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PERSONAL INDEBTEDNESS, COMMUNITY CHARACTERISTICS AND THEFT CRIME

STUART G. MCINTYRE

ABSTRACT. Becker (1968) and Stigler (1970) provide the germinal works for an economic analysis of crime, and their approach has been utilised to consider the response of crime rates to a range of economic, criminal and socioeconomic factors. Until recently however this did not extend to a consideration of the role of personal indebtedness in explaining the observed pattern of crime.

This paper builds on a recent publication in the literature (McIntyre & Lacombe 2012), and using the Becker (1968) and Stigler (1970) framework, extends to a fuller consideration of the relationship between personal indebtedness and theft crimes. The increase in personal debt in the past decade has been significant, which combined with the recent global recession, has led to a spike in personal insolvencies.

This paper uses data available at the neighbourhood level for London, UK on county court judgments (CCJ's) granted against residents in that neighbourhood, this is our measure of personal indebtedness, and examines the relationship between a range of community characteristics (economic, socio-economic, etc), including the number of CCJ's granted against residents, and the observed pattern of theft crimes using spatial econometric methods.

1. INTRODUCTION

It is well recognised in the economics literature that borrowing plays an important role in household consumption decisions, as Zeldes (1989) demonstrated in testing the permanent income hypothesis. Meanwhile, one of the conclusions of the literature stemming from Becker (1968) on the relationship between unemployment and crime, is that an increase in unemployment ought to be associated with increases in crime, as the unemployed seek to maintain their consumption levels; and a voluminous literature has tested whether this relationship holds (Cantor & Land (1985), Reilly & Witt (1992), Osborn et al. (1992), Pyle & Deadman (1994), Elliott & Ellingworth (1998), Carmichael & Ward (2001)).

Meanwhile, the sociology and criminology literature has made clear that any complete theory of crime has to capture both the criminal *motivation* effect and the criminal *opportunity* effect. One of the main difficulties with understanding the relationship between unemployment and crime has been to disentangle the impact of increased unemployment in an area in terms of the motivation and opportunity components. Increased unemployment reduces legitimate income, increasing the attractiveness of illicit sources of income, but at the same time increased unemployment in an area is likely to reduce criminal opportunity in an area due to increased numbers of residents staying at home or otherwise not being away from the area during working hours.

There is a more fundamental difficulty though with the proposition that increased unemployment will lead to increased crime; that it ignores the important role, understood in the wider economics literature, of borrowing in consumption smoothing. The idea that an individual becomes unemployed and then seamlessly turns to crime as a substitute source of income, seems unrealistic. A more believable proposition is that an individual, facing economic hardship which reduces legitimate income, would first seek to run down their savings, then would borrow money from institutional and even informal sources in order to support their current consumption, and only when their savings have been exhausted and they are liquidity constrained, will they resort to illicit sources of income to support their consumption needs.

In this sense, a better predictor for the relationship between economic hardship and crime is a measure of personal indebtedness which is based on debt default. In this paper we utilise just such a measure, and using spatial econometric methods we test the association between debt default and theft crimes in London, UK using neighbourhood data. Our model allows us to capture a range of both criminal *motivation* and criminal *opportunity* effects, as well as the important role played by spatial heterogeneity in explaining the observed pattern of theft crimes.

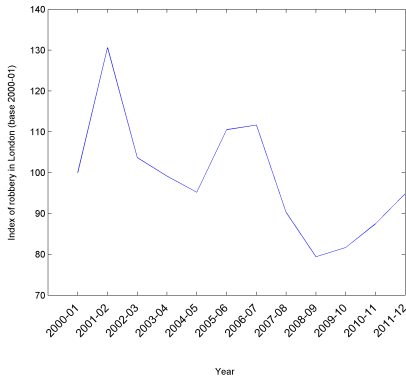
2. MOTIVATION

Since the global recession began in 2008 there has been an increase in robbery, thefts and burglary in London, Figure 1 charts an index of these crimes in London based on 2000-01 levels. The well recognised overall decline in crime since 2000 is evident from Figure 1, however a clear increase in all of these crimes is evident from the start of the recession in 2008-09.

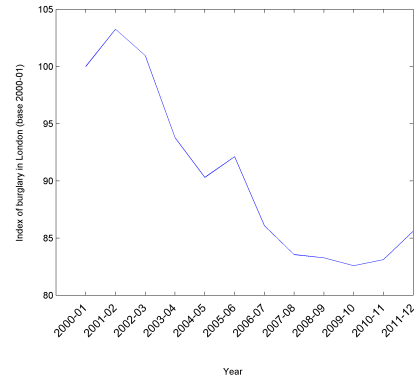
Looking at data on consumer credit (Figure 2) and personal insolvencies (Figure 3) we can see a number of things. Firstly from Figure 2 we can see that over the past decade there has been a large increase in outstanding consumer credit in the UK, and also in the USA. Since 2008 there has been a reduction in the level of outstanding consumer credit, however it has only returned to 2005 levels in the UK and 2006 levels in the USA. Further, from Figure 3, we can see that there has been a spike in personal insolvencies in England & Wales since 2008, while in the USA from 2006¹ bankruptcies have increased significantly. Against the backdrop of unprecedented levels of consumer debt and spikes in personal insolvencies, the question arises whether there is any relationship to increases in the number of theft crimes observed.

Unfortunately we do not have neighbourhood personal indebtedness data for the period of the recent recession. However, if the level of personal indebtedness in a given community is indeed an important factor in explaining theft crime levels in that community and in neighbouring communities, evidence found in support of this relationship in economically

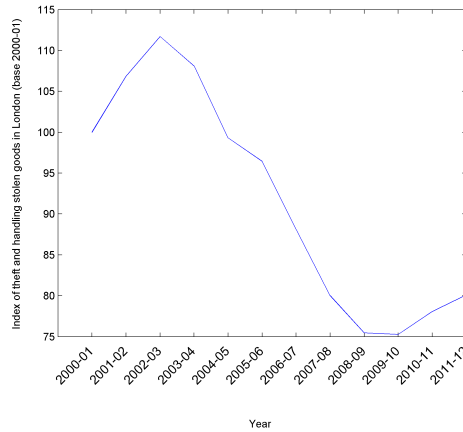
¹White (2007) explain the sharp decline in non-business bankruptcies in the USA in 2006 as arising from the passage of the Bankruptcy Abuse Prevention and Consumer Protection Act which made “bankruptcy law much less debtor-friendly” (White 2007, 175).



