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Household Repayment Behaviour and Neighbourhood Effects

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Abstract: The recent financial crisis has revealed the financial vulnerability faced by a significant number of households in the UK. Households experiencing financial problems may potentially fall into arrears in meeting financial obligations such as rent, mortgage payments or household bills. Indeed, such arrears have been regarded as one of the most direct measures of financial stress at the household level. In this paper, we explore the relationship between household repayment behaviour and neighbourhood ties in order to identify possible channels of support for households experiencing financial stress. We analyse data on 17,723 households drawn from wave one of the UK longitudinal study, *Understanding Society*, merged with information on neighbourhood ties defined at the postcode area level elicited from a sample of 48,906 individuals. Our findings, which relate to the post financial crisis era, suggest that households in regions characterised by strong neighbourhood ties are less likely to report being in arrears and that this relationship is particularly apparent in the case of housing costs. This inverse relationship is strongest in regions characterised by a high density of individuals who feel able to turn to someone in the neighbourhood for support or advice. Thus, neighbourhood and community groups, which enhance social interaction and neighbourhood ties, may be effective channels of support for financially vulnerable households.

Key Words: Arrears; Household Finances; Neighbourhood Effects

JEL Classification: D12; D14

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1. Introduction

The recent financial crisis has revealed the financial vulnerability that a significant number of individuals and households face in many developed economies, with households simultaneously holding relatively high levels of debt and limited savings to fall back on in times of financial adversity. The increase in household debt over the past three decades in many countries has been well-documented in both the economics literature and the wider media.¹ Such increases in the level of debt at the household level have led to concern amongst policy-makers in a number of countries over the extent of financial vulnerability and risk faced by households, especially in the context of the current financial and economic climate.² As argued by Hamilton (2003), increases in household borrowing may make households vulnerable to reductions in their income or to changes in the interest rate. Households holding debt with limited financial assets are particularly vulnerable to financial shocks related to job loss, a fall in real wages or changes in their personal circumstances such as divorce or changes in household expenditure and financial commitments due to, for example, having children. Households experiencing such changes in their financial situation may encounter problems with meeting their financial obligations leading to financial hardship, which may result in them falling into arrears in meeting payments.

There is a growing empirical literature exploring household finances (see, for example, Guiso et al., 2002, for a comprehensive review of this area), with the analysis of

¹ Given the growth in owner occupation following the financial deregulation of the 1980s, there has been a phenomenal rise in mortgage debt in the U.K.: for example, the growth rate in mortgage debt as a proportion of GDP in the UK between 1992 and 2002 is estimated at 21% (European Mortgage Federation, OECD Economic Outlook). Similarly, the secured debt to income ratio has increased by 42% between 1995 and 2005 (Bank of England, National Statistics). The Council for Mortgage Lenders reported an increase in the number of new repossessions, 2007-2009, with an increase of over a third in 2009 relative to the previous year (see the Council of Mortgage Lenders website for further details, <https://www.cml.org.uk/cml/home/>).

² The findings of Brown and Taylor (2008), for example, who jointly model household debt and assets, suggest that the youngest households are the most vulnerable to changes in their financial circumstances being characterised by a high proportion of individuals with debt yet no financial assets. In addition, the probability of having debt and no financial assets is found to substantially increase if households are in the lowest income quartile. Furthermore, the individuals in these households are characterised by a relatively high probability of being unemployed in the following year suggesting persistence in financial problems.

financial hardship at the household level, including the propensity to fail to meet financial obligations, attracting increasing attention in the economics literature.

The focus in the existing literature has been on mortgage payment problems with most studies analysing U.S. data. Furthermore, there has been a particular focus on default behaviour rather than arrears in both the empirical and theoretical literature (see Leece, 2004, for a comprehensive review of the economics of the mortgage market). Arguably, a better understanding of arrears behavior might lead to a greater ability to forecast mortgage defaults, which would have been particularly significant during the recent financial crisis.³ The early research on rent and mortgage arrears exploited aggregate data to explore trends in mortgage arrears and repossessions with the focus on structural factors, such as interest rates and income gearing, and factors related to ability to pay, for example unemployment and marriage break-down (see the recent comprehensive survey on possessions and arrears by Aron and Muellbauer, 2010). We discuss the small body of relevant UK literature below.

In an early contribution, Brookes et al. (1994), using aggregate time series data on the proportion of mortgages in arrears or repossessed over time, find no role for income or the divorce rate in explaining mortgage arrears, although the divorce rate and inflow into unemployment are found to influence repossessions. Whitley et al. (2004), who explore the growth in household arrears using aggregate time series data, find that housing equity, unemployment, income and interest payments influence mortgage arrears. Figueira et al. (2005) employ an error correction model to explore the long-run and short-run dynamics in the aggregate level of mortgage arrears. Their findings highlight the importance of changes in the rate of unemployment, loan-to-income and debt-to-service ratios.

The small yet growing number of household level studies represent an important contribution to our understanding of housing payment problems since, as argued by Leece

³ I am grateful to an anonymous referee for highlighting this important point.

(1995), the use of aggregate time series data may mask household responses to changes in the economic environment. Furthermore, as stated by Burrows (1998), the probability of falling into mortgage arrears is a complex interaction of socio-economic and personal factors. Examples of household level studies include Lambrecht et al (1997), who analyse a sample of defaults and repossessions, 1987-1991, in the U.K. and find that the average time to default is positively related to income and inversely related to interest rates. Analysing debt arrears in general, Bridges and Disney (2004), using the 1999 Survey of Low Income Families, jointly model the probability of being in arrears and debt repayments and, conditional on being in arrears, the magnitude of the arrears. In their sample, 45% of households are in debt arrears. Interestingly, they find no strong evidence of persistence in debt arrears. Böheim and Taylor (2000) use the *British Household Panel Survey (BHPS)*, 1991-1997, to explore the incidence of housing payment difficulties and evictions and repossessions and their descriptive statistics indicate a large degree of persistence in housing payment problems. More recently, Dawson and Henley (2012) explore the relationship between unrealized financial expectations and mortgage repayment problems using the *BHPS* and find that over-optimism is associated with a higher probability of mortgage payment difficulties.

There has also been some analysis of the consequences of falling into housing payment arrears in the existing literature. For example, Taylor et al (2007) explore the impact of unsustainable housing commitments on psychological well-being using the *BHPS*, 1991-2003. Their findings suggest that arrears and housing payment problems are associated with significant psychological costs for male household heads, whilst, for female household heads, persistence in unsustainable housing costs leads to psychological costs. Duygan-Bump and Grant (2009), who analyse arrears using the European Community Household Panel 1994-2001, find that falling into arrears has long-term consequences for employment, self-employment and home ownership and health. Finally, Gathergood (2009), focusing on

mortgage-holding households, explores the prevalence of mortgage arrears and mortgage repayment risk in the UK using the *BHPS*. Unemployment, long-term sickness and relationship break-down are all found to predict mortgage arrears.

