Why rising tides don't lift all boats: An explanation of the relationship between poverty and unemployment in Britain

Simon Burgess
Karen Gardiner
Carol Propper

Contents

Centre for Analysis of Social Exclusion

      Simon M Burgess
      Karen Gardiner
      Carol Propper

Editorial Note and Acknowledgements

Abstract

This paper is motivated by the lack of any obvious relationship between aggregate poverty and unemployment in Great Britain. We derive a framework based on individuals' risks of unemployment and poverty, and how these vary over the economic cycle. Analysing the British Household Panel Survey for 1991-96, we are able to square the micro evidence — that unemployment matters for poverty – with the macro picture — that there's no strong link. We then go on to identify which household and individual characteristics are associated with whether an individual's poverty risk is vulnerable to the economic cycle.

Non-technical summary

This paper examines the links between poverty and aggregate unemployment, focusing on Britain in the 1990s. While we know that being unemployed is an important predictor of poverty status, much less is known about how poverty is related to *aggregate* unemployment. We address this at two levels of analysis – the aggregate and the individual. We focus on four questions. Firstly, why do we not observe aggregate poverty and unemployment rates moving together over time? Secondly, why do we find that the relationship between poverty and aggregate unemployment varies across different socio-economic groups in the population? Thirdly, what individual and household characteristics are found to be important for whether an individual's poverty moves with, against or independently of aggregate unemployment and, finally, is responsiveness to the cycle beneficial?

We develop a general analytical framework and apply it to the working age population in Britain during the first six years of the 1990s using data from the British Household Panel Survey. In the main, we use a relative poverty definition and the ILO measure of unemployment, although our methods are also applied to alternative commonly-used definitions. The framework expresses the individual's poverty risk as a function of three key propensities: the probability of being unemployed (average value of 6% for our sample), the probability of being poor when not unemployed (10%), and the additional probability of becoming poor on becoming unemployed (23%). We predict values for these for each adult in every year and then estimate individual parameters of how each propensity moves with aggregate unemployment. From this we derive an expression for how much poverty changes when aggregate unemployment goes up or down, in terms of these estimated parameters. We call this the 'Calculated Response of Poverty to Unemployment' (CRPU).

In responding to the first question — how we can understand why there is such a weak link between aggregate poverty and aggregate unemployment — we calculate the value of the CRPU for everyone aged 16 to 55. Using an ILO measure of unemployment and a relative definition of poverty we get a low value that translates into an elasticity of poverty with respect to unemployment of 0.13. For a doubling of the

1

unemployment rate from 5% to 10%, this implies just a one percentage point rise in the poverty rate. When we break this down into the contribution of the different parameters we find that on average there is indeed a substantial increase in individual poverty risk on becoming unemployed, but this drops as aggregate unemployment rises. Hence, in the main, increases in aggregate unemployment are not converted into higher aggregate relative poverty.

We then examine different groups in the population and find that there is considerable variation across the groups in how much their poverty responds to aggregate unemployment, as measured by the group values of the CRPU. One particular parameter is found to be influential in driving these differences: the extent to which the chances of being poor when *not* unemployed move with aggregate unemployment. Interestingly, this suggests the groups whose poverty responds to aggregate unemployment are those who experience cyclical fluctuations in household income when *in work*.

To understand what characteristics are associated with high or low values of CRPU and its components, our remaining analysis focuses on individuals. We find that both individual and household factors influence how an individual's poverty fluctuates with aggregate unemployment. Individuals whose poverty is strongly associated with the cycle (either positively or negatively) are younger and live in households with fewer workers and more non workers and children. When we explore the contribution of the separate components of the CRPU we find that the major determinant of the overall relationship between poverty and the cycle is not, as one might expect, the chances of becoming unemployed, but our measure of how much the poverty risk when *not* unemployed moves with aggregate unemployment. This confirms the group-level findings: the people who experience more variation in poverty when unemployment rises and falls are those whose in-work household income is more cyclical.

Finally, we are interested in who fares better — can we say poverty tends to be lower for those who benefit from booms or those who are protected from recessions? When we examine the average poverty for different values of the CRPU we find a clear picture. Those who are largely protected from the cycle fare best: individuals in households with more workers, less children and whose households remain intact

during the time we observe them. Conversely, those individuals whose poverty moves strongly with or against aggregate unemployment are most likely to be poor, suggesting that strategies to reduce poverty of households may also reduce responsiveness of household incomes to the cycle.

1.   Introduction

Unemployment in Britain is currently at 3.7%, its lowest level for many years. Yet this low unemployment is not accompanied by low levels of poverty.[1] Nor is this lack of a positive relationship a once-off phenomenon. Figure 1 plots the relationship between poverty, defined in relative terms, and unemployment for the UK between 1965 and 1997. It is clear that the relationship between poverty and unemployment is not a simple one: only in the mid-1980s is there a sustained period in which the relationship is positive. Clearly, poverty is not a single-cause phenomenon and *ceteris* are certainly not *paribus* over this time, but when unemployment changes considerably over a short period of time (as it does several times during the period depicted in Figure 1) one might expect to see some impact on poverty in the same direction.

This puzzle provides part of the motivation for this paper: given the evidence linking individual unemployment experience to poverty,[2] how is the relationship between aggregate poverty and aggregate unemployment to be understood? As Danziger and Gottschalk (1986) pose the question, "Do Rising Tides Lift All Boats?". We propose a framework for understanding the issues and apply this to Britain using the British Household Panel Survey (BHPS) for the years 1991-96. We use a relative definition of poverty (as is done in the European debates) and focus on those aged 16 to 55, since it is the working age population for whom we would most expect to find a clear link between their poverty and unemployment.

There are three other related questions that our work addresses. First, the relationship between unemployment and poverty differs considerably between different groups. For example, Blank (2000) shows that over the last 30 years in the US, the relationship between poverty and unemployment has been significantly different for black and for female-headed households than for the rest of the population; it has also

---

1   Our usage of the terms 'poverty' and 'unemployment' is defined precisely below.

2   See for example Jenkins (2000) for Britain and Hill, Hill and Walker (1998) for the US.

changed through time. Different households may experience unemployment differently, depending, for example, on the skill levels of the individuals in the household and the composition of the household. More generally, the fact that not all groups benefit equally from an improvement in the macro economy has been clearly established for an earlier period in the US (Danziger and Gottschalk, 1993), and for the UK (Burgess and Propper, 1999). This is clearly an issue of some importance: why is it that economic booms reduce the poverty of some groups but others are largely unaffected? Why are some groups more vulnerable to recessions than others? Second, building on this, can we identify 'protective factors' that help to insulate people from the effects of recessions? Or to take advantage of booms? A rich vein of literature has tackled this from a macro perspective,[3] but the possible diversity of experience across individuals and households implies that a micro approach is useful. Our approach aims to establish whether there are differences across individuals in the relationship between poverty and aggregate unemployment and if so, whether these can be linked to differences in observed characteristics. Finally, if individuals do differ, are the individuals who experience little link between poverty and unemployment those individuals who also experience little poverty or are they in fact individuals who experience frequent poverty? In other words, are the factors that protect an individual from experiencing a strong link between poverty and unemployment 'protective factors' or are they the flip side of the fact that the poverty of these individuals is persistent and therefore not very responsive to improvements in the business cycle?

Using our framework we find that, while on average individuals do suffer a large increase in their poverty risk when they become unemployed, this penalty decreases in times of high aggregate unemployment. Hence when overall unemployment rises this does not translate into much of an increase in the relative poverty rate. When we look at different demographic groups in the population we find considerable variation in how group poverty varies with the cycle. To get more insight into what is driving these differences we focus on individuals.

---

[3]   See Haveman and Schwabish (1999) and Cutler and Katz (1991).

We find that the poverty experience of individuals varies from strongly pro-cyclical to strongly anti-cyclical. Although it might appear counter-intuitive, anti-cyclical poverty can arise, particularly with a relative poverty line which is tied to average incomes. For example, those on fixed incomes such as benefit recipients, will be less likely to be poor when unemployment is high because (other things equal) the poverty line will be lower. Surprisingly, the major driver of the link between individual poverty and the aggregate unemployment rate is the behaviour of household income when individuals are *not* themselves unemployed. So it is the labour supply and income of household members which determines responsiveness of an individual's poverty to the cycle. Factors which are associated with a high degree of cyclicality include living in households with a low number of workers, living with children, having lower education and living in households whose composition changes over the sample window. When we consider if it is beneficial to be protected from the cycle we find that it is the people whose poverty moves very little with unemployment who are rarely poor. Those whose poverty moves strongly either with or against the cycle suffer the highest poverty levels on average. Thus the same factors that protect individuals against poverty also protect them from this poverty being associated with the business cycle.

Repeating the analysis using an absolute definition of poverty gives qualitatively similar results. While the aggregate relationship between absolute poverty and unemployment is stronger in the data we use, the main driving force at the individual level of this relationship remains the behaviour of household income when individuals themselves are not unemployed. Similarly, the factors associated with vulnerability to the cycle remain the same whether poverty is defined in relative or absolute terms.

This paper is organised as follows. Section 2 sets out a framework that we propose for understanding the connections between aggregate unemployment and aggregate poverty. Section 3 describes the data we will use, the British Household Panel Survey (BHPS). Section 4 reports our results and section 5 concludes.

2.   Modelling Framework

For individual i at time t the probability of being poor, denoted π_{it}, can be expressed in terms of the probabilities of being poor conditional on not being unemployed, q_{it}, the probability of being poor conditional on being unemployed p_{it}, and the probability of being unemployed u_{it}:

$$\pi_{it} = q_{it} + u_{it}\,(p_{it} - q_{it}) = q_{it} + u_{it} \cdot r_{it} \qquad (1)$$

where $r_{it} = p_{it} - q_{it}$.

We allow each of the components of this identity to depend upon the aggregate unemployment rate, U_t:

$$q_{it} = a_i + \alpha_i U_t + e^q_{it} \qquad (2)$$

$$u_{it} = b_i + \beta_i U_t + e^u_{it} \qquad (3)$$

$$r_{it} = g_i + \gamma_i U_t + e^r_{it} \qquad (4)$$

where a_i, b_i and g_i are individual fixed effects. This is a very flexible form, allowing all of the components to vary with aggregate unemployment, and allowing for maximum heterogeneity with each individual having separate intercept and slope terms. We assume e^u_{it} to be independent of the other errors (whilst by definition e^q_{it}, and e^r_{it} are correlated), and all errors to be independent of U_t, and of all parameters a, b, g, α, β, γ.