(A) Robbery



(B) Burglary



(C) Theft and handling stolen goods

FIGURE 1. Index of London crime (base 2000-01) based on data from <http://maps.met.police.uk/tables.htm>

good times is arguably stronger evidence of this relationship than evidence obtained during periods of general economic crisis.

3. LITERATURE REVIEW

This paper draws on three separate literatures: criminology, sociology and economics. In this section we briefly review the main contributions of each of these literatures, with a focus on the key message of each in motivating and understanding the observed pattern of crime, which we draw together in the final part of this section.

3.1. Economics literature. Becker (1968) provides the following means of thinking about the rational offenders decision to commit, or not, a crime. Defining y_0 as the income in

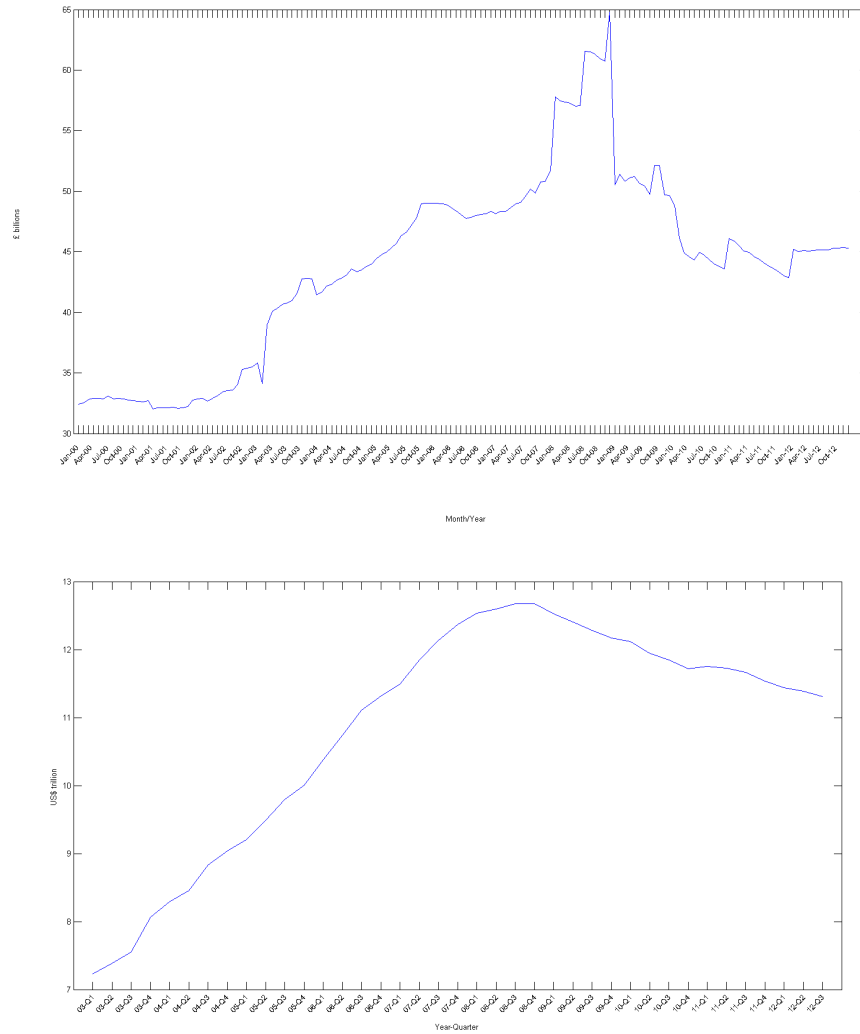


FIGURE 2. Consumer credit in the UK (Monthly amounts outstanding of other consumer credit lenders (excluding the Student Loans Company) net unsecured lending to individuals (in sterling millions) seasonally adjusted. Source: Bank of England.) and USA (USA Total Household Debt Balance. Source: New York Federal Reserve).

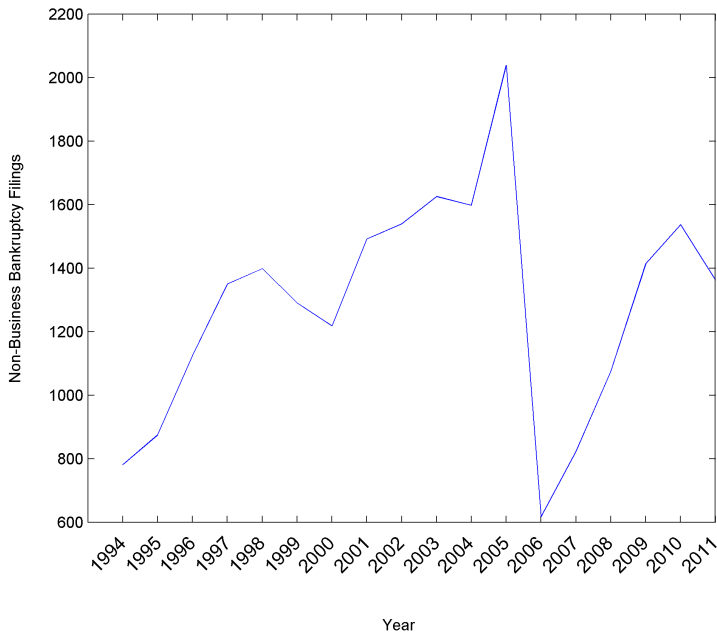
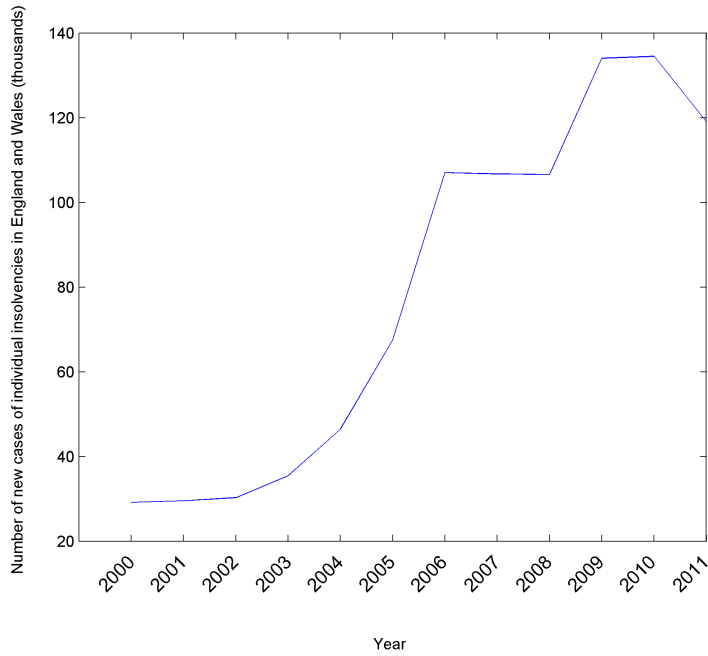