In this paper, we contribute to the growing literature exploring financial problems at the household level. We focus on arrears since, as argued by Whitley et al (2004), household arrears are one of the most direct measures of financial stress in the household sector. Additionally, as argued by Breunig and McKibbin (2011), measures of arrears may be regarded as the first symptoms of household financial stress which may ultimately lead to bankruptcy, foreclosure and repossession. Hence, furthering our understanding of the determinants of household arrears should be of particular interest to policy-makers, especially in the context of the current economic climate. In this paper, using household level data for the U.K., we focus on the relationship between three types of arrears and neighbourhood effects. Thus, we focus on financial problems defined more broadly than housing payment problems and therefore adopt a wider approach than the existing literature.

Our main contribution, however, lies in our focus on the relationship between neighbourhood effects and the probability of being in arrears. It is apparent that neighbourhood ties may influence the likelihood of being in arrears via a variety of channels. For example, as argued by Breunig and McKibbin (2011), p.1004, ‘it is no doubt embarrassing to admit failure to pay bills on time.’ It may be the case, therefore, that concern for the perceived social stigma associated with being in arrears, which may be related to an expected loss in social standing in the neighbourhood due to exhibiting ‘socially unacceptable’ behaviour, may serve to lower the probability of being in arrears, with such a relationship being heightened in regions characterized by strong neighbourhood ties. Alternatively, it may be the case that, in regions characterized by strong neighbourhood effects, the provision of informal support or the sharing of information and advice may serve

to lower the likelihood of being in arrears. In a similar vein, Georgarakos and Fürth (2012) explore the relationship between social capital and household repayment behavior. Their findings suggest that high stocks of social capital, as measured by generalized trust and participation in voluntary organizations, are inversely associated with the probability of being in arrears.

2. Data and Methodology

Our analysis is focused on wave 1 of *Understanding Society*, which is the follow-up survey to the *British Household Panel Survey (BHPS)*, a survey conducted by the Institute for Social and Economic Research comprising approximately 10,000 annual individual interviews, from 1991 to 2008. The *BHPS* was replaced by *Understanding Society* in 2009, which is a longitudinal survey of approximately 40,000 households in the UK, with face-to-face interviews carried in January 2009 and January 2011 for wave 1, where the actual number of completed (usable) household interviews yields 30,169 observations. Thus, the sample size is considerably larger than in the *BHPS*, which is particularly important given the regional aspect to the analysis conducted in this paper. In addition, *Understanding Society* provides an opportunity to explore repayment behaviour in the post financial crisis era.⁴ Once we exclude observations with missing values on key variables, households in Northern Ireland (this is discussed further below) and restrict the sample to those households who are either paying off a mortgage or paying rent, the sample employed in our econometric analysis is reduced to 17,723 households.⁵

⁴ The overall aim of *Understanding Society* is to ‘provide high quality longitudinal data about subjects such as health, work, education, income, family, and social life to help understand the long term effects of social and economic change, as well as policy interventions designed to impact upon the general well-being of the UK population.’ (www.understandingsociety.ac.uk).

⁵ In the sample of 30,169 households, 1,292 households reside in Northern Ireland, where rates rather than council tax exist (this is discussed further below). Hence, they are omitted from the analysis. In the remaining sample, 8,180 households own their house outright and hence are excluded from the sample. The remaining households omitted from the sample are a combination of households who responded ‘don’t know’ to the housing cost question, refused to answer or supplied a value of zero and those with missing values on key questions such as those relating to arrears.

We explore the incidence of three different types of household arrears, where the information relating to arrears is elicited from the responses to the following questions, which are asked at the household level. Firstly, *many people find it hard to keep up with their housing payments. In the last twelve months, have you ever found yourself behind with your rent/mortgage?*⁶ Secondly, *in the last twelve months, have you ever found yourself behind with paying your Council Tax?*⁷ Thirdly, *sometimes people are not able to pay every household bill when it falls due. May I ask you, are you up to date with all your household bills such as electricity, gas, water, rates, telephone and other bills or are you behind with some of them?*⁸ The possible responses were: up to date with all bills; behind with some bills; or behind with all bills. Those households indicating they were behind with some or all bills were coded as being in arrears with household bills. In the sample of 17,723 households, 15% report being in arrears with the rent or mortgage, 12% report being in arrears with their council tax and 10% report being behind with household bills. With respect to regional variation in reporting arrears, see Table 1, where there is considerable variation across the regions especially in arrears in housing costs and arrears in bills. Table 2 presents the correlation matrix between reporting the three types of arrears. It is apparent that the correlations are all positive and statistically significant indicating that financial hardship in one dimension may be associated with financial hardship in other dimensions.

⁶ Due to the nature of the question, it is apparent that housing costs (i.e. rent and mortgage payments) are combined. As highlighted by an anonymous reviewer, this may be problematic if owner occupiers and renters behave differently. Furthermore, in the context of an imperfect capital market where affordability and collateral are important, differences in housing tenure are potentially important. Throughout the econometric analysis, we control for housing tenure type in order to control for the existence of such differences.

⁷ Council tax is the local taxation system in England, Scotland and Wales, which partially funds the services provided by local government. In Northern Ireland, rates represent the local taxation system. Hence, we omit individuals residing in Northern Ireland from our sample given that this form of arrears is not applicable to them.

⁸ The inclusion of rates as an explicit example in this question relates to the inclusion of Northern Ireland in the sample where, as noted above, rates are the local taxation system. It is possible that some respondents in England, Scotland and Wales may interpret council tax as rates. If this is the case the last two types of arrears may not be mutually exclusive. In the overall sample, 5% of households report both arrears in council tax and household bills. If we restrict this to a sample of household heads who were aged over 18 when rates were replaced in 1990 in England and Wales and 1989 in Scotland by the Community Charge, this percentage is slightly higher at 6% suggesting that misreporting of the question may not be problematic.

We initially focus on exploring the determinants of the probability that households report each of the three types of arrears via a binary probit framework as follows:

$$\begin{aligned}
 a_h^j &= 1 \text{ if } a_h^{j*} = \gamma n_{ir} + \mathbf{X}'_h \beta + \varepsilon_j > 0 \\
 a_h^j &= 0 \text{ otherwise}
 \end{aligned} \tag{1}$$

where $j=1, 2, 3$ represents the three types of arrears, there are $h=1, \dots, H$ households, a_h^* is a latent dependent variable, \mathbf{X}'_h is a vector of household and head of household characteristics, defined in detail below, n_{ir} denotes aggregate neighbourhood effects, our key covariates of interest, as perceived by individuals (i) residing in region, r (a detailed discussion of the definition and construction of these variables is given below), and ε_h is a random error term.

