. On average, 7.6% of the sample is therefore found to be in financial difficulties, a percentage that varies between 6% and 9% across the period. The last column shows the income poverty rate which was at 10.6% in 2003 and then increased to between 12% and 14% in the period from 2004 to 2011.

Table 2 displays the joint distribution of both concepts across time, as well as the sample size. Between 3% and 5% of the individuals in the sample are both income poor and in perceived financial difficulties. The percentage is very similar for those individuals reporting to be in financial difficulties but, at the same time, are not income poor (on average 3.8%). Instead, 9.5% of individuals do not state to be in financial difficulties but are considered income poor. In total, an average of 17.1% of the sample is affected by either one or both phenomena. Moreover, Table 3 indicates that 28.4% of the income poor perceive themselves in financial difficulties, while only 4.4% of the non income poor are in such a situation. These pooled results indicate that the overlap between the two measures is not perfect which confirms that the two concepts measure different aspects of disadvantage (as was explained in the introduction) and are complementary.

[INSERT TABLE 2]
[INSERT TABLE 3]

These results were obtained taking a cross-sectional perspective. The following descriptives take into account the longitudinal dimension. In terms of transitions, the first panel of Table 4 shows the probability of reporting being in financial difficulties, conditional on the previous year's perception. Note that 45.9% of the individuals initially in perceived financial difficulties remain in the same situation, compared to 4.3% of the individuals not initially in this status. The corresponding percentages in the case of income poverty are respectively 68.4% and 4.5% (see lower

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[8]Figures on the overall population are similar and can be found in STATEC (2013).

panel of Table 4). This suggests a sizeable persistence for both concepts, especially strong in the case of income poverty. Fusco and Islam (2012) and Fusco (2013) found similar results.

<div align="center">
[INSERT TABLE 4]
[INSERT TABLE 5]
</div>

Looking at the relation between the two concepts in consecutive years, in Table 5, it is possible to see that lagged income poverty and current perceived financial difficulties are linked: the conditional probability of being currently in perceived financial difficulty is 26.2% for the initially poor, whilst it is only 4.4% for the initially non poor. The relative risk is of 5.96, which means that the initially income poor are almost 6 times as likely as the non initially income poor to perceive themselves in financial difficulties. The relative risk of being income poor depending on the previous perceived financial difficulties status is of 5.4 (the probability of currently being income poor for those initially in perceived financial difficulty is 52.5%; for those initially non poor it is of 9.7%).

These descriptive statistics suggest that both concepts display state dependence and are related dynamically. Whether these descriptives are the result of individual heterogeneity or of causal mechanisms is an empirical question that is addressed in the remainder of this paper.

3   Methodology

Our econometric strategy consists in jointly estimating the processes of income poverty (P_{it}) and perceived financial difficulties (S_{it}) while controlling for unobserved heterogeneity, initial conditions, state dependence and feedback effects.[9] We estimate two different models. In Model 1, a dynamic joint random effects probit for S_{it} and P_{it} is estimated. In Model 2, all the information available in the data set is used through the estimation of a dynamic random effects probit for P_{it} and a dynamic random effects ordered probit for S_{it}. Formally, the simultaneous equations can be written as follows:

$$S_{it}^* = \alpha S_{it-1} + \theta P_{it} + \beta P_{it-1} + \gamma' X_{it} + u_i + \epsilon_{it} \tag{1}$$
$$P_{it}^* = \chi P_{it-1} + \delta S_{it-1} + \eta' Z_{it} + v_i + \mu_{it} \tag{2}$$

where $i = 1, 2, ..., N$ are individuals and $t = 1, ..., T$ are the number of periods under study.