FIGURE 3. Total individual insolvencies in England and Wales (Source: The Insolvency Service) and US non-business bankruptcy (Source: American Bankruptcy Institute).

the absence of any criminal activity being undertaken by the individual, the payoff from not committing crime is taken as:

$$(1) \quad U_{NC} = u(y_0)$$

If the individual does engage in crime they obtain income y_1 if not apprehended, tried, convicted, and given punishment F , and $y_1 - F$ otherwise; the condition is imposed that $y_1 - F \leq y_1$.

We also need to define the probability that the individual is apprehended as p (it is assumed that all individuals who are apprehended are tried, convicted, and punished with certainty). The payoff from committing the crime is therefore equal to $p \cdot (y_1 - F) + (1 - p) \cdot (y_1)$; giving an expected utility equal to:

$$(2) \quad EU_C = p \cdot u(y_1 - F) + (1 - p) \cdot u(y_1)$$

Crime, under this approach, will not occur (sometimes called the no-crime condition), where:

$$(3) \quad U_{NC} > U_C$$

Becker used this simple model to illustrate how, in the presence of a sufficiently large F and subject to a couple of other conditions², p could be very low and crime could be eradicated. Thus costs incurred in maintaining a large p , through law enforcement activity, could be saved. This simple model has been the basis for the empirical literature examining different aspects of the economics of crime, most importantly for our purposes is the literature on the relationship between unemployment and crime; since it provides the closest parallel to our discussion of the relationship between financial hardship and crime.

There is a large literature in economics looking at the relationship between economic conditions and crime (see for example Brenner (1971, 1976, 1978), Brenner & Harvey (1978), Cantor & Land (1985), Elliott & Ellingworth (1998), Pyle & Deadman (1994), Reilly & Witt (1992), Osborn et al. (1992), Carmichael & Ward (2001)). Most, if not all, take their theoretical premise from the work of Becker (1968). An important strand of this literature focuses on the relationship between unemployment and crime, and there are mixed findings in this literature; some papers find this relationship to be positive (Reilly & Witt 1992, Osborn et al. 1992, Elliott & Ellingworth 1998, Carmichael & Ward 2001), others find it to be negative (Cantor & Land 1985)³, while some find no or only weak evidence to support a relationship between unemployment and crime (Pyle & Deadman 1994).

²These are that individuals are risk neutral or risk averse, and the possibility of sufficiently severe punishments, i.e. $F \lim \rightarrow \infty$.

³Cantor & Land (1985) find that the relationship between unemployment and crime is initially, and generally, negative, but for some crime types there is a lagged positive effect relating to the increase in the motivation effect.

Part of the reason why there is such a large literature in this area is that increased unemployment in an area would likely impact on both sides of Becker's (1968) model. Increased unemployment reduces legitimate income, but equally increased unemployment in an area will be expected to increase the number of people at home during the day. This would likely increase the probability of detection for crimes in the local area (Osborn et al. 1992). It has now been recognised that both the *motivation* and *detection* components must be captured in the analysis of this relationship. There is an additional complication in this literature, noted by Cantor & Land (1985), that being in employment creates opportunities for individuals to engage in criminal acts.

One difficulty with the Becker (1968) theory itself is that it fails to account for the fact that not all of those who could financially benefit from crime resort to it. This was a point recognised in Reilly & Witt (1992) who appealed to the sociological concept of 'social control' (explained below) in explaining why some individuals resort to crime and others do not. A different approach was taken by Dhimi & al Nowaihi (2012) in a recent paper which considered the Becker (1968) model in the context of non-expected utility theory.

This paper is of particular interest in providing a more flexible means of thinking about the decision outlined in Equation 3 above; specifically, their extension of Becker (1968) using rank dependent utility and cumulative prospect theory. It is clear that not everyone who could financially gain from committing a crime commits that crime; the difficulty with the expected utility treatment is that it fails to reflect this reality. The fact that there exists a class of utility functions which capture the behaviour of individuals in overweighting low probability events, provides a useful means of thinking about the individuals decision about whether or not to commit a crime; reflecting the observed level of criminality.

The starting point for Dhimi & al Nowaihi (2012) in extending Becker (1968) is the introduction of a probability weighting function (pwf), which they denote $w(p)$. The pwf is used to transform the probabilities in Equation 2 from the linearity in probabilities assumption of expected utility. Figure 4 illustrates the expected utility weighting ($\alpha=1$) and the Prelec probability weighting function (with $\alpha = 0.1, 0.3, 0.6$)⁴.

Dhimi & al Nowaihi (2012) rewrote the no crime condition (Equation 3) under rank dependent expected utility as:

$$(4) \quad \Gamma(p, F) \leq u(y_0)$$

where, $\Gamma(p, F) = [1 - w(1 - p)]u(y_1 - F) + w(1 - p)u(y_1)$. In this way, we can better account for the fact, noted earlier, that not all those who could financially benefit from crime, do so. Dhimi & al Nowaihi (2012) also extend Becker's (1968) expected utility proposition to consider utility under cumulative prospect theory. The essential point here is that expected utility theory isn't able to capture the reality of human behaviour, however by introducing probability weighting functions, we can derive a utility function which better reflects the decisions individuals make.

⁴The prelec function takes the form $w(p) = e^{-(-\ln p)^{1/2}}$.

FIGURE 4. Prelec versus expected utility probability weighting.

