Addressing Over-Indebtedness in South Africa: What role should supply-side and demand-side interventions play?

This paper examines over-indebtedness in South Africa and argues that supply regulation, in the absence of targeted demand-side interventions, will be insufficient to address it. A two-stage game theoretic model of supply-side intervention is constructed and used to illustrate the limits to intervention that result from the government-credit lender interaction. The model's implications are then assessed in the context of the measures instituted through the National Credit Act (N.C.A). Following this, a logistic regression model of over-indebtedness is constructed using the 2005 National Income and Expenditure Survey. The model finds significant relationships between over-indebtedness and income, labour market status, settlement type and other respondent characteristics and thus provides insight into the type of demand-side interventions that would most assist government in addressing over-indebtedness.

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Introduction

In the wake of the sub-prime crisis there has been renewed interest in the role that governments should play in securing financial system stability. In South Africa, where household debt to income reached an all time high of 78.2% in 2008, this interest has primarily centred on the government strategies in place to protect those households that are most vulnerable to becoming over-indebted. (South African Reserve Bank, 2008) In the face of high interest and inflation rates, many have begun to wonder whether the regulatory measures recently instituted through the National Credit Act will prove sufficient in securing household sector financial stability.

The central thesis of this paper is that a government strategy that relies on supply-side interventions to protect its citizens from over-indebtedness is unlikely to succeed. Rather, successful credit market management strategies will require interventions targeted at addressing the underlying sources of demand, in addition to supply-side regulatory measures.

We commence by providing a literature review which details empirical assessments of South African household indebtedness, examines the rationale behind the current supply regulatory measures and reviews international perspectives on the scope for demand side intervention.

In Section 1, we construct a game theoretic model of the interaction between government and credit suppliers. Solving this game demonstrates that the degree of protection against over-indebtedness that government can provide citizens with, through supply-side intervention, is fundamentally constrained by its dynamic interaction with credit suppliers. We subsequently provide an assessment of how specific properties of the National Credit Act have meant that the equilibrium degree of protection that government can offer through it, is relatively low.

In Section 2, we shed light on what the focus of demand side intervention should be by constructing a logistic regression model of over-indebtedness. The model uses the 2005 National Income and Expenditure Survey and isolates the profile of those households which are most likely to be over-indebted. Moreover the results demonstrate the interaction between other policy objectives such as unemployment reduction and over-indebtedness. Finally the model highlights the necessity of a targeted financial literacy education strategy.

Literature Review

What is over-indebtedness and how indebted are South Africans?

The term over-indebted is a controversial one as its use necessarily requires a normative evaluation of the level of debt. None-the-less, consensus seems to be evolving with regards to finding an operative definition of the term. The E.U. Commission Report surveys all the member states (Davydoff, Jentzsch, & Kempson, 2008) and finds that terms common to their various definitions are encapsulated in the following description: "a private household is over-indebted if its income over an extended period is not sufficient for servicing debt on time (after deducting costs of living expenses) despite a reduction of the standard of living". This definition abstracts from the theoretical consumption-smoothing debates and focuses on observable indications of financial distress.

The consumer credit market in South Africa prior to The National Credit Act was chiefly governed by The Usury Act. The Usury Act created a lending rate ceiling for credit for all transactions except those covered by The Exemption. This exemption spurned significant growth in financial services that targeted the lower end of the income spectrum as firms were able to obtain significantly higher interest rates and to exploit the interest rate arbitrage opportunity. This rapid proliferation, in conjunction with reckless lending practices, higher interest rate cycles and an increasingly consumption orientated culture contributed to a momentous rise in the incidence of households reporting themselves as financially distressed. (Hawkins D. P., 2003)

The most commonly sighted indicator of the increase in indebtedness that underlies this financial distress is the household debt-to-income ratio sited in The South African Reserve Bank Quarterly bulletin (South African Reserve Bank, 2008). This ratio was at 78.2% for the first quarter of 2008 representing the highest level of household indebtedness since data reflecting credit extension to households began to be published in 1991. (Hawkins P. , 2006)

The literature investigating indebtedness in South Africa has attempted to remedy two problems with the information content of this figure. Firstly, the debt-to-income ratio is an aggregate one and, as a result, does not give us any indication of the relative dispersion of indebtedness. Consequently Daniels (2001) (2003) analyses the underlying trends in indebtedness through survey data. Using the 1995 Income and Expenditure Survey and 1999 Wefa Southern Africa income and expenditure data, Daniels finds that there is a racial distribution to indebtedness, with African people experiencing the lowest levels of indebtedness, while white people were the most indebted. He also finds that there is a distinct gender distribution to indebtedness, where male-headed households are

at least twice as indebted as female-headed households. Finally he notes that the ability to repay debt was low and declining for many income groups at the bottom end of the income distribution between 1995 and 1999 owing to the combined effects of low and decreasing cash flow levels and rising housing costs, which had resulted in substitution shifts away from durable goods and towards consumer goods in the consumption schedule.

A second difficulty with the debt-to-income ratio is that it is a stock (i.e outstanding debt) over a flow (income) and as a result does not give us a tangible point at which to evaluate whether household have become over-indebted. Melzer and Moothilal (2008) remedy this by creating a model with a number of assumptions about the term & interest rate structure of different types of debt and then calculating the debt payments that households are making by using outstanding balance data from the 2005 N.I.E.S. They then define an over-indebted household as one that has one or more outstanding formal loans and; has municipal arrears OR is very poor (i.e. it has an income of less than R5 per person per day) OR has a total combined debt servicing and basic expenditure ratio of 70% or more to disposable income. Using this methodology they find that 22% of all households in South Africa can be considered over-indebted.

Why should the government utilize supply-side interventions for the credit market?

Given that one of the causes of the increase in over-indebtedness in 1990's was the lax regulatory environment, many have come to believe that the primary tool for addressing over-indebtedness is tighter regulation of the suppliers of credit. This rationale is perhaps most evident in the National Credit Act which explicitly lists the prevention of over-indebtedness as one of its main objectives.

As Goodwin-Groen (2006) notes the previous legalisation was quite lax in terms of what suppliers had to disclose to the customers and this impaired their ability choose the products that they could actually afford and that were suited to the their needs. This problem was exacerbated by various marketing practices which had become standard in the industry such as unsolicited door to door marketing sales. On the supplier side, the legislation was once again not strictly clear in terms of horizontal information sharing amongst credit providers, resulting in poorer access to critical screening information for certain sectors of the credit market and resulting high rates to compensate for the increased risk. In particular the major banks were often reluctant to share mortgage, vehicle finance and other information. In addition to this, suppliers often engaged in reckless lending practices, where they did not actively seek evidence of the potential consumer's credit worthiness because they were aware that the consumer would most likely have no mechanism to back out of the obligation once engaged, due to weakness in insolvency and debt restructuring laws. (Goodwin Groen, 2006)

Whilst this analysis is insightful, it fails to capture a fundamental constraint on the degree of protection that government can provide to consumers through supply-side interventions. In "The Regulators Dilemma", Porteous(2006) examines the fine line that government must tread between protecting consumers from becoming over-indebted and supporting the profitability of financial intermediaries so as to increase access to credit. Recognizing the implicit trade-off between these two objectives is essential to understanding the degree to which government can rely on supply side intervention to protect consumers from becoming over-indebted.

A substantive strand of recent game theoretic literature examining the interaction between government and credit suppliers in developing markets has focused on the impact that government subsidies can have on access to credit. Stiglitz(1997) demonstrates that subsidies for credit extension can actually decrease supply if the micro-finance industry has a monopolistically competitive structure and the subsidies induce entry that results in a loss of scale economies or that has negative externalities with regards to enforcement across suppliers. Andersen & Moller (2006) focus on the implications of strategic interaction between formal and informal lenders and show that a subsidy to the formal sector may increase the fragility of a co-funding equilibrium by increasing the bank's incentives to deviate. As such, a subsidy can be counterproductive resulting in a breakdown of the co-funding equilibrium and thus creating strictly lower profits to both lenders.