We assume that in period t, individuals can be characterised by a latent propensity for perceived financial difficulties, S_{it}^*, that takes the form:

$$S_{it} = I(S_{it}^* > 0) \tag{3}$$

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[9]Other applications of a similar methodology can be found in Alessie et *al.* (2004), Haan and Myck (2009), Amuedo-Dorantes and Serrano-Padial (2010), Devicienti et *al.* (2010), Devicienti and Poggi (2011), Michaud and Tatsiramos (2011) or Ayllón (2015).

where, in Model 1, $I(S_{it}^* > 0)$ is an indicator function taking the value of 1 if S_{it}^* is positive and 0 otherwise. In the case of the ordered variable (Model 2), the latent outcome S_{it}^* is not observed but we do have an indicator of the category in which the latent category falls, S_{it}. Thus,

$$S_{it} = j \quad \text{if} \quad \mu_j < S_{it}^* \le \mu_{j+1}, \qquad j = 1, ..., m \tag{4}$$

where $\mu_0 = -\infty, \mu_j \le \mu_{j+1}, \mu_m = +\infty$. As explained above, S_{it} is a variable with six categories (j).

The same assumptions are done in the case of income poverty with

$$P_{it} = I(P_{it}^* > 0) \tag{5}$$

and $I(P_{it}^* > 0)$ as an indicator function taking the value of 1 if P_{it}^* is positive and 0 otherwise.

In order to take into account the possible interrelationship between poverty and perceived financial difficulties, a feedback effect is introduced in each equation that will assess the degree of dependence between both phenomena. That is, δ will control for the influence of past perceived financial difficulties on current poverty. We expect δ to be positive and precisely estimated showing that individuals that perceived in the past that they had difficulties making ends meet are more likely to be found in poverty in the present period. In a similar fashion, β that captures the influence of past poverty status on current perception of financial difficulty is likely to be positive but according to the descriptives, the magnitude of β might be smaller than that of δ. Furthermore, current poverty status P_{it} enters as an explanatory variable in the perceived financial difficulties equation to assess the importance of the relationship between both phenomena during the current period. Note that we do not consider that current perceived financial difficulties influence current poverty as the mechanisms through which perceptions may affect individuals' income generating abilities are likely to be slow. For example, it would take time for negative perceptions to affect durably individuals' cognitive skills or motivation. In our dynamic framework, the objective situation can only be influenced by feedback effects from past perceptions and not by current effects. The effect of income poverty on perceived financial difficulties is immediate, and can last over time, while the effect of perceived financial difficulties on income poverty is delayed. The one year lag of each variable assures control over state dependence. We expect α and χ to be positive and statistically significant.[10]

X_{it} and Z_{it} are the standard explanatory variables used in existing literature (Jenkins, 2011) which are expected to affect both processes. They reflect demographic and working characteristics and refer to the individual (age, age squared, gender, citizenship, employment status, health status, marital status, education) and the household (composition, the attachment to the labour market of all household members, tenure status, etc.). Gender and citizenship are treated as time-invariant

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[10]Buddelmeyer and Cai (2009) use a similar strategy to study the interrelationship between health and poverty. In their case, they introduce the lagged value of poverty in a health equation while current health (not lagged) in the poverty equation. Their argument is that the effect of health on income is immediate while the effect of income on health is slow.

variables. Regarding the latter, this choice was justified by the fact that the proportion of individuals changing citizenship is extremely low in the estimation sample.

In order to take into account unobserved heterogeneity, both equations follow Wooldridge (2005)'s approach in the treatment of initial conditions. The control over unobserved heterogeneity is important in our model to avoid overestimating state dependence (see, for example, Weber, 2002). Moreover, the inclusion of an individual specific effect results in an initial conditions problem: we cannot know whether the observed phenomena started even before each individual entered the survey. That is, we need to control that each initial condition is correlated with the individual specific effect (u_i and v_i, respectively). Ignoring the initial conditions problem would result in inconsistent estimates.

