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Financial strain in the United Kingdom

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Abstract

UK households have been exposed to economic recession followed by a government programme of austerity putting many under severe financial strain. Using UK longitudinal household data, we find that the feeling of not being able to cope financially matters for individual mental health and general health status even when controlling for individual heterogeneity and potential reverse causation. We develop a theoretical model which brings some of the rigour of lifetime economic decision-making models to bear on our understanding of the causes of financial strain. Our estimation results for this model highlight that shocks to how we view our financial situation are more important for subjective financial well-being than not having enough income or being liquidity constrained. Recent welfare and pension reforms intended to reduce budget deficits may have exacerbated financial strain and thus increased public healthcare costs. In the case of disability benefits reform, we find that the uncertainty generated by an opaque process of reassessment caused financial strain to increase even when households were not materially worse off.

JEL: I10, I18, D12, I30.

1. INTRODUCTION

The 2008 financial crisis and subsequent government programmes of austerity have led to a rise in financial strain in the advanced economies. Higher levels of suicide, alcohol problems and mental illness have been associated with increasing financial difficulties (OECD, 2014; Frank et al., 2014). In the UK, household debt increased dramatically before the financial crisis from 117% of GDP in 2000 to 180% of GDP in 2009 and it is predicted to return to these levels in 2021 (OBR, 2016; Guiso and Sodini, 2013). Since 2010, the UK government has reduced welfare spending by introducing stricter eligibility criteria for benefits such as disability benefits and these reforms have hit the most deprived areas of the country the hardest (Beatty and Fothergill, 2014).

In this paper, we define financial strain using self-reported difficulties in managing financially. We use data from the British Household Panel Survey and the UK Household Longitudinal Survey to show that financial strain has worsened mental health and general health status in the UK. Given that there is a wider social cost of financial strain, we explore a lifetime consumption model perspective to understand how households become or avoid feeling financially strained. We then consider whether a recent reform to disability benefits has made financial strain worse.

Our focus on a subjective measure of financial strain is motivated by results showing that it is not objective measures of debt or arrears that best explain the impact of financial difficulties on mental health but instead the subjective feeling of not being able to cope financially. Worries about debt are the strongest predictor of depression among mothers of infants (Reading and Reynolds, 2001) ; perceived financial strain worsened the mental health of individuals on the verge of bankruptcy whereas the amount of debt had no effect (Selenko and Batinic, 2011); and the association between reporting depression and a subjective financial measure is stronger than for objective measures of the financial position of the household for UK families (Bridges and Disney, 2010). Similar results have been found for the effects of financial difficulties on physical health. Drentea and Lavrakas (2000) found that the ef-

fect of a debt-stress index on physical impairment persisted across all specifications unlike measures of credit card debt and debt/income ratios which were statistically insignificant in some models. French and McKillop (2015) show that health among low-income Northern Irish households is not affected by the size of the debt, the type of debt or the number of different lenders rather the subjective experience of feeling financially strained has a robust relationship with most aspects of health including ability to self-care, problems performing usual activities, pain problems, and psychological health. The emotional responses to economic hardship of shame, failure, worry or concern leads to coping behaviours detrimental to health (Turunen and Hiilamo, 2014) and Nelson et al. (2008) find that the financially-strained more readily indulge in impulsive behaviours such as overeating unhealthy foods, excessive consumption of drugs and alcohol, sedentary behaviour and physical fighting.

There are several suggested causes of financial strain in the literature. The subjective experience of being financially strained is often conceptualized in terms of the stock of unsecured or secured debts (del Rio and Young, 2008) or net wealth once debts are offset by household assets (Christelis et al., 2009). However, debt, in itself, may not cause distress as households need to borrow at various stages of the lifecycle - for example, the young need to borrow to invest in education or to set up home and therefore high levels of debt in this group should not necessarily cause difficulties. The inability to meet debt repayments or pay utility bills would indicate that financial commitments are becoming unsustainable (Mirowsky and Ross, 1999) but, with access to further credit, such temporary problems can be managed. This suggests that the inability to borrow or liquidity constraints are the real cause of financial strain. It is also possible for liquidity unconstrained households to experience financial strain. If we assume households borrow against future income, it may be the case that the lifetime level of consumption this allows is insufficient to provide an adequate standard of living. Not having enough money to meet basic needs such as food, shelter, safety and medicines will increase feelings of not being able to cope (Brooks-Gunn, 1997; Jessop et al., 2005; Turunen and Hiilamo, 2014). The other possibility is that unexpected events

occur for which the household has not made adequate provision. Even with the ability to access as much credit as future incomes permit, the household may underestimate the risk of unemployment, unplanned pregnancy, illness, or natural disaster and the psychological effects of uncontrollable shocks may be greater than persistent financial hardship (Wadsworth et al., 2008; Santiago et al., 2011). Economic theory on lifetime consumption provides a useful framework for bringing together these ideas.

UK government policy may have had the unintended consequence of exacerbating feelings of not coping. To demonstrate this point, we consider the replacement of Incapacity Benefit by Employment Support Allowance for those unable to work due to a disability and we find that the process of simply moving from the old to the new disability benefit increased the probability of financial strain by up to 7.9 percentage points even though claimants were not materially worse off. Other elements of the welfare reform package may have also increased financial strain. For example, the move to a single monthly payment of universal credit from several welfare payments over the month may have created problems with financial management and budgeting (CAB, 2013). Other UK policies may also have had a similar effect. Recent reforms to pensions now allow those over the age of 55 to withdraw up to 25% of their pension savings as a lump-sum which opens up the possibility of pensioners mismanaging their pension planning, targeting of pensioners by unscrupulous investment companies, and excessive financial demands from children (BBC, 2014). The implications of the new state pension to be introduced in 2016 have not been clearly explained and the simplicity of the new system has either been misunderstood or overstated (Crawford and Tetlow, 2016).