The model presented in this paper seeks to advance our understanding of the government-credit supplier interaction by abstracting from the strategic interaction amongst credit suppliers and focusing on the trade-off that government faces when it seeks not only to increase access to credit, but also to protect citizens from over-indebtedness, through costly-to-implement regulation.

What scope is there for demand based intervention?

The EU Commission Report on Over-indebtedness (Davydoff, Jentzsch, & Kempson, 2008), provides a strong framework from which to assess the multi-faceted nature of factors contributing to over-indebtedness. Davydoff et al construct a logistic regression model using data obtained from The European Survey of Income and Living Standards (EU SILC). The (EU SILC) has a number of questions that elicit subjective and observable indications of over-indebtedness. Davydoff et al explore the relationship between over-indebtedness and age, housing tenure, family type, marital status employment status and income. They find that households in which the head of household was unemployed were most likely to report arrears once other characteristics including disposable income and household structure were taken into account. They also find that single people have a much higher risk of self-reported problems paying bills but that among couples, the likelihood of payment difficulties was lowest among those who were married, especially if for the first time. The

likelihood of reporting payment difficulties was considerably higher amongst those who were co-habiting and those who were remarried.

There has been very little multivariate analysis conducted in South Africa to ascertain the extent to which various structural and social characteristics impact on the demand for credit and consequently on over-indebtedness. That said, Hurwitz and Luiz (2007) review data from 3 financial service providers and find that the depth of over-indebtedness of urban working class consumers is of concern. They find that consumers have an extremely limited understanding of the real costs of credit and are constrained by a lack of access to information and an inability to make absolute trade-offs and comparisons between options. Consumers are often earning too little and supporting too many people to have a choice; absolute monthly affordability and instalment size dictates what they will spend, rather than the overall costs of the purchase including the finance charges.

These results are corroborated by FinScope, a national financial literacy survey conducted annually by The FinMark Trust, which surveyed some of the attitudes to debt in South Africa at the end of 2007. (Napier, 2007)

Statement	Agreed
You make sure every month that you have enough money to pay your accounts or instalments	45%
If you don't have enough money to pay all your debts, you pay one debt one month and the next month you pay another debt	26%
You love spending money to buy things, even if you have to use credit to do so	25%

Source: FinMark Trust 1

Braucher (2006) examines over-indebtedness in America and argues that only policy strategies that are contain a balanced mix of demand and supply measures can hope to address indebtedness. She argues that the tendency to overlook social issues like divorce and consumerism in favour of legislative measures like bankruptcy reform is dangerous in that these demand based determinants of over-indebtedness may be endemic and thus prove resilient to changes in the legislative environment.

Section 1: The Limits to Supply-Side Intervention

Modelling the Trade-off

Part B, Section 3 of National Credit Act sets out the objectives of the N.C.A , and amongst others lists

a) *"Promoting the development of a credit market that is accessible to all South Africans, and in particular to those who have historically been unable to access credit under sustainable market conditions;*
b) *Addressing and preventing over-indebtedness of consumers, and providing mechanisms for resolving over-indebtedness based on the principle of satisfaction by the consumer of all responsible financial obligations;"*

The South African case is novel amongst developing nations in that the government has expressly indicated its desire to increase access whilst simultaneously protecting consumers from becoming over-indebted. Given that this protection is typically introduced through administrative measures that are costly to credit providers there is an inherent trade off between government's objective of increasing access to finance and that of preventing indebtedness. It is this trade-off that Porteous(2006) identifies in "The Regulators Dilemma". The following model thus attempts to provide a systematic exposition of this trade-off and its implications for the utility of supply-side intervention with regards to preventing over-indebtedness.

Assumptions

The model assumes that there is one representative credit supplier that monopolistically maximizes its profit with respect to r, the interest rate. Its payoffs are given by the profit function:

$$\boldsymbol{V_2 = [(1 + r)(1 - \hat{\alpha}) - (1 + \beta\delta)]C_D}$$

We assume that there are 2 types of borrowers in the market that the credit supplier operates in; type a borrowers who are safe and type b, who will default. We assume that the credit supplier does not know whether individuals are type a or type b. α is the percentage of the population that are type b and hence gives the probability of default on any loan. We assume that the intermediary does not have perfect knowledge of α and that it thus optimizes with respect to $\hat{\alpha}$ which is its estimation of α. $\hat{\alpha}$ lies between 0 & 1. As a result, the revenue that the credit supplier expects to make is equal to $(\mathbf{1} + \boldsymbol{r})$ multiplied by the estimated probability that the loan will be repaid $(\mathbf{1} - \hat{\alpha})$ multiplied by the value of credit that is extended .

β represents the level of protection that the government provides from over-indebtedness; we can basically understand this as how difficult government makes it to become over-indebted. δ

represents the cost efficiency of government's interventions in achieving that degree of protection. δ ranges from 0 to ∞ with a small value for δ meaning that the cost imposed on the credit supplier in achieving the targeted level of protection is very minimal (i.e. the measures are cost efficient). Lastly $\boldsymbol{C_D}$ gives the value of credit that is demanded and it is given by the linear credit demand function: $C_D = 1 - r$ with a maximal value of 1 indicating that 100% of the potential market actually demands credit at an interest of 0. As the primary purpose of this model is to examine the government –credit supplier interaction we assume that the credit provider faces no other costs except those imposed through the governments efforts to protect consumers.

The government's payoffs are given by the Cobb Douglass Utility function:

$$\boldsymbol{V_1 = {C_D}^{*1-\gamma}.\beta^{\gamma}}$$

Which simply demonstrates that the government's utility is an increasing function of both the quantity demanded in credit market equilibrium and how difficult it makes it for citizens to become over-indebted. γ rests between 0 & 1 with higher levels of γ being indicative of the government placing an increasing degree of importance on the prevention of over-indebtedness relative to the amount of credit granted.

We assume that the game is a two stage sequential game with government deciding on β in the first stage and the credit supplier observing this β and setting r accordingly.

Market Equlibrium

The credit supplier acts as a monopolist and thus it faces a downward sloping demand curve and seeks to maximize profits by setting Marginal revenue = Marginal cost.

$$\boldsymbol{V_2 = [(1+r)(1-\hat{\alpha}) - (1+B\delta)]C_D}$$

$$= [(1+r)(1-\hat{\alpha}) - (1+B\delta)](1-r)$$

$$= [(1-\hat{\alpha} + r - r\hat{\alpha})(1-r) - (1+\beta\delta - r - r\beta\delta]$$

$$= [1-\hat{\alpha} + r - r\hat{\alpha} - r - r\hat{\alpha} - r^2 + r^2\hat{\alpha} - 1 - \beta\delta + r + r\beta\delta]$$

$$\frac{dV_2}{dr} = [-2r + 2r\hat{\alpha} + 1 + \beta\delta] = 0$$

$$\therefore \boldsymbol{r^* = \frac{-(1+\beta\delta)}{2(\hat{\alpha} - 1)}}$$

The government, however, knows the parameters of the credit supplier's profit maximisation problem and as a result, anticipates the supplier's response when it is setting β. Thus we have:

$$\boldsymbol{V_1 = {C_D}^{*1-\gamma}.\beta^{\gamma}}$$

$$= (1 - r^*)^{1-\gamma}.\beta^{\gamma}$$

$$= \left(1 + \frac{(1+\beta\delta)}{2(\hat{\alpha} - 1)}\right)^{1-\gamma}.\beta^{\gamma}$$

