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Consumer bankruptcy: Decision, choice and access to credit afterwards

Atilla Gumus[1] | Alper Kara[2] | Ahmad Hassan Ahmad[3] | Karligash Glass[3]

[1]Nottingham Business School, Nottingham Trent University, Nottingham, UK

[2]Business School, University of Huddersfield, Huddersfield, UK

[3]Loughborough Business School, Loughborough University, Loughborough, UK

Correspondence
Alper Kara, Business School, University of Huddersfield, Huddersfield, UK.
Email: a.kara@hud.ac.uk

Abstract

We examine the effects of the bankruptcy benefit and adverse events on the consumer bankruptcy decision. Employing zero-inflated ordered probit models and a unique longitudinal survey of approximately 66,000 individuals in Great Britain, we find that consumers are more likely to enter into bankruptcy proceedings when the bankruptcy benefit increases and when they become unemployed. We find that the effects of adverse events differ across bankruptcy types. Individuals who experience the onset of health problems are more likely to choose reorganization of debts (i.e., *income gleaning*), whereas individuals who get divorced or separated are more likely to prefer the discharge of debts (i.e., *fresh start*). We also examine access to credit after bankruptcy. We find that individuals are excluded from the credit markets post-bankruptcy and the impact differs across bankruptcy types. Credit exclusion for fresh starters is dramatic, swift but short-lived, while for income gleaners, it is gradual, slow but lasts longer.

KEYWORDS

access to credit, adverse events, bankruptcy benefit, consumer bankruptcy, Great Britain, personal bankruptcy

1 | INTRODUCTION

The last two decades have seen a rapid growth of unsecured consumer debt in Great Britain (GB). As a consequence, consumer bankruptcy has also increased from a rare event to a relatively common phenomenon.[1] The total number of consumer bankruptcy filings has increased five-fold during this period, from around 30,000 in 1998 to 150,000 in 2018 (Figure 1).[2] As consumer bankruptcy has become an important issue not only in GB but also globally, studies attempted to explain the increasing trend and the reasons behind the decisions of consumers to file for bankruptcy.[3]

The literature on consumer bankruptcy focuses on two theories in explaining the bankruptcy decision: the *strategic behaviour theory* and the *adverse events theory*. The strategic behaviour theory suggests that consumers file for bankruptcy when their financial benefit from bankruptcy is higher, regardless of their ability to repay. This view states that consumers act strategically and plan to file for bankruptcy in advance (White, 1998b; Zhang et al., 2015). The adverse events theory suggests that consumers file for bankruptcy because of the adverse events, such as unemployment, health problems and divorce, that they experience. These adverse events cause financial distress in the form of income reduction and debt increase which eventually result in bankruptcy (Domowitz & Sartain, 1999; Gross & Notowidigdo, 2011; Himmelstein et al., 2005). However, empirical evidence
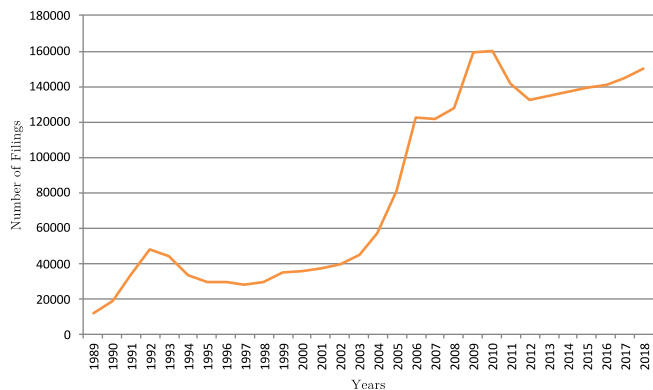
FIGURE 1 Consumer bankruptcy filings in Great Britain. [Colour figure can be viewed at wileyonlinelibrary.com]

supporting the theory is limited, mainly due to the lack of individual-level data. Most of the individual level studies on consumer bankruptcy use only US household data (see, e.g., Fay et al., 2002; Han & Li, 2011).

The literature also discusses the economic objectives of having consumer bankruptcy laws (Chatterjee & Gordon, 2012; Li & Sarte, 2006; White, 2005). One objective is to have a mechanism to repay at least partially to creditors in case of insolvency or default. If the creditors were not paid in case of default, this would harm the credit markets by increasing interest rates and reducing access to credit. A related objective is to protect debtors from aggressive collection efforts by creditors because debtors may lose their jobs as a result of garnishment of debtors' vehicles or wages.[4] Another objective is to provide partial consumption insurance to 'honest but unfortunate' debtors against adverse shocks to consumption such as divorce, job loss and health problems. If consumption decreases dramatically, it may cause bigger problems such as the impact on the debtor's family members, untreated health problems becoming permanent illnesses or disabilities.[5]

At the same time, it is often argued that after bankruptcy both credit demand and credit supply are likely to be affected (Jagtiani & Li, 2015). Individuals are likely to have less demand for credit as they have a stronger balance sheet with less or no unsecured debt, and more disposable income after bankruptcy. Therefore, they may be able to access more and cheaper credit. The improved balance sheet also makes borrowers more creditworthy to lenders. However, a bankruptcy flag on the credit report also signals that previously bankrupt individual may be the risky type compared to non-bankrupts with similar balance sheets (Cohen-Cole et al., 2013; Musto, 2004). Theoretical models assume the presence of a market exclusion after bankruptcy (Athreya, 2004; Chatterjee

et al., 2007; Livshits et al., 2007), however, there is limited empirical evidence on the credit access after bankruptcy, mainly due to the lack of individual-level data. It is argued that bankrupt individuals can obtain new credits 1 year after bankruptcy filing (Staten, 1993). Other studies find that bankrupt individuals are less likely to have credit cards (Stavins, 2000), face borrowing constraints and reduced credit limits in the post-bankruptcy period (Cohen-Cole et al., 2013; Fisher et al., 2004; Jagtiani & Li, 2015; Musto, 2004).

In this paper, our main goals are to explore, first, the driving reasons behind the consumers' decision to file for bankruptcy, and, second, whether these factors are influential in consumers' choice of bankruptcy type. Regarding the first goal, we aim to test the predictions of the *strategic behaviour* and *adverse events* theories by considering whether the effects of the bankruptcy benefit and adverse events are observable in the UK context. To do so, and following the predictions of these theories, we hypothesise that consumers act strategically and plan to file for bankruptcy in advance if their bankruptcy benefit is high. We also hypothesise that consumers are more likely bankrupt when they face an adverse life event, such as unemployment, health problems or divorce, as these events increase financial distress and reduce income. Regarding the second goal, we aim to examine the possible link between the two main factors leading to bankruptcy (i.e., bankruptcy benefit or adverse events) and the two main choices of bankruptcy type of either *discharge* or *reorganization* of debts. We do not have a particular theory to test for this objective as there is a dearth of literature looking at these issues. However, we predict that households with high level of debt would prefer to discharge rather than reorganize their debts. We also predict that individuals facing adverse life events, in particular divorce, may want to discharge all debts to make a fresh start in life. As a secondary goal of this research we also to investigate consumers ability to access finance after bankruptcy. In particular we aim to explore whether bankrupt consumers are more likely to be excluded from the credit markets after bankruptcy compared to non-bankrupt counterparts. Following the predictions of the theoretical literature, we hypothesise that consumer are likely to face difficulty in accessing finance after bankruptcy. Furthermore, we also examine whether the ability to access finance in the post-bankruptcy period varies depending on the choice of bankruptcy type.

We utilize Wealth and Asset Survey (WAS), a unique longitudinal survey by the Office of National Statistics in GB, which covers approximately 66,000 individuals' demographics, well-being, income, assets, debt,

and bankruptcy filings over the period of 2006–2014 in four waves. The data provides the granular detail to calculate an individual's bankruptcy benefit, simply the difference between dischargeable debts by filing bankruptcy and eligible assets for liquidation at the time. The survey also asks individuals whether they have entered into any formal insolvency proceedings or a debt management scheme in the previous period. This allows us to identify not only the bankruptcy but also type of the insolvency proceedings that an individual has entered into, either the discharge of debts (termed *fresh start*) or the reorganization of debts (termed *income gleaning*). WAS tracks adverse events, such as unemployment, divorce and health problems, that individuals have experienced between the waves during this period. We use a zero-inflated ordered probit (ZIOP) model to account for the fact that bankruptcy is a rare event and, therefore, the data includes a high fraction of non-bankrupts. ZIOP also deals with the endogeneity due to possible sample selection bias.

We find that consumers are more likely to enter into bankruptcy proceedings when the bankruptcy benefit increases. However, separating the effect into its two components, the dischargeable debt seems to be the overriding factor in the bankruptcy decision. Regarding the adverse events, we find that becoming unemployed is the dominant reason influencing the consumer bankruptcy decision. The effects of other adverse events differ across bankruptcy types. Individuals who experience the onset of health problems are more likely to choose the income gleaning, whereas individuals who get divorced or separated are more likely to choose the fresh start. We also find that bankrupt individuals are excluded from the credit markets and the magnitude is different for different types of bankruptcy. The fresh starters' credit exclusion is dramatic, swift but short-lived, while the exclusion of the income gleaners is gradual, slow but lasts longer.

Our contribution to the literature is fourfold. First, previous studies on the consumer bankruptcy decision treat bankruptcy as a uniform case and provide little information about the different bankruptcy types (Fay et al., 2002; Zhang et al., 2015).[6] In reality, not all bankruptcy types have the same consequences; therefore, it is necessary to analyse bankruptcy types separately to better understand the bankruptcy decision. Having the required granular data, we investigate both the bankruptcy decision and the bankruptcy types and compare them, rather than oversimplifying all the bankruptcy decisions as the same type. As the major contribution of this research, we test *the strategic behaviour* and *adverse events theories* according to the bankruptcy types.

Second, we deal with a potential endogeneity issue which previous studies do not explore (Fay et al., 2002),

or only do so for the strategic behaviour (Zhang et al., 2015). Since the consumer bankruptcy is a legal process, bankruptcy filers must have formal debts from financial intermediaries in the form of a consumer loan or a credit card. However, it is possible that some individuals are excluded from financial markets voluntarily or involuntarily. Therefore, we suspect that the non-bankrupt individuals belong to one of two groups, *participants* or *non-participants* of financial markets, which may lead to a potential selection bias problem. In previous studies, probit models have been combined with Heckman models to deal with sample selection and instrumental variables to deal with endogeneity problems (Zhang et al., 2015). As in all such studies, it is difficult to identify variables which affect selection but not the outcome. As an alternative method to deal with these problems, Harris and Zhao (2007) propose the ZIOP model. They derive the ZIOP model in two steps. First, the participation group can be modelled using a probit model. Then, participation levels are modelled using an ordered probit model. By applying the ZIOP model, we alleviate the potential endogeneity for both the bankruptcy decision and the different bankruptcy types. Furthermore, the ZIOP model fits well when the data exhibit a high fraction of observations in the lowest category. Standard probit and ordered probit models cannot account for the excess number of zero observations when the zeros relate to an extra, distinct source. This is particularly relevant to our analysis in this paper as observations of bankrupt (i.e., referred as zero) is substantially less in comparison to non-bankrupt as only less than 1% of households go bankrupt each year in GB.[7]

Third, we contribute to the literature by examining the access to consumer credit after bankruptcy for different types of bankruptcy, which may have dissimilar consequences in accessing credit post-bankruptcy. Most of the previous studies on the bankruptcy decision and the post-bankruptcy credit access, such as Athreya and Janicki (2006) and Cohen-Cole et al. (2013), analyse the bankruptcy as a uniform event and provide little information about the different bankruptcy types. However, not all bankruptcy types have the same consequences. They have different procedures and applications regarding discharging debt and liquidating assets. For example, almost all the debts are discharged, and the assets are liquidated under Bankruptcy and Debt Relief Orders. However, the debts are mostly reorganized rather than discharged under Individual Voluntary Arrangements and Debt Management Plans based on the expected future income. Another example is that post-bankruptcy credit demand effect is likely to be larger for fresh starters than income gleaners. This is because the unsecured debts of fresh starters are discharged, while income gleaners continue

to repay some of their debts for a longer payment schedule. Therefore, credit supply adjustment for income gleaners would take a longer time. Overall, bankruptcy types should be analysed separately to better understand the bankruptcy decision and the post-bankruptcy credit access.