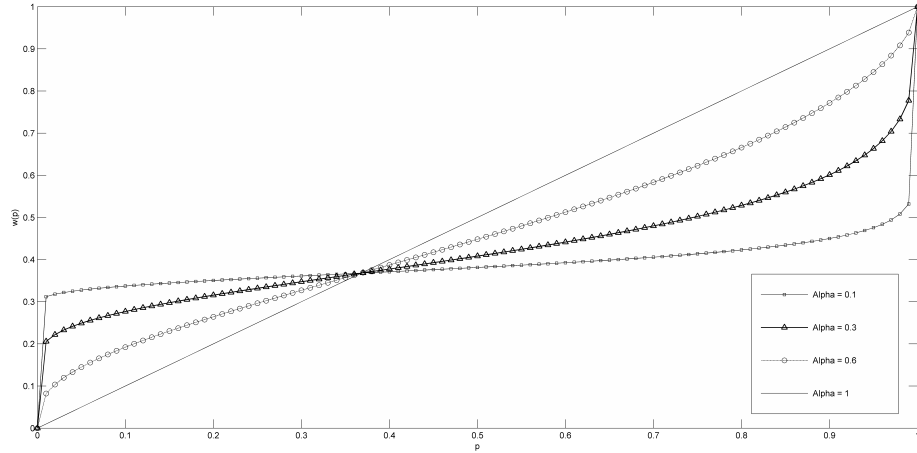


Figure 4 captures an important component of the reality of the decision that individuals take about whether or not to engage in crime, and as such provides us with a good starting point for better understanding these issues. The popularity of non-expected utility theories of crime lies in their ability to explain why people overweight low probability events, such as the probability of getting caught committing a crime⁵. This is not the end of the story though, and the argument has been made before, in relation to tax evasion, that there are reasons beyond simply overweighting the likelihood of small probability events to explain the observed level of compliance with the law.

In one study (Alm et al. 1992) it was shown that in experiments: “compliance is not always due to overweighting or to extreme risk aversion, since there is some compliance when there is no chance of detection and there is some evasion when the expected value of the evasion gamble is negative” (Alm et al. 1992, 36). This suggests that there are other reasons why people comply with laws that aren’t due to overweighting the probability of detection if they do not comply- i.e. they still comply even when there is no probability of detection to overweight.

We focus on this argument in providing a means of motivating our general crime model. The actual probability of detection in a given area will vary with some of the variables identified in our model, for instance the population density and the degree of population turnover, and the motivation for committing crime will vary with other variables for instance income. While part of the explanation for the fact that not everybody who could

⁵In the UK the probability of being caught and charged after stealing a car has been calculated (for 2002) at around 13%, the probability of then being convicted at around 7%, the chance having been convicted of being sent to jail at around 1% and the odds that you are then sentenced to more than three months in jail at 1 in 200 (see <http://www.prnewswire.co.uk/news-releases/car-thieves-enjoy-one-in-200-chance-of-getting-away-with-it-154572235.html>)

benefit from committing crime does so will lie in an overweighting of small probability events and the presence of social norms and conventions. In understanding why debt default might cause an increase in crime we would argue that the best approach to understanding this issue lies in the work of Tversky & Kahneman (1992) on cumulative prospect theory. Just as everyone who could benefit from engaging in criminal enterprises doesn't, it is equally the case that not all criminals will be indebted.

Rank dependent utility provides a useful way of thinking about the behaviour of the average individual, as we saw above, and thus explaining observed crime levels using the Becker (1968) model. In order to understand why personal indebtedness motivates a resort to criminality, we rely upon Dhimi & al Nowaihi's (2012) extension of Becker (1968) using the cumulative prospect theory of utility developed by Tversky & Kahneman (1992).

The basic idea of cumulative prospect theory is that individuals evaluate decisions based on gains and losses relative to some reference point, and that losses hurt more than equivalent gains; in other words a loss of \$100 causes a greater loss in utility than a gain of \$100 causes in increased utility. The biggest problem with empirically estimating this class of utility functions is determining the reference point which individuals use in evaluating their options. See Barberis (2012) for a review of prospect theory and its applications.

In our case, where we are evaluating the Becker (1968) model's decision whether to commit the crime or not, it is not clear, in general, what reference point an individual would use. However, when evaluating the impact of personal indebtedness it seems obvious that there are no circumstances under which an increase in debt default could be considered a *gain* relative to *any* reference point. In this way we can consider increases in debt default as representing losses relative to the individual's reference point, and thus an increase in crime to offset these losses à la Becker (1968) would be anticipated.

3.2. Sociology & Criminology literature. In explaining the level of criminality in an area, sociologists have generally relied upon explanations related to the ecology of the area, the educational attainment of the population, the level of legitimate earnings, etc. In the context of the unemployment-crime relationship raised earlier in the paper, sociologists, such as Box (1987), have emphasised the impact of anomie and a lack of legitimate means for advancement in explaining the decision by those in economic downturns to resort to criminality.

Box (1987) summarises the three schools of thought explaining why those experiencing economic hardship may resort to crime as: strain theory, control theory, and conflict theory. Strain theory and conflict theory are both theories focused on explaining the individual level decision to engage in criminal activity. Strain theory, the name derives from the idea that certain experiences- for instance unemployment- can create 'strain' in the lives of those affected; encompasses the idea that those experiencing financial difficulty become alienated from society and feel relatively deprived, leading to a resort to illicit sources of income. Conflict theory focuses on the role of stereotypes and profiling in driving those affected to conform with the stereotype.

In terms of community characteristics, control theory focuses on the social bonds, or more broadly a sense of community, which acts to reinforce social norms and deter a

resort to criminality among those experiencing hardship. Of course the reverse holds and where social bonds are weak, it is anticipated that in response to the same hardship those residing in areas with weaker social ties will be more likely to resort to crime to augment their income. A good proxy for these social norms, and their strength in an area is the extent of population turnover. It is intuitively obvious that it is more difficult to establish social bonds and ties in an area where population turnover is higher⁶. This also relates to the Becker (1968) framework in affecting the expectation of deterrence. In areas with low social ties, and a high degree of turnover in the population, the probability of detection will likely be lower.