This paper makes the following original contributions. Currently, there are very few economic theories of financial strain. Studies generally take a certain definition of financial strain as implicitly understood and not requiring theoretical motivation. In this paper, we develop a theoretical model which brings some of the rigour of lifetime economic decision-making models to bear on our understanding of the causes of financial strain. This allows

for a more complete analysis of the effects of low income, economic shocks and liquidity constraints on self-reported financial difficulties than has been undertaken previously. Our second contribution is that we evaluate UK government policy for its effect on financial strain. We consider the replacement of Incapacity Benefit by Employment Support Allowance and find results compatible with our theoretical model of financial strain. Other elements of the welfare reform package and recent reforms to pensions could also be evaluated in the same way. A third contribution is that we use a UK nationally representative survey to replicate results found in other international studies that the subjective feeling of being under financial strain matters not only for mental health but also for general health status and, moreover, financial strain matters more than the size or nature of debts or the level of income.

The paper is structured as follows: Section 2 develops the theoretical model within the framework of intertemporal choice; Section 3 describes the data and provides some descriptive statistics; Section 4 reports analyses of the links between financial strain and health, estimates parameters of the model of financial strain and analyses the effect of disability benefit reassessment on financial strain; and Section 5 concludes.

2. MODEL

We begin with a simple model of intertemporal choice following (Deaton, 1992). The head of household in period t chooses household consumption for every period in order to maximize utility:

$$Max_{c_t} \left[U(c_t, \sigma_t) + E_t \left(\sum_{\tau=t+1}^T \beta^\tau U(c_\tau, \sigma_\tau | c_t) \right) \right] \quad (1)$$

The household derives positive utility in each period t from the level of consumption c_t while the stock of strain capital experienced by the household σ_t provides negative utility.

If strain is driven by elements associated with an exogenous income process, utility is quadratic in consumption and preferences are separable in consumption and stress:

$$U(c_t, \sigma_t) = c_t - ac_t^2 + f(\sigma_t) \quad (2)$$

The standard results then pass through ; that is, households expect consumption to be constant over time and related to income smoothed over time by borrowing and saving or *permanent income*:

$$c_t = E_t c_{t+k} = \frac{r}{1+r} A_t + \frac{r}{1+r} \sum_{k=0}^{\infty} (1+r)^{-k} E_t y_{t+k} \quad (3)$$

i.e. equal to the annuitized value of current wealth and expected future incomes.

From this perspective, financial strain could then occur in three ways:

1. Permanent income is insufficient to meet basic needs putting the household under financial strain;
2. Permanent income shocks cause consumption levels to be revised and such revisions cause strain; or
3. Households are liquidity constrained and cannot smooth income over time

Financial strain levels therefore evolve according to:

$$\sigma_t = \rho \sigma_{t-1} + s_\lambda (Y_b - Y_t) + s_\Delta (E_{t-1} - E_t) Y_t + s_c \mathbb{1}_{c,t} + f(\Theta_t)$$

where $s_\epsilon > 0, s_Y > 0, s_c > 0$ and $\mathbb{1}_c = \begin{cases} 1 & \text{if liquidity constrained} \\ 0 & \text{otherwise} \end{cases} \quad (4)$

Giarda (2013) finds financial distress to be state dependent and, therefore, we include the first term in equation (4) to indicate the level of strain depreciating at a rate of ρ per time period. The next terms capture the effects of basic needs, income shocks and liquidity constraints.

The second term describes the effect of not having enough income to cover basic needs Y_b and this level of need is determined by household characteristics. For tractability, we

assume Y_b to be time-invariant. If permanent income Y_t is lower than Y_b (by one unit) then the stock of strain is increased (by s_λ units). Permanent income is in per capita terms to reflect household demographics.

The third term captures changes in expectations about permanent income from period $t - 1$ to period t i.e. $(E_{t-1} - E_t)Y_t$ represents a shock to permanent income. This could be due to an unexpected change to income in the current period or revisions to expectations about future income e.g. announcement of proposed redundancies or withdrawal of benefits. As Y_t is in per capita terms, this term will also reflect unexpected changes in household size and composition e.g. unplanned pregnancy. If expectations of permanent income are revised downwards (by one unit), strain is increased (by s_Δ units).

The fourth term is an indicator of whether the household is liquidity constrained. Households that would otherwise borrow will then achieve a lower level of consumption causing them financial strain. This lower consumption has two sources (i) anticipating possible future constraints, households curtail consumption and save more to accumulate buffer assets, and (ii) if assets run out and the household suffers a negative income shock it will have to reduce consumption. We would expect liquidity constraints in the absence of savings to have a greater effect on strain.

The last term is a function of a matrix of household characteristics Θ which may mitigate or exacerbate strain e.g. presence of young children.

In this model, income is an exogenous process over which the household has no control. A more sophisticated model would have the household choosing not just its level of consumption but also its labour supply. Members of the household may work more in order to lessen their degree of financial strain but working long hours is also unpleasant and this trade-off could then be modelled.

3. DATA

3.1. Variables

The BHPS was an annual socio-economic survey of a representative sample of more than 5,000 households in Britain which ran for 18 waves ending in 2008. A substantial Northern Irish sample was added from wave 11 in 2001 providing UK-wide coverage. The UK Household Longitudinal Study (UKHLS) is a longitudinal survey of the members of approximately 40,000 households in the United Kingdom. From wave 2 onwards, this survey included continuing BHPS participants. The most recent available data release is wave 5 which was collected 2013-14. The data used in this study are taken from BHPS waves 11-18 and UKHLS waves 2-5. This dataset provides us with consistent complete UK coverage and also covers the period before and after the 2008 financial crisis.

The household's *financial situation* is assessed from responses to the question 'How well would you say you yourself are managing financially these days?' The five possible responses are 'living comfortably', 'doing alright', 'just about getting by', 'finding it quite difficult' and 'finding it very difficult'. Following Bridges and Disney (2010), we define the household as being under *financial strain* if the head of household responds that he/she is 'finding it quite difficult' or 'finding it very difficult'.