$$\frac{\partial V_1}{\partial \beta} = (1-\gamma)\left(\frac{\delta}{2(\hat{\alpha} - 1)}\right)\left(1 + \frac{(1+\beta\delta)}{2(\hat{\alpha} - 1)}\right)^{-\gamma}\beta^{\gamma} + \left(1 + \frac{(1+\beta\delta)}{2(\hat{\alpha} - 1)}\right)^{1-\gamma}.\gamma\beta^{\gamma-1} = 0$$

$$\therefore (1-\gamma)\left(\frac{\delta}{2(\hat{\alpha} - 1)}\right)\left(1 + \frac{(1+\beta\delta)}{2(\hat{\alpha} - 1)}\right)^{-\gamma}\beta^{\gamma} = -\left(1 + \frac{(1+\beta\delta)}{2(\hat{\alpha} - 1)}\right)^{1-\gamma}.\gamma\beta^{\gamma-1}$$

$$\therefore \frac{\beta\delta(1-\gamma)}{2(\hat{\alpha} - 1)} = -\gamma\left(1 + \frac{1 + B\delta}{2(\hat{\alpha} - 1)}\right)$$

$$\therefore \beta\delta(1-\gamma) = -\gamma 2(\hat{\alpha} - 1) - \gamma(1 + \beta\delta)$$

$$\therefore \beta\delta = -2\gamma\hat{\alpha} + \gamma$$

$$\therefore \boldsymbol{\beta^* = \frac{\gamma(1 - 2\hat{\alpha})}{\delta}}$$

Comparative Statics

There are a number of important results here:

Firstly we note that $\frac{\partial r^*}{\partial \beta}, \frac{\partial r^*}{\partial \delta} \& \frac{\partial r^*}{\partial \hat{\alpha}} > 0$. This tells us that increases in the protection of citizens from over-indebtedness, decreases in the cost efficiency of the government mechanisms used to protect citizens and increases in the estimated proportion of defaulters will all increase the interest rate in equilibrium.

Secondly we note that $\frac{\partial \beta^*}{\partial \gamma} > 0$ whilst $\frac{\partial \beta^*}{\partial \alpha}$ & $\frac{\partial \beta^*}{\partial \delta} < 0$. This tells us that increases in the relative importance that government attaches to the protection of consumers will increase the optimal level

of protection targeted by the government, whilst increases in the estimated probability of default or in government inefficiency will decrease it.

Thirdly given that $\gamma \; and \;\; \delta$ are non-negative by definition, it will only be optimal to provide a positive level of protection when $(1 - 2\hat{\alpha}) > 0$ i.e. when $\hat{\alpha} < 0.5$. When $\hat{\alpha}$ is greater than this the reduction in credit provision that would result from the increased interest rate instituted by the credit provider to compensate for the cost of protection, would be so large as to wipe out the benefit to government from positive levels of protection provision. In such an environment it would be in government's interests not only to refrain from increasing the credit provider's costs by setting β at a postive level, but to actually set β at a negative level, i.e. to provide a subsidy for the credit provider to provide credit loans.

The Optimality of Protection

If we examine $\boldsymbol{\beta}^*$ we can see that its numerator has an upper bound of 1. $\boldsymbol{\beta}^*$**,** however, does not have an upper bound as it tends to infinity as δ tends towards 0. That said, if the government intervention imposes some positive cost on the intermediaries, we will have $\delta \geq \bar{\delta} > 0$ => $\boldsymbol{\beta}^* \leq \boldsymbol{\beta}^*(\bar{\delta})$. The model thus implies that as long as there some positive costs imposed on credit suppliers through government intervention there will be an upper bound for $\boldsymbol{\beta}^*$**,** that is to say, there will be a limit to the degree of protection from over-indebtedness that the government can aim to provide citizens with through supply-side intervention.

The model thus implies that government legislative intervention will invariably be crafted and implemented in a manner that leaves citizens partially vulnerable to becoming over-indebted if the government is acting so as to maximize its objective function. This result is of fundamental importance in understanding the measures advanced through the National Credit Act and why they have not been constructed in such a manner as to provide the highest degree of protection possible, i.e. why the government has refrained from making it as hard as possible to become over-indebted through supply-side intervention. A particularly telling example of how this dynamic manifests itself is that of the operation of small loans under the N.C.A.

The N.C.A ostensibly caps the rate of interest that lenders can charge through maximums that are set for the different categories of loans. Our concern for the moment is with regards to what it deems a 'short-term credit transaction', which is defined as 'a credit transaction in respect of a deferred amount at inception of the agreement not exceeding R8 000, and in terms of which the whole amount is repayable within a period not exceeding 6 months'.

The maximum interest rate for short term credit transactions is 5 per cent per month, or 60 per cent per year. (Campbell, 2007)

Firstly we should note that there is a differential in the maximum interest rate for this section and that for 'unsecured credit transactions' which are defined as 'credit transactions in respect of which the debt is not supported by any pledge or other right in property or suretyship or any other form of personal security and which are more than R8 000 and/or are repayable over a period of more than 6 months". The maximum interest rate on unsecured credit transactions is linked to the South African Reserve Bank Repurchase Rate, and is calculated by applying the formula: (Repurchase Rate × 2,2) + 20 per cent per year. The maximum interest rate on unsecured credit transactions is therefore currently 46.4 per cent per year (or 3,5 per cent per month), based on the current Repurchase Rate of 12 per cent per year, and is considerably less than that for short term credit transactions.

Secondly we should not that the N.C.A also allows for an initiation and a service fee to be charged. The former is defined as a "fee in respect of cost of initiating a credit agreement" and the latter is a "fee that maybe charged periodically by a service provider in connection with the routine administration of maintaining a credit agreement". (Campbell, 2007)

Table 1 Maximal Initiation Fees

Loan amount	Initiation fee	Initiation fee as a per-centage of loan amount	Method of calculation
R200	R30	15%	15% of R200 [reg 43(3)]
R500	R75	15%	15% of R500
R1 000	R150	15%	15% of R1000, or R150 maximum [reg 42(2)]
R2 000	R250	12,5%	R150 + R100 (10% of R1000, which is the amount in excess of R1000) [reg 42(2)]
R5 000	R550	11%	R150 + R400 (10% of R4000, which is the amount in excess of R1000)
R8 000	R850	10,6%	R150 + R700 (10% of R7000, which is the amount in excess of R1000)
R9 500	R1 000	10,5%	R150 + R850 (10% of R8500, which is the amount in excess of R1000)
Loans greater than R9 500	R1 000	Less than 10,5%	The maximum limit [reg 42(2)]

Source: 1 National Credit Regulator

Predictably, most credit suppliers in the short term credit transactions sector are setting initiation fees at the maximum. (Stokes, 2008)What is particularly problematic here is that most customers

Table 2 Total Cost Of Credit

	Amount of initial loan	Duration of loan	Interest (5% pm or 3,5% pm) (R)	Initiation fee (pm, when paid in instalments) (R)	Service fee (always R50 pm) (%)	Total cost of credit (interest + initiation fee + service fee) (R and %)
1	R200	1 month	R10 pm	R32 pm	25% pm	R92 pm **46% pm**
2	R500	1 month	R25 pm	R79 pm	10% pm	R154 pm **31% pm**
3	R500	6 months	R25 pm	R15 pm	10% pm	R90 pm **18% pm**
4	R1 000	1 month	R50 pm	R158 pm	5% pm	R258 pm **26% pm**
5	R1 000	6 months	R50 pm	R30 pm	5% pm	R130 pm **13% pm**
6	R1 664	6 months	R83 pm	R43 pm	3% pm	R176 pm **11% pm**
7	R5 000	6 months	R250 pm	R108 pm	1% pm	R408 pm **8% pm**
8	R8 000	6 months	R400 pm	R167 pm	0,6% pm	R617 pm **8% pm**
9	R10 000	24 months	R350 pm	R61 pm	0,5% pm	R461 pm **4,5% pm**
10	R20 000	36 months	R700 pm	R48 pm	0,25% pm	R798 **4% pm**

Source: 2 National Credit Regulator

seek loans precisely because they are illiquid, and as a result, they are unable to pay the initiation fee upfront and so it is often capitalized and paid with the instalments. This effectively, increases the repayment burden and can act so as so to mask the real cost of credit for micro loans. Whilst the interest caps reduce the maximal interest for loans in this category from the pre-N.C.A mean of 360% per annum to 60% per annum, credit suppliers are using the initiation and service fee provision of the N.C.A to ensure that they are still able to obtain high levels of profit. As Gareth Stokes document in his article (Stokes, 2008), the charging of initiation and service fees at their maximal rates is significantly commonplace in the market.