Wooldridge (2005) proposes to find the density of the dependent variables from $t = 1, ..., T$ conditional on the initial conditions and the explanatory variables. That is, the density of the unobserved specific effect conditional on the dependent variables at $t = 0$ is specified. Formally, we can write the specification as follows,

$$u_i = a_0 + a_1 P_{i0} + a_2 S_{i0} + a_3 \overline{X_i} + \kappa_i \tag{6}$$

$$v_i = b_0 + b_1 S_{i0} + b_2 P_{i0} + b_3 \overline{Z_i} + \nu_i \tag{7}$$

Following Stewart (2007), the mean of each time-varying explanatory variable is added in order to allow for a certain degree of correlation between the independent variables and the individual specific effect (see also Mundlak, 1978; Alessie et al., 2004). κ_i and ν_i are integrated out using Gauss-Hermite quadrature with 12 points.[11] Moreover, a joint normal distribution with zero mean and $\sigma^2_{\kappa_i, \nu_i}$ variance is assumed for both individual-specific effects, which are allowed to be freely correlated: ρ_{κ_i, ν_i}. A positive (negative) ρ indicates that unobservables that make individuals more likely to be poor also make them more (less) likely to perceive themselves in financial difficulties.[12]

Finally, the idiosyncratic error terms ϵ_{it} and μ_{it} are assumed to follow a normal distribution with zero mean and unit variance and are serially independent.

4 Empirical results

Table 6 shows the results of Models 1 and 2. Recall that, in the first case, we run jointly two random effects (RE) probit while in the second case, perceived financial difficulties (S_{it}) are modelled by means of an ordered RE probit. In both cases, current poverty status (P_{it}) is included in the perceptions equation following the idea that current financial difficulties are likely to be affected not only by past poverty experiences but also by the current economic situation of the household.

[INSERT TABLE 6]

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[11]Consistent results were obtained when running the models with 6 and 24 quadrature points.

[12]The models are estimated using the software aML. Details about the software and estimation procedures used therein can be found in Ayllón (2014) or Lillard and Panis (2003).

In Model 1, the positive and highly significant coefficients for S_{it-1} on S_{it} (0.44***) and P_{it-1} on P_{it} (0.75***) indicate that both phenomena are affected by a considerable degree of genuine state dependence as commonly found in the literature. That is, experiencing one of the outcomes in the past increases *by itself* the probability of experiencing the same outcome in the present. Noticeably, the coefficient for the initial conditions in both equations is greater than the lagged which indicates a considerable correlation between the unobserved heterogeneity effect and the initial conditions. These results are confirmed by Model 2.

Turning to the feedback effects, results suggest that past perceived financial difficulties have a positive influence on current poverty while past poverty has no effect on the current feeling of financial difficulties. As a matter of fact, both phenomena would seem to be strongly related mainly through the initial conditions. However, when all the information available in the dataset is taken into account through the use of the ordinal variable, results show the existence of a interrelationship between both phenomena. Past poverty increases the probability of current perceived financial difficulties (0.08***). And, at the same time, past perceived financial difficulties increase the probability of currently being income poor for those that were making ends meet 'with some difficulty', 'with difficulty' and 'with great difficulty'.[13] The feedback effect from perceived financial difficulties on income poverty constitutes our main result since it provides evidence for the fact that subjective perceptions can have objective effects on an individual's outcomes (De Neve *et al.*, 2013). This result is in line with the recent literature suggesting that financial stress can have an effect on individuals' behaviour so that psychological mechanisms should not be overlooked when it comes to designing anti-poverty policies.

The last rows in Table 6 show the standard deviation of the individual-specific effects for each equation which are highly significant pointing to the importance of taking into account unobserved heterogeneity in this context. Moreover, ρ that accounts for the correlations between both effects, indicates that unobservables that make individuals more prone to be poor also make them more likely to perceive that they have difficulties making ends meet. The latter result suggests that the joint estimation of the two equations is necessary.

The results regarding the covariates are discussed on the basis of Model 2 (see Table 7). Recall that for time-varying variables, the individual time averaged value of each covariate is included in the model (see Equations 6 and 7). The coefficients of these time-averaged variables are, however, not interpretable since they account for the correlation between the covariates and the unobserved heterogeneity. Therefore, for brevity, the coefficients for these variables as well as those related to year dummies are not reported in the Table. We focus first on the results for demographic characteristics. Age is not related to monetary poverty but it is related to perceptions of financial difficulties. The probability of having problems to make ends meet is negatively associated with age but the likelihood slightly increases during older