Equations (2) – (4) are reduced form relationships for an individual between the various individual probabilities and aggregate unemployment. Note that poverty is defined at the household level rather than individual level. This means the net effect of aggregate unemployment on household poverty is considerably more complex than the labour supply response of a single individual. Changes in unemployment status for an individual will impact on the labour market responses of other individuals in the household. Households of different size and composition may show different responses to unemployment. As the nature of households has changed considerably over the last

thirty years or so, we might expect the response of households to unemployment to change as well.

The parameters of these equations have an interpretation in terms of the wages and employment of the individual and their household behaviour, and so also of the wages and employment of others in the household. There will be factors other than individual fixed effects and unemployment that determine these relationships (for example, age or changes in household status). The time-varying components of these that are correlated with the cycle will be picked up by the U_t term; the orthogonal components will go into the error terms.

Equation (2) is the chance that the individual will be poor when not unemployed. At an individual level, this depends on wages (and other sources of income) and hours. At the household level at which poverty is defined, participation issues are also important, since they will determine household income. The fixed effect, a, varies across individuals because of their own wages and hours (if employed), benefit entitlement (if inactive) and incomes from other members of the household (i.e. will depend on both labour supply and wages of other household members, as well as unearned income).

The relationship between chances of being poor when not unemployed and aggregate unemployment, α, is likely to depend on the extent to which wages respond to the cycle. If wages are pro-cyclical, then α is positive. Across individuals, there may well be groups for whom this is more likely (for example, the low skilled, individuals who are employed outside the public sector). In addition, the extent to which labour supply and wages of other household members is pro-or counter-cyclical will affect the value of α. Abraham and Haltiwanger (1995) (reviewing principally US evidence) argue that the cyclicality of wages may vary over time, but favour the view that wages are more likely to be pro-cyclical than counter-cyclical.

Equation (3) is a more standard unemployment equation relating the individual's chances of being unemployed to the aggregate business cycle. The propensity to be unemployed is a function of human capital: individuals with low skills are less likely to be employed regardless of the cycle. The same group would also be expected to be vulnerable to the business cycle, as these individuals benefit in terms of employment

in good times (see Nickell, 1999). In addition, new labour market entrants and those in occupations in which employment is pro-cyclical will have higher values of β than others.

Equation (4) is the 'poverty penalty' associated with unemployment. This might be thought to be a major part of the relation between poverty and unemployment. It is the difference in the probability of an individual being poor between that individual being unemployed and not unemployed. The size of the income gap and the closeness of income to the poverty line will be a function not only of the individual's wages when in work compared to their employment-related income when not in work, but also of the level of total income. In addition, it will be affected by the income, and thus labour supply, of other members of the household.

A large (positive) fixed effect, g, is associated with a large gap between wages and benefits. Positive correlation of the labour supply of members of a household will result in a larger gap; negative correlation will yield a smaller gap. A large gap could also result from the absence of other earners in the household. If the wages and labour supply of the household are less likely to move with the cycle when the individual is unemployed then a negative coefficient on the cycle (a negative γ) is likely to result.

We can derive the relationship between aggregate poverty and aggregate unemployment by aggregation over all individuals:

$$\Pi_t = (1/N) \sum_i \pi_{it} = (1/N) \sum_i (q_{it} + u_{it}.r_{it})$$

Substituting for (2) – (4), the relationship between aggregate poverty and unemployment can be expressed in terms of the parameters of the reduced form equations:

$$\Pi_t = \left[\overline{a} + c(b,g)\right] + U_t\left[\overline{\alpha} + \overline{g} + c(b,\gamma) + c(\beta,g)\right] + U_t^2\left[\overline{\gamma} + c(\beta,\gamma)\right] \qquad (5)$$

where $\overline{a}$ is the mean of a etc., and $c(y, z)$ is the covariance of y and z.[4]

---

4   The non zero correlation of e^q and e^r does not appear in this equation as there are no cross terms in q and r

Equation (5) gives the relationship between aggregate poverty and unemployment in terms of micro parameters. This forms the basis of our investigation into the three issues we set out in the introduction. We return to interpret this relationship[5] below once we split unemployment up into average unemployment ($\overline{U}$) and cyclical unemployment ($U - \overline{U}$). Having set out the basic model, it turns out to be easier to interpret the micro parameters if we re-write the micro equations in terms of deviations of aggregate unemployment around its average value:

$$q_{it} = a_i + \alpha_i\left(U_t - \overline{U}\right) + e^q{}_{it} \tag{2$'$}$$

$$u_{it} = b_i + \beta_i\left(U_t - \overline{U}\right) + e^u{}_{it} \tag{3$'$}$$

$$r_{it} = g_i + \gamma_i\left(U_t - \overline{U}\right)t + e^r{}_{it} \tag{4$'$}$$

This is useful in that the interpretation of the fixed effects is the individual's average value of the respective dependent variable; so b_i for example, is the individual's average unemployment rate. All the previous comments about (2) – (4) apply to these equations. Using this new formulation, we can again derive the relationship between aggregate poverty and aggregate unemployment:

$$\Pi_t = \left[\overline{a} + \overline{gU} + c(b,g)\right] + \left(U_t - \overline{U}\right)\left[\overline{\alpha} + \overline{g} + \overline{\gamma}U_t + c(b,\gamma) + c(\beta,g)\right]$$
$$+ \left(U_t - \overline{U}\right)^2\left[c(\beta,\gamma)\right] \tag{6}$$

This equation allows us to discuss the steady-state relationship between unemployment and poverty (when $U = \overline{U}$) and the dynamic relationship as they move together over time.

The terms in the equation have a straightforward interpretation. The first square bracket is the steady-state poverty level. It depends on the mean values of a and g and the covariance of b and g. This makes a lot of sense – poverty depends on the poverty rate of the non-unemployed ($\overline{a}$)

---

5   This equation is useful for interpreting directly regressions of poverty and unemployment run by others. It is also useful for those sceptical of the idea of a long-run equilibrium unemployment rate.

and the additional poverty among the unemployed ($\bar{g}$) times the average unemployment rate. These terms are the straightforward counter-part to equation (1). But because we have aggregated heterogeneous individuals, there are also distributional issues to consider. These are captured by the term *c(b, g)*. If the people who are often unemployed (high *b*) are also people for whom unemployment is particularly bad in income terms (high *g*) then obviously this will raise poverty – thus a positive *c(b, g)* raises Π. It is the terms in this first square bracket that matter in a comparison of long-run average poverty and long-run average unemployment between different areas.

Turning to the dynamic terms, the main focus of interest in this paper, the second and third square brackets show how aggregate poverty changes as unemployment changes. Note that $\bar{g}$ matters here also – as people move into unemployment in a recession, they suffer the resulting poverty penalty; the aggregate relationship then reflects the average penalty. The dynamic effect also includes a role for $\bar{\gamma}$. This measures the average *change* in the poverty penalty as aggregate unemployment changes. We anticipate that this might be negative as a recession usually has a more detrimental effect on the income of the employed (as wages fall) than on those on relatively stable benefits. The other main term is $\bar{\alpha}$. This is the average effect of unemployment on the probability that a non-unemployed individual will be poor. As noted above, this channel works through effects on the income of the individual herself and others in the household. We would expect high unemployment to reduce incomes and so to raise the likelihood of poverty. The two covariance terms *c(b, γ)* and *c(β, g)* also have an intuitive role. Take the former: if people who are most likely to be unemployed are also the people for whom the poverty penalty worsens in recessions, then poverty will rise by more when unemployment increases. Similarly for the latter: if the people whose unemployment is cyclically sensitive are also people with a high poverty penalty, then again poverty will rise by more when unemployment increases. The final covariance term multiplying the squared unemployment deviation has a similar interpretation.

It is the role of $\bar{g}$ that people most likely have in mind in expecting a strong relationship between aggregate poverty and aggregate unemployment. This analysis shows that we also need to consider $\bar{\alpha}$, $\bar{\gamma}$, *c(b, γ)* and *c(β, g)*.

To keep things simple, we focus on the linear relationship between aggregate poverty and aggregate unemployment; using (6) we derive:

$$\left|\frac{d\Pi_t}{dU_t}\right|_{U_t=\overline{U}} = \overline{\alpha} + \overline{g} + c(b,\gamma) + c(\beta,g) + \overline{\gamma U} \equiv CRPU \tag{7}$$

We compute this expression below for the aggregate and for a variety of groups of the population and denote it *CRPU* (the Calculated Response of Poverty to Unemployment).

Equation (7) allows examination of the determinants of the aggregate relationship between unemployment and poverty in terms of micro behaviour. Given estimates of these micro parameters, it is possible to calculate both the aggregate relationship, and more interestingly, to examine variation in these parameters across individuals to establish whether particular groups of people or particular characteristics are associated with a weaker or stronger relationship between poverty and unemployment. To derive this requires estimates of these key parameters from micro data, and we now turn to discuss this.

3. Data and definitions

This section discusses our micro dataset, the British Household Panel Survey (BHPS), defines the measure of poverty and unemployment we use and describes the sample selection criteria and our methods of estimating the six parameters $a, b, g, \alpha, \beta, \gamma$. We also provide some initial description and interpretation of the estimated parameter values.

Our arguments are illustrated using data drawn from the first six waves of the BHPS[6] covering 1991-96. The first wave of the BHPS was designed as a nationally representative sample of the population of Great Britain

---

6   We are grateful to the Data Archive at Essex University for supplying the data. The BHPS data waves 1 to 6 were deposited by the Economic and Social Research Council Centre, the Institute for Social and Economic Research and the BHPS net income variables were kindly deposited by Sarah Jarvis and Stephen Jenkins. Neither the original collectors nor the suppliers of the data bear any responsibility for the analyses or interpretations presented here.

living in private households in 1991, and had an achieved sample size of some 5,500 households covering some 10,000 persons. See Taylor A (1994) and Taylor M (1998) for detailed information about the BHPS. On-going representativeness of the (non-immigrant) population has been maintained by using a 'following rule' typical of household panel surveys: at the second and subsequent waves, all original wave 1 sample members (OSMs) are 'followed' (even if they move house, or if the household splits up), and there are annual interviews with all adult members of all households containing either an OSM, or an individual born to an OSM whether or not they were members of the original sample. New panel members who subsequently stop living with an OSM are, however, not followed and interviewed again. Thus, for example, if a non-OSM married an OSM at wave 2, and the partnership subsequently dissolved, the OSM is followed, but the non-OSM is not.