We also contribute to the literature by studying access to credit after bankruptcy in the long term. Theoretical models assume the presence of the post-bankruptcy market exclusion for a considerable time (Athreya, 2004; Chatterjee et al., 2007). Empirical evidence for short term exclusion shows that the exclusion after bankruptcy is short-lived (Cohen-Cole et al., 2013). However, long term evidence on market exclusion after consumer bankruptcy is non-existent.

Finally, the literature on consumer bankruptcy mostly relates to US households under the US laws and there is no empirical study on the consumer bankruptcy decision in GB.[8] However, GB bankruptcy laws differ from US bankruptcy laws regarding dischargeable debts and eligible assets for liquidation. For example, there is a homestead exemption in most US states. One can keep their main residence (regardless of its value) and file for bankruptcy in some states. There is no such exemption in GB. Therefore, the consumer approach to the bankruptcy will be different in the US than GB based on different bankruptcy benefits. Therefore, we contribute to the literature by providing the first evidence for GB and its consumer bankruptcy procedures. Similarly, one of determinants of the financial exclusion is the consumer bankruptcy law of the country. Since the consumer loans are mostly discharged in the bankruptcy procedures, the creditors adjust their policies based on the bankruptcy law. In a pro-debtor bankruptcy law, creditors are willing to provide less credit to consumers when it is compared to more pro-creditor consumer bankruptcy laws due to the risk of default (White, 2005). Thus, the consumer bankruptcy decision should be analysed under different laws to understand the consumer behaviour better.

The rest of the paper is organized as follows. The next section discusses the consumer bankruptcy procedures in GB. Subsequently, we review the existing literature on consumer bankruptcy in Section 3 and discuss the theoretical approach in Section 4. Section 5 explains the data and variables and discusses the econometric approaches applied. Section 6 presents empirical results and Section 7 concludes.

2 | BACKGROUND OF CONSUMER BANKRUPTCY PROCEDURES IN GB

Bankruptcy is the legal mechanism involving individuals that cannot pay their debts. Consumer bankruptcy[9] refers to the bankruptcy of individuals. Great Britain has two legal jurisdictions: England and Wales, and Scotland. Even though the bankruptcy law is devolved to the Scottish Parliament by the Scotland Act 1998, consumer bankruptcy laws in both jurisdictions are similar. Bankruptcy in England and Wales is a formal process for financially distressed individuals to discharge their eligible debts under the Insolvency Act 1986. To be made bankrupt, a court issues a *bankruptcy order* after applied by either the individual or a creditor who is owed £750 or more by the individual. Bankruptcy processes are administered by an official receiver who is an officer of the bankruptcy court. In addition, a licensed insolvency practitioner as a trustee from the private sector can be appointed by the creditors. The debtor's assets[10] are disposed to pay his or her debts. During the bankruptcy process, the debtor is subject to some restrictions such as the prohibition of credit use of more than £500 and being the owner or the manager of a company. Restrictions last until the bankruptcy process ends and the debts are discharged which usually takes 12 months. There are very limited debt categories that cannot be discharged in bankruptcy, most importantly student loans.[11] The bankruptcy order in Scotland, *sequestration*, is the equivalent of the bankruptcy order in England and Wales and has similar procedures.[12,13]

A simpler and quicker form of the bankruptcy order is called *Debt Relief Order* (DRO) which is introduced in April 2009 in England and Wales, and Scotland. To be eligible for a DRO, along with the other requirements,[14] the debtor's total unsecured debt must not exceed £15,000 and the total gross assets must not exceed £300. Additionally, the debtor's disposable income after deduction of normal household expenses must not exceed £50 per month. DROs are a simple form the bankruptcy orders for very low-wealth and low-income consumers. Since almost all of the debts are discharged under bankruptcy orders and DROs, these two bankruptcy types can be considered as 'fresh start'.

A second form is the *Individual Voluntary Arrangement* (IVA), a contractual arrangement between the financially distressed debtor and the creditors. The debtor agrees to pay at least 75% of the debt under the new repayment plan negotiated by an insolvency practitioner. The new repayment plan usually takes 5 years and the return to creditors is usually higher than they would receive under bankruptcy orders. IVAs aim to individuals who have enough money left over after essential expenses. When an IVA is approved, it applies to all creditors, including any who disagreed with it. *Protected Trust Deeds* (PTDs) are the Scottish equivalent of IVAs.[15]

A third option is *Debt Management Plan* (DMP). DMPs are an agreement between the debtor and the

creditors to pay all of the debts under a new repayment plan which is negotiated by a licensed debt management company. The debtor makes regular payments to the debt management company, and the company shares this money out between the creditors. DMPs are not legally binding, so the creditors do not have to agree on a plan and can pursue individual collections. *Debt Arrangement Schemes* (DASs) are the Scottish equivalent of DMPs.[16] Based on the expected future income, the debts are mostly reorganized rather than discharged under IVAs and DMPs (PTDs and DASs in Scotland, respectively). Therefore, these two bankruptcy types can be considered as 'income gleaning'.

3 | LITERATURE REVIEW

Literature on consumer bankruptcy is often published in economics, finance and legal journals. Legal literature mostly focuses on bankruptcy laws, procedures and their applications. Some legal studies rely on available survey data to analyse the bankruptcy decision, which is closely related to the economically oriented empirical literature. Economics and finance literature on consumer bankruptcy focus on both theoretical and empirical studies.

3.1 | Theoretical studies

Theoretical studies on consumer bankruptcy typically discuss optimal consumer bankruptcy policies. They generally have a partial or general equilibrium approach which includes household maximization problem with other equilibrium conditions such as competition (Athreya, 2002, 2006), resource constraints (Gross et al., 2014; Li & Sarte, 2006) and market clearing (Livshits et al., 2007; Narajabad, 2012). Some of these studies have contradictory conclusions. For example, modelling the trade-off between the consumption smoothing role of bankruptcy and the interest rates, Athreya (2002) argues that the elimination of bankruptcy altogether has substantial benefits. In contrast, Li and Sarte (2006), studying the implications of US personal bankruptcy rules for resource allocation and welfare, argue that the complete elimination of bankruptcy provisions causes significant declines in output and welfare.

Many models assume that if the consumers default on their debts, they always file for bankruptcy (Chatterjee et al., 2007; Livshits et al., 2007). However, some debtors default without filing for bankruptcy. In this case, the creditors may exercise collection efforts such as taking money from the debtors' wages and accounts. The collection efforts are sometimes risky, because the debtors may lose their jobs or file for bankruptcy in response. White

(1998b) models the default option versus the bankruptcy choice and finds that both creditors and debtors play mixed strategies, which means some debtors may default without being pursued by the creditors.

Another issue discussed in the literature is the trade-off between credit availability and work incentives after bankruptcy and partial consumption insurance. In their model with two types of debtors, Wang and White (2000) show that the 'fresh start' bankruptcy policy is optimal if all the debtors are non-opportunists. However, if the debtors have opportunistic behaviour, then the policy should require some payments from post-bankruptcy earnings because the fresh start policy attracts opportunists to file for bankruptcy even if they are able to repay their debts. The more debtors file and benefit from bankruptcy, the less access to credit at higher interest rates.

The option value of the consumer bankruptcy is also discussed in the literature. If the debtors' ability to pay decreases in the future, they can exercise their option to file for bankruptcy and the creditors bear the burden of debts. The price of performing the option is the debtor's eligible assets for liquidation. White (1998a) calculates the value of the option for households using a representative sample of US households and finds that many debtors who do not benefit from filing for bankruptcy immediately gain from having the option to file in the future.

3.2 | Empirical literature

The earlier empirical studies on consumer bankruptcy generally use aggregate-level data due to the lack of suitable household-level data (such as Buckley, 1994; Domowitz & Eovaldi, 1993; Shepard, 1984). There is limited household-level empirical literature on consumer bankruptcy. Hence, relatively fewer studies focus on the demographics and behaviour of individuals who file for bankruptcy. Examining the demographics of bankruptcy, Sullivan et al. (1994) find that bankrupt individuals have less income and assets, and more debts compared to non-bankrupt individuals. Education level also affects the bankruptcy decision. Household heads with more years of education are found to be less likely to file for bankruptcy (Fay et al., 2002). Similarly, US postal codes with a higher percentage of residents with undergraduate-level education have significantly lower bankruptcy rates controlling for income, ethnicity, marital status, age, sex and employment among others (Lefgren & McIntyre, 2009).

There are primarily two theories that explain the bankruptcy decision. The first one is the strategic behaviour theory. This theory suggests that consumers file for bankruptcy when their financial benefit from bankruptcy

is higher, regardless of their ability to repay. A strand of the literature focuses on consumers' bankruptcy benefit and their bankruptcy decision. Domowitz and Sartain (1999), based on US household data, find that consumers with more credit card debt are more likely to file for bankruptcy. Similarly, Gross and Souleles (2002) show that bankruptcy rates are associated with delinquent debt. Furthermore, Zhu (2011), using data from the consumer bankruptcy filers in the US state of Delaware, finds that the household expenditure on durable goods such as houses and vehicles contributes to the consumer bankruptcy significantly. In addition, White (1998b) and Zhang et al. (2015) support the strategic behaviour theory and state that consumers act strategically and plan to file for bankruptcy in advance.

The second theory is the adverse events theory. This theory suggests that consumers file for bankruptcy because of the adverse events they experience such as job loss, health problems and divorce. Some studies focus on this theory and analyse the relationship between adverse events and the consumer bankruptcy decision in the US. Sullivan et al. (1989) find that adverse events lead to consumer bankruptcy by decreasing consumers' ability to repay. Domowitz and Sartain (1999) show that households with a medical debt of 2% or more of their income have more than 20 times higher probability of filing for bankruptcy. Himmelstein et al. (2005) find that 28.3% of the consumer bankruptcy filings were due to illness or injury and 46.2% of the filings were related to major medical causes. Similarly, Gross and Notowidigdo (2011) find that medical costs have crucial importance in roughly 26% of consumer bankruptcies among low-income households. Analysing both the effect of financial benefit and adverse events on the consumer bankruptcy, Fay et al. (2002) find that the consumer bankruptcy is mostly related to consumers' financial benefit, which is the dischargeable debts minus non-exempt assets, from filing for bankruptcy.[17] Their findings support the first theory but, not the second one. They find little support for the hypothesis that filings for bankruptcy increases when adverse events occur. Lefgren and McIntyre (2009) find that filing rates may also be affected by policies such as exemptions and garnishment procedures. Hence, an optimal consumer bankruptcy policy is needed to protect both the debtor and the creditors, which is one of the main questions in the literature on consumer bankruptcy.

Another strand of the literature is devoted to the social stigma[18] and information costs[19] based on US data. Sullivan et al. (2006) find that increased filings result from increased financial distress rather than the declining bankruptcy stigma. Cohen-Cole and Duygan-Bump (2008) argue that the increase in consumer bankruptcy

filings is more likely associated with the decreased information costs rather than the decreased social stigma. Fay et al. (2002) also show that households live in districts that have higher bankruptcy rates are more likely to file for bankruptcy, which implies that the locality is an important determinant of the bankruptcy decision. Other studies in the literature also include the relationship between the consumer bankruptcy and credit markets (Dick & Lehnert, 2010; Gropp et al., 1997), and between the consumer bankruptcy and the labour supply (Chen & Zhao, 2017; Han & Li, 2007).

There is also a strand of literature that examines the post-bankruptcy credit access. After bankruptcy, both credit demand and credit supply are likely to be affected (Jagtiani & Li, 2015). Individuals are likely to have less demand for credit as they have a stronger balance sheet with less or no unsecured debt and more disposable income after bankruptcy. Therefore, they may be able to access more and cheaper credit. Improved balance sheet makes borrowers more creditworthy to lenders. However, a bankruptcy flag on the credit report also signals that previously bankrupt individual may be the risky type compared to non-bankrupts with similar balance sheets (Cohen-Cole et al., 2013; Musto, 2004). Theoretical models assume the presence of a market exclusion after bankruptcy (Athreya, 2004; Chatterjee et al., 2007; Livshits et al., 2007), however, there is limited empirical evidence on the credit access after bankruptcy, mainly due to the lack of individual-level data. It is argued that bankrupt individuals are able to obtain new credits 1 year after bankruptcy filing (Staten, 1993). Other studies find that bankrupt individuals are less likely to have credit cards (Stavins, 2000), face borrowing constraints and reduced credit limits in the post-bankruptcy period (Fisher et al., 2004).