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[13]Separate regressions would have indicated a stronger feedback from lagged perceived financial difficulties to poverty and also from past monetary poverty to current subjective economic hardship. That is, if we were to ignore the cross-effects between both phenomena that take place through unobservables, we would be overestimating the feedbacks between both processes. (Results are available from the authors upon request.)

ages, as indicated by the coefficient of age squared in the first equation. In relation to migration status, it is important to bear in mind that the migrant population in Luxembourg is quite large and heterogeneous. The first waves of migration came to work in the steel industry and were characterised by low skills, while recent waves are composed of young, high skilled and mainly European migrants attracted by the financial sector and European institutions. This heterogeneity is reflected in our results which are in line with the previous literature (Fusco and Islam, 2012): being Portuguese or from a non EU15 country is positively related with declaring great financial difficulties and at the same time to be found in monetary poverty. By contrast, in the case of individuals from another EU15 country, we find that they are more likely to be below the poverty line but their nationality is not associated with having difficulties to make ends meet.

[INSERT TABLE 7]

Regarding marital status, being divorced and especially being a widow is positively related with having difficulties to make ends meet compared to married individuals. A lower diversification of risk in terms of the number of persons in the household increases the risk of perception in financial difficulties, even when controlling for the objective situation. Moreover, divorced people are amongst those with a higher probability of monetary poverty.

Lone parenthood is related to both financial difficulties and monetary poverty. The presence of children of various age categories has different impacts on the risk of objective and subjective poverty. While an additional young child (less than 6) increases the risk of perceived financial difficulties, an additional older child (aged between 6 and 11 or between 12 and 17) does not. Regarding income poverty, children from any age category increases the risk of income poverty. The result on younger children probably captures the immediate effect of a birth on the perception of individuals — which also results in a higher risk of income poverty — that disappears over time. By contrast, the presence of additional older children also have a direct effect on income poverty.

On the results relative to the labour market, noticeably, being in a part time job is only related to being found in monetary poverty but not with having financial inadequacy. This is partly explained by the fact that for an important number of individuals working in a part time job is a desired choice (73% in 2006 of those working in a part-time job according to Blond-Hanten et *al.* 2008). Instead, being unemployed is positively related with both phenomena. As a matter of fact, unemployment is probably the most important explanatory variable in both equations according to the size of the coefficient. 'Other' that contains inactive individuals in the labour market such as disabled or housewives is positively related with both subjective and objective measures of economic hardship. The number of working adults in the household is clearly negatively related both to financial inadequacy and monetary poverty.

Finally, access to property is only related to having difficulties to make ends meet and not to monetary poverty which is understandable given that access to property necessarily implies the payment of a mortgage. But, at the same time, one is only granted a mortgage when proving that a certain level of financial resources is achieved. On the other hand, being a tenant is only related to monetary poverty.

4.1 Robustness checks

The results obtained in the previous sections are conditional on some choices made. In order to give robustness to our conclusions regarding feedback effects, we estimated a series of models (similar to Model 2) based on alternative choices. First of all, we checked whether our results were dependent on the poverty line used. With this objective, we set three new thresholds at 50% and 70% of the median equivalent income and an implicit poverty line aiming at equalizing the proportion of income poor and individuals in perceived financial difficulties (even though an ordinal variable is used).

[INSERT TABLE 8]

Results on state dependence are remarkably stable as are those for the feedback effect from past perceived financial difficulties towards current income poverty. This confirms our previous finding whereby there are psychological mechanisms increasing the probability of someone to be income poor after that person has perceived himself in such a situation in the past. By contrast, when moving the poverty line no feedback effect from past income poverty on current perceived financial difficulties was found. However, initial poverty and current poverty strongly impact on perceived financial difficulties.[14]

5 Conclusions

The aim of this paper was to analyse whether income poverty and perceived financial difficulties are dynamically interrelated. We characterise this interrelationship by estimating dynamic (probit and ordered) joint models controlling for state dependence, unobserved heterogeneity and initial conditions to Luxembourg survey data. Our main result highlights the existence of a feedback effect from past perceived financial difficulties on income poverty. In addition, a feedback effect from past income poverty on current perceived financial difficulties was found when perceived financial difficulties was modelled as an ordinal variable, but not when it was modelled as a binary variable.