In contrast to the existing literature, in order to explore the robustness of our results, we also employ a system probit framework to allow for the potential interdependence between reporting the three different types of arrears. For example, a household facing difficulty in meeting housing payments may potentially also fall behind in paying other household bills. Thus, given the positive correlations presented in Table 1 above, we explore the robustness of our findings by estimating a system of three equations which capture housing cost arrears (equation 2a below), council tax arrears (equation 2b below) and, finally, arrears in household bills (equation 2c below). The key advantage of estimating a system of equations is that it allows us to account for the correlation via unobservable household characteristics that may affect all three types of arrears (such as the financial literacy of the household members or other financial commitments not observed in the data). We specify a system of three latent equations as follows:

$$a_h^{1*} = \gamma_1 n_{ir} + \mathbf{X}'_h \beta_1 + \varepsilon_1 \tag{2a}$$

$$a_h^{2*} = \gamma_2 n_{ir} + \mathbf{X}'_h \beta_2 + \varepsilon_2 \tag{2b}$$

$$a_h^{3*} = \gamma_3 n_{ir} + \mathbf{X}'_h \beta_3 + \varepsilon_3 \tag{2c}$$

Assume that the error terms in the three latent equations are independently and identically distributed and jointly follow a multivariate normal distribution with mean 0 and covariance matrix Σ . That is, $(\varepsilon_1, \varepsilon_2, \varepsilon_3)' \sim MVN[0, \Sigma]$ where the covariance matrix is given by

$$\Sigma = \begin{pmatrix} 1 & \rho_{12} & \rho_{13} \\ \rho_{12} & 1 & \rho_{23} \\ \rho_{13} & \rho_{23} & 1 \end{pmatrix}, \quad (3)$$

ρ_{jk} being the correlation coefficient between ε_j and ε_k ($j, k = 1, 2, 3; j \neq k$) and $\text{Var}(\varepsilon_1) = \text{Var}(\varepsilon_2) = \text{Var}(\varepsilon_3) = 1$ for identification purposes.

With respect to neighbourhood ties, we focus on the effects of aggregate perceptions relating to neighbourhood ties in a particular region such that a change in an individual's ties to the neighbourhood cannot influence the aggregate measure of ties to the neighbourhood in that region. Thus, this approach, where we control for the density of neighbourhood ties in the household's region of residence, reduces the probability of endogeneity bias. Given that, by construction, neighbourhood ties are invariant at the regional level, we cluster the standard errors at the regional level (see Moulton, 1990).

For robustness, we explore eight different measures of neighbourhood ties, based on questions asked to all adults residing in the sample of households, namely: *I feel like I belong to this neighbourhood*; *The friendships and associations that I have with other people in my neighbourhood mean a lot to me*; *If I needed advice about something I could go to someone in my neighbourhood*; *I borrow things and exchange favours with my neighbours*; *I would be willing to work together with others on something to improve my neighbourhood*; *I plan to remain a resident of this neighbourhood for a number of years*; *I like to think of myself as similar to the people that live in this neighbourhood*; and *I regularly stop and talk to people in my neighbourhood*. The possible responses to each of the eight questions were: strongly agree; agree; neither agree nor disagree; disagree; or strongly disagree. We initially consider

the responses from the individual level data in wave 1 of Understanding Society comprising completed interviews with 48,906 adults to calculate the proportion of individuals responding strongly agree or agree across each of the standard regional classifications: North East; North West; Yorkshire and Humberside; East Midlands; West Midlands; East of England; London; South East; South West; Wales; and Scotland.⁹ Table 3 presents the mean value of the neighbourhood variables across each of the 11 regions. It is apparent that there is considerable variation across the neighbourhood variables as well as across the regions. Given the wide geographical area covered by the 11 standard regions, we have constructed the neighbourhood variables at the postcode area level, which translates into 136 postcode areas. The last column in Table 1 presents the number of postcode areas within the 11 standard regions. The empirical analysis is thus based on the neighbourhood variables defined at the postcode area level. Given the high degree of correlation between the eight neighbourhood variables, see the correlation matrix presented in Table 4, we include each measure separately rather than simultaneously in equations (1), (2a), (2b) and (2c).

Following the existing literature, we control for a range of head of household and household characteristics. We control for a set of standard demographic and socio-economic characteristics of the head of household controls including: gender; marital status; age; (the omitted category is aged over 65); highest educational qualification (the omitted category is no education); self-assessed health (the omitted category is poor or very poor health); and employment status. With respect to household characteristics, again we control for standard characteristics such as: housing tenure (the omitted category is renting from the private sector); household income; number of adults in the household; and number of children in the

⁹ Information on neighbourhood ties is not available in wave 2 of *Understanding Society*, which relates to data collected between January 2010 and April 2012. Similarly, there are issues relating to the availability of the key variables in the *BHPS*. For example, detailed information relating to neighbourhood ties is only available in the 1998, 2003 and 2008 waves, whilst information relating to arrears in household bills is only available in the 1995 wave. Information on council tax arrears is not available and the information relating to housing repayment problems is not consistent with the *Understanding Society* question.

household. Given our focus on the financial situation of households, we also exploit the detailed information available in *Understanding Society* and include a set of variables capturing financial commitments of the household, namely: monthly housing costs; monthly food expenditure; and annual fuel expenditure. Finally, it is apparent that the household's standard of living may influence their financial situation, which we proxy with the following set of variables: car ownership; whether the following are in the household, colour television, video recorder/DVD player, satellite dish/Sky TV, cable TV, deep freeze or fridge freezer, washing machine, tumble drier, dish washer, microwave oven, home computer/pc, compact disk player, landline telephone or mobile telephone. We also control for month of interview to capture any seasonal differences in repayment behavior. Summary statistics relating to variables employed in the empirical analysis are presented in Table 5.

3. Results

In Table 6, we present the results from estimating the three univariate probit models, where the estimated coefficients are presented in Table 6 Panel A and the marginal effects are presented in Table 6 Panel B. We focus the discussion initially on our key covariates of interest, namely the variables relating to the density of neighbourhood ties. It is apparent from Table 6A that all of the estimated coefficients on the neighbourhood variables are negative in the case of mortgage and rent arrears and, with the exception of willingness to work with others to improve something in the neighbourhood, are all statistically significant. In the case of council tax arrears, only the estimated coefficients on belonging to the neighbourhood and the importance of friendships and associations in the neighbourhood are on the borderline of statistical significance, whereas, with respect to arrears with bills, six of the estimated coefficients of the neighbourhood variables attain statistical significance. We focus our discussion below on the estimated marginal effects.

It is apparent from Table 6 Panel B that the marginal effects associated with the neighbourhood variables in the case of arrears in housing costs (i.e. rent or mortgage) are all large relative to the effects of head of household and household characteristics and, with the exception of the variable capturing willingness to work with others on something to improve the neighbourhood, are all statistically significant. The marginal effects are all negative indicating that households residing in regions characterized by strong neighbourhood ties are less likely to report being in arrears with housing costs. It is apparent that the largest inverse effect is associated with being able to go to someone in the neighbourhood for advice. Similarly, being able to borrow things or exchange favours is inversely associated with the probability of being in arrears with housing costs suggesting that the informal provision of support and advice in neighbourhoods may serve to lower the probability of falling into financial difficulties in paying housing costs. The second largest marginal effect relates to thinking of oneself as similar to the people living in the neighbourhood. The importance of feeling a sense of belonging to the neighbourhood as well as identifying with individuals in the neighbourhood suggest that avoiding arrears in housing costs may be related to a desire to conform with 'socially acceptable' behavior. Interestingly, the marginal effect relating to regularly stopping and talking to people in the neighbourhood is also relatively large and has the strongest statistical significance amongst the neighbourhood variables. Such a finding highlights the potential importance of informal social interaction in mitigating such financial problems.