To see this, consider that in relation to housebreaking, in areas with low social ties and high population turnover it is less likely that neighbours will be surprised by the presence of strangers or willing to challenge those they do not recognise. In areas with less social chaos and disorganisation, where people know their neighbours and are consequently more likely to challenge the presence of strangers, the probability of detection, and hence p in Equation 2, is greater.

In the criminology literature the relationship between economic downturns and crime was well summarised by Farrington et al. (1986): “unemployment causes financial hardship, which in turn causes crime designed to alleviate that hardship...” (Farrington et al. 1986, 335). A similar argument could be made about personal indebtedness, and indeed given that incurring debt may be the first stage of ‘coping’ for those experiencing financial hardship it is arguable that the presence of personal indebtedness represents an aggravated stage of financial hardship compared to becoming unemployed.

3.3. Key conclusions from the literature. For our purposes in this paper there are some key issues arising from the literature. The framework from Becker (1968) provides us with a useful means to explain the observed pattern of crime. In order to do so we must control for a range of criminal opportunity (including factors influencing the probability of detection) and criminal motivation effects; for instance the importance of social disorganisation and chaos emphasised in the sociology literature, and the importance of variables such as population density as emphasised in the criminology literature.

It is clear from the literature that the best framework for explaining the observed level of criminality is the non-expected utility versions of Becker (1968) introduced by Dhimi & al Nowaihi (2012). While an overweighting of low probability events helps to understand the observed level of criminality, cumulative prospect theory provides an excellent means of thinking about the impact of personal indebtedness on theft crimes. While in applications of cumulative prospect theory there is often some difficulty in determining the appropriate reference point, this is not an issue in extending the Becker (1968) model for our purposes. Relative to *whatever* reference point people use it is hard to see how debt default can be considered anything other than a loss relative to that reference point. In such a scenario a resort to an illicit income source is surely more attractive.

⁶Chilton (1964) notes that in a study by Clifford Shaw population change, poor housing, TB, adult crime rate and mental disorders were taken to represent a measure of social disorganisation which were found to be highly correlated with levels of juvenile delinquency.

Given that our data here relate to a single city, variations in the punishment levied for different offences are unlikely to be large. Even if, in practice, the disposal of certain offences in certain courts in particular areas does tend to carry a harsher sentence than it would in courts in neighbouring areas, it is unlikely that this is going to be significantly harsher and something which is common knowledge among the population. We outline our modelling approach in the following section.

4. DATA & MODEL

In this paper we use data from the UK Neighbourhood Statistics website (neighbourhood.statistics.gov.uk) covering a range of economic, crime and socioeconomic variables at the ‘super-output’ area level. There are two ‘super-output’ area levels; lower and middle, we utilise middle super output area (MSOA) data in this paper. There are 982 MSOA’s in London with a minimum resident population of 5,000 people and an average of 7,200.

There are 6 theft crimes considered in this analysis (theft from the person, robbery, burglary of a dwelling, burglary of a non-dwelling, theft from a motor vehicle, and theft of a motor vehicle), of which 3 are presented here, these are: robbery, burglary of a dwelling and theft of a motor vehicle. All crime variables are converted into crime rates (crimes per 1000 people usually resident) using population data.

We include a range of economic and socioeconomic variables to capture both the criminal motivation and criminal opportunity effects defined in the literature. In addition, we include details on the income in the area, the level of personal indebtedness in an area, a measure of the quality of the housing in an area, the composition of the population in terms of age (the more children and elderly people, the higher the resident population is likely to be during the day), the population turnover (as a measure of the strength of social ties), and population density (capturing one aspect of the probability of detection).

Two of our variables are only available for the middle year of our analysis (housing in poor condition and average weekly household income). While the use of these variables in the previous and following years analysis is not ideal, it is the best that can be done given that we are working at a small area level. Our spatial weight matrix is specified on the basis of contiguity.

We estimate the three most common spatial econometric models in our analysis, these are: the spatial error model (SEM) the spatial autoregressive model (SAR) and the Spatial Durbin model (SDM) (see LeSage & Pace (2009) for a textbook exposition of these models). All models are estimated using Bayesian spatial econometric methods with diffuse, relatively uninformative priors specified. Having calculated the three spatial econometric models (SAR, SEM, SDM) we calculate posterior model probabilities to select the best fit model, the results of which we then present. All models are considered equally plausible ex-ante.

5. EMPIRICAL RESULTS

In this section we recap the results previously presented in McIntyre & Lacombe (2012) and discuss the results from the extended analysis in this paper. This previous work was

carried out using fewer explanatory variables, for instance we did not include the proportion of elderly people in an area. In the analysis in this paper we consider a broader range of explanatory variables which we feel better capture the factors which will influence the probability of detection in an area.

In our extended results we present, for each theft crime type, a model using the number of CCJs granted in each area as our measure of personal indebtedness, but we also include a measure of the proportion of these which are of valued at over £1000 and also a measure of those which are valued at less than £251. In our earlier work we focussed on the total value of CCJs as our measure of personal indebtedness, however in order to investigate whether the distribution of the value of CCJs matters in explaining theft crime rates, we needed to use the number of CCJs as our initial measure of indebtedness in this analysis. In the results which follow we calculate 95% and 99% credible intervals, and where the interval does not include 0, i.e. the credible intervals have the same sign, these are considered significant at the appropriate level. Credible intervals and coefficients in bold in Tables 2 - 4 are those which are significant at the 95% level.

5.1. Results from McIntyre & Lacombe (2012). Table 1 presents the regression results published in McIntyre & Lacombe (2012). These results demonstrate a number of things; firstly the importance of spatially modelling crime data, secondly the importance of personal indebtedness in explaining the observed pattern of theft crimes, and also the consistency of these results with economic, criminal and sociological theories of crime. To pick out a couple of results; we can see from 1 that poor quality housing is positively and directly associated with all crime types, and that income is negatively associated with robbery, non-dwelling burglary and theft of a motor vehicle. In terms of personal indebtedness, the positive association relates to robbery and theft from the person, arguably two of the least ‘skilled’ theft crimes possible and thus could be considered ‘entry level offences’.

Building on these results there are certain features which we want to examine further in this paper. While we have included a measure of personal indebtedness in our initial regression results, we are interested to understand whether the importance of personal indebtedness in explaining crime patterns varies according to the size of the debt. In addition, and focussing on the issue of deterrence and the probability of detection, we also include here a measure of the proportion of the population which is elderly. Finally, given that population turnover is taken as a proxy for the strength of social ties, we experiment with different measures of population turnover.