In every wave, mortgage payers were asked the amount of their most recent total monthly mortgage payment. *Secured debt* was then calculated by annualising this figure and multiplying by the number of years left to run on the mortgage. In wave 15 of BHPS, the heads of household were asked the total amount they owed on a number of financial commitments including personal loans and credit cards but not including mortgages. If they indicated that these commitments were in their name alone, we added the amount of the financial commitments of all other members of the household to this total to construct our *unsecured debt* variable. In wave 4 of UKHLS, totals owed on credit card and other financial commitments were asked about separately. These were added and the total household unsecured debt

was calculated as outlined previously. Total annual household net income was provided in BHPS while monthly household net income provided in UKHLS was converted to annual net income. These were then divided by the OECD modified equivalence scale to give *equivalized income*. For ease of interpretation, we also divided households into three tertiles and used the middle tertile as the reference category in the analyses.

A number of variables describing the composition of the household were also used (race, country of origin, age of head of household, number of children, age of children, head of household has partner) as well as variables describing the educational and employment status of the head of household and partner. The relationship of the household to the housing market is captured by whether the head of household is a homeowner and whether the head of household has moved location since the last survey.

3.2. *Constructed variables*

Following (Benito, 2009), we use two questions to construct income shock variables. The first is a financial expectations question from the previous period: ‘Looking ahead, how do you think you will be financially a year from now, will you be....’ ‘better than now’, ‘worse than now’ or ‘about the same’? We then use responses to the household’s financial situation question from the previous period and the current period to determine the actual change in circumstances. If the financial situation changes were as expected then there was no shock. If the financial situation changes were worse (better) than expected then the *shock* variable takes a value of +1 (-1).

More rigorously, let responses to the financial expectations question correspond to:

$$E_{t-1}(Y_t - Y_{t-1}) = E_{t-1}Y_t - E_{t-1}Y_{t-1}$$

Let responses to the household’s financial situation at time t correspond to $E_t Y_t$. In which

case, the change in financial situation is:

$$E_t Y_t - E_{t-1} Y_{t-1}$$

Then comparing expected change to actual change we have:

$$(E_{t-1} Y_t - E_{t-1} Y_{t-1}) - (E_t Y_t - E_{t-1} Y_{t-1}) = E_{t-1} Y_t - E_t Y_t = (E_{t-1} - E_t) Y_t$$

which is the third term in equation (4).¹

Households whose consumption exhibited excess sensitivity to income were classified as liquidity constrained. The theoretical justification is that under the permanent income hypothesis, consumption should be constant over time unless new information arrives i.e.:

$$\Delta c_t = v_t \tag{5}$$

where v_t is a random error term. Therefore, information from the previous time period does not explain changes in consumption and $\beta_j = 0$ for all j below (Jappelli and Pistaferri, 2010).

$$\Delta c_t = \sum_{j=0}^J y'_{t-1-j} \beta_j + v_t \tag{6}$$

If, for any particular household, $\beta_j \neq 0$ then consumption is excessively sensitive to income. Conventionally, this has been interpreted as evidence that these households are liq-

¹The limitation to this reasoning is that the household's financial situation question is being used to generate σ_t above. Revisions to expectations about strain will correlate with revisions to expectations about income if expectations in period $t - 1$ of basic needs, liquidity constraints and household characteristics in period t were the same as realized values in period t . With these assumptions, it would then be legitimate to use changes in financial strain to determine income shocks.

$$\begin{aligned} E_{t-1} \sigma_t &= \rho \sigma_{t-1} + s_\lambda (Y_{b,t} - E_{t-1} Y_t) + s_c \mathbb{1}_{c,t} + f(\Theta_t) \\ E_t \sigma_t &= \rho \sigma_{t-1} + s_\lambda (Y_b - E_t Y_t) + s_\Delta (E_{t-1} - E_t) Y_t + s_c \mathbb{1}_{c,t} + f(\Theta_t) \\ \implies (E_{t-1} - E_t) \sigma_t &= -s_\lambda (E_{t-1} - E_t) Y_t - s_\Delta (E_{t-1} - E_t) Y_t = (-s_\lambda - s_\Delta) (E_{t-1} - E_t) Y_t \end{aligned}$$

liquidity constrained and are unable to borrow to smooth consumption (Jappelli and Pagano, 1989; Attanasio, 1999). Carroll (2001) argues that, under certain conditions, unconstrained precautionary savers will also exhibit excess sensitivity of consumption to income over time as they refuse to borrow from future income to finance current consumption out of fear of being unable to repay their debts. Other possible reasons are that consumers are impatient and ignore the future; have non-separable preferences; produce at home or own durable goods (Attanasio, 1999). Externally imposed liquidity constraints cannot easily be distinguished from these other types of behaviour. We therefore follow other authors by regarding all households where consumption is excessively sensitive to income as being liquidity constrained (Benito and Mumtaz, 2009; Beznoska and Ochmann, 2012) although we also interact the liquidity constraint variable and an indicator of no savings to more accurately identify households with externally imposed liquidity constraints.

We estimate a finite mixture model of the form:

$$f(\Delta\mathbf{c}|\mathbf{x}; \mathbf{z}; \theta_1, \theta_2; \pi_1, \pi_2) = \pi_1(\mathbf{z})f_1(\Delta\mathbf{c}|\mathbf{x}; \theta_1) + \pi_2(\mathbf{z})f_2(\Delta\mathbf{c}|\mathbf{x}; \theta_2) \quad (7)$$

where \mathbf{x} is a matrix of independent variables including lagged income y_{-1} ; θ_i are parameters which differ between unconstrained and constrained groups; π_i are the probabilities of being constrained or not which are dependent on a matrix \mathbf{z} . In the unconstrained group, the coefficient on lagged income should be zero ($\beta_1 = 0$ in equation (6)) while in the constrained group this coefficient should be non-zero. The probabilities of group membership are specified conditional on a matrix of plausible predictors of liquidity problems using a logit model. As in other studies, we use household food and grocery consumption as our dependent variable and results are given in Table 1. Panel (a) in Table 1 shows that only Group 2 shows evidence of excess sensitivity ($\beta = -0.018$; $p = 0.03$) whereas Group 1 households smooth out the effect of variations in income on consumption by accessing credit ($\beta = -0.004$; $p = 0.11$). The marginal density of being in the unconstrained group is given in panel (b). Having

a partner or being a homeowner increases the probability of being unconstrained as does saving but the effects for the saving variables are not statistically significant. On the other hand, those who move house frequently are more likely to be credit constrained.