The key definitions used in this paper are those for poverty and unemployment. We have chosen a relative poverty definition as is usual in most European debates about poverty, although we also look at how our results differ if an absolute poverty line (fixed in real terms) is used instead. Our relative poverty definition is very similar to the approach taken in the UK Department of Social Security's annual publication 'Households Below Average Income' (HBAI), the UK's semi-official poverty definition (see DSS, 1999). It is these poverty statistics from the HBAI Reports which are plotted in Figure 1. The main aspects of this relative poverty definition are an income measure of current household disposable income before housing costs, a poverty line of half mean contemporary income, adjusting income for household size and composition using the McClement's (before housing costs) equivalence scale, and taking individuals as the unit of analysis (including children). Hence, the poverty rate is the percentage of the population who have an equivalised household disposable income which is less than half the mean income level, but we also examine results using a fixed real poverty line (50% of mean income in 1991, uprated for prices in subsequent years).[7]

---

7   It should be noted that throughout the paper the poverty lines are based on mean income of the whole BHPS sample, even where the analysis is for the working age sample only.

The other key definition used in the paper is unemployment. We have chosen the ILO definition of unemployment because it is internationally understood and is not tied to benefit receipt. It counts those who are not working but are available for work and have looked for work in the last four weeks. The ILO unemployment *rate* expresses the number of ILO unemployed as a proportion of the economically active population — the ILO unemployed, employed, self-employed and those on government training schemes and maternity leave. In sensitivity analyses we also use the UK's 'claimant count' definition of unemployment which is the number of people claiming benefit (Job Seekers' Allowance or National Insurance credits) through an Employment Services Office on a particular day, who say they are unemployed and satisfy the conditions to claim their benefit. Details of replicating these definitions in the BHPS are provided in the Appendix. Compared with the official unemployment and poverty figures plotted in Figure 1 our BHPS estimates of the aggregates are somewhat different.

Our sample selection criteria are as follows.[8] Of the 15,422 individuals who have a value for equivalised household disposable income in at least one BHPS wave we have 64,259 observations of household incomes, an average of 4.2 observations per individual. On the basis of this sample we define each individual's poverty and unemployment status and calculate the poverty and unemployment rates for the whole population. We then excluded the 28,473 person-year observations for people who are aged under 16 or over 55 (but information for these individuals from other waves is used as long as they are within the chosen age bracket) and another 297 person-year observations where required variables have missing values. This leaves us with 35,489 observations on 9,233 people.

The first step in the derivation of (7) is to produce series for q_{it}, u_{it} and p_{it} for each individual where these are respectively the probability of being poor when not unemployed, the probability of being unemployed, and

---

8   Despite the design of the BHPS to provide a representative sample of the British population, the final subsample we use is not representative due to our rather stringent requirements on age and minimum number of income observations (at least five). Hence, it was not appropriate to use grossing-up weights in presenting the results for this sample.

the probability of being poor when unemployed. To derive predicted values of these and of r_{it} the following relationships are estimated:

$$q_{it} = f^q(t, X_{it}, t^*X_{it}, e^q_{it}) \tag{8}$$

$$u_{it} = f^u(t, X_{it}, t^*X_{it}, e^u_{it}) \tag{9}$$

$$p_{it} = f^p(t, X_{it}, t^*X_{it}, e^p_{it}) \tag{10}$$

where t is a vector of time dummies, X_{it} is a vector of individual demographic variables (age, age squared, sex, education and region), demographics of other people in the household (household size, number of children by age, and number of other adults by sex, age and education) and labour market characteristics of other adults in the household (work status and occupation of other adults) and e^k_{it}, $k=q, p, u$, are i.i.d. errors. The inclusion of time dummies and the interaction of time dummies with the X vector allows maximum flexibility in the predicted associations with characteristics at different dates. These probit first stage regressions are estimated using the N x T sample of 35,489 person-year observations. As q_{it} and p_{it} are conditional on being not unemployed and unemployed respectively, they are not observed for all individuals in the sample. Individuals contribute observations to the regressions for q and p only when they are in the appropriate conditioning state; everyone is at risk of being unemployed in all periods.

In theory, a better fit could be achieved by estimating equations (8)-(10) allowing for fixed individual effects. A fixed effects probit model is not used to derive the fitted values as fitted values are needed for all observations in the data set. There are observations that do not contribute to the estimates of either p_{it} or q_{it} as they are either never unemployed or always unemployed during the sample window, so a fitted fixed effect could not be estimated for these observations. As all observations have values of X_{it} so predicted values can be derived from probit estimates using the N x T sample.

As q_{it} and p_{it} are defined conditional on being not unemployed and unemployed respectively, a prediction of each for all observations requires that estimation of equations (8) and (10) allows for sample selection into unemployment. The probability that an individual is

unemployed is given by equation (9). Sample selection is allowed for using a two-step procedure, where the regressors in equations (8) and (10) are augmented to allow for sample selection. In equation (10) the additional regressor is the inverse mills ratio (IMR) $\phi(X_{it})/\Phi(X_{it})$. In equation (8) the additional regressor is $-\phi(X_{it})/(1-\Phi(X_{it}))$. As the same variables are used as regressors in all three equations, identification of the IMR terms is by functional form alone. While this is unfortunate, the logic of our procedure enforces this. The coefficients from these regressions are available from the authors.

The parameter estimates from these regressions are used to calculate a q_{it}, u_{it} and p_{it} series for each individual where prediction is for *all* observations in the sample. So note that if an individual is never unemployed they will have a series for p_{it} predicted for them based on this estimation. Having predicted p_{it} and q_{it} we compute $r_{it} = p_{it} — q_{it}$.[9] The predicted values for each series have the following form (excluding the selection terms):

$$\hat{y}_{it} = \hat{a}_1 + \hat{a}_2 t + \hat{a}_3 X_{it} + \hat{a}_4 t * X_{it} , \; y = r,q,u \tag{11}$$

The first two terms on the right hand side are common to all individuals so do not vary across or within individuals. X_{it} varies with both *i* and *t,* so the predicted values will vary across and within individuals over time. Part of the variation over time is common to all individuals — $\hat{a}_1 + \hat{a}_2 t$ — while the rest of (11) is idiosyncratic.

The second stage is to estimate the relationship — for each person — between the predicted values for q_{it}, u_{it} and r_{it} and aggregate unemployment, to estimate equations (2'), (3') and (4'). This isolates that component of the individual's time series observation that is correlated with aggregate unemployment from that part which is not. This stage entails estimating three separate regressions for each individual, and we estimate this using only observations with 5 or 6 time series observations.[10] 10,148 observations of individuals who have fewer than 5 time series observations are dropped, resulting in a base sample of

---

9   So selection terms are used to calculate both q_{it} and r_{it}

10   A SUR estimator could be used. As we do not calculate standard errors of the components of CRPU the estimates here are not derived using this estimator.

25,341 observations for 4,398 adults. From these three regressions estimates of three intercept terms and three slope terms per individual, *a, b, g, α, β, γ,* are derived. These are used to calculate equation (7). A summary of the distributions of these parameters, as well as the relevant covariances, are presented in Table 1.[11] Equation (11) shows these parameters are derived from the correlation of individual (and their household) characteristics over time with aggregate unemployment. The individual specific estimates of *a, b, g* also contain a term common to all individuals which does not vary over time (the common constant in equation (11)), while the estimates of *α, β, γ* also contain time varying terms common to all individuals ($\hat{a}_2 t$ from (11)).

Table 1: Summary Statistics from Second Stage Regressions

Parameter	Mean	Median	25th percentile	75th percentile
a	0.103	0.057	0.021	0.135
α	0.072	0.163	-0.981	1.360
b	0.055	0.044	0.027	0.070
β	1.012	0.615	0.065	1.618
g	0.228	0.192	0.080	0.360
γ	-1.599	-0.892	-7.465	3.857
c(b,g)	0.002	-	-	-
c(b,γ)	0.003	-	-	-
c(β, g)	0.038	-	-	-
c(β, γ)	0.891	-	-	-

Notes:
1. Based on sample of 4,398 observations.
2. Uses preferred definitions of ILO unemployment and relative poverty.

From equation (2') *a* is the estimate for each individual of their average probability of being poor conditional on being not unemployed (implies being either employed or inactive). Over the sample the average is 0.103, an expected poverty rate of just above 10% for those not unemployed. The other parameter from equation (2') is *α*, how the chances of being

---

11 Standard errors are not given as the dependent variable is calculated rather than observed.

poor when not unemployed move with aggregate unemployment. On average this is positive, the mean value of 0.072 implying that a percentage point increase in aggregate unemployment above its mean would result in less than one tenth of a percentage point increase in the risk of being poor when not unemployed. While this overall response is not large, the data does indicate considerable variability in α across sample members. The value at the 25th percentile is -0.98 suggesting that for a substantial proportion of the sample their chances of being poor when not unemployed are actually greater when unemployment is low. The value at the 75th percentile is 1.36.

Defined in equation (3'), the average probability of unemployment for the individual is captured by the parameter b. Over the sample this has a mean value of 0.055, an average unemployment rate of 5.5%. All observations have positive values for b and the range is from 2.7% at the 25th percentile to 7.0% at the 75th percentile. The extent to which an individual's own unemployment moves with aggregate unemployment is defined as β. As we would expect, on average this is close to one but some people have negative values indicating that their unemployment risk is counter-cyclical.

On average we expect unemployment to be associated with a higher risk of poverty than not being unemployed. This average 'extra' poverty risk from unemployment compared with not, is referred to as the 'poverty penalty' of unemployment and is defined in equation (4') as g. On average we can see that the mean value is 0.228, implying that an individual entering the state of unemployment will experience about a 20 percentage point rise in their chances of becoming poor. Hence, if we combine this with the information about a, this tells us that at the mean a person has a 10% chance of poverty when not unemployed but this rises to 30% if they become unemployed. For most observations this poverty penalty is, as we would expect, positive, but there is a small group in the sample (about 4%) for whom g is negative. Also defined in equation (4') is γ, the extent to which the poverty penalty of unemployment moves with aggregate unemployment. The average value of γ is negative, -1.599. On average the poverty penalty of unemployment is greater at times of low unemployment than high. However, there is a considerable range in the value of this parameter. For some individuals the poverty penalty is strongly counter-cyclical, for others it is strongly pro-cyclical.

All of the covariances that appear in equation (6) are calculated for the whole sample and the values presented in Table 1. The only association between parameters which is large is $c(\beta,\gamma)$, suggesting that people whose unemployment tends to follow the cycle also have higher poverty penalties in times of high aggregate unemployment.