The pattern of neighbourhood effects associated with council tax arrears is not so clear cut, with only two of the marginal effects of the neighbourhood variables attaining statistical significance, albeit at a borderline level. Such findings, therefore, suggest that the influence of social pressure and/or the provision of informal advice and support do not appear to be important in the context of such payments. This may reflect the fact that council tax

payments represent a smaller portion of the household budget than rent or mortgage payments. Alternatively, given the controversy surrounding the introduction of council tax in the U.K., the perceived social stigma associated with falling behind with such payments may not be so great. Additionally, for households facing council tax payment difficulties, councils do offer schemes associated with spreading payments or a reduction in council tax depending on personal circumstances (see www.gov.uk/council-tax/ for further details). Thus, specific arrangements as well as guidelines are available for those households who face difficulties in paying council tax.

With respect to arrears in household bills, six of the marginal effects related to the neighbourhood variables attain statistical significance: importance of friendships and associations in the neighbourhood, being able to get advice from someone in the neighbourhood, borrowing things and exchanging favours with neighbours, planning to remain a resident of the neighbourhood, thinking of oneself as similar to others in the neighbourhood and regularly stopping and talking to people in the neighbourhood. These six variables are inversely associated with the probability of reporting being in arrears with household bills. It is apparent that the provision of advice or support in the case of this type of financial difficulty continues to exert a statistically significant influence, with borrowing things and exchanging favours being associated with the largest marginal effect. This is also the case for the extent of social interaction in the neighbourhood, with, for example, regularly stopping and talking to neighbours having the second largest inverse effect on the probability of reporting being in arrears with household bills, providing further evidence endorsing the importance of informal social interaction in mitigating financial problems.

Thus, it seems to be the case that neighbourhood effects appear to be particularly important in the case of housing cost payments, which are arguably the most important part of the household budget both in terms of the financial outlay and in terms of securing

accommodation for the household. Moreover, falling into arrears in housing costs can ultimately lead to eviction or repossession. Hence, keeping up to date with such payments plays a crucial role in remaining in a particular neighbourhood. This pattern of results is also apparent in Table 7, where we explore the robustness of the findings by employing a system probit approach. Moreover, the estimated correlation parameters reported in Table 7 are all large and highly statistically significant thereby endorsing the joint modeling approach.¹⁰

With respect to commenting briefly on the effects of the other control variables, the findings are relatively consistent across the three types of arrears and are in line with the existing literature. It is apparent that individuals in the oldest age category are less likely to report being in any of the three types of arrears than individuals in the other age categories. Higher levels of education (i.e. degree level) and being in excellent or very good health also appear to lower the likelihood of being in arrears. The results suggest that larger households are more likely to report being in arrears. Finally, in accordance with expectations, income and owner occupancy are both associated with a reduced probability of being in arrears.¹¹

Robustness: Ordered Probit and Zero Inflated Ordered Probit Models

In order to further explore the robustness of our findings, we analyse a series of ordered probit models where the dependent variable is an index of the number of types of arrears reported at the household level. The index runs from zero to two, where 77% of households report no arrears, 13% report being in only one type of arrears and 10% report being in two or

¹⁰ The results from the system probit approach are obtained via the `mvprobit` Stata command, see Cappellari and Jenkins (2003). Marginal effects in the system approach can be calculated for all possible combinations of the three binary dependent variables including the two cases where all three dependent variables equal 1 and where they all equal 0. The common approach is to compare predicted probabilities when the explanatory variable of interest is excluded then included in the model. Focusing on the cases where the joint probability is 1 (i.e. reporting all three types of arrears) and for the joint probability of zero (i.e. not reporting arrears of any type), in accordance with the results discussed above, the marginal effects are all negative. The largest inverse effect relates to the importance of friendships and associations in the neighbourhood and the smallest inverse effect relates to the effect of being willing to work with others in the neighbourhood.

¹¹ In order to explore the robustness of our findings, we have conducted the empirical analysis with the neighbourhood variables defined at the standard regional level as well as at the local authority district level and we obtain the same pattern of results. In addition, the pattern of results prevails regardless of whether region controls or controls for regional characteristics such as the regional unemployment rate are included or not.

more types of arrears.¹² Once again, due to the high correlation between the eight neighbourhood variables, we estimate eight ordered probit models, with standard errors clustered at the regional level and with each of the different controls for neighbourhood ties entered separately rather than simultaneously. In Table 8, we summarise our results presenting the estimated coefficients and marginal effects associated with each of the eight neighbourhood variables. It is apparent that, with the exception of willingness to work together with others the neighbourhood, all of the estimated coefficients on the neighbourhood variables are negative and statistically significant. The pattern of the marginal effects suggests that neighbourhood ties are positively related to the likelihood of reporting not being in arrears of any type and inversely associated with the likelihood of being in one type or two or more types of arrears. The effects of a high density of individuals in the region responding that they feel like they belong to the neighbourhood and that there is someone in the neighbourhood to turn to for advice both have relatively large effects on the probability of the household reporting not being in arrears. In addition, the effects of feeling similar to the people that live in the neighborhood and regularly stopping and talking to people in the neighbourhood are both characterized by highly statistically significant effects.

It is apparent that the dependent variable is characterized by a large proportion of zero observations, which suggests that an econometric approach suited to a zero inflated ordered dependent variable may be appropriate. In order to further explore the robustness of our findings, we employ the zero inflated ordered probit (ZIOP) approach of Harris and Zhao (2007), based on two latent equations: a splitting probit equation and an ordered probit equation.¹³ The excessive number of zeros observed in the dependent variable may arise due to the existence of two types of zeros. Although we would expect a large proportion of the

¹² Since only 3% of the sample report being in three types of arrears we have collapsed the top two categories of the dependent variable and hence the analysis is based on a three point rather than four point index.

¹³ We use the stata code provided by Bagozzi et al (2012) to estimate the model. We are very grateful to them for making the code available.

population to report not being in arrears at a particularly point in time, it may be the case that due to the stigma associated with being behind with financial obligations, some households report not being in arrears when this is not the case. As noted above, Breunig and McKibbin (2011) highlight the embarrassment associated with admitting failure to pay bills. Furthermore, their analysis indicates the effects of survey design on the reporting of financial difficulty at the household level, with the self-completion questionnaire approach being associated with higher levels of reported financial difficulty than the face-to-face interview approach. Given that *Understanding Society* is administered as a face-to-face interview, we might therefore expect an excessive level of zeros in the information reported on arrears. Thus, concern regarding admitting to being in arrears may serve to inflate the number of zero observations recorded in the data.

