The Role of Loan Guarantee Schemes in Alleviating Credit Rationing in the UK

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Abstract

It is a widely held perception, although empirically contentious, that credit rationing is an important phenomenon in the UK small business sector. In response to this perception the UK government initiated a loan guarantee scheme (SFLGS) in 1981. In this paper we use a unique dataset comprised of small firms facing a very real, and binding, credit constraint, to question whether a corrective scheme such as the SFLGS has, in practice, alleviated such constraints by promoting access to debt finance for small credit constrained firms. The results broadly support the view that the SFLGS has fulfilled its primary objective.

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I. Introduction

A common concern raised in the small business literature is that capital market imperfections exist and limit the availability of finance to small firms. Such concerns have led to the widespread use of loan guarantee programmes throughout the developed and developing world. Almost without exception this type of intervention in the capital market has sought to provide loan security to smaller firms who would not otherwise be able to obtain debt finance through conventional means (Riding,1998).

In this paper we use a unique dataset comprised of borrowers who, in the absence of the loan guarantee scheme (SFLGS), would be perfectly rationed in the debt capital market. That is to say that they have been refused all potential sources of debt finance at the time of SFLGS loan application. Thus our explicit research question is whether the existence of a loan guarantee scheme has fulfilled its primary objective of alleviating capital constraints to smaller firms. A particular innovation in our data is that we have information concerning *ex post* loan default. This is particularly important for the credit rationing debate as default represents what Astebro and Bernhardt (1999) call a type 1 error. That is to say that banks made the correct decision in the first instance not to lend to the firm in the absence of the loan guarantee. By contrast, SFLGS loans which are successfully repaid would, in the absence of the SFLGS, represent a missed opportunity for the bank. This would be termed a type 2 error by the previous authors. Broadly speaking if default increases as constrained firms become unconstrained via the loan guarantee, then banks are, under certain conditions, better off without a scheme. This occurs as loan guarantees raise the equilibrium price and volume traded in the market.

The associated literature on credit rationing essentially deals with lenders response to risk. For example, size of firm is often taken to be a good proxy for firm risk, as is age of firm. Whilst both may be true in a wider sense, it is also true that within each size and age category of firm there is a distribution of risk across firms within that group. Riding (1998) is definitive on this point and indeed argues that ‘in no case have such objectives of risk subsidisation been

articulated for loan guarantee schemes,' and further that,' the objective is to assist small firms, not to subsidise risky firms. It is the task of the credit markets to discriminate according to quality of borrower. It is the objective of the loan guarantee scheme to facilitate capital formation for small firms.'

This leads us into the key issue surrounding the rationale for loan guarantee schemes, that of credit rationing. The existence or otherwise of credit rationing which is not based on borrower quality is fundamental to the requirement for a corrective scheme such as the UK's Small Firms Loan Guarantee Scheme (SFLGS) as it exists in its present form[1]. In short to justify the continuation of an SFLGS, it must be the case that small firms cannot gain access to (proportionally) as much credit, or credit on equally favourable terms, as larger firms of equal risk.

The subject of credit rationing itself has been the focus of a considerable body of theoretical work. Yet as Thakor (1989) points out the notion of a credit rationing equilibrium where banks are competitive 'has baffled economists for a long time'. The reason for this difficulty can be articulated using a basic demand-supply framework. Quite simply, if there is an excess demand for bank funds (i.e more firms want loans than banks are currently prepared to supply at the governing market price) then theory implies that banks should raise loan price (the interest rate) to equate demand for loans with supply, thus increasing profits. We know from the evidence on small firm loan refusal rates that in the normal course of bank lending this does not happen (Cambridge,1996, Cowling,1998, Levenson and Willard, 1997, Storey,1997). The question is why banks refuse to lend to some firms.