4. Results

We begin with an analysis of the aggregate relationship between unemployment and poverty, then look at differences between socio-economic groups and move on to examine the individual factors that affect vulnerability to the cycle.

(a) *Aggregate: why is there not a strong positive relationship between aggregate poverty and aggregate unemployment?*

We started the paper with Figure 1 showing the puzzling co-movement of aggregate poverty and aggregate unemployment. In fact, this is not just specific to this time period and choice of definitions. Figure 2 portrays the relationship between poverty and unemployment defined several ways. The top left hand side graph shows relative poverty and ILO unemployment from 1984 to 1997. The top right hand side graph replaces ILO with claimant unemployment and is for 1965-1997. The middle two graphs replace the poverty rate of all households with the poverty rate amongst only non-pensioner households; we might expect the poverty of this population to be more positively related to aggregate unemployment. The middle right hand side replaces the unemployment rate with the proportion of workless households. The bottom two graphs replace the relative poverty definition with one fixed in real terms for the whole population (50% of 1979 mean income). It is clear from all the graphs that, other than possibly a couple of years, there has not been a strong positive relationship between aggregate poverty and aggregate unemployment in Britain during the last four decades. Most of the pictures seems to be characterised by no correlation at all: between the mid 1970s and the early 1980s for example, unemployment tripled and poverty barely changed at all.

For the BHPS data that we use here, there is similarly no strong pattern in the relationship between relative poverty and unemployment rates

for those aged 16 to 55 in the BHPS for the years 1991-96 (see table in the Appendix). There is, however, more of a positive relationship between absolute poverty and unemployment for the BHPS data for this sample. It is worth noting that the lack of a relationship is not universal – indeed, data from the US, using an absolute definition of poverty, reveal the expected pattern: see Figure 3. Here we see poverty and unemployment moving together over time, albeit that the relationship is shifted by other factors.[12] In particular, the link appears weaker during the 1970s and 1980s than during the 1960s.

Our framework helps us to understand this puzzle. We can use our estimated parameters to calculate the terms in equation (6) to yield:

$$\Pi_t = 0.121 + (0.341 - 1.599 U_t)\left(U_t - \overline{U}\right) + 0.891\left(U_t - \overline{U}\right)^2$$

or, setting $\overline{U}$ to the sample average of 0.0716,

$$\Pi_t = 0.101 + 0.328\, U_t - 0.708\, U_t^2$$

This shows a positive relation between the two series, but in fact a rather weak one even though we have restricted our sample to working age adults, the group for whom we might expect the link to be strong . This can be seen as follows: comparing unemployment at 5% and 10%, a substantial jump, relative poverty simply rises from 11.6% to 12.7%. This one point jump is dwarfed by the changes in poverty that have taken place in recent times. Alternatively, we can compute the elasticity of poverty with respect to unemployment as a unit-free measure of responsiveness: this is 0.134. This hardly describes a strong relationship between the cycle and relative poverty.

The advantage of our approach is that it permits an analysis of *why* there is so little responsiveness. To do this we use the decomposition of the

---

12   It would be interesting to enter into a comparative analysis of the UK and the US, to use this framework to ask where this difference arises. This is left to future work.

linear relationship provided by (7). For the ILO definition of unemployment and a relative poverty line, this yields:[13]

$CRPU$	$= \bar{\alpha} +$	$\bar{g} +$	$\overline{\gamma U} +$	$c(b,\gamma) +$	$c(\beta, g)$
0.226	= 0.072	0.228	(-1.599*0.0716)	0.003	0.038
			= -0.114		

At this aggregate level, it is clear that $\bar{\alpha}$ is small. While $\bar{g}$ itself is quite sizeable, this is partially cancelled out by the narrowing of that penalty poverty as unemployment rises (that is, $\bar{\gamma}$ is negative and substantial). The economics behind this is that as the economy moves into recession, the incomes of those in work fall whilst household incomes of the unemployed are likely to fluctuate less, thus narrowing the gap between the unemployed and non unemployed. The covariances are very small and are clearly not responsible for any part of the correlation.

This aggregate relationship is not invariant to the measures of unemployment and poverty. In Table 2 we present the calculation of equation (7) for ILO unemployment and the relative poverty line (as above), then for claimant unemployment and the relative poverty line, and finally for ILO unemployment and a fixed poverty line (50% of 1991 mean income, kept constant in real terms). The value of CRPU is sensitive to the definitions.[14] However, the differences in the estimated responsiveness of poverty to unemployment when we change definitions are in the expected direction. With a relative poverty line, as the economy moves into recession and average incomes fall, the increase in poverty will be less than if a fixed poverty line is used. Since claimant unemployment is directly related to eligibility for (mainly means-tested)

---

13   We should be clear what these numbers are. The values of *CRPU* are calculated (not estimated) from the micro regressions reported above. If our model is correct, *CRPU* is the value of the slope coefficient we would expect to see from a linear regression of aggregate poverty on aggregate unemployment. Because we only have 6 time series observations we are not in a position to seriously test this.

14   When we look at the distribution of CRPU across individuals (see below) we find that the differences in median CRPU across the three specifications are quite a lot less than the differences in means. For the definitions, in the order of Table 2, the medians are 0.322, 0.416 and 0.516.

benefits poverty will be more strongly linked to this definition of unemployment than the ILO measure.[15]

Table 2

$$CRPU = \overline{\alpha} + \overline{g} + \overline{\gamma U} + c(b, \gamma) + c(\beta, g) \ [\overline{U} = 0.0716]$$

Alternative unemployment and poverty definitions	CRPU	$\overline{\alpha}$	$\overline{g}$	$\overline{\gamma U}$	c(b, γ)	c(β,g)
ILO unemployment and relative poverty line[1]	0.226	0.072	0.228	(-1.599*0.0716) = -0.114	0.003	0.038
Claimant unemployment[2] and relative poverty line	0.417	0.291	0.191	(-1.819*0.0716) = -0.130	0.009	0.057
ILO unemployment and fixed real poverty line[3]	0.977	0.836	0.208	(-1.741*0.0716) = -0.125	0.017	0.041

Notes:
1. Main definitions used throughout the paper — see section 3 for details.
2. Currently claiming benefits as a registered unemployed person.
3. 50% of mean income in 1991, kept constant in real terms.
4. Based on sample of 4,398 observations.

Comparing across the three specifications, it is clear that it is primarily variation in $\overline{\alpha}$ that drives the variation in CRPU. $\overline{\alpha}$ is lowest in the first line, higher in the second, and highest in the third, and the values of CRPU follow this pattern. The changes across specifications in the other parameters are smaller.

---

15   Whilst the results in Table 2 suggest a much stronger positive relationship between a fixed poverty measure and ILO unemployment than the other definitions, this finding is not confirmed by the median values nor longer time series in Figure 2. In the remainder of the paper we continue to focus on our preferred definitions: ILO unemployment and a relative poverty measure, but indicate how our results vary for the other definitions in Table 2.

In summary, and perhaps paradoxically, what our analysis so far shows is that it is changes in the incomes of the non-unemployed with the cycle that appears to generate the (weak) relationship between poverty and unemployment.

Our framework can be used to examine how, and why, the relationship between poverty and unemployment differs between different demographic groups. For example, Blank (2000) finds that for the US this relationship is both different over time and between black and white households and female-headed households. Table 3 presents simple cross-tabulations of *CRPU*, the linear relationship between group poverty and aggregate unemployment,[16] and the components of CRPU (from (7)) for a variety of breakdowns of the population. The parameter means and covariances are computed for each group.

The patterns in the table mirror the patterns at aggregate level. $\bar{\alpha}$ is typically positive, $\bar{g}$ is universally positive and $\bar{\gamma}$ is universally negative. The covariances, perhaps surprisingly, are small for all groups. It seems that the first order effects (group means) dominate and distributional effects from aggregating heterogeneous individuals can be ignored.

The table indicates that there are important differences in the relationship between relative poverty rates and aggregate unemployment across demographic groups. For family type, the values range from 0.462 to –0.735. CRPU rises monotonically with the number of workers in the household. Poverty rates of men are, on average, more pro-cyclical than women. There is considerable variation by family economic status. The relationship between CRPU and income falls with income above the lowest income quintile.

---

16 The results in Table 3 are based on our preferred measures of unemployment and poverty: ILO and relative poverty.

Table 3: Comparisons across groups of the calculated relationship between group poverty and aggregate unemployment

$$CRPU = \bar{\alpha} + \bar{g} + \bar{\gamma}\bar{U} + c(b,\gamma) + c(\beta,g) \; [\bar{U} = 0.07]$$

Characteristic[1] (share of sample)	CRPU	$\bar{\alpha}$	$\bar{g}$	$\bar{\gamma}$	c(b, γ)	c(β,g)	c(β, γ)	absolute value of CRPU[6]
Family Type:								
couple & kids (45%)	0.462	0.265	0.240	-1.403	0.001	0.056	0.042	3.077
couple no kids (26%)	0.155	0.082	0.170	-1.570	-0.013	0.029	0.604	1.594
single & kids (5%)	-0.735	-0.793	0.311	-2.843	-0.017	-0.032	1.120	5.367
single no kids (23%)	0.028	-0.111	0.252	-1.669	0.031	-0.025	3.040	2.856
Number of workers in the household:								
zero (10%)	-0.413	-0.607	0.291	-1.477	0.073	-0.064	3.372	5.036
one (31%)	0.091	-0.198	0.305	-0.853	0.008	0.037	1.236	3.683
two (46%)	0.340	0.265	0.200	-1.741	-0.027	0.028	-0.335	1.913
three or more (14%)	0.388	0.500	0.110	-2.865	-0.002	-0.016	1.426	1.868
Whether household is intact[2]:								
Non-intact (34%)	0.172	0.052	0.229	-2.138	0.005	0.039	1.880	3.600
Intact (66%)	0.256	0.082	0.228	-1.327	0.004	0.037	0.486	2.320
Sex:								
male (48%)	0.403	0.161	0.303	-1.306	0.006	0.026	1.077	2.536
female (52%)	0.025	-0.010	0.159	-1.868	-0.007	-0.016	0.593	2.946

Table 3 continued

Family Economic Status:

one or more self-employed (14%)	0.283	0.121	0.221	-1.676	-0.009	0.069	0.366	2.683
all adults working full-time (42%)	0.246	0.163	0.200	-1.984	-0.004	0.029	1.407	2.021
couple, 1 full-time, 1 part-time (16%)	0.588	0.342	0.268	-0.830	-0.015	0.053	-0.367	2.050
couple, 1 full-time, 1 not working (11%)	-0.099	-0.374	0.245	-1.110	0.020	0.089	0.222	3.364
single or couple, working part-time (4%)	1.089	0.897	0.298	-1.620	-0.019	0.028	-1.957	3.828
head or spouse unemployed (5%)	0.975	0.853	0.247	-0.806	-0.007	-0.060	0.468	4.979
other (9%)	-1.056	-1.185	0.242	-2.107	0.063	-0.025	3.637	5.023
Income Quintile[3]:								
bottom (20%)	0.070	-0.109	0.281	-1.788	0.033	-0.007	1.488	5.108
2 (24%)	0.543	0.369	0.256	-1.794	0.021	0.026	1.248	3.008
3 (20%)	0.239	0.193	0.219	-2.395	-0.025	0.024	0.272	2.102
4 (18%)	0.091	-0.030	0.193	-1.469	0.001	0.032	1.280	1.798
top (19%)	0.032	-0.146	0.180	-0.431	0.001	0.028	0.890	1.473
Total (100%)	**0.226**	**0.072**	**0.228**	**-1.599**	**0.003**	**0.038**	**0.891**	**2.750**

Notes:
1. An individual is assigned the characteristic type which they have most times out of the waves they are seen.
2. A household is defined to be intact when the same person is the head in each wave seen, and their marital status is the same.
3. Equivalised household disposable income.
4. Covariances are calculated within groups.
5. Group level estimates of *CRPU* for 4,398 observations, using ILO unemployment and relative poverty measure.
6. Estimates of absolute value of CRPU (ie. magnitude of CRPU, disregarding whether positive or negative) are calculated at individual level and then averaged across group.