5.2. Further results. Tables 2-4 present the initial results from our spatial econometric analysis of three types of crime in London for the years 2003 to 2005⁷. As is standard in the spatial econometrics literature we have calculated the direct, indirect and total effects (see LeSage & Pace (2009) for more on this). The spatial coefficient in all our models is highly significant.

⁷A shortage of time in preparing this manuscript is the only reason for the absence of the results for the other crime types.

Taking our results in turn, from Table 2 we can see that for robberies our results for all three years are largely consistent. The only difference is that in 2003 the proportion of CCJs valued at greater than £1000 is positively associated with robberies both directly (i.e. within that neighbourhood) and indirectly (in neighbouring areas). Otherwise, in all years the variables which capture the probability of detection (net changes in population and population density) are negative and significant, suggesting that low social ties and housing density are related to fewer robberies in that area. Poor housing condition is also positively associated with robberies in all years.

In terms of the motivation components, we can see that income is negatively associated with robberies in all years, while the proportion of males in the population and the net inflow of males aged 16 to 24 are positively associated with robberies. In terms of personal indebtedness, as expected, the greater personal indebtedness, the greater number of robberies which are observed in that area (directly) and in neighbouring areas (indirectly).

Turning to Table 3 we can see that, again, there is a high degree of consistency over time in explaining thefts of motor vehicles. Higher income is associated with fewer theft of cars (perhaps as richer people purchase cars which are more difficult to steal), while housing in poor condition (a measure of poverty not related to income) is positively associated with thefts of cars. In the case of thefts of cars, the proportion of OAPs (old age pensioners) in the population is negatively associated with thefts of cars.

Given that in a city such as London a high proportion of commuters travel by public transport, leaving cars at home, it makes sense that the greater the proportion of elderly people in an area the greater the probability of detection while stealing a car in that area. The same is true of the proportion of young children in an area (0-15 years). The more young children in an area, the more parents are likely to be in the area during the day to look after these children, and hence the greater the probability of detection while stealing a car in that area. Some variables are important only in 2003 and 2005, for instance the net inflow of 15 to 24 year olds, we have no explanation for this, but we do note that where it is significant it accords with our expectations in being positively associated with thefts of motor vehicles. In all years the number of CCJs granted in an area is positively associated with thefts of motor vehicles in that area and in neighbouring areas, as expected.

In the final set of results in Table 4, our results are more varied across the three years. Certain results are consistent over time, these are: that the greater the net inflow of 15 to 24 year olds the greater the number of burglaries, that the more houses in poor condition the more burglaries as would be expected, and finally that the greater the proportion of the population which are children (aged 0-15) the fewer burglaries which occur. These are all in line with our expectations regarding criminal motivation and opportunity.

The number of CCJs granted in an area is positively and significantly associated with burglaries in the first two years, but not 2005, although in 2004 and 2005 the proportion of CCJs valued at less than £251 is significantly and positively associated with house burglaries in that area. In terms of the indirect results, the impact on neighbouring areas, in each period there is a positive and significant impact of one of our measures of personal indebtedness on burglaries of dwellings in neighbouring areas. In terms of the income variable, we see a complex picture, but again this is in line with our expectations. We see

here that income in an area is positively associated with house breaking in that area. This would be expected in the sense that the richer the area, the more valuable the potential loot. However, we also see that income is negatively related to burglaries in neighbouring areas, which again makes sense and captures the criminal motivation effect.