The common thread that ties much of the literature together is the role that information plays in the small firm - bank relationship. On this, the seminal credit rationing paper by Stiglitz and Weiss (1981) argues that borrower quality is *ex ante* undetectable by the lending bank (termed adverse selection). By

[1] Similar rationales have been articulated for the US SBA Loan Guarantee Program and Canadian schemes.

implication this gives the firm an unfair advantage over the bank. De Meza and Southey (1996), by contrast, argue that banks, due to their extensive experience of small business lending, are well informed and efficient processors of information. A second problem under this sort of information problem (termed moral hazard) would be one where the borrower responds to an upward movement in interest rates (cost of borrowing) by switching his funds to a riskier project. For the bank the implications are such that its expected profits are in fact lower than was the case before it raised the interest rate. Here it is optimal for the bank not to raise its interest rates to clear the credit market as it suffers through lower profits due to firms choosing higher risk projects. In a second paper on this theme, Stiglitz and Weiss (1983) develop their work to give a time dimension to the small firm - bank lending relationship. Here banks deny credit to any borrower who has defaulted on a previous loan. Assuming that borrowers know this bank strategy, the implications are that borrowers are induced to always choose the safest project with the lowest probability of failure.

So where does collateral fit into the debate? A number of theoretical papers (Besanko and Thakor, 1987, Bester, 1985) have argued that collateral can act as a sorting device. By this we mean that only good risk borrowers will be willing to put up collateral against a loan as they feel confident that they will not default and lose their assets. Bad borrowers, knowing that they are risky, are very reluctant to offer collateral against borrowing as they have a higher probability of losing it. In this type of framework offering collateral also has implications for the cost of borrowing. For example, a good borrower who offers collateral to the bank will be compensated with a lower interest rate. A bad borrower, unwilling to offer collateral, will pay a high interest rate. In this type of regime banks separate out borrowers by risk type by the nature of the contracts they accept, even in the presence of asymmetric information. This is where the first divergences begin to appear in the credit rationing debate. Bester *op cit* argues that bringing collateral into the credit market can eliminate credit rationing. Besanko and Thakor *op cit* argue the opposite. Their case is founded upon the possibility that in cases where the good and bad borrowers are sufficiently

different in terms of their riskiness, the amount of collateral required from good borrowers may well exceed their wealth (asset) endowment. Thus a proportion of genuinely good, low risk, borrowers are unfairly credit rationed. This sort of credit rationing would be *prima facie* evidence in support of loan guarantee schemes.

Taking this line of debate a little further, and bearing in mind the evidence of the effects of gifts and inheritances on the probability of starting a business (see for example, Blanchflower and Oswald, 1998, Holtz-Eakin *et al*, 1994, Lindh and Ohlsson,1996) we can consider a regime in which there are 'poor' and 'rich' borrowers. This concept is particularly important in the light of the comment of Hanson (1983) who in relation to the US argues that;

"entrepreneurial talent is not the prerogative of the wealthy, but is broadly distributed throughout the population as a whole. Without reasonable access to financing, many of our countries' most talented and aggressive entrepreneurs will be cut out of the economic system. Innovation and business development will become a luxury reserved for the wealthy, and the economy as a whole will suffer."

Once again we turn to the ongoing work of Stiglitz and Weiss (1987). Here they again show that borrowers can be rationed in equilibrium, and importantly even those with low risk probabilities. This once again would be a cause for concern and support the hypothesis of unjustifiable credit rationing. Having briefly reviewed the core theoretical issues in relation to credit rationing, one might conclude that in situations where information is asymmetric, it can be quite rational for banks to ration credit. Yet we have also seen that under certain conditions good borrowers can be denied access to credit. In summary we turn to a quote from Thakor *op cit*, "Credit rationing is probably a more complex phenomenon than even current models suggest. It is virtually impossible for static models to allow full comprehension of the rich tapestry of factors that interact to determine a banks decision to ration credit." In line with our discussion on the theoretical controversies surrounding credit rationing and its

implications, the empirical evidence is equally diverse. Historically, the earlier empirical evidence on the existence or otherwise of credit rationing was often set in a macroeconomic context. The most common testable hypothesis was whether loan rates were 'sticky'. By stickiness we mean that the response of bank lending margins to changes in base rates is not instantaneous, or not equivalent.

Empirically, the early work of Jaffee(1971) and Goldfeld (1966), both of whom tested the speed of adjustment on commercial loan rates compared to open market rates, found that adjustment was slow, implying credit rationing. More recent work by Slovin and Sushka (1983) found that the speed of adjustment was at least two quarters, although they argue that this is tantamount to instantaneous adjustment. Others who provide evidence supporting credit rationing are King (1986), although results are not conclusive, and Sofianos, Wachtel, Melnik (1990) who found evidence for credit rationing, albeit only for commitment lending (that is lending the bank has agreed to allocate to the firm over a specified period should the firm require those funds).