It is evident then that the government regulations have not been set so as to maximize the difficulty of becoming over-indebted. With the ceiling on interest rates being at such high levels, and the use capitalization of initiation and administration fees being common place, it is quite clear that individuals in this sector of the economy are still vulnerable to becoming involved in contracts that precipitate over-indebtedness. Government's failure to provide maximal protection to them however, is not the result of a mere oversight, but rather a consequence of the inherent trade-off that it faces between its desire to protect citizens and its desire to increase access to finance. The desire to increase access to finance necessarily requires government to leave "sufficient legislative room" for credit suppliers to make the profits they require in order to increase the credit they supply. This fundamental constraint, which is introduced by the dynamic government-credit supplier interaction, means that attempts to prevent-over-indebtedness cannot exclusively rely on supply-side interventions. Rather the government must construct a strategy that treats seriously both the supply and demand side of the credit market if it hopes to prevent over-indebtedness.

The Cost Efficiency of the N.C.A measures.

A key parameter that affects the optimal degree of protection against over-indebtedness provided by government is the cost efficiency of its measures, as given by δ. As we noted previously $\frac{\partial \beta^*}{\partial \delta} < 0$. indicating that the less cost efficient government is (i.e. the higher δ is) the lower the optimal level of protection against over-indebtedness that it targets. In order to determine whether it is possible that the N.C.A will provide significant levels of protection for the citizens, it is therefore imperative for us to examine the cost efficiency of the measures that it has instituted.

Origination and compliance costs

In the past most credit providers assessed a client's credit worthiness primarily through their stated income. The N.C.A has now made it mandatory for credit suppliers to ascertain the nature of the applicants other credit commitments and to use these in determining whether they can be granted more. Whilst this obviously makes it harder for individuals to become over-indebted, setting up the communications infrastructure to be able to process such queries quickly has proved quite costly. As a result credit bureaux enquiries are typically charged near the maximal rate allowed by the N.C.A, which is that of R20/query. According to Experian(2007), approximately 16.695 million credit accounts were opened between October 06 & September 2007. If all lenders only lodged 1 enquiry with a credit bureaux this would have resulted in a R338 million compliance cost for the industry. This transactional cost creates a particular disincentive to service the small loan sector as it represents a proportionately larger percentage of the actual principle advanced.

This cost of compliance has also been exacerbated by the partially retrospective scope of the N.C.A. For example, there have been disputes with regards to whether loans that were given approval in principle, but were not actually executed, should be subject to the more intense scrutinising that the N.C.A requires. As a result, a number of banks are currently undergoing the expensive process of reviewing a significant portion of their loan portfolio. An example of this would be FNB which had to deal with disputes from agitated clients who fell within the 0.5% of its home loan portfolio that is now under review. (The Citizen, 2008). Furthermore, a commonplace practice in the banking sector was the sale of loan books, either as a risk managing tool or as part of a acquisition process. The N.C.A makes what was in the past merely a substitution of parties to the contract, an actual new credit agreement, and as a result banks looking to purchase loan books will need to ascertain the approval of every counterparty to the loans within it, and ensure that their credit-worthiness meets the stricter criteria identified through the N.C.A. (Raath, 2008)

In addition to the origination costs that the N.C.A entails, there are also significant compliance costs. Banks offering a full spectrum of financial services are still subject to compliance with over 200

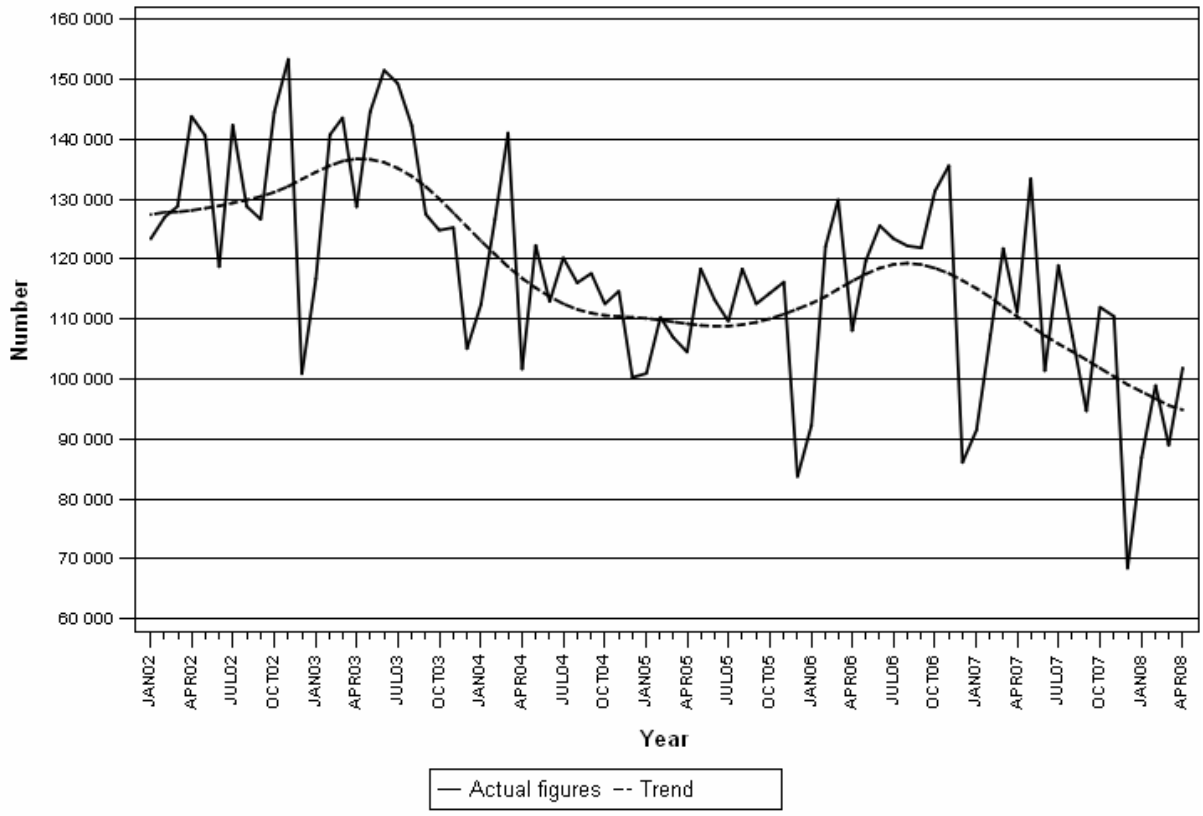
different Acts of parliament and to regulatory supervision by The Reserve Bank, The Financial Services Board, and now, The National Credit Regulator. The addition of this third regulator means that a significant amount of time and money must now be put into organising and reporting data in the particular format required by the N.C.R.