[TABLE 1 HERE]

3.3. Descriptive statistics

Descriptive statistics for selected variables are given in Table 2 for key financial variables and selected socio-economic control variables. Just over one third of heads of households are female. About one-fifth have no educational qualifications and the level of unemployment is low at 3%. Of most relevance to this study are the indicators of the household's financial circumstances and a sizeable minority are observed to have experienced financial difficulties. 8% of heads of household feel financially strained, 4% of households have experienced a financial shock and 13% are liquidity constrained. On the other hand, almost half of households (42%) are able to save some of their income for purposes other than to meet regular bills. Average household income is £24,925 before adjusting for household size, household secured debt is £31,122, and unsecured debt is £3,288, but this variable is only available for two waves. One-fifth of heads of household had a score of 4 or more on the General Health Questionnaire (GHQ12) indicating psychiatric morbidity. A self-report of 'poor' or 'very poor' health was classed as poor health and in our sample slightly more than one in ten heads of household are in poor health.

[TABLE 2 HERE]

4. RESULTS

4.1. *The social cost of financial strain*

We first estimate the effect of subjective feelings of financial strain for mental health and general health status using a probit model of the form below:

$$h_{it}^* = \gamma\sigma_{it} + \beta'\Phi_{it} + \alpha_i + \varepsilon_{it} \quad (8)$$

where h_{it}^* is a latent mental health or general health status variable, σ_{it} is financial strain and Φ_{it} is a set of control variables. Random effects, α_i , are also used where possible to account for individual household heterogeneity. A number of probit models of psychiatric morbidity and of self-reported poor health are estimated. Marginal effects are reported in Table 3 for selected variables. The full set of control variables includes household-level variables (race, country of origin, age, gender, respondent has partner, homeowner, moved house, household income, number of children, age of children), educational qualifications, employment status, partner education and employment status, region dummies, wave dummies and measures of debt.

[TABLE 3 HERE]

There are two potential sources of endogeneity in the empirical analysis of these relationships. First, in addition to debt causing health problems, poor health may also cause debt problems. Keese and Schmitz (2014) argue that, with universal healthcare provision as in the UK, health cannot cause financial difficulties through treatment expenses and therefore the only reverse path of causation is poor health causing job loss and leading to financial problems. We therefore follow these authors in testing the robustness of our results when restricting our sample by eliminating those households where any adult is not working in

any wave. Bridges and Disney (2010) highlight a second form of endogeneity which arises for subjective reports of financial distress and self-reported health. They argue that individual heterogeneity could drive correlations between self-reports of mental health and financial strain. A negative psychological disposition could cause individuals to report low mood and have a very pessimistic view of their financial affairs. By allowing for random effects, we remove this potential source of endogeneity and focus on the variation of health with financial strain within household over time.

In the first three columns of Table 3, the dependent variable is a binary variable which equals one if the head of household shows symptoms of psychiatric morbidity. In the first regression in column (1), all 12 waves of the data are used. We see that women have a 6.4 percentage point higher probability of reporting poor mental well-being whereas there is little association with age. Heads of households in the lowest or highest income tertiles of households have a lower chance of reporting a high GHQ-12 score than the middle income tertile base category. Of most interest to this study, we also see that secured debt increases the chance of psychiatric morbidity but this effect is very small. A 10% increase in the ratio of secured debt to annual household income will increase the probability of having a GHQ-12 score of 4 or more by only 0.03 percentage points. In contrast, being under financial strain increases the probability of psychiatric morbidity by 14.6 percentage points. This large effect persists when we include a measure of unsecured debt. This measure is only available in wave 15 of BHPS and wave 4 of UKHLS and estimates are reported in column (2) where these two waves are pooled. Financial strain now increases the probability of psychiatric morbidity by 19.5 percentage points while an increase in the ratio of unsecured debt to annual household income does not increase the probability of having a GHQ-12 score of 4 or more. The effect of secured debt is slightly larger than before but of the same low order. In the third regression in column (3), we account for the potential endogeneity of debt and financial strain to poor mental health. The coefficient on financial strain is only slightly lower than before while secured debt no longer has a statistically significant effect on mental health.

In the columns 4-6, the dependent variable is a response of ‘poor’ or ‘very poor’ to the following question asked in BHPS: ‘Please think back over the last 12 months about how your health has been. Compared to people of your own age, would you say that your health has on the whole been’. No equivalent question was asked in UKHLS. The effect of financial strain on poor health status is statistically significant in column (4) but the magnitude is not as great as in the models of psychiatric morbidity. Heads of financially strained households have a 5.0 percentage points higher probability of reporting poor health status. The magnitude of the effect of secured debt is statistically significant but very small as before. Including a measure of unsecured debt in column (5) does not change the conclusion that the perception of financial strain has an important impact on health but debt levels are much less important. The magnitude of the impact is attenuated but still statistically significant in column (6) where we remove the possibility that poor health has caused financial difficulties by eliminating those households where any adult is not working in any wave. Financial strain now increases the probability of reporting poor health status by 3.6 percentage points. Specifying the individual effect as a random variable assumes that the individual-specific effect is uncorrelated with the explanatory variables. In the presence of correlation between the individual effects and explanatory variables, two approaches to modelling binary choice with panel data are suggested that allow for this correlation and permit the estimation of marginal effects: (1) projecting the effects onto group means of the time-varying variables (Chamberlain, 1980) (2) correcting the bias in the probit FE estimator (Fernández-Val and Weidner, 2016). Using these two estimation approaches does not change the conclusion given here. Results are available on request

The key finding here is that the subjective feeling of being under financial strain matters not only for mental health but also for general health status.² Moreover, financial strain matters more than the size or nature of debts or the level of income. These findings are

²Although, self-reported health assessments are principally assessments of the respondent’s physical functioning they are also influenced by negative affective states but to a much lesser degree (Mavaddat et al., 2011).

robust to two types of potential endogeneity discussed in the literature.