A number of studies provide empirical evidence on post-bankruptcy outcomes in accessing finance. Musto (2004), using US data, examines the effect of the removal of personal bankruptcies from credit reports after 10 years on access to credit. He finds that in the short-term the removal of records increases the creditworthiness of the individuals, with an increase in both credit scores and the number and total limit of credit cards observed. However, for the long-term they observe that credit scores are lower than the initially given scores after the removal of the bankruptcy records. Overall Musto's (2004) findings suggest that lenders reduce the credit supply to borrowers in the post-bankruptcy period. Cohen-Cole et al. (2013) also provides empirical evidence on consumers access to credit after bankruptcy in the US. They find that consumers observe a substantial reduction in their credit limits right after the bankruptcy filing. However, they find that this effect is reduced in

the medium-term. They also show that individuals with good credit score before filing bankruptcy are more limited in accessing finance in comparison to those individuals with low credit score before filing bankruptcy. In contrast to the findings of these two studies, Jagtiani and Li (2015) argue that individuals' ability to access credit in the post-bankruptcy period are significantly impacted in the US. They find that bankrupt individuals have much reduced credit limits (even though their credit scores recover) and the impact is long lasting. They also find that this is a supply side effect, stemming from lender behaviour. Although there is research on access to credit in GB context (Deku et al., 2016; Kara & Molyneux, 2017), there is no research examining this issue after bankruptcy. Hence, we also contribute to the literature in this direction.

Our major contribution to the literature reviewed is that, unlike previous studies, we do not treat bankruptcy decision as a uniform case and analyse bankruptcy types separately to better understand the bankruptcy decision. We examine both the bankruptcy decision and the bankruptcy types and test the *strategic behaviour* and *adverse events* theories accordingly. Similarly, we also contribute to the literature by examining the access to consumer credit after bankruptcy for different bankruptcy types and by looking at access in both the short term and the long term.

4 | THEORETICAL APPROACH

4.1 | Strategic behaviour theory

The strategic behaviour theory suggests that consumers are more likely to file for bankruptcy when their benefit from bankruptcy is higher, regardless of their ability to repay. This view states that consumers act strategically and plan to file in advance. The bankruptcy benefit is defined as the financial benefit of the consumers under the bankruptcy procedures. The benefit from filing for bankruptcy for individual i, can be calculated as follows (Darolia & Ritter, 2015; Fay et al., 2002; Li et al., 2011):

$$bankruptcy\ benefit_{i,t} = \max[d_{i,t} - w_{i,t} - Court_t, 0], \quad (1)$$

where, *bankruptcy benefit*$_{i,t}$ is the bankruptcy benefit for individual i at time t, which is non-negative because consumers file for bankruptcy strategically if their benefit from bankruptcy is non-negative. $d_{i,t}$ and $w_{i,t}$ are the individual i's dischargeable debts in bankruptcy and eligible assets for liquidation at time t, respectively. $Court_t$ is court costs and administrative fees for bankruptcy at time t. $d_{i,t}$ is calculated as total net debts of individual i,

excluding non-dischargeable debts such as student loans at time t, similarly $w_{i,t}$ is calculated as the total net wealth of individual i, excluding the non-eligible wealth such as the pension wealth and some household items at time t. Dischargeable debts and eligible assets follow the bankruptcy procedures as explained in Section 2.

This study slightly modifies the theoretical model introduced by Zhang et al. (2015). In their model, Zhang et al. (2015) defines three periods. The consumer choose debt in the first period, then an adverse event may (not) be realized in the second period, and the consumer decides (not) to file for bankruptcy in the third period. In our model, we have applied the similar setting in two periods. The consumer choose debt in the first period and decides (not) to file for bankruptcy in the second period and the adverse event may (not) be realized in between. This setting makes the model simpler and fits well with our database's 2-year interval structure.

Our model considers a standard, two-period decision-making framework. In the first period, the consumer borrows money. In the second period, one of the two states prevails: a good state or a bad state. The good state represents the planned state without any adverse event, while the bad state represents the occurrence of adverse events. Each state corresponds to a decision node, and the probability of each state is π_g and π_b, respectively, with $\pi_g + \pi_b = 1$.

As usual, a consumer has to decide how much to consume at each state; her consumption is denoted as c_t, $c_{g,t+1}$ and $c_{b,t+1}$ where c_t represents the consumption in the first period, $c_{g,t+1}$ the consumption in the good state and $c_{b,t+1}$ the consumption in the bad state in the next period. The consumer has a twice continuously differentiable utility function with the following conditions:

$$u'(c) > 0, u''(c) < 0, \quad (2)$$

$$\lim_{c \to 0} u'(c) = \infty, \lim_{c \to \infty} u'(c) = 0, \quad (3)$$

and the consumer has the following expected utility:

$$U = u(c_t) + \delta \left[\pi_g u(c_{g,t+1}) + \pi_b u(c_{b,t+1}) \right]. \quad (4)$$

The endowment in consumption units at each node is denoted as w_t, $w_{g,t+1}$ and $w_{b,t+1}$. We normalize the endowment to zero in the first period. Therefore, we assume that $w_t = 0 \le w_{b,t+1} < w_{g,t+1}$ for convenience. Moreover, credit markets are available to the consumer at the market interest rate r. As usual, a single consumer takes interest rates as given. The consumer decides how much debt to take subject to a debt limit which is exogenously determined by the creditor; so, it is assumed that

$0 < d_t \le \overline{d}$ where d_t denotes the debt the consumer takes at time t and $\overline{d}$ the debt limit. The debt in the next period denoted as $d_{t+1} = (1 + r)d_t$.

The strategic behaviour consumer is a rational consumer who includes the bankruptcy option in her maximization problem. In the first period, she takes the debt to consume. In the next period, she considers the bankruptcy option no matter whether the outcome is good or bad. If she files for bankruptcy, her eligible assets will be liquidated but in return, her debts will be discharged. Therefore, the strategic behaviour consumer solves the following problem:

$$\max_{c_t, c_{g,t+1}, c_{b,t+1}} u(c_t) + \delta\big[\pi_g u(c_{g,t+1}) + \pi_b u(c_{b,t+1})\big], \quad (5)$$

subject to

$$c_t = d_t$$

$$c_{g,t+1} = \max\big[w_{g,t+1} - d_{t+1}, \max[d_{t+1} - w_{g,t+1} - Court_{t+1}, 0]\big]$$

$$c_{b,t+1} = \max[w_{b,t+1} - d_{t+1}, \max[d_{t+1} - w_{b,t+1} - Court_{t+1}, 0]]$$

$$0 < d_t \le \overline{d}$$

The maximum operator in the constraints corresponds to the bankruptcy decision. If the consumer, for example, decides not to file for bankruptcy in the good state, the constraint becomes $w_{g,t+1} - d_{t+1}$. If she files for bankruptcy, the constraint becomes $\max[d_{t+1} - w_{g,t+1} - Court_{t+1}, 0]$ which is the bankruptcy benefit. The strategic behaviour consumer chooses the most profitable option in any case.

4.2 | Adverse events theory

The adverse events theory suggests that consumers file for bankruptcy due to adverse events such as job loss, divorce and health problems which reduce their income, hence their ability to repay their debts dramatically. Sullivan et al. (1989, 2006) support this theory by using data from bankruptcy filings from several US states. They conclude that while some cases of strategic behaviour may exist, the bankruptcy is predominantly due to adverse events and they state that no one plans to go bankrupt.

This theory assumes that consumers do not plan to file for bankruptcy. If an adverse event occurs, they may be compelled to file for bankruptcy. If such an event does not occur, they do not consider filing for bankruptcy. An important question arises from this assumption: 'why do not they include a bankruptcy option in the good state?'

One explanation can be utility penalties arising from future reputation losses from filing (Dubey et al., 2005). Such losses can be the restricted future access to credit markets and the negative impact on credit score (Musto, 2004). For example, a bankruptcy flag on a consumer credit report stays there for 10 years which affects the access to credit in the future negatively. If these losses are high enough, they may deter consumers to file in the good state even if it is financially practical. Therefore, consumers may optimally decide not to consider a bankruptcy option (Zhang et al., 2015).

The adverse events consumer takes decisions sequentially. In the first period, she takes the debt to consume and plans accordingly. In the next period, if the planned events occur, she consumes as planned and she does not consider the bankruptcy option. If an adverse event occurs, she includes the bankruptcy option in her maximization problem. If she files for bankruptcy, her eligible assets will be liquidated but in return, her debts will be discharged.

The adverse events theory has the same model as the strategic behaviour theory. They have the same assumptions regarding decision nodes, debts, endowments, utility functions and the expected utilities. The only difference is the optimisation problem. The adverse events consumer solves the following optimisation problem:

$$\max_{c_t, c_{g,t+1}, c_{b,t+1}} u(c_t) + \delta\big[\pi_g u(c_{g,t+1}) + \pi_b u(c_{b,t+1})\big], \quad (6)$$

subject to

$$c_t = d_t$$

$$c_{g,t+1} = w_{g,t+1} - d_{t+1}$$

$$c_{b,t+1} = \max[w_{b,t+1} - d_{t+1}, \max[d_{t+1} - w_{b,t+1} - Court_{t+1}, 0]]$$

$$0 < d_t \le \overline{d}$$

The model suggests that the adverse events consumer only files for bankruptcy in the bad state, while the strategic behaviour consumer may file for bankruptcy in any state.

The models presented in this section are simplified models to represent the main aspects of the bankruptcy decision. As the case for all models, these models have some limitations and do not capture all the relevant aspects of the consumer bankruptcy such as the role of social stigma, information, bankruptcy types, access to credit in the future, entrepreneurial activities and work

incentives. Some of these aspects are not possible to capture in the data, though. For further studies, it is possible to modify the models to address some of these issues in a reduced form by including parameters for access to credit markets in the future, or utility penalties in case of bankruptcy, but it is unclear whether such additions would yield tractable models.

5 | DATA AND METHODOLOGY

5.1 | Data

We use data from the Wealth and Assets Survey (WAS) which is provided by the Office for National Statistics. WAS is a longitudinal survey that focuses on the economic well-being of individuals in Great Britain by collecting data on assets, savings, income, and debts of individuals and private households.[20] The survey estimates are designed to be representative of the population of Great Britain, therefore, the WAS uses a 'probability proportional to size' (PPS) method of sampling cases. In addition to the geographical distribution, the WAS sample is also designed to be representative of the population in terms of characteristics of individuals and households such as age, sex, marital status, employment status and education level. All interviews have a two-yearly interval between waves, therefore providing estimates of change in relation to the same period of time.[21] The WAS estimates physical wealth, property wealth, financial wealth, and private pension wealth by asking households about their assets, liabilities and pension schemes. It also includes household and individual demographics, socioeconomic characteristics, and measures of financial attitudes, behaviours, and difficulties. Related to financial difficulties, the WAS asks individuals two specific questions about the consumer bankruptcy. All adult respondents are asked the following question:

> *Have you entered into any formal insolvency proceedings or into a Debt Management Plan (DMP) in the last year?*

Respondents are required to choose '*Yes or No*'. If they choose '*Yes*', then they are asked:

> *What type of insolvency proceedings have you entered into?*

Respondents are required to choose one of the following options:

1. *Bankruptcy*
2. *An Individual Voluntary Arrangement*
3. *A Debt Management Plan*
4. *A Debt Relief Order*

We identify respondents who choose (1) or (4) from the list above as 'fresh start' bankrupts, while respondents who choose (2) or (3) are identified as 'income gleaning' bankrupts.

The strategic behaviour theory suggests that consumers, acting strategically and planning to file in advance, are more likely to file for bankruptcy when their benefit from bankruptcy is higher, regardless of their ability to repay. The bankruptcy benefit is defined as the financial benefit of the consumers under the bankruptcy procedures. We calculate the bankruptcy benefit, as per Equation (1), for each individual by using their eligible assets and dischargeable debts following the bankruptcy procedures. We present information on bankruptcy benefits in Table 1. We observe that 6.3% of the individuals have a positive bankruptcy benefit, but only 1.4% of them have a sizable benefit (i.e., more than £10,000). These rates are substantially higher than the actual bankruptcy rates.[22] The mean and median values of the bankruptcy benefit are negative, but some financially distressed consumers have positive benefit values.

Another view on consumer bankruptcy is that individuals file for bankruptcy due to adverse events such as unemployment, divorce and health problems which reduce their income, hence their ability to repay their debts dramatically. The WAS keeps track of the characteristics of the individuals. The panel structure of data allows us to observe the adverse events between waves for each individual. We specify three adverse events based on the literature (e.g., Domowitz & Sartain, 1999; Fay et al., 2002; Himmelstein et al., 2005) as *becoming unemployed* (job loss), *getting divorced* or *separated* and the onset of *a serious health problem* which limits the physical activity. Since we focus on adverse events as negative shocks, we observe each individual two periods and note any change in these characteristics.