Debt collection and litigation costs

The Reckless Credit Agreements clause and the powers allocated to debt counsellors and Magistrates which can be found in Chapter 4, Part D of the N.C.A (Parliament of South Africa, 2005) have significantly altered the collections process for lenders. In instances where suppliers are judged as not having met the N.C.A requirements in terms of determining creditworthiness the court may judge the granting of credit as reckless and render the initial contract invalid. Furthermore, distressed debtors are entitled to approach a debt counsellor who after assessing the particulars of the case can recommend a restructuring of the particular liability that the debtor faces with a financing agent. The fact that the debt counsellor's decision is a recommendation and not necessarily legally binding for the lender has created a great degree of confusion with regards to how much time and resources lenders should spend with debt counsellors before seeking enforcement through the courts. The inevitable hedging of litigation risk that such legislative uncertainty precipitates is considerably costly.

Even though the Credit Bureaux Monitor indicated that quarter on quarter default rates were actually increasing for the latter part of 2007 (National Credit Regulator, 2007) Statistics South Africa's Monthly monitor of civil debt cases, has shown a significant decline in the summons that have been issued for debt. Whilst this may be indicative of lenders not being able to enforce what were reckless credit agreements, it is also likely to display the increased costs of enforcement that lenders now face, with the these costs making enforcement on an increasing proportion of defaults unprofitable.

Figure 1 Civil Summonses Issued for Debt



The significant costs that the N.C.A has imposed on lenders through origination, reporting, debt collection and litigation risk, have meant that the cost efficiency of this government legislation has not been particularly high, i.e. δ is relatively large. As a result, the optimal degree of protection that government can provide against over-indebtedness, through the N.C.A measures is expected to be relatively low.

The Estimated Probability of Default

Our analysis shows that $\frac{\partial \beta^*}{\partial \hat{\alpha}} < 0$. As a result decreasing $\hat{\alpha}$, which is the lenders estimation of the probability of default, will increase the level of government's optimal degree of protection against over-indebtedness. Our model assumed that the lender does not know whether a particular individual is a type a or type b and as a result it does not provide us with a direct analysis of the differential impact that screening devices used by the lender may have. None-the-less, we can get an understanding of the impact of such devices by assuming that they would allow the lender to get a more accurate estimation of the risk and would thus bring $\hat{\alpha}$ down and closer to α (assuming that the lender will always tend to over-estimate the default risk in the absence of definitive information). In such an environment, government interventions that aide lenders in getting a more accurate assessment of the default risk, i.e that reduce $\hat{\alpha}$ will act so as to increase the level of β^*

.The N.C.A's measures that are targeted at increasing the use and provision of data to credit bureaus are thus potentially of significant value in that they may help lenders get a more accurate assessment of the default risk they face. Unfortunately a number of problems have impeded this benefit from feeding through.

Firstly the degree of compliance of credit providers has been low with a number of credit providers taking up to 6 months to upload account details into credit bureaux databases. In order for the bureaux to be of any real help, lenders need to know that the data they contain is real time data, otherwise the marginal benefit of using them for enquiries may fall below the marginal cost.

A second problem is that over-indebted clients are known to use the simultaneous lodging of multiple applications as a means of obtaining extra credit. Even with real-time loading of credit extension details, such a tactic can go undetected, and as such, decreases the certainty with which lenders can use credit bureaux information.

Lastly the N.C.A provided an amnesty for consumers with bad records in the past and required credit bureaux to delete adverse information of particular categories. This decision was based on the belief that credit bureaux in the past had kept inaccurate records that prevented people from getting credit. Through the 1st phase of the credit information amnesty (implemented 1 June 2007) over 16 million records were removed from Experian's records, relating to more than 6 million consumers (Experian, 2007). Whilst this may have eased credit constraints on these individuals, it has probably also taken away from the ability of the credit bureaux's to provided lenders with a more accurate means to estimate $\hat{\alpha}$.

The net result of is that whilst the information sharing provisions of the N.C.A had the potential to reduce the default risk estimated by lenders , $\hat{\alpha}$, problems in the functioning of these institutitons have meant that this reduction has not fully materialized and as a result , the optimal degree of protection that government can provide against over-indebtedness remains relatively low.

Section 2: The Role of Demand-Side Interventions

Given the constraints that government faces with regards to supply side interventions it is clear that preventing over-indebtedness will require government to simultaneously utilize supply ***and*** demand side measures. Indeed, the various initiatives that government has supported with regards to financial literacy education are indicative of its acknowledgement of this fact (Piprek, 2004). In order for such demand side interventions to be successful however, it is imperative for us to identify the key factors that make individuals most vulnerable to becoming over-indebted. This section provides insight into these factors by constructing a logistic regression model of over-indebtedness using the 2005 National Income & Expenditure Survey.

Data

The NIES is conducted every five years with the aim of providing an input into the goods and services that should be included in the Consumer Price Index (CPI) basket as well as collecting reliable information on income, acquisition and expenditure patterns. It also provides an independent source of information that is required to estimate the final private consumption expenditure component of the National Accounts. The survey has the following main features:

Table 3: Main Features of IES Data Sets

Distinguishing features		IES 2005/2006
Sample size		24 000 dwelling units
Methodology		Diary and recall
Main questionnaire		One questionnaire (five interviews)
Diaries		Four weekly diaries
Expenditure data collection approach	**Goods**	Acquisition approach
	Services	Payment approach
	Own production	Consumption approach
Survey period		One year September 2005 to August 2006
Reference period: Food expenditure		September 2005 to August 2006
Visits per household		Minimum six
Classification of expenditure items		Classification of Individual Consumption According to Purpose (COICOP)

Some important changes have taken place in the design of the 2005/6 survey. Most notable of these; the addition of a diary method of data collection, the increased survey duration, the change in classification codes and use of the acquisition approach for durable and semidurable goods purchased. We should note that comparisons against national accounts data and other surveys show that the N.I.E.S understates debt significantly (Statistics South Africa, 2005/6).

Methodology

The framework for the analysis is adopted from The E.U Commissioned report on over-indebtedness. (Davydoff, Jentzsch, & Kempson, 2008). Unlike The European Survey of Income and Living Standards which is used by Davydoff et al, the N.I.E.S does not contain any questions that directly elicit whether households are over-indebted. As a result WE follow the methodology used by Daniels (2003) and Melzer (2008) to identify those households that are over-indebted. As the core emphasis is on debt related financial distress, the over-indebted dummy variable is equal to 1 when a household has a debt service and essential expenditure to income ratio[1] that exceeds 70% ***or*** it has municipal arrears.[2] The 70% mark is used as households will still need some room to pay for emergencies, medical care and sundry items such as entertainment. Municipal arrears, whilst in some cases reflecting inefficiency in local government collections, are internationally used as an indicator that households are unable to meet their financial obligations (Nash, 2005), (Betti, Yin, Verma, Rossi, & Domourshkin, 2001). As the N.I.E.S only has data on the outstanding balance of the loan the following assumptions are used to calculate the debt service payments.