The joint modelling of both concepts also allowed us to find that individual-specific effects for each equation were highly significant pointing to the importance of taking into account unobserved heterogeneity in this context. The positive correlation suggests that the unobserved factors that make individuals more prone to be poor also make them more likely to perceive that they have difficulties to make ends meet. In terms of covariates, it can be noted that employment (number of adults at work) protects from being income poor and from perceiving financial difficulties

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[14]In terms of robustness checks, note also that the results were very similar when using four categories (instead of five) for the variable on perceived financial difficulties by aggregating individuals declaring making ends meet with difficulty and with great difficulty in the same group. In addition, as already mentioned, we also ran a robustness check to assess whether the mismatch between the income reporting period and the time of measurement of the covariates and equivalence scale made any difference to our results. Correcting this mismatch resulted in the same conclusions. (These results are available from the authors upon request).

while being a lone parent or having young children increase the likelihood of being confronted to income poverty or perceived financial difficulties.

These results have important implications in terms of our understanding of the interrelationship between dimensions of poverty since they provide further evidence for the fact that subjective perceptions can have objective effects on individuals' behaviour and outcomes (De Neve et *al.* 2013). In fact, as mentioned by Mani et *al.* (2013, pg. 980) "being poor means coping not just with a shortfall of money, but also with a concurrent shortfall of cognitive resources. The poor, in this view, are less capable not because of inherent traits, but because the very context of poverty imposes load and impedes cognitive capacity." These elements suggest that psychological mechanisms should not be overlooked when it comes to designing anti-poverty policies (Amir et *al.*, 2005; Anand and Lea, 2011). The manner in which this should be carried out constitutes a promising avenue for future research.

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Table 1: Distribution of perceived financial difficulties and poverty rate, per year

Year	Perceived financial difficulties						Poor
	very easily	easily	fairly easily	with some difficulty	with difficulty	with great difficulty	
2003	11.2	37.2	30.5	13.9	5,3	1.9	10.6
2004	13.9	36.0	29.4	14,1	4.8	1.9	13.0
2005	12.3	38.6	28.6	14,1	4.6	1.7	12.7
2006	10.7	37.5	32.3	13,8	4.3	1.5	13.1
2007	9.8	38.7	30.5	14,2	5.0	1.9	12.9
2008	9.1	37.7	30.1	15,5	5.7	2.0	13.4
2009	8.8	33.7	31.9	17,6	5.9	2.1	14.4
2010	7.9	34.7	32.7	15,8	6.6	2.3	14.5
2011	9.2	32.0	32.3	17,1	6.6	2.8	13.3
Total	**10.1**	**35.9**	**31.1**	**15.3**	**5.5**	**2.1**	**13.2**

Source: PSELL3/EU-SILC, 2003-2011, authors' computation. Weighted results.

Table 2: Joint distribution of financial difficulties and income poverty, per year

Year	Not poor, nor in FD	Income poor only	In FD only	Both	N
2003	85.3	7.5	4.0	3.1	4951
2004	83.6	9.7	3.4	3.3	5055
2005	83.6	10.1	3.8	2.6	5089
2006	84.1	10.2	2.7	3.0	5455
2007	84.3	8.9	2.8	4.1	5582
2008	82.9	9.4	3.7	3.9	5412
2009	81.6	10.4	4.0	4.0	5891
2010	81.4	9.7	4.1	4.8	6684
2011	81.4	9.2	5.3	4.2	7522
Total	**83.0**	**9.5**	**3.8**	**3.8**	**51641**

Source: PSELL3/EU-SILC, 2003-2011, authors' computation. Weighted results. Last column refers to annual sample size.

Table 3: Probability of being in perceived financial difficulties given poverty status in the same year

		Perceived financial difficulties at t		
		Not in FD	In FD	Total
Poverty at t	Not poor	95.6	4.4	100.0
	Poor	71.6	28.4	100.0
	Total	**92.4**	**7.6**	**100.0**

Source: PSELL3/EU-SILC, 2003-2011, authors' computation. Weighted results. Pooled observations across the period.