4.2. *Explaining financial strain*

In the following section, we estimate our model of financial strain in equation (4) by assuming the level of income for basic needs Y_b can be modelled by a time-invariant household effect α_i and we replace permanent income Y_{it} with current income y_{it} as a crude proxy. We then have a dynamic random-effects model:

$$\sigma_{it} = \rho\sigma_{i,t-1} - s_\lambda(y_{it}) + s_\Delta(E_{i,t-1} - E_{it})Y_{it} + s_c\mathbb{1}_{c,it} + \alpha_i + \beta' \Theta_{it} + \epsilon_{it} \quad (9)$$

To simplify interpretation, we initially regard the dependent variable as being continuous not categorical. The stock of financial strain is then given on a scale of 1 (‘living comfortably’) to 5 (‘finding it very difficult’). Estimation of dynamic random-effects models are complicated by assumptions about behaviours of the initial dependent variable values. A consistent generalized method of moments (GMM) estimator independent of the initial conditions is provided by using a series of differences and lags as instruments (Arellano and Bover, 1995; Blundell and Bond, 1998). Although, the large number of instruments provides more efficient estimates, such a large instrument set over-fits endogenous variables biasing estimates and also weakens statistical tests of the instruments’ validity (Roodman, 2009). We therefore reduce the instrument count by replacing the system GMM instruments with their principal components (Kapetanios and Marcellino, 2010; Roodman, 2015). A similar set of controls to those used in the previous section provides the matrix of household characteristics Θ_{it} and estimates for equation (9) are given in Table 4.

[TABLE 4 HERE]

In Table 4 column (1), we see that the coefficients in the model are signed as expected

and are statistically significant. The stock of financial strain is relatively persistent and depreciates at an annual rate of 0.509. Income reduces financial strain and we interpret the coefficient s_λ as meaning an increase in household income per capita by £10,000 above the level necessary to cover basic needs reduces the stock of strain by 0.0462 units. In comparison, the size of the coefficient on the shock variable, s_Δ , is surprisingly large. If expectations of permanent income are revised downwards then strain is increased by 0.772 units. This is a much larger effect than the effect of income and also much larger than the effect of being liquidity constrained, s_c . This result is in line with arguments elsewhere that the psychological effects of uncontrollable shocks may be greater than persistent financial hardship (Wadsworth et al., 2008; Santiago et al., 2011). Long-run effects will of course be roughly twice as large for all regressors.³

In the second regression in column (2), we make two adjustments. First, we replace equivalized income by indicator variables of income tertiles in order to highlight the fact that financial strain is dominated by the effect of unexpected events. The second adjustment we make is to replace our indicator variable for liquidity-constrained households with an indicator for liquidity-constrained households where the head of household does not save. This eliminates those households with a precautionary saving motive which display excess sensitivity of consumption to income through self-imposed liquidity constraints. These households would not be expected to be under financial strain and therefore we would expect the coefficient estimate for liquidity constraints to increase once they have been removed. Estimates show that, as expected, the lower the income tertile the higher are the feelings of financial strain. But at the lowest level of income in the first tertile, the coefficient estimate of 0.090 is still substantially lower than the effect of a shock which is practically unchanged at 0.770. The coefficient on being in a liquidity-constrained household increases to 0.079, but still the effect is relatively small.

³Following Hamilton (1994), for a general first-order difference equation of the form $\sigma_t = \rho\sigma_{t-1} + w_t$, the effect on σ of a permanent change in w beginning in period t is given by $\frac{1}{1-\rho}$. For estimates in column (1) of Table 4, we have $\frac{1}{1-\rho} = \frac{1}{1-0.506} \approx 2$

As system GMM estimation requires a continuous financial strain variable which is unavailable to us, we replace the categorical financial situation variable with our dichotomous financial strain variable. The model now becomes a dynamic random effects probit model for which we need to take account of the problem of initial conditions. The initial observations are likely to be correlated with the random effects as these unobserved characteristics (e.g. resilience) will affect levels of strain in every period. We follow Wooldridge (2010) by parameterizing the unobserved household effect α_i conditional on the initial value σ_{i1} and leads and lags of all strictly exogenous variables as follows:

$$\alpha_i = \alpha_0 + \alpha_1 \sigma_{i1} + \alpha_2' \mathbf{z}_i + u_i \quad (10)$$

where \mathbf{z}_{it} is a set of strictly exogenous variables evaluated at time t and $\mathbf{z}_i = (\mathbf{z}_{i1}, \dots, \mathbf{z}_{iT})$.

Estimates are given with and without this parametrization of the random effects in Table 4, columns (3) and (4) respectively.⁴ In column (3), shocks raise the probability of being under financial strain by 9.3 percentage points and the magnitude of this effect dominates income levels and liquidity constraints. The Wooldridge specification in column (4) does not change this general conclusion although the effect of income levels is diminished by the added controls. The marginal effects are estimated at mean values of all other variables and hence will under-report the effect of each variable on the section of the population most vulnerable to financial strain. For example, the marginal effect of a shock for those on low incomes who are liquidity constrained will be much greater than the marginal effect of a shock for the average household reported here. Also, long-run effects will be slightly larger than the short-run effects indicated in Table 4.