TABLE 2. Further results #1

	2003			2004			2005						
	Lower 1% Coefficient	Lower 5% Coefficient	Upper 99% Coefficient	Lower 1% Coefficient	Lower 5% Coefficient	Upper 99% Coefficient	Lower 1% Coefficient	Lower 5% Coefficient	Upper 99% Coefficient				
Direct													
Average weekly income	-0.2320	-0.2114	-0.1484	-0.1965	-0.1751	-0.1137	-0.0533	-0.0304	-0.2155	-0.2005	-0.1369	-0.0716	-0.0504
Percentage of pop. aged 0-15	-0.1244	-0.1058	-0.0449	-0.1270	-0.1021	-0.0539	0.0007	0.0186	-0.1318	-0.1169	-0.0581	0.0002	0.0156
Percentage of pop. male aged 0-15	-0.0439	-0.0299	0.0200	-0.0449	-0.0299	0.0200	0.0859	0.0363	-0.0516	-0.0346	0.0171	0.0719	0.0908
% of males in population	-0.0069	0.0090	0.0658	0.0170	0.0324	0.0815	0.1302	0.1445	0.0114	0.0281	0.0794	0.1318	0.1477
% OAPs in population	-0.0720	-0.0495	0.0165	-0.0325	-0.0153	0.0485	0.1108	0.1329	-0.0522	-0.0298	0.0341	0.0988	0.1191
Houses in poor condition	0.1324	0.1494	0.2056	0.1292	0.1468	0.2055	0.2641	0.2811	0.0777	0.1003	0.1579	0.2167	0.2338
Net change in population	-0.1500	-0.1336	-0.0810	-0.1376	-0.1229	-0.0719	-0.0206	-0.0059	-0.1718	-0.1569	-0.1054	-0.0543	-0.0357
Net inflow 15 to 24	0.0445	0.0689	0.1426	0.0226	0.0361	0.0819	0.1341	0.1540	0.0735	0.0900	0.1530	0.2318	0.2570
Population density	-0.1589	-0.1480	-0.0902	-0.1573	-0.1404	-0.0856	-0.0296	-0.0145	-0.1577	-0.1408	-0.0858	-0.0277	-0.0096
Number of CCI's granted	0.0091	0.0291	0.0835	0.0202	0.0361	0.0897	0.1436	0.1605	-0.0031	0.0158	0.0719	0.1284	0.1472
% of CCI's valued at greater than £1000	-0.0151	0.0014	0.0478	-0.0188	-0.0045	0.0429	0.0898	0.1025	-0.0365	-0.0247	0.0227	0.0706	0.0845
% of CCI's valued at less than £251	-0.0434	-0.0317	0.0101	-0.0115	-0.0012	0.0391	0.0812	0.0931	-0.0452	-0.0339	0.0082	0.0510	0.0634
Indirect													
Average weekly income	-0.2493	-0.2173	-0.1414	-0.2437	-0.2123	-0.1298	-0.0579	-0.0344	-0.2503	-0.2182	-0.1399	-0.0707	-0.0479
Percentage of pop. aged 0-15	-0.1249	-0.1041	-0.0428	-0.1490	-0.1282	-0.0615	0.0007	0.0219	-0.1484	-0.1251	-0.0595	0.0002	0.0165
Percentage of pop. male aged 0-15	-0.0449	-0.0284	0.0191	-0.0404	-0.0250	0.0294	0.0900	0.1134	-0.0511	-0.0357	0.0174	0.0739	0.0942
% of males in population	-0.0068	0.0089	0.0628	0.0188	0.0352	0.0931	0.1562	0.1776	0.0121	0.0287	0.0811	0.1401	0.1605
% OAPs in population	-0.0726	-0.0476	0.0156	-0.0364	-0.0166	0.0553	0.1304	0.1575	-0.0539	-0.0303	0.0346	0.1020	0.1253
Houses in poor condition	0.1093	0.1289	0.1960	0.1324	0.1536	0.2347	0.3284	0.3588	0.0754	0.0968	0.1613	0.2414	0.2728
Net change in population	-0.1529	-0.1331	-0.0771	-0.1675	-0.1470	-0.0820	-0.0230	-0.0066	-0.1936	-0.1706	-0.1078	-0.0522	-0.0354
Net inflow 15 to 24	0.0424	0.0629	0.1357	0.0240	0.0395	0.0934	0.1593	0.1853	0.0691	0.0880	0.1561	0.2474	0.2866
Population density	-0.1651	-0.1460	-0.0860	-0.1968	-0.1691	-0.0979	-0.0334	-0.0145	-0.1715	-0.1542	-0.0878	-0.0276	-0.0090
Number of CCI's granted	0.0080	0.0262	0.0795	0.0212	0.0405	0.1024	0.1710	0.1926	-0.0032	0.0150	0.0735	0.1367	0.1564
% of CCI's valued at greater than £1000	-0.0144	0.0012	0.0456	-0.0228	-0.0053	0.0490	0.1066	0.1246	-0.0380	-0.0254	0.0231	0.0724	0.0887
% of CCI's valued at less than £251	-0.0429	-0.0305	0.0096	-0.0123	-0.0014	0.0447	0.0952	0.1164	-0.0482	-0.0349	0.0084	0.0527	0.0701
Total													
Average weekly income	-0.4733	-0.4235	-0.2897	-0.4350	-0.3813	-0.2436	-0.1122	-0.0648	-0.4570	-0.4141	-0.2768	-0.1440	-0.0986
Percentage of pop. aged 0-15	-0.2480	-0.2074	-0.0877	-0.2731	-0.2355	-0.1155	0.0014	0.0409	-0.2795	-0.2412	-0.1177	0.0003	0.0321
Percentage of pop. male aged 0-15	-0.0894	-0.0585	0.0391	-0.0738	-0.0470	0.0552	0.1654	0.2084	-0.1064	-0.0706	0.0345	0.1455	0.1850
% of males in population	-0.0137	0.0181	0.1286	0.0359	0.0682	0.1745	0.2850	0.3179	0.0237	0.0584	0.1606	0.2689	0.3036
% OAPs in population	-0.1415	-0.0971	0.0322	-0.0692	-0.0321	0.1038	0.2378	0.2874	-0.1056	-0.0589	0.0687	0.1991	0.2411
Houses in poor condition	0.2483	0.2845	0.4016	0.2694	0.3028	0.4402	0.5802	0.6203	0.1546	0.1988	0.3192	0.4496	0.4922
Net change in population	-0.2965	-0.2654	-0.1581	-0.3024	-0.2661	-0.1540	-0.0445	-0.0126	-0.3586	-0.3231	-0.2131	-0.1074	-0.0693
Net inflow 15 to 24	0.0867	0.1325	0.2783	0.0466	0.0761	0.1754	0.2907	0.3345	0.1457	0.1800	0.3091	0.4723	0.5362
Population density	-0.3199	-0.2853	-0.1763	-0.3485	-0.3062	-0.1836	-0.0637	-0.0290	-0.3275	-0.2923	-0.1736	-0.0551	-0.0186
Number of CCI's granted	0.0165	0.0556	0.1630	0.0418	0.0771	0.1921	0.3106	0.3476	-0.0063	0.0315	0.1455	0.2610	0.2978
% of CCI's valued at greater than £1000	-0.0291	0.0025	0.0834	-0.0411	-0.0098	0.0919	0.1945	0.2244	-0.0741	-0.0499	0.0458	0.1431	0.1696
% of CCI's valued at less than £251	-0.0844	-0.0625	0.0197	-0.0228	-0.0026	0.0838	0.1749	0.2055	-0.0907	-0.0675	0.0167	0.1025	0.1342
R-squared	0.4243			0.4180					0.4003				
Rbar-squared	0.4177			0.4114					0.3935				