Table 4: Probability of being in financial difficulties at t given status at $t-1$ and probability of being poor at t given status at $t-1$

		Perceived FD at t		
		Not in FD	In FD	Total
Perceived FD at $t-1$	Not in FD	95.8	4.3	100.0
	In FD	54.1	45.9	100.0
	Total	**92.8**	**7.2**	**100.0**

		Poverty at t		
		Not poor	Poor	Total
Poverty at $t-1$	Not poor	95.5	4.5	100.0
	Poor	31.6	68.4	100.0
	Total	**87.2**	**12.8**	**100.0**

Source: PSELL3/EU-SILC, 2003-2011, authors' computation. Weighted results. Pooled observations across the period.

Table 5: Probability of being in financial difficulties at t given poverty status at $t-1$ and probability of being poor at t given status in perceived financial difficulties at $t-1$

		Perceived FD at t		
		Not in FD	In FD	Total
Poverty at $t-1$	Not poor	95.6	4.4	100.0
	Poor	73.8	26.2	100.0
	Total	**92.8**	**7.2**	**100.0**

		Poverty at t		
		Not poor	Poor	Total
Perceived FD at $t-1$	Not in FD	90.3	9.7	100.0
	In FD	47.6	52.5	100.0
	Total	**87.2**	**12.8**	**100.0**

Source: PSELL3/EU-SILC, 2003-2011, authors' computation. Weighted results. Pooled observations across the period.

Table 6: Main results for the joint RE probits for S_t and P_t (Model 1) and the ordered RE probit model for S_t and joint RE probit for P_t (Model 2) including current poverty status

| | Model 1 | | | | Model 2 | | | |
| | Perceived financial difficulties equation | | Poverty equation | | Perceived financial difficulties equation | | Poverty equation | |
	Coeff.	std.error	Coeff.	std.error	Coeff.	std.error	Coeff.	std.error
S_{t-1}	0.437***	(0.043)	0.138***	(0.050)				
$S_{t-1}[0]$					-0.469***	(0.028)	0.131	(0.090)
$S_{t-1}[2]$					0.247***	(0.020)	0.039	(0.047)
$S_{t-1}[3]$					0.595***	(0.028)	0.166***	(0.055)
$S_{t-1}[4]$					0.765***	(0.037)	0.206***	(0.701)
$S_{t-1}[5]$					0.809***	(0.050)	0.402***	(0.090)
S_0	0.759***	(0.058)	0.377***	(0.056)				
$S_0[0]$					-0.682***	(0.038)	-0.221***	(0.098)
$S_0[2]$					0.607***	(0.029)	0.183***	(0.056)
$S_0[3]$					1.135***	(0.038)	0.430***	(0.065)
$S_0[4]$					1.311***	(0.050)	0.560***	(0.080)
$S_0[5]$					1.658***	(0.067)	0.687***	(0.106)
P_t	0.226***	(0.049)			0.200***	(0.029)		
P_{t-1}	0.011	(0.046)	0.746***	(0.039)	0.082***	(0.027)	0.735***	(0.038)
P_0	0.237***	(0.054)	0.935***	(0.057)	0.149***	(0.035)	0.851***	(0.055)
σ_{κ_i}	0.738***	(0.036)			0.691***	(0.012)		
σ_{ν_i}	0.771***	(0.035)			0.758***	(0.034)		
ρ_{κ_i,ν_i}	0.324***	(0.054)			0.263***	(0.039)		

Source: PSELL3/EU-SILC, 2003-2011, authors computation. Significance: *** 99% confidence level, ** 95% and * 90%.