The table also shows that the main component driving differences in group mean *CRPU's* is differences in group mean α. Thus, to understand differences across groups in the sensitivity of their poverty rate to the business cycle, one needs to understand the impact of aggregate unemployment on their household income when in work. This mirrors the finding above that the main driver of the (weak) relationship between aggregate poverty and aggregate unemployment is α. It suggests that it is not primarily different unemployment propensities that matter between groups but household income fluctuations when not unemployed.

However, examination of the average value of CRPU may be somewhat misleading. As we will show below, individuals' calculated poverty responses to unemployment range from negative (poverty moves strongly against unemployment) to positive (poverty moves strongly with unemployment). In other words, individual responses may be pro or anti-cyclical (or neither). Much of the literature to date has focused on identifying those who are pro-cyclical from those who are not. An examination of average values of CRPU by group or individual characteristics may therefore be misleading, since negatives and positives may cancel out to give the appearance of little movement with the cycle. Furthermore, as we discuss below, the individuals with large negative or large positive values of CRPU (poverty moves strongly *with or against* the cycle) share many of the same observable characteristics. Hence, we now turn from looking at the actual value of CRPU to examining the absolute value of CRPU, which captures vulnerability to the cycle in terms of poverty (not whether the movements in poverty happen to be pro- or anti-cyclical).

The final column of Table 3 presents the average by group of the absolute value of CRPU, a measure of cyclicality of poverty. The pattern that emerges is somewhat different from the average of the actual value of CPRU. What is clear is that individuals in households with fewer workers, more children, where a change in household composition arises during the sample window, and where income is lower are more vulnerable to the cycle. So the absolute value of CRPU is highest within family type for single adult families with children, highest within number of workers for households where there are no workers, is higher for non-intact than intact households, rises with a decrease in attachment of the family members to the labour market, and falls

monotonically with income. These patterns are quite striking in their regularity: groups who from other research are identified as at risk of poverty are also those whose poverty status changes most with the cycle.[17]

(b) What factors are associated with individuals' vulnerability to the cycle?

While the analysis above was designed to illuminate the relation between *aggregate* poverty and *aggregate* unemployment, we now use it at a micro level to examine how each individual's poverty varies with aggregate unemployment. Each individual has her own value of *a, b, g, α, β, γ* from which an individual CRPU is calculated; individual-level 'covariances' are calculated as $c_i(b,\gamma) = (b_i - \bar{b})(\gamma_i - \bar{\gamma})$ using the whole sample means.

The importance of α is confirmed by examining the plot of values of CRPU against the three key parameters (α, g, γ) at the level of the individual. Figure 4 presents these plots for each of the three definitions of unemployment and the poverty line given in Table 2.[18] The plots show that, for all three definitions, there is a clear linear relationship between α and CRPU. On the other hand, the relationship between *g* and γ and CRPU is much weaker for all three definitions.

The other key feature of Figure 4 is that the horizontal axes show that individual values of CRPU range from strongly negative to strongly positive, suggesting that it is not sufficient to distinguish the procyclical from the acyclical. Table 3 has already shown that there is high vulnerability to the cycle (as measured by the absolute value of CRPU) for disadvantaged groups.

---

17   Furthermore, when we produced the equivalent results for our alternative definitions of poverty and unemployment, the patterns in absolute value of CRPU across groups are very similar to those in Table 3; the group values of actual CRPU are rather more sensitive to the unemployment and poverty measures used.

18   The top and bottom 1% of the CRPU observations are omitted from this figure. The sample size falls from 4398 to 4311 observations.

This pattern of association between poverty and vulnerability to the cycle is confirmed by the plot of CRPU against poverty rates at the individual level. Figure 5 plots centiles of CRPU against average poverty rates for those centiles. It is clear that poverty is worst for both low *CRPU* and high *CRPU* individuals. These individuals are very vulnerable to the cycle, their poverty moving either strongly with or against aggregate unemployment. It is the individuals with some slight exposure to the cycle who fare best in poverty terms.

Table 4 cuts the data a different way and examines the distribution of the value of *CRPU* by poverty experiences. The key feature of the table reflects the same pattern as Figure 5.[19] Namely, those who have no poverty have a middling value of *CRPU* and a fairly tight distribution around the mean of 0.27. Among those suffering higher levels of poverty, the main fact is a much higher spread of *CRPU* values – both below and above those for the not poor group. Thus both cuts tell the same story: those whose poverty is strongly linked to the cycle, either positively or negatively, are most likely to be poor.

Given these findings, which factors are associated with vulnerability to the cycle? *A priori* one might expect that the characteristics of those whose poverty moves strongly against the cycle (large negative values of CRPU) would be quite different from what we observe about the people whose poverty moves strongly with the cycle (large positive values of CRPU). However these groups appear to be remarkably similar; a slightly greater tendency amongst the anti-cyclical group towards economic inactivity and lone parenthood was the only difference between them. Hence once again it is most appropriate to look at vulnerability to the cycle (as measured by the absolute value of CRPU) rather than the actual value of value of CRPU. Table 5 reports the results of regressing the absolute value of *CRPU* on a set of characteristics of the individual and her household. The characteristics considered are age, sex, the number of children in the household, education of the individual, measures of the number of workers, unemployed and inactives in the household, whether the household is intact and equivalised household income quintile group. Since for some

---

19   As do the equivalent results for Figure 5 and Table 4 for our alternative
        definitions of poverty and unemployment.

of these characteristics individuals can move between categories, individuals are allocated to their modal category within the observation window.

Table 4: Relationship between number of years poor and values of *CRPU*

Number of years poor:	Value of *CRPU*					
	mean	median	standard deviation	25th percentile	75th percentile	frequency (%)
0	0.269	0.330	3.121	-0.549	1.341	71.5
1	0.015	0.551	5.778	-2.305	3.207	11.7
2	-0.260	0.041	6.929	-3.921	3.857	6.8
3	0.804	0.127	7.531	-3.490	5.046	4.1
4	0.013	-0.535	8.214	-4.365	5.470	2.5
5	0.233	0.097	6.394	-3.017	4.189	2.4
6	1.113	0.617	5.059	-1.204	3.332	1.0
Total	0.226	0.322	4.401	-0.978	1.712	100.0

Notes:
1. Individual level estimates of *CRPU* for 4,398 observations
2. Uses preferred definitions of ILO unemployment and relative poverty.

Table 5: Regression of absolute value of *CRPU* on characteristics

Characteristic[1] (share of the sample in brackets)	Regression coefficients (standard errors in brackets)
age group:	
26 to 35 (35%)	-1.367 **
	(0.148)
36 to 45 (28%)	-1.762 **
	(0.155)
over 45 (20%)	-1.354 **
	(0.163)
sex:	
female (52%)	0.179 *
	(0.093)
no. of kids in the household:	
one (23%)	0.728 **
	(0.120)
two or more (27%)	1.461 **
	(0.128)
education:	
O level/CSE (38%)	-0.729 **
	(0.130)
A level/HND (28%)	-0.792 **
	(0.142)
degrees (12%)	-1.275 **
	(0.181)
no. of workers in the household:	
one (31%)	0.225
	(0.192)
two (46%)	-1.057 **
	(0.215)
three or more (14%)	-1.030 **
	(0.245)
no. of unemployed in the household:	
one or more (7%)	0.371 *
	(0.191)
no. of inactive adults in the household:	
one (29%)	-0.026
	(0.121)
two or more (5%)	0.191
	(0.245)
whether household is intact:	
intact (66%)	-1.064 **
	(0.102)

equivalised household income quintile group:	
2 (24%)	-1.184 **
	(0.154)
3 (20%)	-1.623 **
	(0.169)
4 (18%)	-1.682 **
	(0.179)
top (19%)	-1.701 **
	(0.188)
constant	6.424 **
	(0.254)

Notes:
1.   An individual is assigned the characteristic type which they have most times out of the waves they are seen.
2.   Excluded groups (share of the sample in brackets): age group: 25 & under (17%), sex: male (48%), no. of kids in the household: zero (49%), education: no qualifications (23%), no. of workers in the household: zero (10%), no. of ILO unemployed in the household: zero (93%), no. of inactive adults in the household: zero (66%), whether household is intact: not intact (34%), equivalised household income quintile group: bottom (20%)
3.   * 90% significance level, **95% significance level
4.   Standard errors here are calculated in usual way (no account is taken of the fact that *CRPU* is a sum of other estimated parameters).
5.   A household is defined to be intact when the same person is the head in each wave seen, and their marital status is the same.
6.   Individual level estimates of *CRPU* for 4,398 observations.
7.   Uses preferred definitions of ILO unemployment and relative poverty.

A very clear pattern emerges. Vulnerability to the cycle is associated with being young, female, having more children in the household, having fewer workers, less education and less income. Most of these associations are statistically significant, so that each factor adds to others the individual may experience. The results also confirm the differences across groups shown by the final column of Table 3.[20]

Our results make it clear that vulnerability to the cycle is associated with many of the same factors that are associated with vulnerability to poverty; for example, worklessness in households (Gregg et al, 1999) or

---

20   The regression results in Table 5 are robust to the definitions of unemployment and poverty we use.

being a single parent. It is also clear that household characteristics matter: household labour supply, whether the household is intact, income and presence of children, in addition to the respondent's own age, sex and education, affect the individual's vulnerability to the cycle.