Since the adverse events reduce the income dramatically, an interpretation of the adverse events view implies that income should be negatively and significantly related to the probability of filing for bankruptcy, but not the bankruptcy benefit, because the bankruptcy benefit is mostly related to individuals' wealth rather than their income. In contrast, the bankruptcy benefit view implies that the benefit from bankruptcy should be positively and significantly related to the probability of filing for bankruptcy, but not the income, because the income is not directly related to individuals' bankruptcy benefit from filing. Therefore, a regression of the bankruptcy benefit and the income on individuals' bankruptcy decision should show the significance of the bankruptcy benefit

TABLE 1 Consumers that would benefit from filing for bankruptcy.

Bankruptcy benefit	Wave 1	Wave 2	Wave 3	Wave 4	Total sample
Greater than £0	6.30%	6.10%	6.50%	6.40%	6.30%
Greater than £1000	4.80%	4.60%	4.90%	4.80%	4.80%
Greater than £10,000	1.40%	1.40%	1.50%	1.40%	1.40%
Median (£)	−67,421	−74,483	−70,923	−70,654	−70,500
Mean (£)	−127,388	−134,530	−140,425	−133,897	−133,273
Observations	53,092	34,362	37,643	36,857	161,954

Source: Wealth and Assets Survey.

and income. The effects of adverse events on the bankruptcy decision can be also tested by using related dummy variables for becoming unemployed, getting divorced or separated, and the onset of a serious health problem which limits the physical activity, rather than the variable for income.

For the post-bankruptcy credit access analysis, we identify individuals based on their access to credit. In the WAS individuals are asked whether or not they have access to unsecured credit such as credit cards or store cards. A 'credit user' is an individual who uses and has access to consumer credit, while a 'non-credit user' is an individual who has never used and has no access to credit. Since the bankruptcy is a formal process that individuals can discharge their debts, they must be a credit user in the first place. We then identify the credit users based on their bankruptcy situation as explained above.

5.2 | Bankruptcy decision models

At the outset, we test the strategic behaviour theory by examining the impact of the financial benefit on the consumer bankruptcy decision using the framework developed by Fay et al. (2002). Each individual i is observed over two periods, t and $t+1$. The financial situation and the characteristics of individuals are observed at time t and their bankruptcy decision at time $t+1$ to examine whether or not the financial situation and the characteristics lead to bankruptcy in the next period. The general form of the strategic behaviour model, which explains a dichotomous variable as a function of the financial benefit and other characteristics, is given by:

$$Bankruptcy_{i,t+1} = \beta Bankruptcy\, Benefit_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}, \quad (7)$$

where, $Bankruptcy_{i,t+1}$ denotes a binary variable indicating whether the individual i have filed for consumer bankruptcy at time $t+1$, or not. If the individual files

for any type of bankruptcy, $Bankruptcy$ takes the value of 1, otherwise 0. $Bankruptcy\, Benefit_{i,t}$ represents the bankruptcy benefit if the individual files for bankruptcy. The bankruptcy benefit is calculated as per Equation (1). *Eligible Assets* and *Dischargeable Debts* are also tested as explanatory variables in a variant of the strategic behaviour model. $X_{i,t}$ is the vector of control variables, and $\varepsilon_{i,t}$ the error term, all at time t. Control variables are mainly drawn from the empirical studies on consumer bankruptcy (such as Fay et al., 2002; Gross & Souleles, 2002; Lefgren & McIntyre, 2009; Zhang et al., 2015). *Annual Net Income* indicates the annual income of the individual. *Age* represents the age of the consumer. *Education* is the educational attainment of the consumer. It takes the value of 1 if the consumer has a bachelor's degree or above, 0 otherwise. *Family Size* indicates the number of persons in the household. *White* is the racial origin of the individual and it takes the value of 1 if the individual's racial origin is white, 0 otherwise. *Female* indicates the sex of the individual and it takes the value of 1 if the individual is female or 0 if the individual is male.

Since the aforementioned bankruptcy benefit model imposes the restriction that two components of $Bankruptcy\, Benefit_{i,t}$, which are dischargeable debts and eligible assets, must have the same absolute value but opposite sign coefficients. This restriction can be relaxed by slightly modifying the model as follows:

$$Bankruptcy_{i,t+1} = \beta_1 Dischargeable\, Debts_{i,t} + \beta_2 Eligible\, Assets_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}, \quad (8)$$

where, $Bankruptcy\, Benefit_{i,t}$ is replaced by *Dischargeable Debts*$_{i,t}$ and *Eligible Assets*$_{i,t}$ denoted at time t for the individuals who have positive financial benefits or else zero as stated in Equation (1). This allows us to compare the impacts of the two main components of the bankruptcy benefit separately.

We also investigate the role of adverse events on the bankruptcy decision. We derive the adverse events from the previous studies on bankruptcy decision

(Domowitz & Sartain, 1999; Gross & Notowidigdo, 2011; Himmelstein et al., 2005; Sullivan et al., 1989) and estimate the following model:

$$
\begin{aligned}
Bankruptcy_{i,t+1} = &\, \beta_1 Divorced\ or\ Separated_{i;t,t+1} \\
&+ \beta_2 Unemployed_{i;t,t+1} \\
&+ \beta_3 Health\ Problems_{i;t,t+1} + \gamma X_{i,t} + \varepsilon_{i,t},
\end{aligned}
\tag{9}
$$

where, $Divorced\ or\ Separated_{i;t,t+1}$ denotes getting divorced or separated. It takes the value of 1 if the individual gets divorced or separated, otherwise 0. $Unemployed_{i;t,t+1}$ denotes becoming unemployed and takes the value of 1 if the individual gets unemployed, otherwise 0. $Health\ Problems_{i;t,t+1}$ denotes the onset of a serious health problem that limits the physical activity. If the individual experiences the onset of a serious health problem, it takes the value of 1, otherwise 0. All variables are denoted between time t and $t+1$. $X_{i,t}$ indicates the vector of covariates which are the explanatory and control variables explained previously.

5.3 | Bankruptcy type models

In addition to the bankruptcy decision, we also investigate the impact of the financial benefit and adverse events on the bankruptcy types which are classified as '*income gleaning*' and '*fresh start*'. We slightly modify the aforementioned bankruptcy decision models by replacing the bankruptcy decision with the bankruptcy type. The first model to test the role of the bankruptcy benefit on the bankruptcy type is as follows:

$$
Bankruptcy\ Type_{i,t+1} = \beta Bankruptcy\ Benefit_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t},
\tag{10}
$$

where, $Bankruptcy\ Type_{i,t+1}$ denotes the bankruptcy type of individual i at time $t+1$. It is a categorical variable that takes three values (0 for non-bankrupts, 1 for income gleaners, 2 for fresh starters). $Bankruptcy\ Benefit_{i,t}$ denotes the bankruptcy benefit, $X_{i,t}$ the vector of control variables as explained above, and $\varepsilon_{i,t}$ the error term, all at time t.

We also examine the impact of dischargeable debts and eligible assets separately on the choice of bankruptcy type using the following model:

$$
\begin{aligned}
Bankruptcy\ Type_{i,t+1} = &\, \beta_1 Dischargeable\ Debts_{i,t} \\
&+ \beta_2 Eligible\ Assets_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t},
\end{aligned}
\tag{11}
$$

where we replace $Bankruptcy\ Benefit_{i,t}$ with $Dischargeable\ Debts_{i,t}$ and $Eligible\ Assets_{i,t}$.

To investigate the role of adverse events on the choice of bankruptcy type we utilize the following model:

$$
\begin{aligned}
Bankruptcy\ Type_{i,t+1} = &\, \beta_1 Divorced\ or\ Separated_{i;t,t+1} \\
&+ \beta_2 Unemployed_{i;t,t+1} \\
&+ \beta_3 Health\ Problems_{i;t,t+1} + \gamma X_{i,t} \\
&+ \varepsilon_{i,t},
\end{aligned}
\tag{12}
$$

where, all variables and $X_{i,t}$ vector of covariates are as explained above.

5.4 | Estimation of bankruptcy decision and type models

When using survey data to gather information on the bankruptcy decision, two questions are asked: whether filed for bankruptcy and if so, the bankruptcy type. Two types of consumer prevail: bankrupts and non-bankrupts. However, in reality, three types of consumer exist: non-participants (who never participate in the credit markets, thus are not technically able to file for bankruptcy[23]), participant non-bankrupts (who participate in the credit markets, but never filed for bankruptcy) and bankrupts (who filed for bankruptcy). Even though both the non-participants and the participant non-bankrupts are reported as non-bankrupts, they are driven by different factors. Standard probit and ordered probit models cannot account for the excess number of zero observations when the zeros relate to an extra, distinct source. In previous studies, probit models have been combined with Heckman models to deal with sample selection and instrumental variables to deal with endogeneity to solve this problem (Zhang et al., 2015). As in all such studies, it is difficult to identify variables that affect selection but not the outcome.[24]

As an alternative method to deal with these problems, Harris and Zhao (2007) propose the zero-inflated ordered probit (ZIOP) model. Furthermore, the ZIOP model fits well for an ordinal outcome with a high fraction of zeros than would be expected from a standard ordered probit model, also known as zero inflation. In our case, even though there is a dramatic increase in the number of the consumer bankruptcy in recent decades, it is naturally a rare event. Less than 1% of households go bankrupt each year in GB, therefore our data include a high fraction of non-bankrupts. In the context of ZIOP models, zero is an actual 0 value or the lowest outcome category (non-bankrupts in this case).

Harris and Zhao (2007) start by defining a discrete random variable y that is observable and assumes the discrete ordered values of $0, 1, ..., J$. A traditional Ordered Probit (OP) model would map a single latent variable to the observed outcome y that being related to a set of covariates. However, the ZIOP model involves two latent equation. It uses a probit selection equation and an ordered probit equation. In this model, each individual has to overcome two hurdles: whether to participate in the credit markets and then, conditional on participation, whether to file for bankruptcy. Two types of non-bankruptcy may occur. A non-participant individual is automatically ineligible to file for bankruptcy regardless of his financial and adverse events situation, while a participant non-bankrupt individual may file for bankruptcy once the circumstances require.

First, the participation group (participants vs. non-participants in the credit markets) can be modelled using a probit model. Following Harris and Zhao (2007), let r denote indicating $r = 0$ if the individual belongs to the non-participation group or $r = 1$ if the individual belongs to the participation group. r is related to a latent variable r^* via the mapping: $r = 1$ for $r^* > 0$ and $r = 0$ for $r^* \leq 0$.

where, $\mathbf{z}$ is vector of explanatory variables, γ is a vector of coefficients that have to be estimated, and u is the error term. In the ZIOP model, there is no expectation that both $\mathbf{x}$ and $\mathbf{z}$ are the same in each equation. For example, it might be argued that participation in the credit markets is more likely to be affected by socioeconomic factors, whereas being a non-bankrupt after participation is more likely to be affected by financial situation and adverse shocks. In this analysis, $\mathbf{z}$ includes the control variables, while $\mathbf{x}$ includes both explanatory and control variables. The mapping between $\tilde{y}^*$ and $\tilde{y}$ is given as follows.

$$\tilde{y} = \begin{cases} 0 \text{ if } \tilde{y}^* \leq 0, \\ 1 \text{ if } \mu_0 < \tilde{y}^* \leq \mu_1, \\ 2 \text{ if } \mu_1 < \tilde{y}^* \leq \mu_2, \\ \text{and so on.} \end{cases} \tag{16}$$

where, μ is a boundary parameter to be estimated with the assumption of $\mu_0 = 0$. The ordered probit probabilities are given as follows.

$$\Pr(\tilde{y}) = \begin{cases} \Pr(\tilde{y} = 0 | \mathbf{z}, r = 1) = \Phi(-\mathbf{z}'\gamma), \\ \Pr(\tilde{y} = j | \mathbf{z} r = 1 = \Phi(\mu_j - \mathbf{z}'\gamma) - \Phi(\mu_{j-1} - \mathbf{z}'\gamma) (j = 1, ..., J-1), \Pr(\tilde{y} = J | \mathbf{z}, r = 1) = 1 - \Phi(\mu_{J-1} - \mathbf{z}'\gamma). \end{cases} \tag{17}$$