⁴The parametrization of the random effects in Wooldridge (2010) depends on balanced panels but can be applied to unbalanced panels as long as attrition is ignorable (Cappellari and Jenkins, 2008). The alternative specifications are given to test the robustness of findings.

4.3. *The case of welfare reform*

In this section we examine whether the government's programme of welfare reform has exacerbated financial strain in the UK. As our data finishes in 2013-14 and many of the changes introduced by the Welfare Reform Act 2012 were not rolled out as quickly as originally planned, we analyse an earlier reform. Starting from October 2010, claimants receiving a number of disability benefits - Incapacity Benefit (IB), Severe Disablement Allowance (SDA) and Income Support (IS) paid on the grounds of illness or disability - were reassessed to see if they were eligible for the new Employment and Support Allowance (ESA) disability benefit. The purpose of this reform was to tighten eligibility criteria and to provide support for able-bodied claimants so that they could return to work. The government made the commitment that no IB claimant migrating to ESA would see a cash reduction in their benefit at the point of migration (DWP, 2010).

The process is summarized in Figure 1. Claimants with the most severe functional impairments or who were terminally ill were fast-tracked into a support group (SG) who received the new benefit. All others underwent face-to-face assessments by a healthcare professional. They were then designated as:

- Having limited capability for work and moved onto ESA (Outcome 1). Some of these were placed into a work-related activity group (WRAG) and were expected to eventually move into work where possible. The more severely disabled were moved to the SG and received a higher rate of benefit than people in the WRAG.
- Being fit for work, in which case they could seek employment (Outcome 2) or apply for employment benefits (Jobseeker's Allowance (JSA) or Income Support (IS)) (Outcome 3).

[FIGURE 1 HERE]

There were considerable difficulties with this reform. Roll-out was not completed by March 2014 as originally envisaged. Also, individuals who were unhappy with the reassessment decision were often successful on appeal thus undermining the public perception of the fairness of the tests.

With the data available, we cannot capture all the subtleties of claimants' paths through the reassessment procedure but we can attempt to at least isolate claimants with outcomes 1-3 to determine if their levels of financial strain rose during this process. We expand the data to all households captured by UKHLS waves 2 to 5 and not just the subset of UKHLS households in the original BHPS sample as before. Table 5 provides an analysis of these paths by wave. For example, of the 583 individuals in wave 4 claiming the two disability benefits IB/SDA, 112 underwent reassessment and moved to the new ESA disability benefit in wave 5; 141 moved to unemployment benefits JSA/IS and 12 moved to full-time employment. Most of the remainder stayed on the old benefit though some moved onto pension credit. We can only be certain that the group on IB/SDA in the previous wave and on ESA in the current wave have gone through the reassessment process. Also, some of this group will not have undergone the face-to-face health assessment. Those moving to unemployment benefits or full-time employment may have done so of their own volition. It can be seen that only a very small number in each wave took up employment while a large number simply changed from disability benefits to unemployment benefits.

[TABLE 5 HERE]

We then incorporate these transitions into the model of financial strain in equation 9 and estimate a probit model without random effects due to effectively having only three waves of data. Results are given in Table 6 for those on disability benefits in the previous wave and, for many variables, coefficients are similar to previous estimations. Moving from IB and SDA through the reassessment process and onto ESA makes financial strain worse. The average

marginal effect in column (1) is a 5.6 percentage point short-run increase in the probability of being financially strained or 8.0 percentage point effect in the long-run. As ESA rates for these claimants were designed to be not less than the IB entitlement, we interpret this effect as being purely due to the uncertainty caused by a process seen as arbitrary and subject to long delays. Effects for those who were not fast-tracked into the SG but underwent the face-to-face health assessments were presumably higher. Moving from IB/SDA to an unemployment benefit which may or may not have happened due to reassessment also increased financial strain but to a lesser degree. Moving to full-time employment may reduce financial strain but the small numbers making this move mean the estimate is imprecise. In column (2), we add some of the determinants of financial strain from equation 9. The average marginal effect of moving onto the new disability benefit is less than in column (1) at 4.4 percentage points because some of the effect of moving onto the benefit is mediated through the added variables. The most likely causal pathway is through a financial shock but a more formal mediation analysis is left for further work.

[TABLE 6 HERE]

The numbers on out-of-work disability benefits have not changed substantially over the course of this reform (DWP, 2012a, 2016). Our results indicate that the reform increased financial strain, even for those not materially worse off, with consequences for their mental health and general health status. This agrees with a recent ecological study that found that the roll-out of the reassessment process across the UK was associated with increased suicides, mental health problems, and higher prescribing rates for antidepressants (Barr et al., 2016).

5. CONCLUSION

In recent years, UK households have experienced recession followed by a government programme of austerity. As a result, many households have been under severe financial

strain. A literature has developed in epidemiology, sociology, and economics highlighting the important consequences for individual mental and physical health of the feeling of not being able to cope financially and this effect is seen to be greater than for any objective measures of financial difficulties.

In a large UK sample, we also find financial strain worsens individual mental health and general health status even when controlling for individual heterogeneity and potential reverse causation. We develop a theoretical model which brings some of the rigour of lifetime economic decision-making models to bear on our understanding of the causes of financial strain. Our estimation results for this model highlight that shocks to how we view our financial situation are more important for subjective financial well-being than the level of income or being liquidity constrained. This insight helps explain the case of disability benefits reform where we find that the uncertainty generated by an opaque process of reassessment caused financial strain to increase for households not made materially worse off. We find that, on average, the reassessment process increased the probability of feeling financially strained by 7.9 percentage points. If, as a result, members of these households experienced mental and physical health problems requiring public healthcare resources, the introduction of the reassessment process for these individuals will have increased costs for the taxpayer. More generally, the UK government has reformed other aspects of the welfare system and the pension system. Any cost savings generated by these reforms should be considered in relation to their impact on financial strain.