In the inflation (i.e. the splitting equation) equation, we include variables relating to the interview conditions, namely: the length of time taken to complete the household questionnaire. From the individual questionnaire, we elicit additional information relating to whether the interviewer thought the respondent was somewhat or very suspicious about the study after the interview was completed, an index of the interviewer's observations regarding the respondent's understanding of the questions ranging from excellent, good, fair to poor/very poor and an index of the interviewer's observations about the respondent's cooperation during the interview ranging from excellent, good, fair to poor/very poor. We also control for the head of household's age, gender, marital status and highest level of educational attainment as well as the number of adults and children in the household. The controls in the ordered probit part of the model (i.e. the outcome equation) are as before. The results are summarized in Table 9, where we present estimated coefficients assuming independent error terms across the two parts of the model and where we assume the error terms are correlated (where the estimated correlation parameter is reported in Table 9). It is

apparent from the summary of the findings that the pattern of the results follows that of Table 8, thereby endorsing the importance of neighbourhood effects for household repayment behavior.

4. Conclusion

We have explored the relationship between household repayment behavior and neighbourhood ties analyzing a sample of households drawn from wave one of *Understanding Society*, based on information elicited between January 2009 and January 2011 therefore relating to the post financial crisis era. Our findings suggest that households residing in regions characterized by strong neighbourhood ties are less likely to report being in arrears. Our findings are particularly pronounced in the case of housing costs which may reflect the importance of keeping up to date with mortgage or rent payments for continuing to reside in a particular neighbourhood. Moreover, the estimated effects are generally large relative to those related to household and head of household characteristics highlighting the importance of neighbourhood ties in influencing financial behaviour at the household level and the importance of allowing for such factors when forecasting arrears at the regional level. More accurate forecasting of repayment problems and being in arrears may serve to provide a more accurate regional picture of financial distress and vulnerability for policymakers to use in the design of regional policy.

Our findings may reflect concern over being regarded as exhibiting ‘socially unacceptable’ behaviour in regions characterized by a high density of strong neighbourhood ties. Additionally, in regions with strong neighbourhood ties, the informal provision of support and advice may serve to lower the likelihood of reporting arrears. Our findings are robust to a range of measures of neighbourhood ties covering many facets of such ties ranging from identifying with individuals living in the same neighbourhood to planning to remain living in the neighbourhood. In addition, we explore the robustness of our findings by

employing different econometric modeling approaches and thereby lending further support for the role of neighbourhood effects in influencing household repayment behaviour.

The findings from our empirical analysis, thus, highlight the importance of considering the role of community and neighbourhood influences in financial behaviour and decision-making at the household level. With respect to practical implications, it is apparent that agencies operating at the community level such as the Citizens Advice Bureau or neighbourhood or community groups may play an effective role in enhancing neighbourhood ties and social interaction in areas where such ties are currently weak, which in turn may provide informal channels of support and/or financial advice to households facing repayment difficulties. Thus, our findings highlight possible channels of support for financially vulnerable households.

References

- Aron, J. and J. Muellbauer (2010). Modelling and Forecasting UK Mortgage Arrears and Possessions. Spatial Economics Research Centre Discussion Paper Number 52.
- Bagozzi, B. E., Hill, D. W., Moore, W. H. and B. Mukherjee (2012). Modeling Two Types of Zeros in Ordinal data: The Zero-Inflated Ordered Probit (ZiOP) Model in Conflict Research. Mimeo.
- Böheim, R. and M. P. Taylor (2000). My Home was my Castle: Evictions and Repossessions in Britain. *Journal of Housing Economics*, 9, 287-319.
- Breunig, R. and R. McKibbin (2011). The Effect of Survey Design on Household Reporting of Financial Difficulty. *Journal of the Royal Statistical Society, Series A*, 174, 991-1005.
- Bridges, S. and R. Disney (2004). Use of Credit and Arrears on Debt among Low-Income Families in the United Kingdom. *Fiscal Studies*, 25, 1-25.
- Brookes, M., Dicks, M. and M. Pradhan (1994). An Empirical Model of Mortgage Arrears and Repossessions. *Economic Modelling*, 11(2), 134-144.

- Brown, S. and K. Taylor (2008). Household Debt and Financial Assets: Evidence from Germany, Great Britain and the USA. *Journal of the Royal Statistical Society, Series A*, 171(3), 615-643.
- Burrows, R. (1998). Mortgage Indebtedness in England: An 'Epidemiology'. *Housing Studies*, 13(1), 5-22.
- Cappellari, L. and S. P. Jenkins (2003). Multivariate Probit Regressions using Simulated Maximum Likelihood. *The Stata Journal*, 3, 278-294.
- Dawson, C. and A. Henley (2012). Something will turn up? Financial Over-optimism and Mortgage Arrears. *Economics Letters*, 117, 49-52.
- Duygan-Bump, B. and C. Grant (2008). Household Debt Repayment Behaviour: What Role do Institutions play? Federal Reserve Bank of Boston Working Paper Number QAU08-3.
- Figueira, C., Glen, J. and J. Nellis (2005). A Dynamic Analysis of Mortgage Arrears in the UK Housing Market. *Urban Studies*, 42(10), 1755-1769.
- Gathergood, J. (2009). Income Shocks, Mortgage Repayment Risk and Financial Distress Among UK Households. Centre for Finance and Credit Markets Working Paper 09/03.
- Georgarakos, D. and S. Fürth (2012). Household Repayment Behavior: The Role of Social Capital, Institutional, Political and Religious Beliefs. Working Paper.
- Guiso, L., Haliassos, M. and T. Jappelli (2002). *Household Portfolios*, MIT Press.
- Hamilton, R. (2003). Trends in Households Aggregate Secured Debt. *Bank of England Quarterly Bulletin*, Autumn, pp.271-80.
- Harris, M. N. and X. Zhao (2007). A Zero-Inflated Ordered Probit Model with an Application to Modelling Tobacco Consumption. *Journal of Econometrics*, 141(2), 1073-1099.
- Lambrecht, B., Perraudin, W. and S. Satchell (1997). Time to Default in the UK Mortgage Market. *Economic Modelling*, 14, 485-499.

- Leece, D. (1995). Rationing, Mortgage Demand and the Impact of Financial Deregulation. *Oxford Bulletin of Economics and Statistics*, 57, pp.43-66.
- Leece, D. (2004). *Economics of the Mortgage Market*. Blackwell Publishing.
- Moulton, B. R. (1990). An Illustration of a Pitfall in Estimating the Effects of Aggregate Variables on Micro Units. *Review of Economics and Statistics*, 72, 334-338.
- Taylor, M., Pevalin, D. and J. Todd (2007). The Psychological Costs of Unsustainable Housing Commitments. *Psychological Medicine*, 37, 1027-1036.
- Whitley, J., Windram, R. and P. Cox (2004). An Empirical Model of Household Arrears. Bank of England Working Paper Number 214.