Table 4 Over-Indebtedness Model Assumptions

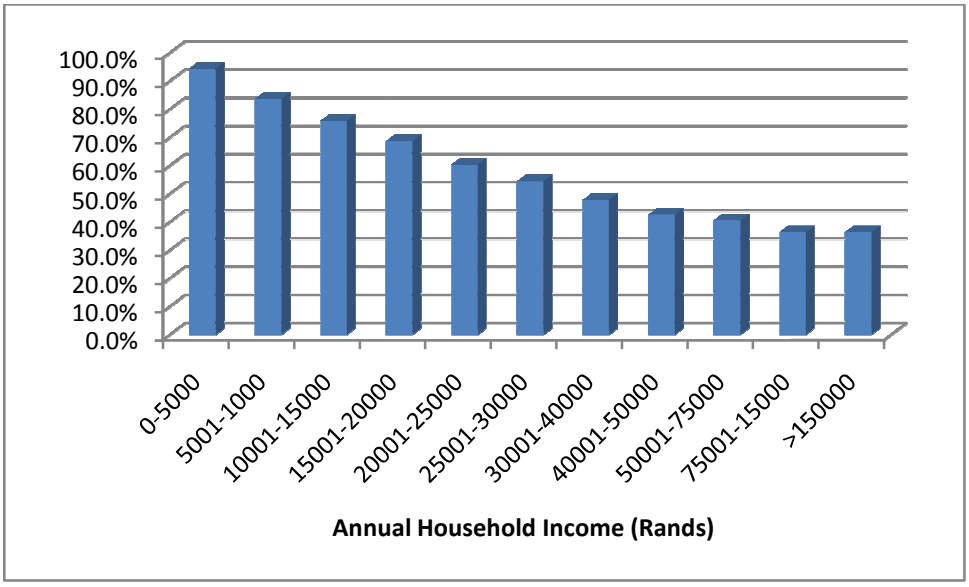
Debt Type	Annual Interest Rate	Total Term	Term Remaining
Bond	10.5%(prime)	240	80
Motor Vehicle	10.5%(prime)	60	20
Overdraft	26.0%	12	4
Other Bank Debt	16.5%%(prime+6)	24	8
Furniture	75.0%	24	8
Retail	28.0%	12	4
Family	5.0%	12	4
Money Lender	360.0%	6	2
Municipal Arrears	11.5%%(prime+1)	12	4
Other	10.5%(prime)	12	4

The interest rate assumptions above are based on the prime lending rate and observed premiums for the year 2005. Of all of the stated assumptions, the estimations are most sensitive to the assumption that is used for the term remaining. As Melzer (2008) shows, however, a doubling of the term remaining value assumed only reduces the percentage of households that are considered over-indebted by 11%. The resulting distribution of households with access to debt that are over-indebted that this indicator generates correlates with Melzer findings that there is a relative concentration of such households in the lower income band.

[1] Essential expenditure = spending on food, transport(excluding the purchase of new vehicles), education and housing and utilities.

[2] Melzer disjunctively adds "*Income of less than R5 per person per day"* to the criteria

Figure 2 Percentage of Credit Active Households that are Over-Indebted

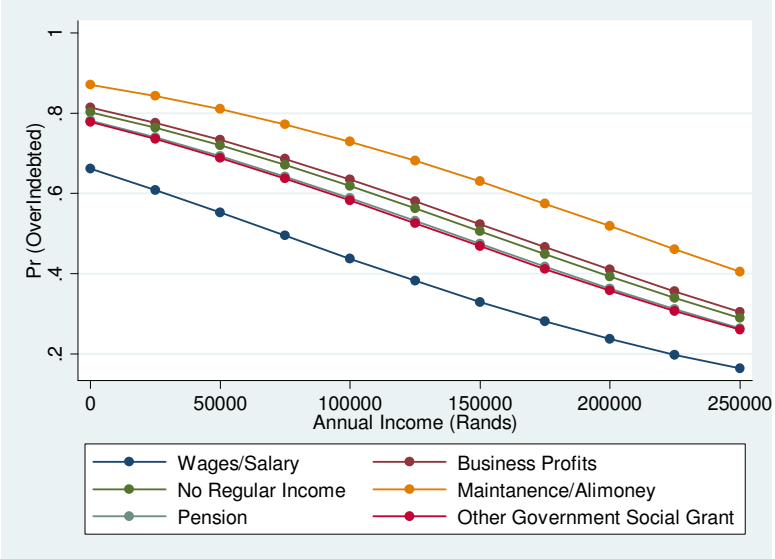


A logistic survey regression model is then constructed using this over-indebted indicator as the dependent variable. Following Davydoff et al (2008) the independent variables that are used consist of head of household characteristics such as age, education levels, race, gender and main source of income and general household characteristics such as household income, housing tenure status, number of household members and settlement type. South Africa displays significant heterogeneity in the allocation of economic decision making within households, varying from dislocated remittance involvement to multiple income stream and consensus decision households (Prinsloo, 2002). The model attempts to reflect this by incorporating both household and head of household variables.

The model has an F-Stat of 21.06 and a P value of 0.000 indicating that the model as whole is statistically significant. Regression diagnostic plots, correlation matrices, tests and results in full may be found in Appendix A

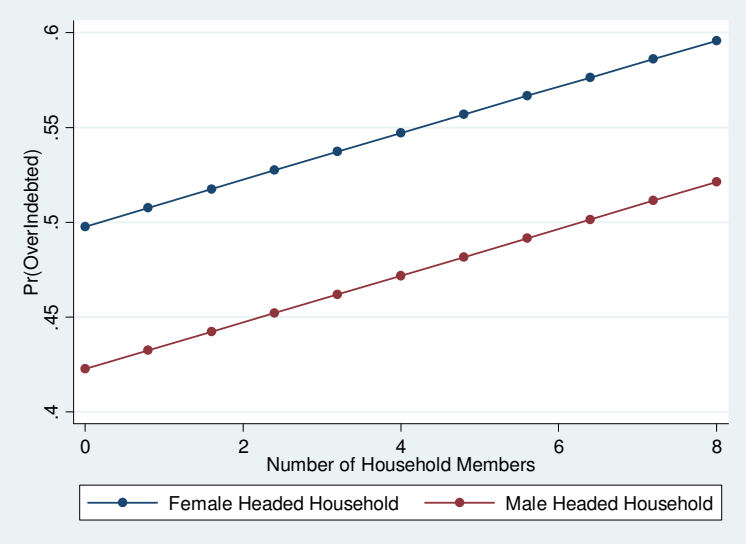
Results

Income & Source of Income



Firstly we note that the predicted probability of being over-indebted decreases with increases in income. This confirms our earlier finding that there is a relative concentration of over-indebtedness in the lower sections of the income spectrum. Secondly we should note that there are significant differentials in the predicted probability of being over indebted between households reporting different sources of income. The odds of being over-indebted were 3.4 times as high for positively indebted households where the head of the household identified Maintenance/ Alimony as their main source of income, as they were for those who reported wages/salary as their main source. The odds were 2.2 and 2.0 times as large for those who indicated business profits and no regular income respectively, and were 1.9 and 1.7 times as large for those receiving pensions and other government social grants. Theses coefficients were all statistically significant at the 0.1% level of significance.

Gender & Household Size



Despite the fact that mean debt to income ratios are significantly higher for male headed households than for female headed ones, those female headed households that do have access to credit are 1.4 times as likely to be over-indebted. It is important to note here that this gives us an indication of the interaction between female headship of a household and over-indebtedness, as opposed to the interaction between being female and being over-indebted. We are particularly interested in the former because given South Africa's history, female headship is traditionally associated with a particular type of family structure, and as such, may give us an indication of the impact of social formations on vulnerability to over indebtedness. The importance of familial structure is also revealed in the upward sloping nature of the graph which indicates that increasing family size increases the probability of being over-indebted. This is in line with our expectations a-priori in that households that have to cater for more members will face greater pressure on their income. The implication of these results is that female headed households, which in the South African context are often single parent households, and households with a large number of members are particularly vulnerable to over-indebtedness.