The latent variable r^* represents the propensity for participation and is given by

$$r^* = \mathbf{x}'\boldsymbol{\beta} + \varepsilon, \tag{13}$$

where, $\mathbf{x}$ is vector of covariates that determines participation, $\boldsymbol{\beta}$ is a vector of coefficients that have to be estimated, and ε is the error term. With the probit model, the probability of participation is given by

$$\Pr(r = 1 | \mathbf{x}) = \Pr(r^* > 0 | \mathbf{x}) = \Phi(\mathbf{x}'\boldsymbol{\beta}), \tag{14}$$

where, $\Phi(\cdot)$ is the cumulative distribution function of the univariate standard normal distribution. Next, conditioning on $r = 1$, participation levels $\tilde{y}$ ($\tilde{y} = 0, 1, ..., J$) are modelled using an ordered probit (OP) model via a second underlying latent variable $\tilde{y}^*$; these levels may also include 0.

$$\tilde{y}^* = \mathbf{z}'\gamma + u, \tag{15}$$

Note that r and $\tilde{y}$ are both unobservable in terms of the zeros. The observed response variable is $y = r\tilde{y}$. Thus, the zero outcome occurs when $r = 0$ (the individual is a non-participant in the credit markets) or occurs when $r = 1$ and $\tilde{y} = 0$ (the individual is a participant non-bankrupt). To observe a positive y, it is a joint requirement that $r = 1$ and $\tilde{y}^* > 0$. It is assumed that ε and u identically and independently follow standard Gaussian distributions. Therefore, the full probabilities for y are given as follows.

$$\Pr(y) = \begin{cases} \Pr(y = 0 | \mathbf{z}, \mathbf{x}) = [1 - \Phi(\mathbf{x}'\boldsymbol{\beta})] + \Phi(\mathbf{x}'\boldsymbol{\beta})\Phi(-\mathbf{z}'\gamma), \\ \Pr(y = j | \mathbf{z}, \mathbf{x}) = \Phi(\mathbf{x}'\boldsymbol{\beta})\left[\Phi(\mu_j - \mathbf{z}'\gamma) - \Phi(\mu_{j-1} - \mathbf{z}'\gamma)\right] \\ (j = 1, ..., J-1), \\ \Pr(y = J | \mathbf{z}, \mathbf{x}) = \Phi(\mathbf{x}'\boldsymbol{\beta})[1 - \Phi(\mu_{J-1} - \mathbf{z}'\gamma)]. \end{cases} \tag{18}$$

The equation above indicates the inflation of non-bankruptcy as it is a combination of non-participation in the credit markets from the probit model and participant

non-bankrupts from the ordered probit process. After the full set of probabilities has been specified and given an *i.i. d.* sample of size N from the population on $(y_i, \boldsymbol{x}_i, \boldsymbol{z}_i), i = 1, ..., N$, the parameters of the full model $\theta = (\beta', \gamma', \mu')'$ can be estimated using maximum likelihood (ML) criteria. The log-likelihood function is given as follows.

$$l(\theta) = \sum_{i=1}^{N} \sum_{j=0}^{J} h_{ij} \ln[\Pr(y_i = j | \boldsymbol{x}_i, \boldsymbol{z}_i, \theta)], \qquad (19)$$

where, h_{ij} will be 1 if individual i chooses outcome j, and 0 otherwise. Traditional ordered probit models treat all observations with zero-valued outcomes as a homogeneous group. By contrast, the ZIOP models assume that zeros could occur in the data as members of two unobservable groups. Individuals in the non-participant group have outcome 0 as the only possible value. The second group, in addition to 0, may also assume any of the other values, $0, 1, ..., J$. In a non-nested situation, information-based model selection criteria, such as AIC and BIC, are appropriate for choosing between the OP and ZIOP model.

In our study, the outcome is an ordered discrete response with three levels coded as 0 for 'non-bankrupts', 1 for 'income gleaning', 2 for 'fresh start'. At this level, it is better to understand these discrete categories have a natural ordering. In the UK bankruptcy code, the bankruptcy types can be categorized into two parts: 'income gleaning' and 'fresh start'. For income gleaning, the debts are mostly reorganized and partially discharged rather than a full discharge. It is expected that the income gleaner will pay a part of his debts from his future income. Therefore, the income gleaning can be considered as 'semi-bankruptcy'. On the other hand, almost all of the debts are discharged under the 'fresh start' bankruptcy and no debt payment is made from the future income after the bankruptcy procedure. Therefore, the fresh start can be considered as 'full-bankruptcy'. This situation shows the natural ordering in bankruptcy categories which justifies the use of an ordered model rather than a multinomial model.

To be able to file for bankruptcy, an individual must participate in credit markets. Conditional on participating, they can decide whether to file for bankruptcy or not. The first decision is a binary choice and is modelled using a probit model, while the second is an ordered choice and is modelled using an ordered probit model. In other terms, to account for the excess of zeros, the ZIOP model allows for zero observations to occur in two ways: as a realization of the probit model (non-participants) and as a realization of the ordered probit model when the binary random variable in the probit model is 1 (participant non-bankrupts).

5.5 | Estimation of the cost of bankruptcy on credit access

We define the bankruptcy cost on credit access as the difference between the credit access for each individual who filed for bankruptcy and the credit access that would have been if they had not filed for bankruptcy (Cohen-Cole et al., 2013). This requires the estimation of counterfactual credit access for individuals who file for bankruptcy. Using the time dimension of the dataset, we estimate the credit cost of bankruptcy of those individuals that file for bankruptcy between two observations. To do so, first, using the sample of individuals that have never filed for bankruptcy between two consecutive observations, we estimate the following model:

$$CreditAccess_{i,t+1} = \beta CreditAccess_{i,t} + \gamma \boldsymbol{X}_{i,t} + u_{i,t}, \qquad (20)$$

where, $CreditAccess_{i,t}$ and $CreditAccess_{i,t+1}$ denotes the unsecured credit available to individual i who never filed for bankruptcy at time t and $t+1$, respectively. $\boldsymbol{X}_{i,t}$ is the vector of explanatory and control variables, and $u_{i,t}$ is the error term, both at time t. $\boldsymbol{X}$ includes *Bankruptcy Decision*, which takes the value of 1 if the individual files for bankruptcy, otherwise 0. In a similar fashion, we use *Fresh Start* and *Income Gleaning* as explanatory variables to identify different bankruptcy types. Control variables include *age*, *education level*, marital *status, family size, ethnicity* and *gender* (definitions are as explained above in Section 4.2). Subsequently, we predict the credit access for the individuals who filed for bankruptcy between time t and $t+1$ by using (1). This estimates the credit limit that would have been available at $t+1$ if they had not filed for bankruptcy:

$$\widehat{CreditAccess}_{j,t+1} = \widehat{\beta} CreditAccess_{j,t} + \widehat{\gamma} \boldsymbol{X}_{j,t} + u_{j,t}, \qquad (21)$$

where, $\widehat{CreditAccess}_{j,t+1}$ is the predicted credit access for individuals at time $t+1$ who filed for bankruptcy between time t and $t+1$. The difference between the actual credit access and the predicted credit access is the cost of bankruptcy on access to credit which can be shown as follows:

$$BankruptcyCost_{j,t+1} = CreditAccess_{j,t+1} - \widehat{CreditAccess}_{j,t+1}, \qquad (22)$$

where, $BankruptcyCost_{j,t+1}$ denotes the cost of bankruptcy which takes a negative value if the individual obtains less credit after filing for bankruptcy than the predicted credit access.

As we analyse the credit access of bankrupt individuals compared to non-bankrupt individuals, a potential selection bias problem might arise as the differences between the two types may stem from various other observable characteristics. Hence, being a bankrupt individual may more likely to be endogenous. To alleviate the selection bias, if any, we use the difference in differences (DID) propensity score matching (PSM) (Rosenbaum & Rubin, 1983).

Following a similar structure with Caliendo and Kopeinig (2008), we define the sample of bankrupt individuals as the treatment group ($D = 1$) and non-bankrupt participants as the control group ($D = 0$). Then, the treatment group is matched with the control group based on its propensity score which is a function of observable characteristics of the individuals:

$$P(X) = prob(D = 1|X) = E(D|X), \qquad (23)$$

where, X denotes the individual characteristics drawn from the existing literature (Jagtiani & Li, 2015). If it is assumed that there is no significant difference in the unobservable variables between the matched groups, the difference in access to consumer credit can stem from having the treatment which is being a bankrupt individual.[25]

Following Dehejia and Wahba (2002), we match the individuals based on the nearest neighbour with the replacement and propensity scores are estimated with a probit model. As robustness checks, we also match the individuals using radius, kernel and stratification methods with common support and estimates the results. The *nearest neighbour* matching requires that for each treated observation i, we select a control observation j with the closest propensity score, $\min |p_i - p_j|$. Replacement means that each control observation can be used as a match to several treated observations. For the *radius matching*, each treated observation i is matched with control observations j that fall within a specified radius, $|p_i - p_j| < r$. For this study, we choose $r = 0.1$ which is commonly used in the literature. For *kernel matching*, each treated observation i is matched with all control observations, with weights inversely proportional to the distance between treated and control observations. *Stratification matching* partitions the common support of the propensity score into a set of intervals and compare the outcomes within these intervals. All these matching methods are defined in the region of common support which restricts matching only based on the common range of propensity scores. Propensity scores are estimated using a probit model utilizing the individual's characteristics. These characteristics are age, income, formal loans, informal loans, education level, family size, marital status, ethnicity and gender. We calculate the average treatment effect on the treated (ATT) both for short term (1 year) and long term (3 years).

6 | RESULTS

6.1 | Summary statistics

Summary statistics comparing bankrupt versus non-bankrupt individuals are presented in Table 2. The total sample includes 66,050 adults, 485 of them are bankrupts, who have entered into a type of insolvency proceeding. Since bankrupts are less than 1% of the total sample, summary statistics for total sample and non-bankrupts are very close to each other, whereas summary statistics for bankrupts differ substantially from the non-bankrupts. On average, the non-bankrupts have greater annual income, more assets and less debts than the bankrupts have. The mean value of bankruptcy benefit for non-bankrupts is considerably less than that for bankrupts. A typical non-bankrupt's bankruptcy benefit is £453, while a typical bankrupt's benefit is £6163 from filing for bankruptcy. Bankruptcy filers have significantly higher debts, on average £7436 dischargeable debts compared to £1684 for the non-bankrupts. Additionally, bankruptcy filers have lower assets for liquidation in case of bankruptcy. The value of assets of a typical bankrupt is £2126, while a typical non-bankrupt's assets are worth £42,390. Bankruptcy filers are also younger and less educated. Both bankrupts and non-bankrupt individuals are similar in terms of ethnic origin and gender. In relation to adverse events, 1.3% of non-bankrupts get divorced or separated, while this ratio is 3.1% for bankrupts. Bankrupt individuals have a higher job loss percentage and 5.4% of bankrupts become unemployed, whereas it is only 1.8% for non-bankrupts. Bankrupts experiencing a serious health problem are 10.9% in comparison to 4.1% for non-bankrupts.

In Table 3, we divide the bankrupt sample into two as income gleaners and fresh starters. In the sub-samples, 382 of bankrupts are identified as income gleaning bankrupts, while only 103 of them are identified as fresh start bankrupts. Differences are observed in the characteristics of the two groups. Fresh starters have lower incomes than the income gleaners. The annual income of a typical income gleaner is £14,915 which is very close to a typical non-bankrupt, whereas on average, the average income is just £8074 for a fresh starter. The income gleaners have slightly more debts than the fresh starters both before and after bankruptcy. On average, an income gleaner has £7739 of dischargeable debts before bankruptcy, while a typical fresh starter has £6.308 of formal

TABLE 2 Summary statistics—bankruptcy decision.