The most important work to use microeconomic data to test theories of credit rationing was that of Berger and Udell (1992), who analysed over one million individual loans in the US over the period 1977 to 1988. Their results on loan rate stickiness show that bank margins (defined as total interest rates minus the treasury rate) are sticky with respect to shifts in nominal treasury rates with a bank margin elasticity of -0.34. Thus bank margins are highly and negatively correlated with treasury rates over time. At this point the evidence is consistent with credit rationing. Yet Berger and Udell also employ a further series of tests to establish the validity of this finding. Here they adopt what they term the 'proportions tests', defined as how the proportion of loans with different contract features vary with credit market tightness. For example, the probability that a given loan will be under commitment, secured, or be floating rate. On commitment lending, for credit rationing to be supported the proportion of new loans made under commitment should increase substantially when treasury rates rise. The collateral test requires that more loans are collateralised when treasury

rates rise. This occurs as firms who do not pledge collateral when rates are low, shift to collateralised lending when rates are high.

Empirically, Berger and Udell using their proportions test for commitment lending find that a doubling of nominal rates of interest reduces the proportion of commitment loans by 1 percent. This is the opposite sign required for credit rationing to be supported. On the collateral test they find that the probability of collateralised lending increases when treasury rates rise. This evidence broadly supports the credit rationing hypothesis. Finally, they examine the floating rate test and find a small decrease in the probability of floating rate loans when treasury rates rise. On the basis of all the evidence presented they conclude that commercial loan rates are sticky, which is consistent with credit rationing as found by previous studies. Yet the incorporation of a host of other contract terms generally negates this initial finding. The notable exception to their rejection of the notion that credit rationing is a significant macroeconomic phenomenon is their result concerning collateral.

This paper is intended to follow as closely as our data permits in the footsteps of the key empirical work of Berger and Udell (1992) for the US by using a unique individual loan level dataset. However, we also present a number of innovations which may help shed more light on the real world significance of credit rationing. In particular we have information on whether an actual loans ends in default. Further, we can distinguish between start-up businesses and those already trading. Both of these variables were unavailable to Berger and Udell and many previous studies. Yet they provide us with much more explicit tests of credit rationing thanhas been possible before. In the former case we can identify whether banks charge higher loan rates for riskier (i.e defaulting) loans which would indicate no rationing and market clearing. In the latter case we would expect start-up businesses to suffer the most from information based problems and thus be the most rationed. These key variables are discussed subsequently. In addition we use data for the UK and for a more recent time period, 1993-1998. The dataset is comprised of some 27,331 loans which represent the total set of SFLGS loans issued over this period.

In line with previous macro and micro level studies we find that loan stickiness is an important feature of loan contracting in the UK as it is in the US. For our observed stickiness there are several alternative explanations, including credit rationing, implicit interest rate insurance and loan recontracting by banks and existing customer firms. Given the sample period is one of relatively strong and stable macroeconomic growth for the UK in the post-1991 recession period, we give less credence to the loan recontracting explanation as this primarily deals with existing firms experiencing financial distress during periods of economic instability or downturns. Regarding implicit interest rate insurance, once again there are some problems that may cast some doubt on the validity of this explanation, not least the fact that some 43% of loans were issued to new firms. The implicit interest rate insurance explanation effectively applies only to repeat borrowers.

We proceed by adopting the empirical approach of Berger and Udell in an attempt to shed more light on the extent or otherwise of credit rationing as a real world phenomena in the UK. In doing so we seek to differentiate credit rationing from an array of alternative explanations for observed loan rate stickiness. Most importantly we provide a detailed empirical examination of how different loan contract features impact on loan rates. This is supplemented by a series of 'proportions tests' which provide more explicit tests of various loan contract theories relevant to credit rationing.

The rest of the paper is set out as follows; Section II describes the nature of the dataset to be used in our empirical analysis. In addition we briefly outline the specific tests adopted originally by Berger and Udell. In Section III, we present our empirical findings. We conclude in Section IV.