TABLE 1: ARREARS BY REGION (%)

	Housing Costs	Council Tax	Household Bills	Observations	Number of postcode areas
North East	15.91	10.56	6.26	767	6
North West	14.11	12.46	11.17	1942	16
Yorkshire & Humberside	12.56	9.22	8.55	1497	12
East Midlands	13.06	10.70	9.67	1355	11
West Midlands	16.97	14.00	12.83	1450	13
East of England	12.22	10.72	8.27	1669	23
London	19.45	12.90	14.94	3384	28
South East	14.17	11.34	9.09	2364	25
South West	10.95	11.57	7.51	1279	12
Wales	12.19	13.56	12.05	730	7
Scotland	10.96	15.06	7.54	1286	16

Note: The number of postcode areas in the final column sum to 169 rather than 136 since there are 33 postcode areas which lie across the standard regions.

TABLE 2: CORRELATION BETWEEN ARREARS VARIABLES

	<i>Housing Costs</i>	<i>Council Tax</i>	<i>Household Bills</i>
<i>Housing Costs</i>	1		
<i>Council Tax</i>	0.4827	1	
<i>Household Bills</i>	0.3522	0.3472	1

Note: all correlation coefficients are statistically significant at the 1% level.

TABLE 3: NEIGHBOURHOOD VARIABLES BY REGION (INDIVIDUAL LEVEL DATA)

	<i>Neigh1</i>	<i>Neigh2</i>	<i>Neigh3</i>	<i>Neigh4</i>	<i>Neigh5</i>	<i>Neigh6</i>	<i>Neigh7</i>	<i>Neigh8</i>	Observations
North East	0.6796	0.6237	0.5427	0.4281	0.7306	0.6725	0.6198	0.7081	2060
North West	0.6786	0.6327	0.5634	0.4577	0.7641	0.6803	0.6323	0.6922	5406
York. & Humber.	0.6865	0.6402	0.5705	0.4725	0.7569	0.6668	0.6209	0.7001	4296
East Midlands	0.6604	0.6072	0.5431	0.4580	0.7323	0.6655	0.5847	0.6831	3808
West Midlands	0.6537	0.6088	0.5445	0.4486	0.7526	0.6533	0.6145	0.6674	4607
East of England	0.6430	0.5981	0.5302	0.4640	0.7366	0.6619	0.5660	0.6699	4453
London	0.6387	0.5906	0.4910	0.4136	0.7555	0.5720	0.5208	0.5608	8280
South East	0.6462	0.5851	0.5355	0.4665	0.7605	0.6517	0.5604	0.6658	6181
South West	0.6690	0.6088	0.5528	0.4874	0.7559	0.6734	0.5791	0.7058	3881
Wales	0.7173	0.6782	0.6216	0.5035	0.7985	0.7115	0.6506	0.7582	2378
Scotland	0.6897	0.6240	0.5667	0.4519	0.7841	0.6868	0.6324	0.7464	3556

**TABLE 4: CORRELATION BETWEEN NEIGHBOURHOOD TIES VARIABLES
USING POSTCODE AREA DATA**

	<i>Neigh1</i>	<i>Neigh2</i>	<i>Neigh3</i>	<i>Neigh4</i>	<i>Neigh5</i>	<i>Neigh6</i>	<i>Neigh7</i>	<i>Neigh8</i>
<i>Neigh1</i>	1							
<i>Neigh2</i>	0.8352	1						
<i>Neigh3</i>	0.6798	0.7307	1					
<i>Neigh4</i>	0.5397	0.5800	0.7041	1				
<i>Neigh5</i>	0.4509	0.4383	0.3537	0.3881	1			
<i>Neigh6</i>	0.6561	0.6350	0.7269	0.6873	0.3237	1		
<i>Neigh7</i>	0.6966	0.7128	0.7203	0.4986	0.2809	0.6992	1	
<i>Neigh8</i>	0.6312	0.6627	0.7861	0.6807	0.3060	0.8647	0.7159	1

Note: (1) all correlation coefficients are statistically significant at the 1% level; (2) *neigh1*=belonging, *neigh2*=friendships and associations, *neigh3*=advice, *neigh4*=borrow and exchange favours, *neigh5*=willing to work together, *neigh6*=plan to remain resident, *neigh7*=think of myself as similar and *neigh8*=regularly stop and talk.

**TABLE 5: SUMMARY STATISTICS
(SELECTED VARIABLES)**

<i>Arrears Variables</i>		<i>Proportion</i>	
Housing Costs		0.1456	
Council Tax		0.1203	
Household Bills		0.1043	
<i>Head of Household Characteristics</i>			
Male		0.4256	
Married		0.7806	
Aged 16-19		0.0120	
Aged 20-29		0.1744	
Aged 30-39		0.2683	
Aged 40-49		0.2682	
Aged 50-59		0.1602	
Aged 60-65		0.0512	
Aged over 65		0.0654	
Education: higher degree		0.1083	
Education: first degree		0.1568	
Education: diploma		0.1058	
Education: a level		0.1068	
Education: gcse		0.2242	
Education: other		0.0830	
Education: none		0.2152	
Employed		0.6670	
Health: excellent		0.1858	
Health: very good		0.3314	
Health: good		0.2822	
Health: fair		0.1346	
Health: poor or very poor		0.0660	
<i>Household Characteristics</i>			
Owner occupier (mortgage)		0.5130	
Rent local authority		0.2537	
Rent private sector		0.2333	
Car ownership		0.7398	
<i>Continuous Variables</i>		<i>Mean</i>	<i>Standard Deviation</i>
<i>Neighbourhood Ties</i>			
Belonging		0.6607	0.0482
Friendships and associations		0.6093	0.0526
Advice		0.5418	0.0506
Borrow and exchange favours		0.4497	0.0475
Willing to work together		0.7538	0.0389
Plan to remain resident		0.6454	0.0646
Think of myself as similar		0.5864	0.0601
Regularly stop and talk		0.6658	0.0749
<i>Household Characteristics</i>			
Number of adults		2.0000	0.9282
Number of children		0.7482	1.042
Log household income		7.7986	0.8518
Log monthly housing cost		5.9335	0.9202
Log food expenditure		5.6759	0.7848
Log annual fuel expenditure		6.4037	2.1278