Table 7: Coefficients for the RE ordered probit model for perceived financial difficulties jointly estimated with the RE probit model for poverty (Model 2)

	Perceived financial difficulties equation			Poverty equation		
	Coefficient	p-value	std. error	Coefficient	p-value	std. error
Female	0.028		(0.022)	-0.032		(0.039)
Portuguese	0.293	***	(0.034)	0.561	***	(0.055)
EU-15	0.017		(0.026)	0.207	***	(0.050)
Not EU-15	0.201	***	(0.045)	0.851	***	(0.069)
Age	-0.058	***	(0.019)	-0.042		(0.042)
Age^2	0.000	**	(0.000)	0.000		(0.000)
Bad health	0.192	***	(0.038)	-0.005		(0.068)
Single	-0.017		(0.058)	-0.247	*	(0.137)
Divorced	0.294	***	(0.057)	0.256	**	(0.110)
Widowed	0.373	***	(0.135)	-0.107		(0.385)
Lone-parent	0.285	***	(0.057)	0.677	***	(0.110)
Children(1-6)	0.047	**	(0.023)	0.227	***	(0.042)
Children(6-11)	-0.040		(0.026)	0.140	***	(0.046)
Children(12-17)	-0.004		(0.025)	0.158	***	(0.046)
Low education	0.068		(0.088)	0.083		(0.214)
Mid education	0.019		(0.074)	0.080		(0.195)
Part-time	0.068		(0.085)	0.570	***	(0.154)
Unempl.	0.361	***	(0.039)	0.205	***	(0.067)
Self-emp.	-0.013		(0.070)	0.213		(0.137)
Other	0.209	***	(0.040)	0.449	***	(0.074)
Adults	0.096	***	(0.020)	0.148	***	(0.038)
Adults work	-0.180	***	(0.021)	-0.506	***	(0.042)
Access housing	0.194	***	(0.039)	-0.056		(0.092)
Tenant	0.045		(0.051)	0.383	***	(0.117)
Constant				-3.821	***	(0.335)
Cut[1]	-0.308		(0.192)			
Cut[2]	1.715	***	(0.192)			
Cut[3]	3.286	***	(0.192)			
Cut[4]	4.534	***	(0.193)			
Cut[5]	5.572	***	(0.194)			
σ_{κ_i}			0.691 *** (0.012)			
σ_{ν_i}			0.758 *** (0.034)			
ρ_{κ_i,ν_i}			0.265 *** (0.039)			
$ln-L$			-46617.74			

Source: PSELL3/EU-SILC, 2003-2011, authors' computation. Significance: *** 99% confidence level, ** 95% and * 90%. Coefficients for the individual time averaged value of each time-varying covariate and of wave dummies are not reported for brevity. Coefficient regarding state dependence, feedback effects, initial conditions are also not reported and can be found in Table 6 (Model 2).

Table 8: Robustness checks for the ordered RE probit model for S_t and bivariate RE probit for P_t with various poverty lines

	50%				70%				same proportion			
	Perceived financial difficulties equation		Poverty equation		Perceived financial difficulties equation		Poverty equation		Perceived financial difficulties equation		Poverty equation	
	Coeff	std.error	Coeff.	std-error	Coeff	std.error	Coeff.	std-error	Coeff	std.error	Coeff.	std-error
$S_{t-1}[0]$	-0.476***	(0.275)	0.106	(0.110)	-0.481***	(0.027)	0.008	(0.077)	-0.476***	(0.028)	0.187*	(0.105)
$S_{t-1}[2]$	0.255***	(0.019)	0.112*	(0.061)	0.250***	(0.020)	0.089***	(0.040)	0.254***	(0.020)	0.144***	(0.059)
$S_{t-1}[3]$	0.617***	(0.028)	0.209***	(0.071)	0.600***	(0.028)	0.109***	(0.052)	0.614***	(0.028)	0.299***	(0.070)
$S_{t-1}[4]$	0.789***	(0.037)	0.376***	(0.082)	0.779***	(0.037)	0.131***	(0.067)	0.787***	(0.037)	0.415***	(0.082)
$S_{t-1}[5]$	0.830***	(0.048)	0.481***	(0.098)	0.834***	(0.048)	0.362***	(0.092)	0.829***	(0.049)	0.492***	(0.097)
$S_0[0]$	-0.673***	(0.037)	-0.022	(0.110)	-0.665***	(0.037)	-0.222***	(0.087)	-0.674***	(0.037)	-0.054	(0.108)
$S_0[2]$	0.600***	(0.028)	0.113	(0.069)	0.590***	(0.028)	0.162***	(0.047)	0.600***	(0.028)	0.118	(0.067)
$S_0[3]$	1.139***	(0.037)	0.421***	(0.078)	1.095***	(0.037)	0.488***	(0.058)	1.140***	(0.037)	0.362***	(0.076)
$S_0[4]$	1.329***	(0.049)	0.481***	(0.091)	1.274***	(0.049)	0.627***	(0.077)	1.332***	(0.049)	0.447***	(0.089)
$S_0[5]$	1.677***	(0.063)	0.516***	(0.111)	1.625***	(0.065)	0.762***	(0.106)	1.675***	(0.066)	0.589***	(0.108)
P_t	0.201***	(0.033)			0.197***	(0.027)			0.209***	(0.032)		
P_{t-1}	0.037	(0.032)	0.685***	(0.048)	0.027	(0.025)	0.690***	(0.035)	0.029	(0.031)	0.668***	(0.045)
P_0	0.154***	(0.039)	0.679***	(0.064)	0.220***	(0.032)	1.022***	(0.052)	0.147***	(0.040)	0.709***	(0.060)
eps1	0.682***	(0.012)			0.677***	(0.012)			0.684***	(0.012)		
eps2	0.727***	(0.040)			0.756***	(0.031)			0.705***	(0.038)		
rho	0.167***	(0.042)			0.305***	(0.038)			0.176***	(0.043)		