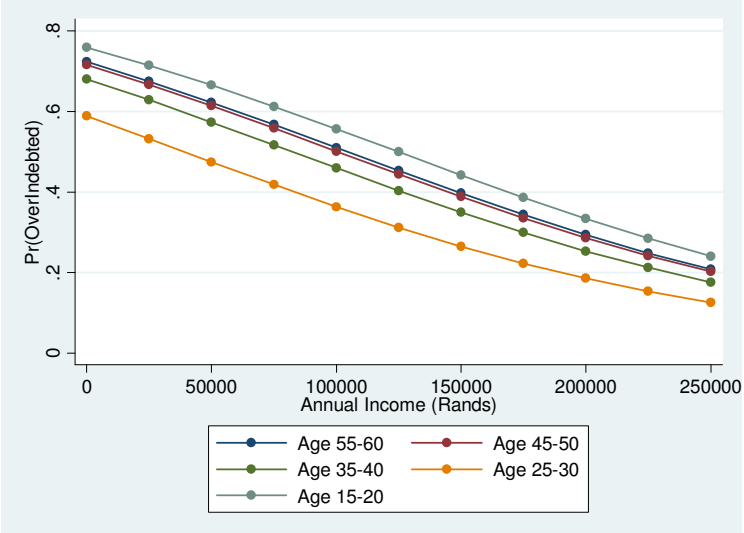
Housing

Figure 3 Predicted Probabilities across Settlement and Tenure Status

.	Own	Rent
Rural	0.4101	0.187
Urban	0.6138	0.3447

The table above gives the predicted probability of being over-indebted across two categorical variables holding all other variables constant at their means. We should note firstly that living in an urban area significantly increases the probability of being over-indebted, once again meeting a priori expectations given the reduced credit constraint that urban households face. At the same time those who own houses, as opposed to renting them are significantly more likely to be over-indebted. The rising interest rate cycle that pertained at the time of the survey may be behind the increased propensity of homeowners to be over-indebted. Both housing tenure and location type where statistically significant at the 0.1% level.

Age



Two things are immediately apparent from the graph. Firstly, the probability of becoming over-indebted increases with the age of the households head for all but 1 of the age cohorts. A possible explanation for this trend with may be that households with a head that is older than the reference

category of 35-40 may feel greater strain on household resources as they take on the responsibility of catering for the needs of more dependents. Secondly the age of households head category that is most likely to be over-indebted is that of household's heads between 15-20 years of age. We should note, however, that this difference is not statistically significant at the 10% level of significance. Whilst there has been a lot of research into the impact that child headship of households is having on South Africa, very little is known about the impact that financial deepening has had on these households.

Education

Category	.	Odds Ratio	Std. Err.	P>|t|
Education *(reference category is no education)	Primary	1.025718	0.1260391	0.8360
	Secondary	1.06051	0.1430784	0.6630
	Tertiary -Technical Institute	1.223611	0.2095839	0.2390
	Tertiary -Academic Institute	2.16384	0.4987174	0.0010

Education was tested in a number of functional forms including years of education, a non-linear transformation, and finally, as a dummy variable for each of the major educational categories. Education was statistically insignificant in all but that the last of these specifications. We found here though that the coefficients on primary-school, high-school and technical tertiary education were statistically insignificantly different from that for no schooling. It was only tertiary academic education that was significant. That said, it actually increased the odds of being over-indebted by 2.1 times, despite the fact that income and age were controlled for. On a prima-facie basis then, it would seem that the financial literacy measures included in previous national formal educational structures did not play a statistically significant role in decreasing the probability that a household became over-indebted. This finding does not have any conclusive implications for assessing the current educational programs as most of the recipients of its curricula would be too young to be heads of households. That said, it does tell us that we cannot automatically assume a link between higher education and better financial management; learning to conduct ones finances well requires a specific set of skills that needs to be directly targeted.

Implications for Demand-Side Intervention

The results have 2 main implications for interventions targeted at the demand-side.

Firstly, the analysis gives insight into the interrelation between over-indebtedness and structural factors that the government does have an influence on. It is evident that having no regular income significantly increases a household's probability of being over-indebted, as does being poor. Under such conditions the demand for credit is always going to be high, with individuals seeking ways to circumvent credit constraints as doing so is a necessity for survival. As a result, measures that target the creation of employment and thus reduce the impetus for sourcing credit can be seen as actively contributing to reducing over-indebtedness. Moreover, in the absence of rapid job creation, it is evident that pensions and social grants can also act so as to reduce the probability of over-indebtedness, although doing so less efficiently than employment. Whilst combating unemployment and poverty are important policy objectives in of themselves, realizing the cross-effect that they can have on over-indebtedness is important in so far as it gives government an alternative channel to target a policy objective that it has identified as being critical.

Secondly, the analysis gives guidance as to where efforts in financial literacy education should be focused. It is clear that households with either very young or very old heads as well as female headed households are particularly susceptible to over-indebtedness. Education that targets such households, in addition to urban dwellers that have been most exposed to the proliferation of financial services, is likely to provide them with the skills necessary to select the financial product that actually meets their needs. Relying on the suppliers of credit to provide consumers with education is detrimental not only in the terms of the cost that eventually gets passed onto the consumer, but also in that the quality of the educational service which is performed by an agent with perverse incentives is generally not of a high standard.

In light of this it would seem that a failure to target financial literacy education at those most vulnerable has been major contributor to its currently limited success. To some extent, the National Credit Act attempts to address this by mandating the National Credit Regulator with the responsibility of providing consumer education and relying on the newly invoked debt counselling process. This approach to education however has a number of problems. An obvious point is that if this is the locus of education, it is far too late in the process. Moreover debt counselling only applies to loans that are obtained through formal mechanisms. This is problematic because as we saw previously, a substantive amount of the loans procured by individuals in lower income groups are from informal sources such as family. As a result, a large sector of those who are most likely to need the information & education that such counselling may provide will obviously not be reached.

In sum it is clear that structural factors that necessitate credit demand are significant determinants of over-indebtedness and that progress in the attainment of policy objectives with regards to decreasing poverty and unemployment is likely to yield significant benefit in terms of addressing over-indebtedness. Furthermore, formal education does not reduce the probability of becoming over-indebted and the pursuit of a strategy that target segments of the population that have been shown to be particularly vulnerable is most likely to do so.

Conclusion

The game theoretic analysis of the government-credit supplier interaction provided in Section 1 demonstrated that the degree of protection against over-indebtedness that government can provide citizens with, through supply-side intervention, is fundamentally constrained by its dynamic interaction with credit suppliers. Moreover, an assessment of the cost efficiency and the impact on the estimation of the probability of default of the National Credit Act demonstrate that the actual degree of protection that is likely to result from it is relatively low.

Section 2 provided insight into what the focus of demand side intervention should be. Results from the logistic survey regression demonstrated the importance of employment and social grants in decreasing the probability of being over-indebted. Moreover the model indicated that demand strategies that target female headed households, urban areas and households headed by very young or very old individuals would focus the state's resources on those households that are most vulnerable to over-indebtedness. Finally the model highlighted the necessity of active & specific financial literacy education implementation.

It is thus evident that addressing over-indebtedness in South Africa will require government to utilize interventions targeted at addressing the underlying sources of demand, in addition to the supply-side regulatory measures instituted through the National Credit Act.