II. Data and Empirical Tests

The data is derived from the complete records for loans issued under the UK Small Firms Loan Guarantee Scheme over the period 1993 to 1998. In total this

represents 27,331 individual loan contracts. These are spread over some 35 banks and financial institutions throughout the UK, although the vast majority (in the region of 80%) are issued by the four major UK clearing banks. The scheme requires that each borrower completes a standard form before the loan is issued. These forms are collated centrally by the Department of Trade and Industry and include data on a host of key features of the borrower firm, the specific loan contract terms and the bank issuing the loan. Table 1 provides a description of each variable used in the empirical analysis.

As can be observed margins are of the order of 3.25% over base, although the spread is rather large peaking at 9.75 over base. It is worth noting here that for some firms such usurious rates refuse to put them off borrowing. In addition only one in three loan contracts involve the posting of assets by the borrower as opposed to solely government guarantee. Further, of the 27,331 loans issued some 20% resulted in default. This information is one of the key innovations in our dataset which can potentially shed some important insights into the issue of credit rationing.

Empirical Tests of Loan Rate Stickiness

The 'stickiness tests' adopted by Berger and Udell are fairly straightforward in that the bank margin (the dependent variable) is regressed against real and nominal interest rates, the key loan contract variables and a measure of macroeconomic circumstance. Allowing for non-linearity's in the term structure of interest rates, the key independent variables are the exogenously determined interest rate (denoted *baserate* in nominal terms and *realbase* for real terms) and the appropriate squared terms (denoted *baserate2* and *realbase2*). Where we differ from Berger and Udell is that we omit a measure of credit market tightness (their CRUNCH variable) as our sample period only covers a period which could not plausibly be viewed as one in which banks might be actively reducing funds available for lending. In short our sample period is one in which UK macroeconomic performance was characterised by moderate and stable (i.e low inflationary) growth. However, this aspect of our data does present a potential problem in that credit rationing, if observed, is most likely to be present when

banks begin to tighten their lending in response to unfavourable changes at the macroeconomic level.

Table 1

Data Used in the Empirical Analysis

Variable	Obs	Mean	Std Dev	Min	Max	Definition
bmargin	27331	0.0325	0.01057	0.0025	0.0975	Bank margin over base
baserate	27331	0.0616	0.00545	0.0525	0.0800	Bank of England base rates
realbase	27331	0.0342	0.00502	0.0245	0.0455	Base rates deflated by price index
commit	27331	0.4277	0.49476	0	1	Coded 1 if loan is under commitment
float	27331	0.6314	0.48241	0	1	Coded 1 if loan is floating rate
collateral	27331	0.3043	0.54141	0	1	Coded 1 if borrower pledges collateral
years	27331	4.8335	1.86461	0	10	Loan term in years
loan	27331	36827.18	43650.2	500	250000	Loan amount in £s
new	27331	0.43437	0.49568	0	1	Coded 1 if firm age<2 years
default	27331	0.20006	0.40005	0	1	Coded 1 if loan defaulted
grgdp	20	0.03076	0.09419	0.00307	0.04965	Real GDP growth

As to the relative merits of using nominal or real interest rates, the use of real rates is arguably more in keeping with theoretical models of credit rationing which by implication is a real macroeconomic phenomenon. However, most empiricists have tended to use nominal rates, in part due to the difficulties surrounding the necessity of adopting appropriate empirical methods of addressing inflationary expectations. Given that our results may differ substantially between real and nominal interest rates, we tread very carefully at this stage. Empirically, Berger and Udell used rational expectations and adaptive expectations models and found little differences between the two. They also noted that by using nominal rates they could avoid most measurement errors. In the real world we probably do not have enough information on whether economic agents react more to changes in nominal or real variables, particularly prices. This is hardly surprising given the substantial degree of retail and factor price rigidity evident in the UK economy. Finally we note that even nominal rate stickiness can be indicative of credit rationing.

In keeping with Berger and Udell, we use contemporaneous interest rates to reflect the fact that lenders (banks) are responding to current conditions at the time of loan application. In short our model allows us to test whether, in equilibrium, banks raise (lower) their loan margins in line (i.e equally) with increases (decreases) in open market rates or whether rationing occurs. Thus we largely ignore periods of disequilibrium when banks might be adjusting to changes in macroeconomic circumstance. In the real world we typically observe that banks adjustment of mortgage rates to changes in open market rates is virtually instantaneous.