Variables	Total sample ($t+1$)		Non-bankrupts ($t+1$)		Bankrupts ($t+1$)	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Bankrupt ($=1$) ($t+1$)	0.007	0.085	0	0	1	0
Bankruptcy benefit (£) (t)	−41,268	1,59,735	−41,606	1,60,269	4409	16,718
Bankruptcy benefit (if benefit >0) (£) (t)	975	5410	453	936	6163	12,603
Dischargeable debts (£) (t)	1726	6554	1684	6465	7436	12,921
Dischargeable debts (if benefit >0) (£) (t)	1270	6294	1228	6198	7005	12,985
Eligible assets (£) (t)	42,095	1,59,377	42,390	1,59,926	2126	10,751
Eligible assets (if benefit >0) (£) (t)	178	1402	177	1403	335	1256
Annual net income (£) (t)	16,397	22,258	16,418	22,311	13,412	13,047
Age (t)	53.19	16.699	53.27	16.704	42.99	12.364
Education (degree or above) ($=1$) (t)	0.232	0.422	0.233	0.423	0.088	0.284
Family size (t)	2.55	1.244	2.54	1.242	2.97	1.425
White ($=1$) (t)	0.938	0.239	0.939	0.239	0.927	0.259
Female ($=1$) (t)	0.527	0.499	0.527	0.499	0.538	0.499
Adverse events						
Get divorced or separated ($=1$) ($t; t+1$)	0.014	0.116	0.013	0.115	0.031	0.173
Get unemployed ($=1$) ($t; t+1$)	0.018	0.134	0.018	0.133	0.054	0.225
Get health problems ($=1$) ($t; t+1$)	0.081	0.274	0.041	0.273	0.109	0.312
Number of observations	66,050		65,565		485	

Source: Wealth and Assets Survey.

debt. The value of assets of a typical income gleaner is £2306, while a typical non-bankrupt's assets are worth only £1459. As expected, it seems that having a regular income plays an important role in the choice of bankruptcy type. The fresh starters and the income gleaners have similar age categories. The fresh starters are less educated than the income gleaners. The two sub-groups are similar in terms of ethnic origin. Related to adverse events, 4.9% of the fresh starters get divorced or separated, while it is only 2.6% for the income gleaners. The job loss rate is similar for both types, which is 5.5% for the income gleaners and 5.1% for fresh starters. Health problem as an adverse event differs according to the bankruptcy types, where 11.9% and 7.6% of the income gleaners and fresh starters experience a serious health problem, respectively.

6.2 | Results of bankruptcy decision estimations

Results for the bankruptcy decision is presented in Table 4. We find a positive relationship between the *Bankruptcy Benefit* and the bankruptcy decision, significant at 1% level, showing that individuals are more likely to file

for bankruptcy strategically when they financially benefit from it. This result is in line with the predictions of the *strategic behaviour theory* as well as with the empirical results of Fay et al. (2002) and Zhang et al. (2015). They find that households in the US respond to financial incentives when making bankruptcy decisions. Our results show that households in Great Britain show similar behaviour.

The coefficients of *Annual Net Income, Age and Education* are all negative and significant at 1% level. Our results show that individuals are less likely to file bankruptcy if they have higher income, showing their ability to repay debt. These findings confirm earlier results from the US studies (Fay et al., 2002; Gross & Souleles, 2002; Lefgren & McIntyre, 2009; Sullivan et al., 1994; Zhang et al., 2015). We also find that the likelihood of bankruptcy is lower for more educated individuals in Great Britain, in line with the findings of the previous US studies (Fay et al., 2002; Lefgren & McIntyre, 2009; Zhang et al., 2015). Furthermore, our results show that in Great Britain older individuals are less likely to bankrupt, as they are more likely to accumulate more wealth over time and need lower levels of financing. Our result on age is also similar to the findings of the previous studies that older individuals are less likely to bankrupt (Fay et al., 2002; Lefgren & McIntyre, 2009).

TABLE 3 Summary statistics—bankruptcy types.

| Variables | Total sample (t + 1) | | Non-bankrupts (t + 1) | | Bankrupts (t + 1) | | | |
| | | | | | Income gleaning | | Fresh start | |
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Bankrupt (= 1) (t + 1)	0.007	0.085	0	0	1	0	1	0
Bankruptcy benefit (£) (t)	−41,268	1,59,735	−41,606	1,60,269	4533	17,438	3949	13,787
Bankruptcy benefit (if benefit > 0) (£) (t)	975	5410	453	936	6343	12,963	5495	11,198
Dischargeable debts (£) (t)	1726	6554	1684	6465	7739	13,295	6308	11,418
Dischargeable debts (if benefit > 0) (£) (t)	1270	6294	1228	6198	7256	13,359	6076	11,504
Eligible assets (£) (t)	42,095	1,59,377	42,390	1,59,926	2306	11,487	1459	7421
Eligible assets (if benefit > 0) (£) (t)	178	1402	177	1403	391	1386	1267	5071
Annual net income (£) (t)	16,397	22,258	16,418	22,311	14,915	13,123	8074	11,260
Age (t)	53.19	16.699	53.27	16.704	42.59	12.613	44.42	11.228
Education (degree or above) (= 1) (t)	0.232	0.422	0.233	0.423	0.099	0.299	0.049	0.216
Family size (t)	2.55	1.244	2.54	1.242	3.05	1.421	2.67	1.409
White (= 1) (t)	0.938	0.239	0.939	0.239	0.929	0.256	0.922	0.269
Female (= 1) (t)	0.527	0.499	0.527	0.499	0.531	0.499	0.563	0.498
Adverse events								
Get divorced or separated (= 1) (t; t + 1)	0.014	0.116	0.013	0.115	0.026	0.159	0.049	0.215
Get unemployed (= 1) (t; t + 1)	0.018	0.134	0.018	0.133	0.055	0.228	0.051	0.216
Get health problems (= 1) (t; t + 1)	0.081	0.274	0.041	0.273	0.119	0.313	0.076	0.311
Number of observations	66,050		65,565		382		103	

Source: Wealth and Assets Survey.

| Variables | Bankruptcy | | |
	Coef.	(Std. err.)	Margin
Bankruptcy benefit	0.142***	(0.025)	0.269***
Annual net income	−0.109***	(0.018)	−0.175***
Age	−0.017***	(0.001)	−0.003***
Education (degree or above) (= 1)	−0.283***	(0.056)	−0.387***
Family size	0.030*	(0.016)	0.032*
White (= 1)	0.005	(0.076)	0.001
Female (= 1)	−0.008	(0.056)	−0.000
Number of observations		66,050	
Wald χ^2		454.92	
Prob > χ^2		0.0000	
Pseudo R^2		0.0794	

TABLE 4 Bankruptcy benefit model—bankruptcy decision.

Note: The numbers reported are the coefficients estimated using probit model. Robust standard errors, which are corrected by allowing error terms for the same individual to be correlated over time, are reported in parentheses. We use the usual convention ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ to indicate whether independent variables are statistically significant. All pound values are in £10,000 increments.

TABLE 5 Debts and assets model—bankruptcy decision.

Variables	Bankruptcy		
	Coef.	(Std. err.)	Margin
Dischargeable debts	0.183***	(0.024)	0.343***
Eligible assets	−0.047***	(0.011)	−0.088***
Annual net income	−0.103***	(0.011)	−0.177***
Age	−0.017***	(0.001)	−0.003***
Education (degree or above) (= 1)	−0.281***	(0.059)	−0.385***
Family size	0.027*	(0.016)	0.001*
White (= 1)	0.006	(0.076)	0.001
Female (= 1)	−0.009	(0.037)	−0.000
Number of observations		66,050	
Wald χ^2		501.22	
Prob > χ^2		0.0000	
Pseudo R^2		0.0850	

Note: The numbers reported are the coefficients estimated using probit model. Robust standard errors, which are corrected by allowing error terms for the same individual to be correlated over time, are reported in parentheses. We use the usual convention ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ to indicate whether independent variables are statistically significant. All pound values are in £10,000 increments.

The bankruptcy benefit model imposes the restriction that dischargeable debts and eligible assets must have the same absolute value but opposite sign coefficients. This restriction can be relaxed, and these two variables can be tested separately. If the dischargeable debts and eligible assets affect the bankruptcy decision equally, then their coefficients will be equal in absolute value but opposite in sign. The results, presented in Table 5, indicate that the coefficient of the *Dischargeable Debts* is positive while the coefficient of the *Eligible Assets* is negative. Both coefficients are statistically significant at 1% level. However, the margin value of the dischargeable debts is considerably greater than the margin value of the eligible assets in magnitude. These results suggest that the discharge of debts is the dominant factor in the bankruptcy decision when it is compared to the assets liquidated under bankruptcy procedures. Comparing our findings to the previous literature based on the US data, the results are in line with Fay et al. (2002) and Zhu (2011) who also find that individuals are more likely to file bankruptcy if they have higher debt levels. Similarly, Domowitz and Sartain (1999) show that consumers with more credit card debt are more likely to file for bankruptcy. On the asset ownership, we confirm Zhu's (2011) findings who also conclude that filing for bankruptcy is lower for households with more assets.

We also estimate the effect of adverse events on bankruptcy decision. Results are presented in Table 6. We find that all of the adverse event variables are statistically significant at 1% level and have positive signs as expected. These results show that adverse events in the form of

unemployment, health problems and divorce has a direct impact on individuals filing bankruptcy. This is plausible as such events cause financial distress either in the form of income reduction of debt increase which may eventually result in bankruptcy. The margin value of the unemployment variable is slightly greater than the coefficients of the other two adverse events, suggesting that becoming unemployed is the dominant factor among adverse events in the bankruptcy decision. This result is in line with Gross and Souleles (2002) who find that unemployed individuals are more likely to file for bankruptcy in the US. Health problems have been observed by many researchers as a significant adverse event that leads to filing bankruptcy (Domowitz & Sartain, 1999; Gross & Notowidigdo, 2011; Himmelstein et al., 2005; Sullivan et al., 1989) and we confirm these results for Great Britain. Our findings on the impact of divorce is also in line with Fay et al. (2002) and Zhang et al. (2015) who find that divorced individuals are more likely to file for bankruptcy. It is worth to mention here that in all specifications the coefficient of the bankruptcy benefit remains almost the same as in the bankruptcy benefit model.

Table 7 shows the summary statistics from the ordered probit (OP) and ZIOP models. As for the information-based model selection criteria, we can see that for bankruptcy filings, the AIC and BIC suggest the superiority of the ZIOP model over the OP model. The results are presented as marginal effects on non-bankrupts ($\text{Pr}(y = 0)$) using the ZIOP model, compared with the results from the probit and ordered probit models which are shown in Table 8. For the ZIOP model, the overall marginal effect

Variables	Bankruptcy		
	Coef.	(Std. err.)	Margin
Bankruptcy benefit	0.141***	(0.025)	0.268***
Age	−0.014***	(0.001)	−0.002***
Education (degree or above) (= 1)	−0.265***	(0.058)	−0.324***
Family size	0.009	(0.016)	0.001
White (= 1)	0.012	(0.073)	0.002
Female (= 1)	0.009	(0.037)	0.001
Adverse events			
Get divorced or separated (= 1)	0.243***	(0.087)	0.461***
Get unemployed (= 1)	0.338***	(0.106)	0.543***
Get health problems (= 1)	0.211***	(0.056)	0.400***
Number of observations		66,050	
Wald χ^2		383.64	
Prob > χ^2		0.0000	
Pseudo R^2		0.0733	

TABLE 6 Adverse events model—bankruptcy decision.

Note: The numbers reported are the coefficients estimated using probit model. Robust standard errors, which are corrected by allowing error terms for the same individual to be correlated over time, are reported in parentheses. Probit regression does not have an equivalent to the R-squared that is found in OLS regression. Instead, McFadden's pseudo R-squared is estimated. We use the usual convention ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ to indicate whether independent variables are statistically significant. All pound values are in £10,000 increments.

on $\Pr(y = 0)$ was divided into two parts: the effect on non-participant ($\Pr(r = 0)$) and the effect on the participant non-bankrupt ($\Pr(r = 1, \tilde{y} = 0)$).

The marginal effects in Table 8 show some interesting differences. For example, annual net income is significantly positively correlated with being non-bankrupt in probit and OP models, However, if non-bankruptcy and non-participation are separated by the ZIOP model, the income is significantly negatively correlated with being non-participant, but positively correlated with being participant non-bankrupt. Similarly, having a degree-level education is positively correlated with non-bankruptcy. The ZIOP model identifies that education is negatively correlated with non-participation, but positively correlated with participant non-bankruptcy. They are all statistically significant. This means that individuals with higher education level and income are more likely to participate in the credit market (which makes them eligible for bankruptcy), but less likely to file for bankruptcy when compared to lower-income and education level individuals.

6.3 | Results of bankruptcy types estimations

We present the results of the Bankruptcy Types estimations in Table 9. We find that both *Bankruptcy Benefit*

TABLE 7 Summary statistics from OP and ZIOP models.

	Filing for bankruptcy	
	OP	ZIOP
Log likelihood	−32,867	−32,483
AIC	66,016	**65,141**
BIC	66,224	**65,474**
LR versus OP		916**

Note: Preferred model with regard to each information criteria is indicated with bold.
** Indicates statistical significance at 5% level.

and *Annual Net Income* are statistically significant at 1% level for both *income gleaning* and *fresh start* bankruptcy types. However, the margin value of the income is noticeably greater for fresh start bankrupts in comparison to income gleaning bankrupts. This result suggests that income is a more important factor for the fresh starters. We find that age and education level are also significant with negative signs. Overall the results for the bankruptcy type model seems to be similar to results in the bankruptcy decision model.