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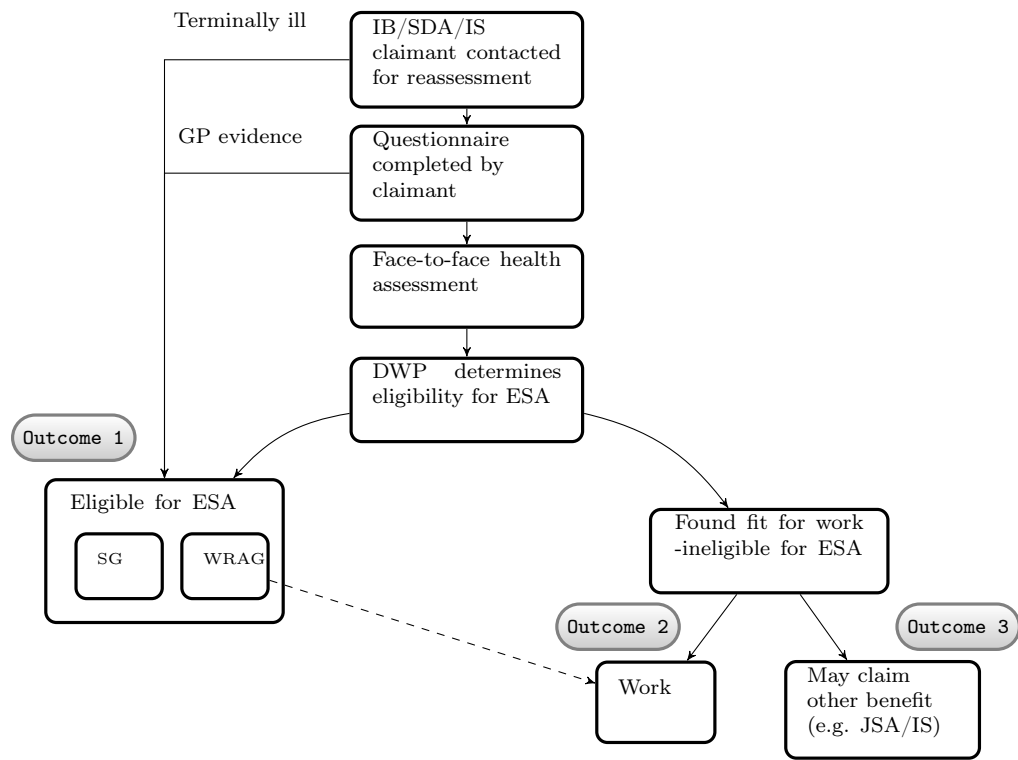
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Fig. 1: Reassessment pathways for disability benefit claimants



Source : Adapted from DWP (2012b)

Table 1: Finite mixture model of liquidity unconstrained and constrained households (coef./s.e.)

(a) Conditional density, $f_i(\Delta\mathbf{c}|\mathbf{x};\theta_i)$

	Group 1 (unconstrained)	Group 2 (constrained)
$\log y_{it-1}$	-0.004 (0.003)	-0.018* (0.008)
$\Delta Adult_{it}$	0.103** (0.007)	0.343** (0.015)
$\Delta Children_{it}$	0.092** (0.006)	0.227** (0.018)
Age_{it}	-0.001** (0.000)	-0.000 (0.000)
$\Delta No. employed_{it}$	0.013** (0.003)	0.058** (0.014)
Constant	-0.146** (0.032)	-0.042 (0.097)
Wave controls	YES	YES
Region controls	YES	YES
π_i	88.4%	11.6%
Log likelihood	-25181	
No. of obs.	62,544	

(b) Marginal density of group 1, $\pi_1(\mathbf{z})$

Head of household saves	0.025 (0.038)
Household savings/income	0.041 (0.098)
Has partner	1.166** (0.040)
Moved since last wave	-1.127** (0.069)
Owns home	0.468** (0.042)
Constant	0.145 (0.076)

Notes : Finite mixture regression model estimated using maximum likelihood. Standard errors are robust to heteroscedasticity. * $p < 0.05$, ** $p < 0.01$.

Table 2: Selected descriptive statistics

	Mean	St. Dev.
Female	0.37	0.48
Age (years)	52	18
No educational qualification	0.22	0.41
Owns home	0.72	0.45
Unemployed	0.03	0.17
Has partner	0.58	0.49
Head of household saves	0.42	0.49
Financial strain	0.08	0.26
Experienced shock	0.04	0.67
Liquidity constrained	0.13	0.34
Household income	£24925	£19122
Secured debt	£31122	£71469
Unsecured debt*	£3288	£13290
Psychiatric morbidity	0.20	0.40
Poor health**	0.11	0.31
No. of observations	69,331	

Notes : *Psychiatric morbidity* is indicated by a score of 4 or more on the General Health Questionnaire (GHQ12). *Poor health status* is a self-report of 'poor or 'very poor' health over the last 12 months. Data from waves 11-18 of BHPS and those BHPS participants interviewed in waves 2-5 of UKHLS. The number of observations corresponds to person-years. * Unsecured debt is only available in wave 15 of BHPS and wave 4 of UKHLS. ** Poor health is only available in UKHLS.

Table 3: Financial strain impact on mental and physical health - marginal effects (coef./s.e.)