TABLE 6: UNIVARIATE PROBIT MODELS

PANEL A	HOUSING COSTS		COUNCIL TAX		HOUSEHOLD BILLS	
	Coef	T-stat	Coef	T-stat	Coef	T-stat
<i>Head of Household Characteristics</i>						
Male	0.0075	0.21	0.0046	0.15	-0.0535	-1.66
Married	-0.0211	-0.50	-0.0158	-0.37	-0.0254	-0.54
Aged 16-19	0.6622	5.11	0.5543	2.89	0.7792	4.81
Aged 20-29	0.7992	9.54	0.8871	6.62	1.0242	9.21
Aged 30-39	0.8627	9.46	0.9486	7.38	1.1457	10.65
Aged 40-49	0.8446	9.65	0.9480	7.03	1.0945	10.05
Aged 50-59	0.7405	9.84	0.9276	7.65	0.9678	10.39
Aged 60-65	0.4584	4.72	0.5163	4.40	0.6139	4.48
Education: higher degree	-0.1353	-2.28	-0.2190	-3.02	-0.2225	-3.30
Education: first degree	-0.1277	-1.99	-0.2679	-3.79	-0.1466	-2.63
Education: diploma	0.0684	1.27	0.0119	0.22	0.0697	1.38
Education: a level	0.0120	0.19	-0.0002	-0.00	-0.0804	-1.22
Education: gcse	0.0876	1.78	0.0520	1.06	0.0864	1.60
Education: other	0.0609	1.25	0.0844	1.55	0.0142	0.25
Employed	0.0518	1.30	0.1794	4.16	-0.1027	-2.54
Health: excellent	-0.3011	-5.10	-0.3045	-4.64	-0.4310	-5.69
Health: very good	-0.2641	-4.80	-0.2247	-3.07	-0.3084	-4.65
Health: good	-0.0788	-1.38	-0.0520	-0.82	-0.1586	-2.32
Health: fair	-0.0166	-0.31	-0.0047	-0.08	-0.0270	-0.41
<i>Household Characteristics</i>						
Owner occupier (mortgage)	-0.1405	-3.32	-0.2341	-4.32	-0.2723	-4.96
Rent local authority	0.4108	10.90	0.2144	4.92	0.2041	4.43
Log household income	-0.1603	-7.10	-0.1662	-7.60	-0.1492	-6.19
Car ownership	-0.1246	-3.26	-0.1086	-2.42	-0.1922	-5.02
Log monthly housing cost	0.0148	0.85	0.0389	1.79	0.0485	2.56
Log food expenditure	-0.1054	-6.46	-0.0807	-4.07	-0.0775	-4.28
Log fuel expenditure	0.0263	3.68	0.0425	4.65	0.0415	5.03
Number of adults	0.1220	8.51	0.0989	6.15	0.0645	3.42
Number of children	0.1317	7.92	0.1257	7.10	0.1537	10.56
Intercept	0.3893	1.09	-0.3992	-1.12	-0.3785	1.28
Belonging	-0.9788	-2.66	-0.7509	-1.66	-0.5779	-1.39
Friendships and associations	-0.8311	-2.59	-0.7321	-1.78	-0.5714	-1.66
Advice	-1.0779	-3.06	-0.4109	-0.99	-0.8798	-2.45
Borrow and exchange favours	-0.9076	-2.61	-0.3514	-0.86	-0.9944	-3.03
Willing to work together	-0.4086	-0.92	-0.0105	-0.02	0.1444	0.31
Plan to remain resident	-0.9656	-4.18	-0.2482	-0.59	-0.8188	-3.08
Think of myself as similar	-1.0522	-3.42	-0.4140	-1.06	-0.8949	-3.03
Regularly stop and talk	-1.0146	-5.37	-0.1110	-0.32	-0.9445	-4.92

Notes: (1) Additional controls: month of interview; (2) Standard errors are clustered at the regional level; (3) Controls included for whether the following are in the household: colour television, video recorder/DVD player, satellite dish/Sky TV, cable TV, deep freeze or fridge freezer, washing machine, tumble drier, dish washer, microwave oven, home computer/pc, compact disk player, landline telephone, mobile telephone; (4) Household income and food expenditure are monthly; (5) Fuel expenditure is annual; (6) Neighbourhood ties variables are included one by one. The full specification above relates to the specification including 'Belonging'; (7) full results for all models are available on request.

TABLE 6: UNIVARIATE PROBIT MODELS

PANEL B	HOUSING COSTS		COUNCIL TAX		HOUSEHOLD BILLS	
	ME	T-stat	ME	T-stat	ME	T-stat
<i>Head of Household Characteristics</i>						
Male	0.0015	0.21	0.0008	0.15	-0.0073	-1.67
Married	-0.0042	-0.50	-0.0027	-0.37	-0.0035	-0.54
Aged 16-19	0.1827	4.09	0.1293	2.26	0.1749	3.44
Aged 20-29	0.2088	8.28	0.2111	5.07	0.2201	6.76
Aged 30-39	0.2131	8.55	0.2105	5.86	0.2291	8.22
Aged 40-49	0.2077	8.68	0.2102	5.63	0.2156	7.59
Aged 50-59	0.1919	8.26	0.2258	5.83	0.2063	7.54
Aged 60-65	0.1141	3.98	0.1157	5.53	0.1227	3.33
Education: higher degree	-0.0254	-2.44	-0.0332	-3.44	-0.0270	-3.93
Education: first degree	-0.0242	-2.10	-0.0403	-4.28	-0.0188	-2.86
Education: diploma	0.0141	1.24	0.0020	0.22	0.0100	1.33
Education: a level	0.0022	0.19	-0.0000	-0.00	-0.0106	-1.28
Education: gcse	0.0180	1.74	0.0090	1.04	0.0124	1.54
Education: other	0.0125	1.22	0.0150	1.49	0.0020	0.25
Employed	0.0102	1.30	0.0293	4.46	-0.0146	-2.45
Health: excellent	-0.0537	-5.92	-0.0456	-5.40	-0.0490	-6.88
Health: very good	-0.0501	-5.09	-0.0363	-3.29	-0.0397	-4.93
Health: good	-0.0154	-1.41	-0.0087	-0.83	-0.0209	-2.43
Health: fair	-0.0033	-0.31	-0.0008	-0.08	-0.0037	-0.42
<i>Household Characteristics</i>						
Owner occupier (mortgage)	-0.0281	-3.37	-0.0400	-4.37	-0.0380	-5.10
Rent local authority	0.0920	10.08	0.0390	4.58	0.0304	4.07
Log household income	-0.0320	-6.96	-0.0282	-7.48	-0.0206	-6.27
Car ownership	-0.0258	-3.12	-0.0191	-2.32	-0.0283	-4.68
Log monthly housing cost	0.0030	0.85	0.0066	1.82	0.0067	2.63
Log food expenditure	-0.0210	-6.43	-0.0137	-4.01	-0.0107	-4.31
Log fuel expenditure	0.0052	3.71	0.0072	4.78	0.0057	4.93
Number of adults	0.0244	8.32	0.0168	5.84	0.0089	3.42
Number of children	0.0263	7.55	0.0213	6.88	0.0212	10.05
Belonging	-0.1954	-2.68	-0.1274	-1.67	-0.0798	-1.40
Friendships and associations	-0.1660	-2.60	-0.1242	-1.79	-0.0789	-1.67
Advice	-0.2151	-3.08	-0.0698	-0.99	-0.1214	-2.50
Borrow and exchange favours	-0.1813	-2.63	-0.0597	-0.85	-0.1371	-3.01
Willing to work together	-0.0817	-0.92	-0.0018	-0.02	0.0200	0.31
Plan to remain resident	-0.1927	-4.31	-0.0422	-0.59	-0.1129	-3.14
Think of myself as similar	-0.2098	-3.49	-0.0703	-1.06	-0.1234	-3.13
Regularly stop and talk	-0.2021	-5.53	-0.0189	-0.32	-0.1301	-5.19