5. Conclusions

Macro data for both the US and the UK indicate a changing relationship over the last 30 years between the business cycle and poverty. The present paper investigates the reasons for this using data at the micro level, rather than the macro level examined by other researchers. We unpack the aggregate relationship into three components at individual level. These can be thought of as reduced form relationships derived from individual and household behaviour. The first is the relationship for an individual between aggregate unemployment (the business cycle) and the probability of being poor, conditional on not being unemployed. The second is the relationship between aggregate unemployment and the probability the individual will be unemployed. The third is the relationship between the difference in the probability of being poor conditional on being unemployed and the probability of being poor conditional on not being unemployed and aggregate unemployment. A lack of a strong relationship at aggregate level can be caused by heterogeneity across individuals in each of these relationships. It can also be caused by the covariances of the responses to aggregate unemployment in one outcome with the response of another outcome. The former can be examined by using aggregate data at group level, but the examination of the latter cannot.

We find that the relationship (or weakness thereof) for an individual of poverty to the business cycle is strongly driven by the impact of the cycle upon the probability of poverty, conditional on not being unemployed. In other words, the business cycle appears to have most impact on the poverty experiences of those who are *not* unemployed. This suggests that, along with movements in wages, it is the labour supply response of other household members (or, more generally, the income of other household members) that affect the sensitivity of transitions into poverty with the cycle.

We also find considerable heterogeneity across individuals in the relationship between poverty and the cycle. We find that the composition of the household, the labour market position of the individual and of other household members is associated with the responsiveness of poverty to the cycle. Again, the results point to the importance of the behaviour of household members in protecting individuals against the cycle. We do not find that the covariances between the reduced form equations drive much of the relationship between poverty and the cycle.

Our results are robust to defining poverty in absolute terms. While the aggregate relationship between poverty defined in absolute terms and unemployment is stronger, our qualitative results remain the same whether poverty is defined in absolute or relative terms. The main driving force, at the individual level, remains the behaviour of household income when individuals themselves are not unemployed. Similarly, the factors associated with vulnerability to the cycle remain the same whether poverty is defined in relative or absolute terms.

Having a response to the business cycle which is strongly linked to the cycle may or may not be beneficial in terms of overall experiences of poverty. In fact, we find that individuals whose poverty experiences are relatively unrelated to the cycle appear to experience less poverty. In other words, being either strongly pro-or anti-cyclical is associated with higher household poverty. An examination of the factors associated with high vulnerability to the cycle gives clear indication of differences between individuals. Vulnerability to the cycle is associated with being young, female, having more children in the household, having fewer workers, less education and less income. These vulnerable groups are the same groups who tend to be vulnerable to poverty. In other words, vulnerability to the cycle is driven by similar factors that are associated with high chances of poverty. Finally, our results suggest that policies to reduce the extent of cyclical poverty will need to address these factors – in particular, the importance of household labour market behaviour and income.

References

Abraham K.G. and J.C. Haltiwanger (1995), "Real Wages and the Business Cycle", *Journal of Economic Literature*, 33: 1215-1264

Bardasi E., S.P. Jenkins and J. Rigg (1999), "Derived net current and annual income variables to accompany BHPS waves 1-7", Working Paper 99-25, ESRC Research Centre on Micro-Social Change, University of Essex, Colchester

Blank R.M. (2000), "Fighting Poverty: Lessons from Recent U.S. History" *Journal of Economic Perspectives*, 14: 3-19

Burgess S. and C. Propper (1999), "Poverty in Britain" in Gregg and Wadsworth (eds), *The State of Working Britain*. Manchester: Manchester University Press

Cutler D. and L. Katz (1991), "Macroeconomic Performance and the Disadvantaged", *Brookings Papers on Economic Activity*, 2: 1-74

Danziger S. and P. Gottschalk (1986), "Do Rising Tides Lift All Boats? The Impact of Secular and Cyclical Changes on Poverty", *American Economic Review*, 76(2): 405-410. Papers and Proceedings of the Ninety-Eighth Annual Meeting of the American Economic Association

Danziger S. and P. Gottschalk (1993), "Introduction", in Danziger and Gottschalk (eds), *Uneven Tides: Rising inequality in America.* New York: Russell Sage Foundation

Department of Social Security (1999), *Households Below Average Income 1979-1997/98.* London: The Stationery Office

Goodman A. and S. Webb (1994), *For Richer, For Poorer: The changing distribution of income in the United Kingdom, 1961-91.* London: Institute for Fiscal Studies

Gregg P., K. Hansen and J. Wadsworth (1999), "The Rise of the Workless Household" in Gregg and Wadsworth (eds), *The State of Working Britain*. Manchester: Manchester University Press

Haveman R. and J. Schwabish (1999), "Macroeconomic Performance and the Poverty Rate: A Return to Normalcy?", Institute for Research on Poverty Discussion Paper No. 1187-99, University of Wisconsin-Madison

Hill M., D. Hill and R. Walker (1998), "Intergenerational dynamics in the USA: Poverty processes in young adulthood", in Leisering and Walker (eds), *The Dynamics of Modern Society.* Bristol: Policy Press

Jenkins S. (2000), "Modelling Household Income Dynamics", *Journal of Population Economics,* forthcoming 13(4)

Nickell S. (1999), "Unemployment in Britain", in Gregg and Wadsworth (eds), *The State of Working Britain.* Manchester: Manchester University Press

Taylor A. (1994), "Appendix: Sample characteristics, attrition and weighting", in Buck, Gershuny, Rose, and Scott (eds), *Changing Households: The British Household Panel Survey 1990-1992,* ESRC Research Centre on Micro-Social Change, University of Essex, Colchester

Taylor M.F. (ed) (1998), *British Household Panel Survey user manual: introduction, technical reports and appendices,* ESRC Research Centre on Micro-Social Change, University of Essex, Colchester

US Census Bureau (2000), *Poverty Status of People by Family Relationship, Race and Hispanic Origin: 1959 to 1999,* <http://www.census.gov/income/histpov/hstpov02.txt>

Appendix

This appendix provides details of how we implement the definitions of poverty and unemployment using the BHPS. We selected the BHPS dataset for our analysis as our methodology requires longitudinal data. To validate the BHPS data, comparisons are made between BHPS estimates and published official statistics for poverty and unemployment and the differences discussed.

Replicating the HBAI poverty definition for people captured in the survey we use has been greatly facilitated by the work of Jarvis and Jenkins (for more information see Bardasi et al, 1999), who have developed a BHPS net income variable to be consistent with the income definition used in HBAI. This income measure comprises the sum over all household members for the month prior to interview of all sources of income less direct taxes, local taxes and occupational pension contributions, and has been adjusted for inflation.[21] Income includes earnings from employment and self-employment, cash social security and social assistance benefits (including state retirement pensions and housing benefits), private transfers (such as child support receipts) and income from savings and investments including private and occupational pensions.

Applying the HBAI before housing costs poverty definition of 50% mean contemporary income to the BHPS data determines each individual's status — 'poor' or 'not poor' — in every year they are observed. It is then possible to aggregate over the sample and estimate a poverty rate in each year of our data. These BHPS estimates for the full and restricted samples (in both cases the mean used to calculate the poverty line is mean income for the full sample) and the published HBAI figures are presented in the table below.

We are not able to replicate the HBAI aggregate poverty figures precisely. Comparing the two series, there is less variation over time in the BHPS estimates and they are consistently lower than the HBAI

---

21   A household is defined to be one person living alone, or a group of persons who either share living accommodation or one meal a day, and who have the address as their only or main residence.

poverty rates. However, there are identifiable explanations: HBAI figures are for the UK whereas the BHPS only covers Great Britain, HBAI estimates are based on different datasets from the BHPS (the Family Expenditure Survey and the Family Resources Survey) and the time periods covered by the two series are not entirely consistent.[22]

To replicate the unemployment definition within the BHPS we classify individuals as ILO unemployed if they did no paid work last week, do not have a job they are away from, have looked for work in the last four weeks, are not a full-time student or taking part in a government training scheme[23] and are between the ages of 16 and 60 (65 for men). In addition to the ILO unemployed, included in the economically active population are those who self-report as employed, self-employed or on government training schemes or maternity leave. The resulting BHPS unemployment rates for the full and restricted samples are also presented in the table below,[24] along with the published official figures for the ILO unemployment rate for Great Britain.

Again there is quite a discrepancy between our full sample BHPS aggregate estimates and the 'official' figures. The BHPS unemployment rates vary less than their published counterparts and the trends indicated for the early 1990s are not entirely consistent. Despite

---

22   For more detail about the time periods covered by HBAI estimates see note 3 to Figure 1. More generally, in generating the BHPS poverty rates in the table we have also followed the HBAI approach in using individual (enumerated cross sectional) grossing-up weights to correct for sampling and non-response bias and apply the same monthly price index. We deviate from the HBAI methodology in not making any adjustment for under-reporting of high incomes (which would increase our poverty rate estimates) or excluding from the sample households where the spouse is temporarily absent, households containing any self-employed adult who has been full-time self-employed for less than two months, or households who were interviewed in the second quarter of 1991.

23   There is no question which asks if people were available for work, so full-time students and those on government training schemes were excluded on the basis that their status made them unlikely to be available for work.

24   Individual (enumerated cross sectional) grossing-up weights have been applied in producing our full sample unemployment rate estimates in order to make them nationally representative.

considerable investigation of these differences, it has not been possible to explain them.[25]

Year	Poverty rate (50% mean contemporary income)			Unemployment rate (ILO)		
	HBAI	BHPS (full sample)	BHPS (restricted sample)	Official	BHPS (full sample)	BHPS (restricted sample)
1991	20.7%	17.8%	11.4%	8.3%	7.9%	7.7%
1992	20.0%	16.6%	11.4%	10.2%	8.4%	7.7%
1993	18.7%	17.3%	12.3%	10.2%	7.5%	6.6%
1994	17.8%	16.6%	11.3%	9.0%	7.4%	6.8%
1995	18%	17.1%	11.5%	8.5%	5.7%	5.5%
1996	19%	16.4%	10.5%	7.9%	5.5%	4.6%

Official sources: HBAI poverty rates: before housing costs, 50% mean contemporary income (see notes to Figure 1 for more details) ; ILO unemployment rates: Employment Gazette, Autumn quarter figures for Great Britain. The official ILO figures presented here offer the most consistent basis for comparison with the BHPS; they differ from those presented in Figure 2, which for example refer to the UK, where consistency with the HBAI poverty figures is the aim.