	Dependent variable : Psychiatric morbidity			Dependent variable : Poor health status		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	BHPS 15 & UKHLS 4	Const. emp.	All	BHPS 15	Const. emp.
Female	0.064** (0.005)	0.058** (0.009)	0.068** (0.011)	0.017** (0.005)	0.003 (0.009)	0.016* (0.007)
Age	0.000 (0.001)	0.001 (0.001)	0.012** (0.003)	0.003** (0.001)	0.007** (0.001)	0.001 (0.001)
Low income	-0.009* (0.004)	-0.017 (0.009)	-0.004 (0.012)	-0.012** (0.003)	-0.011 (0.008)	0.008 (0.007)
High income	-0.009* (0.004)	0.001 (0.010)	-0.013 (0.009)	-0.012** (0.004)	-0.022* (0.010)	-0.003 (0.005)
Log. secured debt/income	0.003** (0.001)	0.005** (0.001)	-0.001 (0.001)	0.002** (0.001)	0.003** (0.001)	0.000 (0.001)
Log. unsecured debt/income		0.001 (0.001)			0.001 (0.001)	
Financial strain	0.146** (0.006)	0.195** (0.013)	0.139** (0.015)	0.050** (0.004)	0.061** (0.012)	0.036** (0.008)
Random effects	YES	NO	YES	YES	NO	YES
Log likelihood	-28566	-4744	-3918	-13533	-1834	-1025
No. of households	13,187		2,412	11,618		2,196
No. of observations	69,331	10,410	10,615	54,405	6,617	8,451

Notes : Probit regressions in (2) and (5) and random effects probit models elsewhere. Only wave 15 of BHPS and wave 4 of UKHLS are in the sample for (2). Only those constantly employed are in the sample for (3). Only UKHLS are in the sample for (4)-(6). Additional controls : Age squared; race (white, non-white) ; country of origin (UK, non-UK) ; whether respondent had partner; whether homeowner; whether moved home in last year; number of children; age of children (12-15, 5-11, 3-4 and 0-2); education(Degree, Other higher degree, A-level etc, GCSE etc, Other qualification, No qualification) ; employment status (employed, unemployed, self-employed, retired) ; partner educational and employment status; whether member of occupational pension plan ; region dummies and wave dummies. Average marginal effects reported. Standard errors are robust to heteroscedasticity. * $p < 0.05$, ** $p < 0.01$

Table 4: Estimates of model of financial strain, σ_{it} (coef./s.e.)

		Dependent variable :			
		Financial situation		Financial strain	
		Parameter estimates		Marginal effects	
		(1)	(2)	(3)	(4)
ρ	Lagged dependent	0.509** (0.008)	0.507** (0.008)	0.128** (0.004)	0.101** (0.005)
$-s_\lambda$	Equivalised income	-4.62×10^{-06} ** (4.40×10^{-07})			
	Low income		0.090** (0.007)	0.018** (0.002)	0.009** (0.003)
	High income		-0.088** (0.007)	-0.020** (0.003)	-0.017** (0.005)
s_Δ	Shock	0.772** (0.005)	0.770** (0.005)	0.092** (0.002)	0.081** (0.003)
s_c	Liquidity constrained	0.021** (0.008)			
	Liquidity constrained \times No savings		0.079** (0.010)	0.019** (0.002)	0.018** (0.004)
	Female	0.011 (0.010)	0.008 (0.010)	0.009** (0.003)	0.008 (0.004)
	Age	0.026** (0.001)	0.027** (0.001)	0.006** (0.000)	0.003** (0.001)
	Constant		0.814** (0.059)		
	Random effects	YES	YES	YES	YES
% of instrument variance extracted by principal components		0.904	0.904		
	No. of households	11,432	11,413	11,412	2,990
	No. of observations	62,838	62,625	62,623	25,176

Notes : System GMM estimates in (1) and (2) generated in two steps to provide a consistent estimate of the residual covariance matrix. A finite-sample correction is applied to this two-step covariance matrix (Windmeijer, 2005). To reduce the instrument count, 77 and 80 instruments are replaced by 19 principal components. Average marginal effects for dynamic random effects probit models in (3) and (4) reported. Wooldridge specification in (4) includes lags and leads of number of children and equivalized income. Additional controls : age squared ; race (white, non-white) ; country of origin (UK, non-UK), whether respondent had partner; whether homeowner; whether moved home in last year; number of children; age of children (12-15, 5-11, 3-4 and 0-2); education(Degree, Other higher degree, A-level etc, GCSE etc, Other qualification, No qualification) ; employment status (employed, unemployed, self-employed, retired) ; partner educational and employment status; whether member of occupational pension plan ; region dummies and wave dummies. * $p < 0.05$, ** $p < 0.01$

Table 5: Transition matrix for those on Incapacity Benefit (IB) or Severe Disablement Allowance (SDA)

	Next wave				All
	ESA	JSA/IS	Work	IB/SDA	
IB/SDA in Wave 2	61	293	23	606	983
IB/SDA in Wave 3	85	220	20	454	779
IB/SDA in Wave 4	112	141	12	318	583

Notes : Row totals are all those on IB/SDA in previous wave and surveyed in current wave. Column headings are Employment Support Allowance (ESA), Jobseeker's Allowance (JSA)/ Income Support(IS), Working full-time (Work), Incapacity Benefit/Severe Disablement Allowance (IB/SDA).

Table 6: Estimates for effect of moving off disability benefits on financial strain - marginal effects (coef./s.e.)

	(1)	(2)
Lagged dependent	0.298*** (0.014)	0.277*** (0.013)
Low income		0.070*** (0.017)
High income		-0.012 (0.024)
Shock		0.154*** (0.010)
Liquidity constrained		0.043** (0.021)
Female	0.047** (0.018)	0.052*** (0.017)
Age	0.009 (0.006)	0.009* (0.005)
Move to ESA	0.056** (0.025)	0.044* (0.023)
Move to JSA/IS	0.015 (0.019)	0.024 (0.018)
Move to work	-0.070 (0.123)	-0.032 (0.110)
Pseudo R^2	0.222	0.309
N	2163	2161

Notes : Sample is those on IB/SDA previous wave. Average marginal effects for probit model reported. Additional controls : age squared ; race (white, non-white) ; country of origin (UK, non-UK); whether respondent had partner; whether homeowner; whether moved home in last year; number of children; age of children (12-15, 5-11, 3-4 and 0-2); education(Degree, Other higher degree, A-level etc, GCSE etc, Other qualification, No qualification) ; employment status (employed, unemployed, self-employed, retired) ; partner educational and employment status; whether member of occupational pension plan ; region dummies and wave dummies. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$