TABLE 3. Further results #2

	2003			2004			2005				
	Lower 1%	Lower 5%	Coefficient	Lower 1%	Lower 5%	Coefficient	Lower 1%	Lower 5%	Coefficient		
Direct											
Average weekly income	-0.3168	-0.2938	-0.2270	-0.1612	-0.1394	-0.1877	-0.0948	-0.3361	-0.2648	-0.1903	-0.1657
Percentage of pop. aged 0-15	-0.1113	-0.0916	-0.0379	0.0329	0.0329	-0.1146	0.0031	0.0207	0.0061	0.0666	0.0866
Percentage of pop. male aged 0-15	-0.1333	-0.1174	-0.0702	-0.0116	-0.0239	-0.0399	0.0116	-0.1302	-0.0609	-0.0078	0.0092
% of males in population	-0.0813	-0.0662	-0.0144	0.0380	0.0512	-0.1070	0.0213	-0.0904	-0.0718	-0.0183	0.0549
% OAPs in population	-0.1605	-0.0918	-0.0518	-0.0073	-0.0073	-0.2285	-0.0093	-0.2033	-0.1803	-0.1103	-0.0480
Houses in poor condition	0.0702	0.0874	0.1482	0.2089	0.2313	0.0370	0.1938	0.0828	0.1038	0.1654	0.2277
Net change in population	-0.1199	-0.1020	-0.0494	0.0049	0.0209	-0.0754	0.0566	-0.0342	-0.0183	0.0382	0.0958
Net inflow 15 to 24	0.0655	0.0910	0.1632	0.2229	0.2405	-0.0495	0.0147	-0.0036	0.0166	0.0809	0.1458
Population density	-0.3166	-0.2960	-0.2388	-0.1842	-0.1631	-0.3095	-0.2317	-0.1588	-0.3340	-0.3163	-0.1989
Number of CCI's granted	0.0539	0.0691	0.1209	0.1746	0.1925	0.0247	0.1068	-0.0066	0.0147	0.0738	0.1345
% of CCI's valued at greater than £1000	-0.0606	-0.0453	0.0044	0.0524	0.0670	-0.0814	0.0623	-0.0506	-0.0344	0.0183	0.0717
% of CCI's valued at less than £251	-0.0533	-0.0381	0.0066	0.0499	0.0639	-0.0547	-0.0392	-0.0195	-0.0023	0.0446	0.0821
Indirect											
Average weekly income	-0.5922	-0.5305	-0.3716	-0.2476	-0.2129	-0.5478	-0.4902	-0.5589	-0.5075	-0.3665	-0.2492
Percentage of pop. aged 0-15	-0.1892	-0.1560	-0.0620	0.0257	0.0555	-0.2470	-0.2094	-0.0977	-0.0733	0.0085	0.0942
Percentage of pop. male aged 0-15	-0.2382	-0.2059	-0.1151	-0.0392	-0.0182	-0.2004	-0.1638	-0.1918	-0.1649	-0.0843	-0.0134
% of males in population	-0.1445	-0.1111	-0.0236	0.0613	0.0888	-0.2333	-0.1962	-0.1272	-0.1006	-0.0253	0.0474
% OAPs in population	-0.3231	-0.2742	-0.1504	-0.0421	-0.0111	-0.4458	-0.3819	-0.3009	-0.2608	-0.1577	-0.0558
Houses in poor condition	0.1101	0.1373	0.2442	0.3651	0.4191	0.0648	0.1031	0.1038	0.1373	0.2289	0.3362
Net change in population	-0.2004	-0.1746	-0.0792	0.0079	0.0351	-0.1404	-0.0555	-0.0469	-0.0263	0.0530	0.1654
Net inflow 15 to 24	0.0980	0.1441	0.2673	0.3965	0.4379	-0.0880	-0.0608	-0.0046	0.0228	0.1117	0.2883
Population density	-0.5864	-0.5286	-0.3910	-0.2477	-0.2076	-0.6304	-0.5621	-0.5234	-0.4829	-0.3565	-0.2497
Number of CCI's granted	0.0852	0.1066	0.1980	0.3070	0.3518	0.0390	0.0732	-0.0095	0.0159	0.1023	0.1941
% of CCI's valued at greater than £1000	-0.1000	-0.0765	0.0071	0.0859	0.1115	-0.1461	-0.0911	-0.0700	-0.0477	0.0253	0.1011
% of CCI's valued at less than £251	-0.0918	-0.0625	0.0108	0.0827	0.1083	-0.0971	-0.0695	-0.0281	-0.0030	0.0620	0.1356
Total											
Average weekly income	-0.8846	-0.8144	-0.5986	-0.4140	-0.3573	-0.8144	-0.7439	-0.9035	-0.8292	-0.6312	-0.4470
Percentage of pop. aged 0-15	-0.2996	-0.2464	-0.0999	0.0415	0.0894	-0.3716	-0.3223	-0.1674	-0.1350	0.0146	0.1597
Percentage of pop. male aged 0-15	-0.3708	-0.3493	-0.1853	-0.0633	-0.0305	-0.3031	-0.2530	-0.3169	-0.2785	-0.1482	-0.0189
% of males in population	-0.2240	-0.1765	-0.0380	0.0094	0.1401	-0.3550	-0.3016	-0.2178	-0.1722	-0.0436	0.0819
% OAPs in population	-0.4965	-0.4314	-0.2422	-0.0676	-0.0187	-0.6650	-0.5784	-0.4954	-0.4342	-0.2630	-0.0986
Houses in poor condition	0.1784	0.2249	0.3934	0.5637	0.6337	0.1036	0.1636	0.1888	0.2431	0.3943	0.5625
Net change in population	-0.3159	-0.2740	-0.1276	0.0128	0.0574	-0.2133	-0.1605	-0.0806	-0.0431	0.0913	0.2310
Net inflow 15 to 24	0.1648	0.2403	0.4305	0.6119	0.6612	-0.1364	-0.0959	-0.0082	0.0399	0.1926	0.3496
Population density	-0.8792	-0.8127	-0.6298	-0.4663	-0.4193	-0.9328	-0.8450	-0.8425	-0.7922	-0.6140	-0.4559
Number of CCI's granted	0.1385	0.1763	0.3188	0.4747	0.5413	0.0653	0.1172	-0.0161	0.0352	0.1760	0.3771
% of CCI's valued at greater than £1000	-0.1576	-0.1221	0.0115	0.1386	0.1806	-0.2264	-0.1717	-0.1191	-0.0829	0.0436	0.1720
% of CCI's valued at less than £251	-0.1483	-0.1003	0.0174	0.1330	0.1709	-0.1525	-0.1090	-0.0456	-0.0054	0.1066	0.2254
R-squared	0.4311	0.4247				0.4040	0.3973	0.3977			
R-bar-squared								0.3908			

6. CONCLUSION

This paper has analysed the relationship between a range of economic and socioeconomic variables and three theft crime for London in the year 2003 to 2005. We have seen that in a number of cases there is broad consistency between our results for all three years of this analysis. We have also seen, again, the important role of personal indebtedness in explaining the observed pattern of theft crimes. Building on the earlier analysis in McIntyre & Lacombe (2012) we have extended to consider both the preceding and succeeding years data, but also a broader range of covariates. Our results reinforce the findings of McIntyre & Lacombe (2012) and extend them in a useful manner.

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