Since most of the results in the paper look at the poverty experiences of a restricted sample (those aged 16 to 55 and present for at least 5 waves), the table also presents the figures for the unweighted poverty and unemployment rates for this restricted sample. As would be expected, this selected group has lower poverty and unemployment than the full sample.

The table below presents the calculated poverty and unemployment rates for our main alternative definitions (see section 3) on the BHPS full and restricted samples:

---

25 One clue to this discrepancy is that Taylor (1994) compared of Wave 1 of the BHPS with the 1% Sample of Anonymised Records from the 1991 Census and found that men in full-time employment and inactive men and women were under-represented but that women in part-time employment were over-represented in the BHPS.

Year	Poverty rate (50% of 1991 mean income, kept constant in real terms)		Unemployment rate (claimant count)	
	BHPS (full sample)	BHPS (restricted sample)	BHPS (full sample)	BHPS (restricted sample)
1991	17.8%	11.4%	7.4%	6.2%
1992	15.3%	10.5%	8.1%	7.0%
1993	15.1%	10.9%	7.9%	6.9%
1994	14.1%	9.4%	7.6%	6.4%
1995	12.4%	8.8%	6.2%	5.9%
1996	12.0%	8.0%	5.9%	4.7%

Source: own calculations

Figure 1: Unemployment and Relative Poverty in the UK, 1965 – 1997
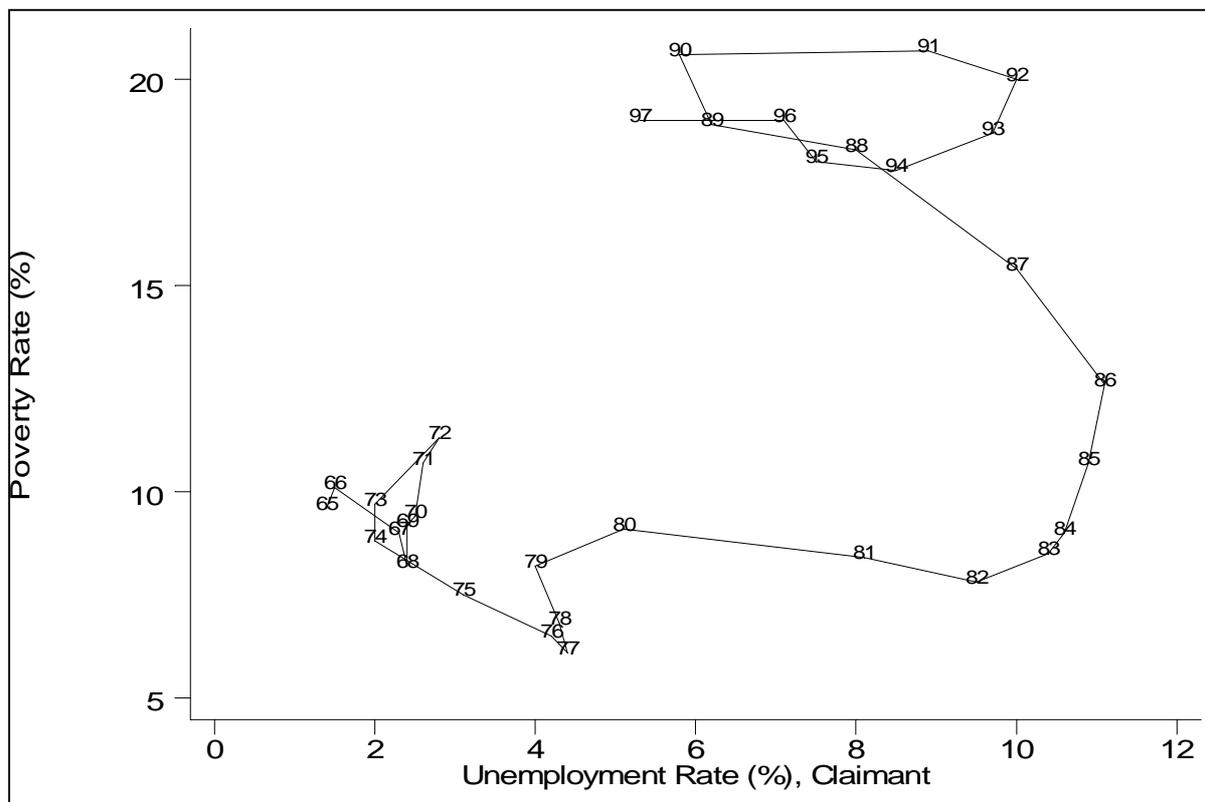
Notes:

1. Relative poverty rates are for income before housing costs, include the self-employed and are based on a poverty line of 50% of mean contemporary income (Goodman and Webb, 1994 for figures up to 1990; DSS, 1999, FES series for 1991-95 and FRS series for 1996-97).

2. Unemployment rates are claimant unemployment from Economic Trends Annual Supplement (code=*BJCE*).

3. For the years 1965 to 1990, the data points for both unemployment and poverty are calendar year averages. During the 1990s the published HBAI poverty rates were no longer calculated for individual calendar years. Since it was not possible to convert the poverty rates in to single year rates, we have used the published HBAI poverty figures. The unemployment rates have been derived to be as consistent as possible with the poverty figures, in terms of the period they cover (by using combinations of annual and quarterly unemployment data). The following labelling is used: label '1991' refers to combined calendar year (CY) 91 and CY 92; label '1992' refers to combined CY 92 and CY 93; label '1993' refers to combined fiscal year (FY) 93/94 and FY 94/95; label '1994' refers to combined FY 94/95 and FY 95/96; label '1995' refers to combined FY 95/96 and FY 96/97; label '1996' refers to FY 96/97; label '1997' refers to FY 97/98.

Figure 2: Unemployment and Poverty in the UK, 1965 – 1997: Three poverty definitions and three unemployment measures
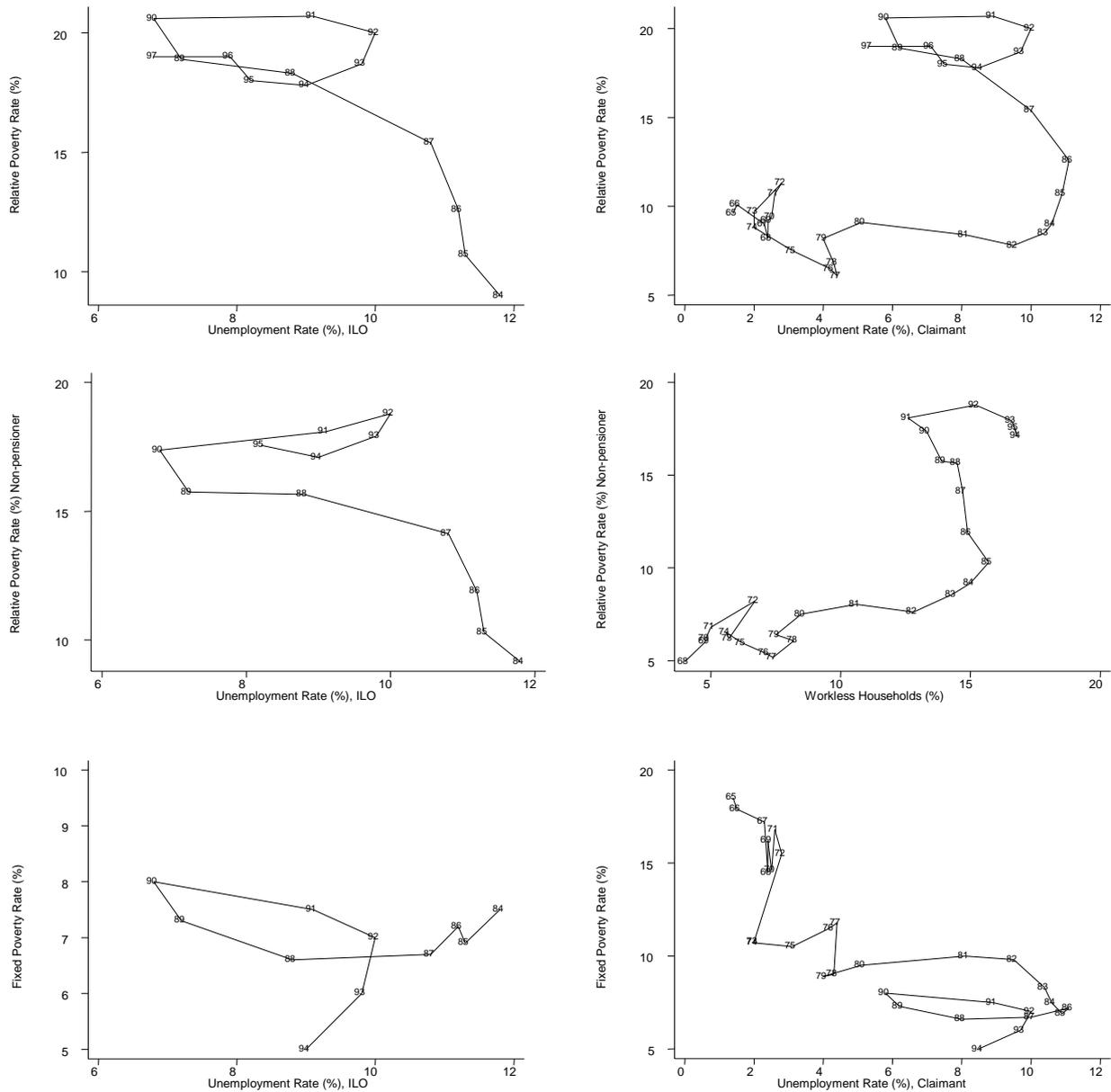
Notes:

1. See notes 1 to 3 for Figure 1.
2. For definitions and sources for non-pensioner poverty rates see note 1 for Figure 1.
3. Fixed poverty rates are for income before housing costs and are based on a poverty line of 50% of 1979 mean income, kept constant in real terms (derived from the same sources as relative poverty rates in Figure 1).
4. ILO unemployment from Labour Force Survey through Office of National Statistics (code=*MGUK*). Note we only have this data from 1984.
5. Workless households figures kindly provided by Jonathan Wadsworth, London School of Economics. Note these data are only available on a calendar year basis.