TABLE 7: MULTIVARIATE PROBIT MODELS: SUMMARY OF RESULTS

	HOUSING COSTS		COUNCIL TAX		HOUSEHOLD BILLS	
	Coef	T-stat	Coef	T-stat	Coef	T-stat
Belonging	-0.9586	-2.76	-0.7762	-1.79	-0.6198	-1.59
ρ_{21} (t-stat)				0.6446 (50.65)		
ρ_{31} (t-stat)				0.4699 (22.06)		
ρ_{32} (t-stat)				0.4957 (25.53)		
Friendships and associations	-0.8757	-2.81	-0.8482	-2.05	-0.6343	-1.86
ρ_{21} (t-stat)				0.6462 (45.49)		
ρ_{31} (t-stat)				0.4514 (22.02)		
ρ_{32} (t-stat)				0.4839 (24.91)		
Advice	-1.0389	-3.03	-0.4443	1.11	-0.9230	-2.66
ρ_{21} (t-stat)				0.6450 (50.53)		
ρ_{31} (t-stat)				0.4692 (21.92)		
ρ_{32} (t-stat)				0.4955 (25.38)		
Borrow and exchange favours	-0.8571	-2.51	-0.3122	-0.92	-0.9903	-3.13
ρ_{21} (t-stat)				0.6451 (50.39)		
ρ_{31} (t-stat)				0.4695 (22.12)		
ρ_{32} (t-stat)				0.4957 (25.59)		
Willing to work together	-0.3090	-0.70	0.0401	0.08	0.1440	0.31
ρ_{21} (t-stat)				0.6453 (51.09)		
ρ_{31} (t-stat)				0.4704 (22.24)		
ρ_{32} (t-stat)				0.4962 (26.00)		
Plan to remain resident	-0.9536	-4.04	-0.2303	-0.55	-0.8181	-3.05
ρ_{21} (t-stat)				0.6455 (50.30)		
ρ_{31} (t-stat)				0.4685 (21.84)		
ρ_{32} (t-stat)				0.4956 (25.14)		
Think of myself as similar	-1.0170	-3.43	-0.4002	-1.06	-0.9052	-3.10
ρ_{21} (t-stat)				0.6451 (50.95)		
ρ_{31} (t-stat)				0.4687 (19.10)		
ρ_{32} (t-stat)				0.4955 (25.31)		
Regularly stop and talk	-1.0133	-5.15	-0.1103	0.32	-0.9746	-4.97
ρ_{21} (t-stat)				0.6462 (50.41)		
ρ_{31} (t-stat)				0.4678 (21.88)		
ρ_{32} (t-stat)				0.4963 (25.13)		

Notes: See notes to Table 6.

**TABLE 8: ORDERED PROBIT MODEL:
SUMMARY OF RESULTS**

	Coef	T-stat
Belonging	-0.9844	-2.68
	ME	T-stat
Belonging (outcome = 0)	0.2755	2.67
Belonging (outcome = 1)	-0.1363	-2.64
Belonging (outcome = 2)	-0.1392	-2.68
	Coef	T-stat
Friendships and associations	-0.9040	2.65
	ME	T-stat
Friendships (outcome = 0)	0.2530	2.64
Friendships (outcome = 1)	-0.1252	-2.62
Friendships (outcome = 2)	-0.1279	-2.64
	Coef	T-stat
Advice	-0.9837	-2.91
	ME	T-stat
Advice (outcome = 0)	0.2753	2.91
Advice (outcome = 1)	-0.1362	-2.87
Advice (outcome = 2)	-0.1391	-2.94
	Coef	T-stat
Borrow and exchange favours	-0.9020	-2.95
	ME	T-stat
Borrow (outcome = 0)	0.2525	2.95
Borrow (outcome = 1)	-0.1249	-2.92
Borrow (outcome = 2)	-0.1276	-2.96
	Coef	T-stat
Willing to work together	0.0102	0.20
	ME	T-stat
Work together (outcome = 0)	-0.0029	-0.20
Work together (outcome = 1)	0.0014	0.20
Work together (outcome = 2)	0.0015	0.20
	Coef	T-stat
Plan to remain resident	-0.8526	-3.01
	ME	T-stat
Remain resident (outcome =0)	0.2386	2.99
Remain resident (outcome =1)	-0.1181	-2.94
Remain resident (outcome =2)	-0.1205	-3.02
	Coef	T-stat
Think of myself as similar	-0.9086	-3.06
	ME	T-stat
Similar (outcome = 0)	0.2543	3.07
Similar (outcome = 1)	-0.1258	-3.01
Similar (outcome = 2)	-0.1284	-3.12
	Coef	T-stat
Regularly stop and talk	-0.8624	-3.74
	ME	T-stat
Stop and talk (outcome = 0)	0.2413	3.72
Stop and talk (outcome = 1)	-0.1195	-3.67
Stop and talk (outcome = 2)	-0.1218	-3.75

Notes: See notes to Table 6.

TABLE 9: ZERO INFLATED ORDERED PROBIT MODELS: SUMMARY OF RESULTS

<i>Zero Correlation</i>	Coef	T-stat
Belonging	-1.0993	-2.70
<i>Correlated Errors</i>	Coef	T-stat
Belonging	-1.0322	-4.24
ρ	-0.5042	-5.53
<i>Zero Correlation</i>	Coef	T-stat
Friendships and associations	-1.0634	-2.77
<i>Correlated Errors</i>	Coef	T-stat
Friendships and associations	-0.9921	-4.39
ρ	-0.5017	-5.46
<i>Zero Correlation</i>	Coef	T-stat
Advice	-1.1444	-2.84
<i>Correlated Errors</i>	Coef	T-stat
Advice	-1.0458	-4.37
ρ	-0.5090	-5.43
<i>Zero Correlation</i>	Coef	T-stat
Borrow and exchange favours	-1.1218	-3.19
<i>Correlated Errors</i>	Coef	T-stat
Borrow and exchange favours	-1.029	-4.08
ρ	-0.5080	-5.45
<i>Zero Correlation</i>	Coef	T-stat
Willing to work together	-0.0408	-0.08
<i>Correlated Errors</i>	Coef	T-stat
Willing to work together	-0.0291	-0.10
ρ	-0.5028	-5.49
<i>Zero Correlation</i>	Coef	T-stat
Plan to remain resident	-1.0482	-3.12
<i>Correlated Errors</i>	Coef	T-stat
Plan to remain resident	-0.9409	-4.84
ρ	-0.5094	-5.26
<i>Zero Correlation</i>	Coef	T-stat
Think of myself as similar	-1.0432	-2.96
<i>Correlated Errors</i>	Coef	T-stat
Think of myself as similar	-0.9553	-4.75
ρ	-0.5083	-5.41
<i>Zero Correlation</i>	Coef	T-stat
Regularly stop and talk	-1.0497	-3.66
<i>Correlated Errors</i>	Coef	T-stat
Regularly stop and talk	-0.9459	-5.59
ρ	-0.5253	-5.36

Notes: See notes to Table 6.