Source: PSELL3/EU-SILC, 2003-2011, authors computation.

A Appendix

Table A.1: Variable labels and descriptives

Variables	Definition	Mean	Std. Dev.
subjo	ordinal Perceived Financial Difficulty	1.763	1.12
	(0. very easy; ...; 5. very difficult)		
subjd	dichotomous Perceived Financial Difficulties	0.076	0.265
	1 if difficulties, 0 otherwise		
poor	1 if income poor (60% threshold), 0 otherwise	0.132	0.338
female	1 if female, 0 otherwise	0.499	0.500
Lux(ref)	1 if Luxembougish citizenship, 0 otherwise	0.522	0.499
Port	1 if Portuguese citizenship, 0 otherwise	0.182	0.38
EU15	1 if citizen of an EU15 country (except Lux and Port)	0.224	0.417
	0 otherwise		
NonEU15	1 if citizen of a non EU15 country, 0 otherwise	0.072	0.259
age	Age in years of the individual	40.248	10.06
agesq	Age^2	1721.329	812.33
health	1 if (very) bad health, 0 otherwise	0.057	0.232
married (ref)	1 if married, 0 otherwise	0.624	0.483
single	1 if single, 0 otherwise	0.268	0.443
divor	1 if divorced or separated, 0 otherwise	0.092	0.289
widow	1 if widow, 0 otherwise	0.016	0.126
highedu (ref)	1 if higher education, 0 otherwise	0.258	0.437
lowedu	1 if low education, 0 otherwise	0.349	0.477
midedu	1 if middle education, 0 otherwise	0.393	0.488
ft(ref)	1 if work full time, 0 otherwise	0.723	0.447
pt	1 if work part-time, 0 otherwise	0.013	0.113
unemp	1 if unemployed, 0 otherwise	0.044	0.205
selfemp	1 if self employed, 0 otherwise	0.049	0.218
other	1 if other labour market status, 0 otherwise	0.169	0.375
nbl6	Number of children in household less than 6	0.294	0.602
nb611	Number of children in household aged 6-11	0.262	0.557
nb1217	Number of children in household aged 12-17	0.248	0.547
nbadult	Number of adults in the household	2.316	0.93
nbaoind	Number of adults at work	0.808	0.703
hhlone	1 if lone parent household, 0 otherwise	0.026	0.159
owner(ref)	1 if household own the accommodation, 0 otherwise	0.210	0.408
acced	1 if owner paying a mortgage, 0 otherwise	0.461	0.498
tenant	1 if tenant, 0 otherwise	0.329	0.469

Source: Own calculation on the PSELL3/EU-SILC, 2003-2011.