41

Figure 3: Unemployment and Absolute Poverty in US, 1960 – 1997
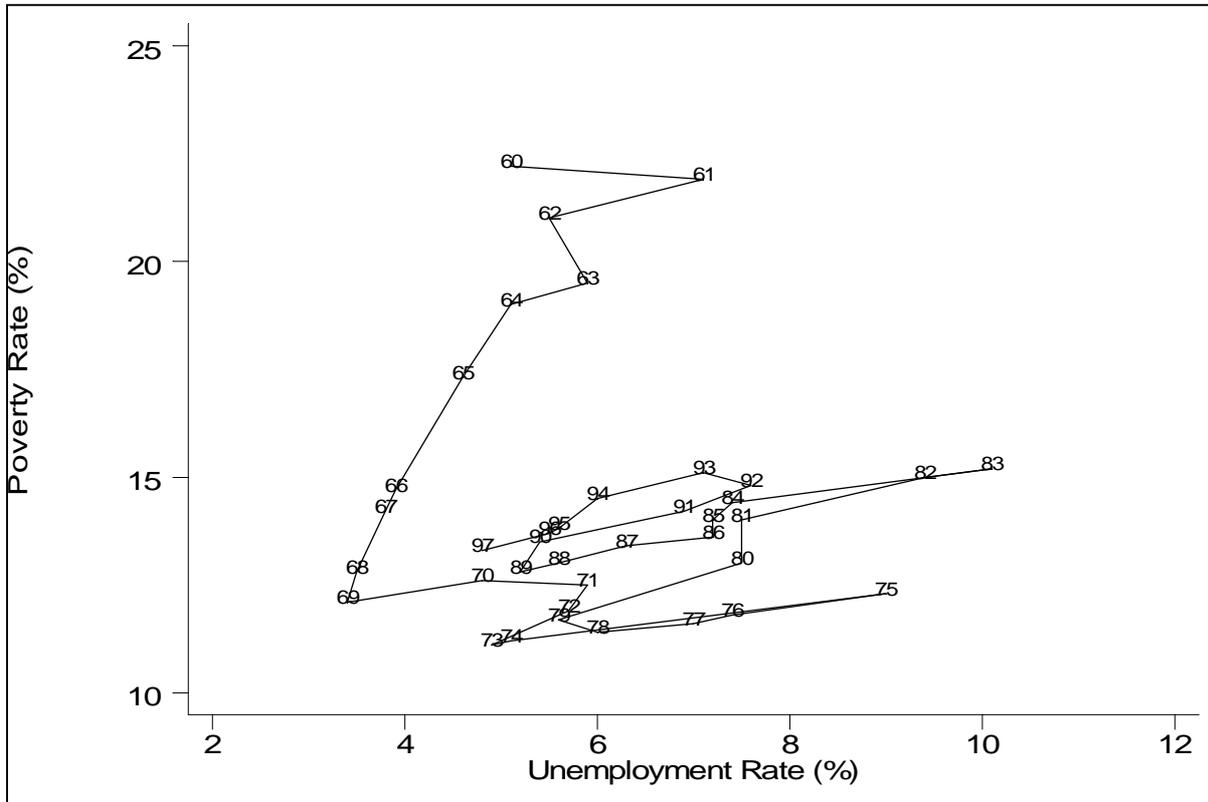
Notes:
1.   Poverty rates are from US Census Bureau (2000).
2.   Unemployment rate from the Current Population Survey; series ID:LFS21000000; seasonally adjusted; civilian labour force 16 years and older; May figure <http://www.bls.gov/top20.html> .
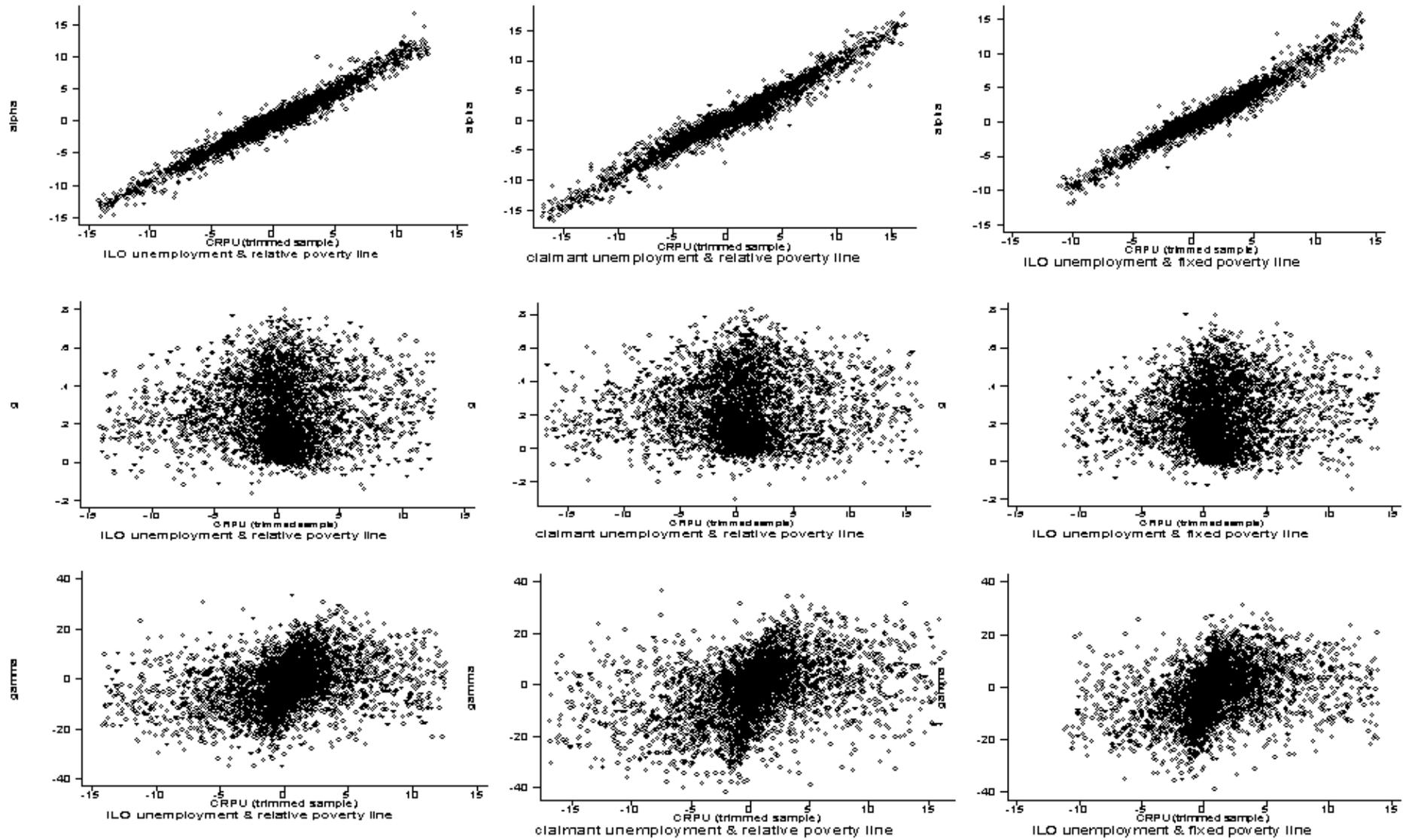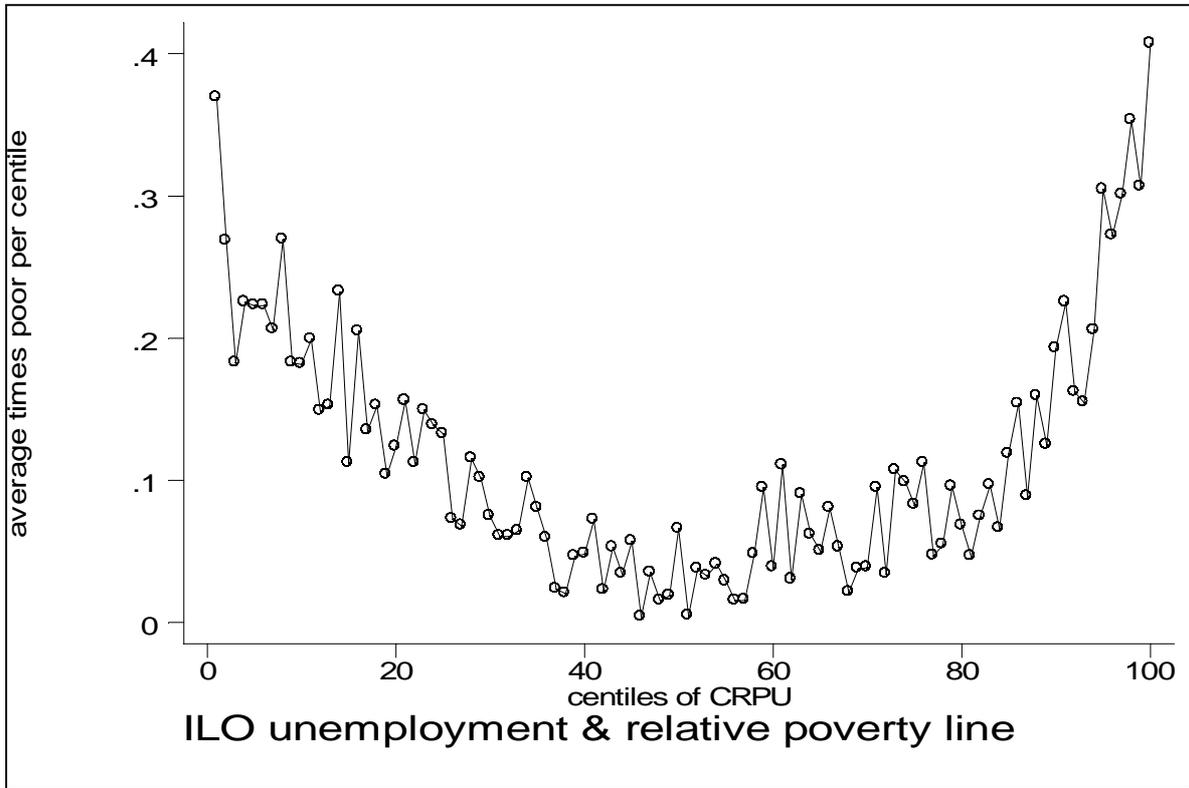
Figure 4: Individual level Relationship between *CRPU* and component parameters.

Notes: 1. Graphs present a trimmed sample of 4,311 observations to exclude outliers: top and bottom 1% of *CRPU* value.

Figure 5: Average poverty by centile of *CRPU*

Notes:

1.   Based on sample of 4,398 observations.