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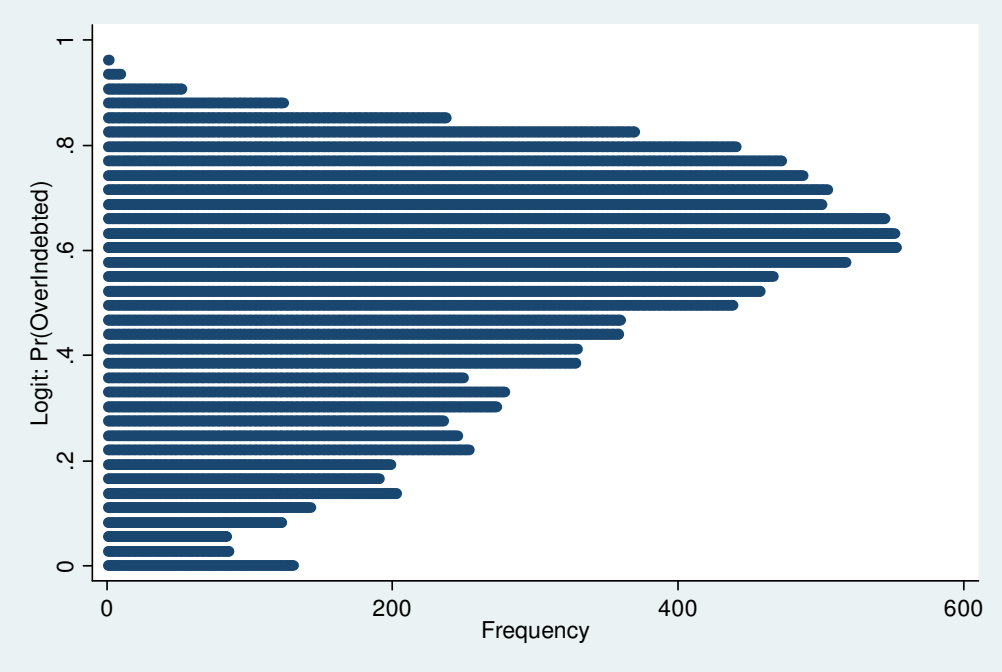
Appendices



.	.2	.3	.4	.5	.6	.7	.8
i.agegrp	_Iagegrp_4-16	(naturally coded; _Iagegrp_8 omitted)					
i.popgrpofhead	_Ipopgrpofh_1-9	(naturally coded; _Ipopgrpofh_1 omitted)					
i.educlevel	_Ieduclevel_0-4	(naturally coded; _Ieduclevel_0 omitted)					
(running logistic on estimation sample)							
Survey: Logistic regression							
Number of strata =	1	Number of obs =	10813				
Number of PSUs =	10813	Population size =	6467582.8				
Design df =	10812						
F(32, 10781) =	21.06						
Prob > F =	0.0000						
			Linearized				

Category	.	Odds Ratio	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Age Group *(reference category = 35-39)							
	15-19	1.515254	0.5408135	1.16	0.2440	0.7527431	3.050171
	20-24	1.127723	0.2125043	0.64	0.5240	0.7794473	1.631615
	25-29	0.668814	0.1061483	-2.53	0.0110	0.4899987	0.9128843

	30-34	0.8074137	0.1066151	-1.62	0.1050	0.6232847	1.045938
	40-44	1.31746	0.1540173	2.36	0.0180	1.047652	1.656754
	45-49	1.244857	0.1497652	1.82	0.0690	0.9833373	1.575929
	50-54	1.571395	0.198882	3.57	0.0000	1.226145	2.013858
	55-59	1.280835	0.1724871	1.84	0.0660	0.9836739	1.667767
	60-64	1.396012	0.2039403	2.28	0.0220	1.048395	1.858888
	65-69	0.9839802	0.172934	-0.09	0.9270	0.6972224	1.388677
	70-74	0.9496225	0.1817368	-0.27	0.7870	0.6525767	1.38188
	75-79	0.9637687	0.2134997	-0.17	0.8680	0.6242931	1.487843
Gender	Male	0.7391287	0.0466597	-4.79	0.0000	0.6530996	0.8364899
Race *(reference category = Black/African)	Coloured	0.8632929	0.0865391	-1.47	0.1430	0.7092863	1.050739
	Indian/Asian	1.126426	0.2677316	0.5	0.6160	0.70691	1.794902
	White	1.698259	0.2410092	3.73	0.0000	1.285854	2.242932
Household Characteristics	income	0.9999908	8.78E-07	-10.46	0.0000	0.9999891	0.9999925
	HH Size	1.050861	0.0139311	3.74	0.0000	1.023906	1.078527
	Rent	0.3309628	0.0374192	-9.78	0.0000	0.2651736	0.4130743
	Settlement	2.286386	0.1550791	12.19	0.0000	2.001744	2.611504
Education *(reference category = no education)	Able to Write	0.9212279	0.0926977	-0.82	0.4150	0.7563209	1.122091
	Primary	1.025718	0.1260391	0.21	0.8360	0.8061602	1.305071
	Secondary	1.06051	0.1430784	0.44	0.6630	0.814071	1.381552
	Tertiary - Technical Institute	1.223611	0.2095839	1.18	0.2390	0.8746421	1.711812
	Tertiary - Academic Institute	2.16384	0.4987174	3.35	0.0010	1.377273	3.399619
Main Source of Income *(reference category = Salary/Wages)	Business Profits	2.236192	0.279721	6.43	0.0000	1.749935	2.857565
	No Regular Income	2.064643	0.2550565	5.87	0.0000	1.620615	2.63033
	Pension	1.897825	0.2427608	5.01	0.0000	1.476938	2.438654
	Other Government Social Grant	1.738441	0.2280794	4.21	0.0000	1.344225	2.248268
	Maintanence	3.43805	0.5525395	7.68	0.0000	2.508982	4.711147
	Subsistance Farming	10.75467	16.1919	1.58	0.1150	0.5622258	205.7234

Column1	Column2	Column3	Column4	Column5	Column6
Logistic regression			Number of obs =	10813	
			Wald chi2(2) =	724.19	
			Prob > chi2 =	0.0000	
Log pseudolikelihood = -6132.5471			Pseudo R2 =	0.1813	

	Robust				
overind |	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
---+---					
_hat |	1.057558	.0394547	26.80	0.000	.9802284 1.134888
_hatsq |	.0495599	.002348	21.11	0.000	.044958 .0541618
_cons |	-.043435	.0312712	-1.39	0.165	-.1047254 .0178555

Variance of error:			3.29		

Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Colu
Correlation Matrix									
	overind	agegrp	gender	income	hsize	popgrp~d	q45own~t	settle~t	q14w
overind	1								
agegrp	0.1226	1							
gender	-0.1554	-0.1008	1						
income	-0.2585	-0.0181	0.1803	1					
hsize	0.0815	0.2823	-0.0693	-0.05	1				
popgrpofhead	-0.1445	-0.0093	0.145	0.4943	-0.1361	1			
q45ownrent	-0.188	-0.219	0.0656	-0.0189	-0.1797	0.0428	1		
settlement	0.0815	-0.0917	0.0909	0.1597	-0.1453	0.2113	0.0605	1	
q14write	0.0644	0.3193	-0.0883	-0.1422	0.1694	-0.1553	-0.083	-0.187	
educlevel	-0.1763	-0.37	0.1296	0.4201	-0.2721	0.3543	0.1347	0.2486	-(
business	0.0371	-0.0256	0.0529	0.124	-0.0029	0.1014	-0.037	-0.012	
noregincome	0.1246	-0.0361	-0.0637	-0.0949	0.1237	-0.0677	-0.053	-0.039	0.
pension	0.1075	0.622	-0.1613	-0.094	0.1631	-0.0382	-0.106	-0.077	0.
othergrant	0.073	0.1121	-0.0714	-0.091	0.058	-0.0641	-0.043	-0.01	0.
maintanence	0.1153	-0.1202	-0.1738	-0.088	-0.0027	-0.0724	-0.021	-0.077	-(
subsistenc~m	-0.0053	0.0217	0.0365	0.0437	-0.011	0.0587	-0.011	-0.057	-(
	noregi~e	pension	otherg~t	mainta~e	subsis~m				
noregincome	1								
pension	-0.1231	1							

othergrant	-0.0722	-0.1069	1		
maintanence	-0.0635	-0.0941	-0.0552	1	
subsistenc~m	-0.0149	-0.0221	-0.013	-0.0114	1