The results for the debts and assets model are presented in Table 10. We find that the coefficient of the *Dischargeable Debt* is positive, and the coefficient of the *Eligible Assets* is negative for both bankruptcy types.

TABLE 8 Marginal effect for non-participant and non-bankrupt.

Variables	Probit Pr(y = 0)	OP Pr(y = 0)	ZIOP Non-participant Pr(r = 0)	Participant non-bankrupt Pr(r = 1, ỹ = 0)	Full Pr(y = 0)
Bankruptcy benefit	−0.176***	−0.149***	-	−0.145***	−0.145***
	(0.033)	(0.028)	-	(0.027)	(0.027)
Annual net income	0.095***	0.114***	−0.136***	0.257***	0.121***
	(0.013)	(0.019)	(0.017)	(0.031)	(0.016)
Age	0.014***	0.018***	−0.001***	0.013***	0.012***
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Education (degree) (=1)	0.219***	0.274***	−0.146***	0.412***	0.266***
	(0.075)	(0.078)	(0.064)	(0.101)	(0.081)
Family size	−0.011	−0.021	0.001	−0.014	−0.013
	(0.062)	(0.059)	(0.057)	(0.046)	(0.069)
White (= 1)	−0.009	−0.009	0.001	−0.009	−0.008
	(0.051)	(0.054)	(0.0039)	(0.081)	(0.067)
Female (= 1)	0.011	0.014	0.004	0.007	0.011
	(0.047)	(0.053)	(0.039)	(0.079)	(0.045)
Number of observations	66,050	66,050	66,050		

Note: Robust standard errors, which are corrected by allowing error terms for the same individual to be correlated over time, are reported in parentheses. We use the usual convention ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ to indicate statistical significance. All pound values are in £10,000 increments. OP stands for ordered probit, while ZIOP is zero-inflated ordered profit.

TABLE 9 Bankruptcy benefit model—bankruptcy types.

Variables	Income gleaning OP Pr(y = 1)	Income gleaning ZIOP Pr(y = 1)	Fresh start OP Pr(y = 2)	Fresh start ZIOP Pr(y = 2)
Bankruptcy benefit	0.154***	0.178***	0.138***	0.145***
	(0.032)	(0.036)	(0.030)	(0.035)
Annual net income	−0.149***	−0.166***	−0.313***	−0.359***
	(0.015)	(0.017)	(0.044)	(0.042)
Age	−0.001***	−0.001***	−0.001***	−0.001***
	(0.001)	(0.001)	(0.001)	(0.001)
Education (degree or above) (= 1)	−0.312***	−0.367***	−0.416***	−0.468***
	(0.081)	(0.088)	(0.095)	(0.101)
Family size	0.001	0.001	0.001	0.001
	(0.055)	(0.057)	(0.041)	(0.038)
White (= 1)	0.001	0.001	0.001	0.001
	(0.055)	(0.056)	(0.068)	(0.076)
Female (= 1)	−0.000	−0.000	0.000	0.000
	(0.058)	(0.057)	(0.085)	(0.089)
Number of observations	66,050	66,050	66,050	66,050

Note: Robust standard errors, which are corrected by allowing error terms for the same individual to be correlated over time, are reported in parentheses. We use the usual convention ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ to indicate statistical significance. All pound values are in £10,000 increments. OP stands for ordered probit, while ZIOP is zero-inflated ordered profit.

TABLE 10 Debts and assets model—bankruptcy types.

| Variables | Income gleaning | | Fresh start | |
	OP Pr($y = 1$)	ZIOP Pr($y = 1$)	OP Pr($y = 2$)	ZIOP Pr($y = 2$)
Dischargeable debts	0.142***	0.165***	0.236***	0.247***
	(0.033)	(0.037)	(0.033)	(0.035)
Eligible assets	−0.061***	−0.059***	−0.169***	−0.165***
	(0.026)	(0.025)	(0.001)	(0.001)
Annual net income	−0.095***	−0.106***	−0.244***	−0.259***
	(0.014)	(0.017)	(0.036)	(0.042)
Age	−0.001***	−0.001***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Education (degree or above) (= 1)	−0.293***	−0.315***	−0.384***	−0.418***
	(0.061)	(0.068)	(0.184)	(0.198)
Family size	0.001	0.001	0.001	0.001
	(0.036)	(0.043)	(0.034)	(0.039)
White (= 1)	0.001	0.001	0.001	0.001
	(0.054)	(0.062)	(0.079)	(0.088)
Female (= 1)	−0.000	−0.000	0.000	0.000
	(0.051)	(0.057)	(0.080)	(0.089)
Number of observations	66,050	66,050	66,050	66,050

Note: Robust standard errors, which are corrected by allowing error terms for the same individual to be correlated over time, are reported in parentheses. We use the usual convention ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ to indicate statistical significance. All pound values are in £10,000 increments. OP stands for ordered probit, while ZIOP is zero-inflated ordered profit.

However, the margin value of the dischargeable debts for fresh starters is considerably greater than the margin value of the dischargeable debts for the income gleaners. These results suggest that discharge of debts is more important for the fresh starters than it is for the income gleaners. On the contrary, we find that the margin value of the eligible assets for income gleaners is considerably greater than the margin value of the eligible assets for the fresh starters. Hence the assets liquidated under the bankruptcy procedures seem to be more important for the income gleaners than it is for the fresh starters. Hence, our results show that debts and assets play different roles in different bankruptcy types. Furthermore, our results are similar to those reported in earlier studies for the US. Domowitz and Sartain (1999) find that households holding more equity in large securable assets are more likely to choose income gleaning (defined as Chapter 13 in the US). Zhu (2011) also find that households with more debt relative to their income are more likely to choose fresh start bankruptcy (Chapter 7) in comparison to income gleaning.

We present the estimates for the effect of adverse events in the consumers' decision on the bankruptcy types in Table 11. We find that becoming unemployed and the onset of a serious health problem are statistically significant for income gleaners, while getting divorced or separated is insignificant. On the other hand, for fresh starters, becoming unemployed and getting divorced or separated are statistically significant, but the onset of a serious health problem is not. These results suggest that adverse events affect the choice of bankruptcy type, and becoming unemployed is an important factor in both bankruptcy types. Individuals who become unemployed are more likely to file for bankruptcy regardless of their choice of bankruptcy type. The margin value of becoming unemployed for income gleaning is greater than that of the fresh start. It suggests that becoming unemployed is more important in income gleaning. Comparing our results to Zhu (2011), they do not find any significant relationship between being divorced or unemployed and bankruptcy type in the US. They report that households facing health problems are likely to choose fresh start.

Individuals who get divorced or separated are more likely to choose the fresh start, aiming to discharge almost all debts. The main driver of this finding could be that since the judge decides how to share the

TABLE 11 Adverse events model—bankruptcy types.

Variables	Income gleaning		Fresh start	
	OP Pr($y = 1$)	ZIOP Pr($y = 1$)	OP Pr($y = 2$)	ZIOP Pr($y = 2$)
Bankruptcy benefit	0.198***	0.210***	0.228***	0.247***
	(0.031)	(0.034)	(0.029)	(0.031)
Age	−0.001***	−0.001***	−0.001***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Education (degree or above) (= 1)	−0.318***	−0.357***	−0.403***	−0.418***
	(0.077)	(0.087)	(0.177)	(0.193)
Family size	0.001	0.001	0.001	0.001
	(0.027)	(0.024)	(0.033)	(0.041)
White (= 1)	0.001	0.001	0.001	0.001
	(0.101)	(0.113)	(0.153)	(0.170)
Female (= 1)	−0.000	−0.000	0.000	0.000
	(0.051)	(0.056)	(0.082)	(0.089)
Adverse events				
Get divorced or separated (= 1)	0.117	0.142	0.632***	0.657***
	(0.286)	(0.272)	(0.212)	(0.223)
Get unemployed (= 1)	0.291***	0.282***	0.191***	0.184***
	(0.139)	(0.133)	(0.073)	(0.088)
Get health problems (= 1)	0.303***	0.315***	0.093	0.083
	(0.077)	(0.085)	(0.151)	(0.145)
Number of observations	66,050	66,050	66,050	66,050

Note: Robust standard errors, which are corrected by allowing error terms for the same individual to be correlated over time, are reported in parentheses. We use the usual convention ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$ to indicate statistical significance. All pound values are in £10,000 increments. OP stands for ordered probit, while ZIOP is zero-inflated ordered profit.

accumulated wealth and debts after the divorce decision, some individuals may end up with a large debt but little wealth. This situation may force them to file for the fresh start bankruptcy as their wealth decreases dramatically. Individuals who experience the onset of a serious health problem are more likely to choose the income gleaning. A plausible explanation could be that health problems may reduce the income dramatically and increase health care expenses, but they do not affect the assets directly. The coefficients of the bankruptcy benefit for both types remain statistically significant as in the bankruptcy benefit model. These results show that even though adverse events may affect the bankruptcy decision their effects may differ widely depending on the bankruptcy type.

These findings may inform policymakers to weigh the trade-off between the strategic behaviour and the adverse events. A fair consumer bankruptcy system is often necessary to smooth the consumption after adverse events; however, it should also deter the strategically oriented individuals. Otherwise, the bankruptcy

system may harm the credit markets and cause interest rates to increase.

6.4 | Results of credit access after bankruptcy

We present propensity score estimating the probability of filing for bankruptcy in Table 12. We find that younger, less educated, and lower-income individuals are more likely to file for bankruptcy. The matching quality indicators are presented in Table 13 which shows substantial reduction in absolute bias for bankrupts, income gleaners and fresh starters. The last two columns of the table indicate that there is a significant total bias reduction and the mean standardized bias after matching is below the 20% level of bias as suggested by Rosenbaum and Rubin (1985). The standardized mean difference for overall covariates used in the propensity score, which was around 18%−20% before matching, is reduced to about 8%−11%

TABLE 12 Propensity score estimations.

Variables	Bankrupts Coef.	(Std. err.)	Income gleaners Coef.	(Std. err.)	Fresh starters Coef.	(Std. err.)
Income	−0.001***	0	−0.001**	(0.000)	−0.001***	0
Age	−0.017***	−0.002	−0.015***	(0.002)	−0.019***	−0.004
Education (degree or above)	−0.355***	−0.088	−0.347***	(0.095)	−0.338***	−0.081
Family size	0.030	−0.026	0.044	(0.027)	−0.038	−0.055
Single	0.152**	−0.066	0.065	(0.075)	0.315	−0.125
Unemployed	−0.011	−0.144	0.083	(0.150)	−0.395	−0.337
White	−0.100	−0.103	−0.133	(0.110)	−0.128	−0.244
Female	−0.042	−0.056	−0.034	(0.061)	−0.060	−0.105
Constant	−1.510***	−0.206	−1.690***	(0.224)	−1.888***	−0.413
Number of observations	29,160		29,120		29,024	

Note: The numbers reported are the coefficients of probit models estimating the propensity score, defined in this case as the probability of being bankrupt, income gleaner and fresh starter, respectively. Standard errors are reported in parentheses. Statistical significance is indicated as ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

TABLE 13 Matching quality indicators before and after matching.

Outcome	Matching method	Pseudo R-sq before matching	Pseudo R-sq after matching	p-value before matching	p-value after matching	Mean standardized bias before matching	Mean standardized bias after matching	Total % |bias| reduction
Bankruptcy	NNM	0.121	0.044	0.000	0.216	18.171	8.154	55.1
	KM	0.121	0.051	0.000	0.254	18.171	7.943	56.3
Income gleaning	NNM	0.087	0.032	0.000	0.476	15.216	9.532	37.4
	KM	0.087	0.039	0.000	0.439	15.216	8.326	45.3
Fresh start	NNM	0.177	0.052	0.000	0.615	20.514	11.789	42.6
	KM	0.177	0.043	0.000	0.582	20.514	10.521	48.7

Abbreviations: KM, kernel matching with bandwidth 0.06 and common support; NNM. nearest neighbour matching with replacement and common support.

after matching. This reduces total bias around 50% through matching and indicates that the covariates were significantly balanced as a result of the propensity score matching procedure. Furthermore, as suggested by Sianesi (2004), pseudo R-squared after matching is fairly low and p-values after matching are insignificant, suggesting that the overall results from the matching procedure are satisfactory in balancing the covariates between the bankrupts and non-bankrupts.

Results of the ATT comparing the ability of various bankrupt individuals in accessing credit after bankruptcy is presented in Table 14. For the short-term (1 year), shown in Panel A, we find that the credit access for bankrupts is around £900 less than the credit access that would have been if they had not filed for bankruptcy. As robustness checks, the results are also consistent in all matching methods and all of them are

statistically significant at the 1% confidence level. The findings support Cohen-Cole et al. (2013) who find that bankrupt individuals are indeed excluded from the credit markets.

Our findings for bankruptcy types suggest that both income gleaners and fresh starters are excluded from the credit market to some extent. The credit access for the income gleaners is around £500 less than the credit access that would have been if they had not filed for bankruptcy, whereas the credit access is approximately £2000 less for the fresh starters. These results suggest that fresh starters are excluded from the credit market more severely than the income gleaners in the short term. These results are comparable to the literature. For example, similar to our findings, Jagtiani and Li (2015) state that income gleaning bankrupts end up with larger credit access than fresh start bankrupts because they are able to

TABLE 14 Average treatment effect on the treated.

	Bankrupts		Income gleaners		Fresh starters	
	ATT	(Std. err.)	ATT	(Std. err.)	ATT	(Std. err.)
Panel A: Short-term (1 year)						
Nearest neighbour matching	−930.261***	−436.409	−434.743***	−275.475	−2019.118***	−752.340
Radius matching	−874.312***	−362.218	−472.312***	−287.513	−1946.612***	−656.834
Kernel matching	−818.686***	−423.025	−467.149***	−282.836	−1960.809***	−671.258
Stratification matching	−847.997***	−495.507	−506.777***	−293.555	−1939.407***	−643.056
Panel B: Long-term (3 years)						
Nearest neighbour matching	−2511.031***	−608.752	−2471.993***	−925.821	−1384.988***	−331.121
Radius matching	−2483.742***	−703.209	−2516.943***	−817.216	−1372.095***	−391.204
Kernel matching	−2406.143***	−888.034	−2532.311***	−916.830	−1362.862***	−485.165
Stratification matching	−2464.736***	−717.919	−2597.558***	−797.526	−1340.819***	−179.080
Number of observations						
Nearest neighbour matching	912		708		198	
Radius matching	4316		3518		982	
Kernel matching	29,160		29,120		29,024	
Stratification matching	29,160		29,120		2904	

Note: The numbers reported are the results for the propensity score matching estimates of the average treatment effect (ATT) of being a bankrupt, an income gleaner and a fresh starter on the access to credit, respectively. Robust standard errors are bootstrapped and reported in parentheses. Statistical significance is indicated as ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

maintain more of their old credit before the bankruptcy filing.

We present the ATT for the long-term (3 years) in Panel B. We find that credit access for bankrupts are approximately £2500 less than the credit limits that would have been if they had not filed for bankruptcy 3 years after filing for bankruptcy. Income gleaners can access around £2500 less credit than their non-bankrupt counterparts. The fresh starters can also access around £1350 less credit than they would have received if they had not filed for bankruptcy.

These results suggest that the exclusion of income gleaners becomes more severe in the long term. The cost of bankruptcy was around £500 in the short term, but it increases by around £2000 and becomes £2500 in the long term. On the other hand, the exclusion of fresh starters softens in the long term. The cost of bankruptcy was approximately £2000 in the short term but it decreases to £1350 in the long term.

Jagtiani and Li (2015) argue that creditors do not treat income gleaning bankruptcy more favourably than fresh start bankruptcy. This argument is supported by our findings. Access to credit for income gleaners worsens in the long term, while it gets better for the fresh starters. Furthermore, Cohen-Cole et al. (2013) state that bankrupts are excluded from the credit markets, but this exclusion is very short-lived. Our findings suggest that this

statement is true for fresh starters, but not income gleaners. The bankrupt individuals are indeed excluded from the credit markets, but the characteristics of the financial exclusion are different for different bankruptcy types. The exclusion of fresh starters from the credit markets is dramatic, swift but short-lived, while the exclusion of the income gleaners is gradual, slow but lasts longer.

The study has important policy implications. The results may help policymakers to assess the effectiveness of the current bankruptcy law in providing relief to income gleaners. Even though fresh starters are excluded from the credit markets immediately after the bankruptcy filing, they are able to regain access to credit soon thereafter. Our findings suggest that fresh starters can get the easiest access to credit afterwards, and they are punished less than the income gleaners. The impact of the consumer bankruptcy on the credit access for income gleaners seem to be long-lasting.

7 | CONCLUSION

We examine the effect of the bankruptcy benefit and adverse events on the consumer bankruptcy decision and access to credit after bankruptcy in Great Britain using a unique longitudinal survey covering over 60,000 individuals. We find that consumers are more likely to

enter into bankruptcy proceedings when the bankruptcy benefit increases. However, separating the effect into two components as dischargeable debts and eligible assets, our findings suggests that the dischargeable debt is the dominant factor in the consumer bankruptcy decision. We also examine the effects of adverse events on bankruptcy decision and find that becoming unemployed is the dominant factor among adverse events.

We also test whether consumers behave strategically and examine whether bankruptcy benefit and adverse events matter for the choice of bankruptcy type. We find that debts and assets play different roles in different bankruptcy types. Bankruptcy benefit effect on bankruptcy decision is significant regardless of the bankruptcy type. However, our findings show that discharge of debts component of bankruptcy benefit is more important for the fresh starters, while assets liquidated under the bankruptcy procedures is more important for the income gleaners. We find that becoming unemployed is a major determinant of consumer bankruptcy, regardless of type. Individuals facing serious health problems prefer income gleaning, whereas individuals who get divorced or separated are more likely to choose the fresh start.

The analysis on the effects of the consumer bankruptcy on access to credit afterwards shows that bankrupt individuals are excluded from the credit markets and the magnitude is different for different bankruptcy types. The fresh starters' credit exclusion is dramatic, swift but short-lived, while the exclusion of the income gleaners is gradual, slow but lasts longer.

Our findings may inform policymakers to weigh the trade-off between the strategic behaviour and the adverse events. In addition, access to credit is generally considered as a financial necessity, and the inability of individuals to access to credit may harm the economic activity. A fair consumer bankruptcy system is often necessary to smooth the consumption after adverse events; however, it should also deter the strategically oriented individuals. Otherwise, the bankruptcy system may harm the credit markets and cause interest rates to increase.

The models presented in this study are simplified to represent the main aspects of the bankruptcy decision. As is the case for all models, our models have some limitations. They do not capture all the relevant aspects of the consumer bankruptcy such as the role of social stigma, information, access to credit after bankruptcy, entrepreneurial activities and work incentives. However, data limitations prevent analysing all these related aspects.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the UK's Office for National Statistics (ONS). Restrictions apply to the availability of these data, which were used under license for this study. Data are available from https://beta.ukdataservice.ac.uk/datacatalogue/series/series?id=2000056#!/access-data with the permission of ONS and UK Data Service.

ORCID

Alper Kara https://orcid.org/0000-0002-8560-0501
Ahmad Hassan Ahmad https://orcid.org/0000-0002-6004-0181

ENDNOTES

[1] The total debt held by the average British consumer was £30,832 in 2018, which is around 112% of average earnings and the average debt has been steadily increasing.

[2] A spike is particularly observed after 2002 as a major reform in the bankruptcy law was introduced in the UK by Enterprise Act of 2002. The reform has made the consumer bankruptcy more pro-debtor by reducing the discharge of debts no later than 1 year which was previously 3 years. The main policy objective of the act was to encourage post-bankruptcy entrepreneurial activity and increase post-bankruptcy labour participation.

[3] A partial list includes Sullivan et al. (1989), White (1998a), Domowitz and Sartain (1999), Gross and Souleles (2002), Fay et al. (2002) and Han and Li (2011).

[4] See Chatterjee and Gordon (2012) for a discussion on the implications of eliminating bankruptcy protection for indebted individuals.

[5] For a more detailed discussion, see White (2005).

[6] There are four different types of bankruptcy procedures in Great Britain. These types can be categorized into two parts as the discharge of debts (fresh start) and reorganization of debts (income gleaning). Similarly, there are two types of bankruptcy in the US. One is liquidation under Chapter 7 and the other one is reorganization under Chapter 13.

[7] The ZIOP model is discussed in detail in Section 5.4.

[8] Great Britain includes England, Scotland and Wales, but excludes Northern Ireland and 97.2% of the UK's population live in Great Britain. Since our dataset includes representative households from Great Britain, we use 'Great Britain' rather than the 'UK' even though some sources use them interchangeably.

[9] In the literature 'consumer bankruptcy', 'household bankruptcy', 'individual bankruptcy' and 'personal bankruptcy' are used interchangeably.

[10] The debtor can keep some job related or household items like tools, clothing and furniture. The debtor's pension wealth is not subject to the bankruptcy either. The US bankruptcy law is more pro-debtor. In addition to these items, the bankrupt filers can also keep their primary residence, so the bankruptcy benefit is expected to be higher in the US than in the GB.

[11] Non-dischargeable debts also include criminal penalties, debts arising from fraud and liabilities arising from family or domestic court action like claims for child support.

[12] For more information, please see Skene and Walters (2006).

[13] All sequestrations are administered by a trustee, who has similar functions with the official receiver in England and Wales, appointed by the court who is a public official. As in the bankruptcy order, the debtors surrender their eligible assets. In return, they obtain a discharge of all debts and obligations for which they were liable at the date of sequestration. Similar to Enterprise Act 2002, a major reform of bankruptcy is introduced with the Bankruptcy and Diligence etc. (Scotland) Act 2007 which reduced the required time for the discharge of debts.

[14] The debtor has to live and work in the UK for the last 3 years and has not applied for a DRO within the last 6 years.

[15] Like IVAs, PTDs bind all creditors and they generally provide for the debtor to make appropriate contributions from income, and in practice many PTDs are income-only because the debtor has no non-exempt assets. PTDs are an alternative to sequestration for the debtors with income. The debtor obtains debt relief and the creditors usually receive better returns than they would have in sequestration.

[16] DASs are an agreement between the debtor and the creditors to reorganize the debt repayment schedule. All creditors whose debts are included must consent to it. DASs are primarily an income-based debt management tool. Even though it is possible to include assets in DASs, many debtors have no assets or choose the DAS precisely because they wish to manage their debts without liquidating their assets.

[17] They find that an increase of $1000 in financial benefit is associated with 7% increase in the probability of filing for bankruptcy.

[18] Social stigma can be in different forms such as negative views of friends and family or inability in obtaining credit.

[19] Knowledge of eligibility, application procedures, bureaucratic details, and so forth may matter on the bankruptcy decision.

[20] The first wave (Wave 1) interviews were carried out from July 2006 to June 2008, covering about 53,300 adult (aged over 16) individuals and 30,500 households. For the second wave (Wave 2), same households were interviewed again from July 2008 to July 2010. Due to the attrition, interviews were achieved with approximately 34,500 adults and 20,000 households. In the third wave (Wave 3), addition to follow-up respondents at Wave 1 and Wave 2, a new cohort was introduced, which is a new random sample of around 12,000 addresses. Wave 3 covered July 2010–June 2012 and was achieved with about 40,400 adults and 21,400 households. Finally, the fourth wave (Wave 4) interviewed 38,300 adults and 20,200 households in July 2013–June 2014.

[21] For example, Wave 1 interviews conducted during July 2006 would be repeated for Wave 2 in July 2008. It is important that this gap remains constant so that estimates of change are comparable from wave to wave.

[22] For a discussion on why the actual rate is considerably low compared to bankruptcy benefits suggest see White (1998a).

[23] It is possible that some individuals are excluded from financial market voluntarily or involuntarily. On the one hand, some individuals may have informal debts from friends or relatives and do not use any formal credit options voluntarily. On the other hand, some individuals may be rejected by financial institutions even though they apply for credit, hence are excluded from the market involuntarily. These individuals are not technically able to file for bankruptcy even though they have positive financial benefits or have experienced adverse events. Since the consumer bankruptcy is a legal process, bankruptcy filers must have formal debts from financial intermediaries in the form of a consumer loan or a credit card loan.

[24] For more information see Sartori (2003).

[25] It is acknowledged that the limitations of this assumption which relies on the selection on observables and PSM only corrects the selection bias among included observable characteristics. While this study controls for a set of covariates to explain access to consumer credit, it cannot be completely ruled out that the existence of unobservable characteristics may still bias the treatment effect (Berkovec et al., 1996; Han, 2011; Pager & Shepherd, 2008).

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