From our basic stickiness regression, we augment the models by incorporating a series of interaction terms, notably *commit, collateral* and *float* with our interest rate measures in order to establish whether key contract terms have substantially different degrees of stickiness. The *commit* variable denotes loan contracts in which the borrower is contractually insured against credit rationing, although survey evidence in the UK suggest that even these types of contractual insurances

can be obviated by the inclusion of loan withdrawal clauses (see for example, Binks *et al*, 1996, Cowling, *et al* ,1991). These effects aside, and in a world characterised by informational asymmetries, we might expect that commitment loan rates would be less sticky than non-commitment rates.

Collateral is an extremely important issue for us given the nature of our data. SFLGS loans require that all available assets which could be used to securitise a conventional bank loan must have been exhausted. The loans issued in our data set which do have some element of personal or firm security reflect that the loan package includes a non-SFLGS loan which runs alongside an SFLGS loan. For those loans with no collateral attached this means that the borrower has no assets to pledge as collateral as far as the bank can ascertain. From the previous literature, we note that collateral is more often than not associated with riskier loans (Cowling,1998), although even this rather intuitive assumption has been challenged on theoretical grounds by Chan and Thakor (1987). Collateral is also typically identified as a means of addressing informational asymmetries (Leeth and Scott,1989). On balance there are arguments to support relative loan rate stickiness on collateralised and uncollateralised loans. Similar arguments can be put forward for relative stickiness between floating and fixed rate loans primarily associated with risk sharing and sorting arguments.

Proportions Tests

Here we present a discussion of the three core 'proportions tests' adopted by Berger and Udell. Essentially the test are designed to elicit more information concerning the relative stickiness of loans with different, and very specific, bundles of contract parameters. For example, is a loan under commitment with collateral pledged more sticky than a loan not under commitment with collateral pledged? The three tests are comprised of estimating a probit model of the probabilities of a loan contract being; (i) under commitment, (ii) collateralised, and (iii) floating rate. Given our sample size we are able to estimate all three models by individual observation. In addition, and in line with the initial

stickiness tests, we estimate each proportions test using real and nominal interest rates, and employ the same set of control variables.

The commitment test provides an explicit test of the significance of credit rationing. For credit rationing to be quantitatively significant in the UK the results must show definitively that new loans issued under commitment increase with open market rates. Empirically our probit results must identify a positive and significant coefficient on our interest rate variables. This occurs as commitment borrowers are contractually insured against rationing in a way that non-commitment borrowers are not. Thus we would expect to observe a reduction in non-commitment borrowing in periods of macroeconomic instability. If this occurs, then it follows that the relative proportion of commitment loans out of total loans will rise.

The collateral and float tests enable us to identify how borrowers with varying contractual terms are more (less) likely to be rationed. In particular the role of collateral when open market rates are increasing will shed more light on the role that information asymmetries play for secured and unsecured borrowers, and how collateralisation might resolve such problems. For fixed rate borrowers increases in open market rates clearly put them in a relatively favourable position *vis a vis* borrowers with variable rate lending. However, the reverse is also true when open market rates are falling.

In all our empirical models we use a number of control variables to take account of additional loan specific, macroeconomic and bank specific factors which were they omitted might otherwise lead us to draw some unsafe conclusions. Specifically we include loan duration, loan size, legal status of the borrowing firm, bank dummies, a dummy for new firms, and real growth in GDP as a proxy for macroeconomic activity. These are all variables which have commonly been used in previous empirical studies and tend to reflect factors which might play a key role in helping the lender to assess borrower type. Finally we include a variable '*default*' which identifies individual loans which were, *ex post,* not repaid for reasons of legal default. Default is identified by a call for guarantee

repayment on the UK Treasury by the lending institution. This particular variable is our key innovation over the original Berger and Udell study and provides us with a pure test of credit rationing in the sense that defaulting firms in a non-credit rationing regime should have higher margins than non-defaulters. In a regime where credit rationing was evident defaulting loans should have sticky margins (see Riley,1987).

III. Empirical Results

Stickiness Test Results

We report the results of our stickiness tests for real and nominal rates of interest in Tables 2 and 3. In both cases the bank margin is regressed against (real or nominal) interest rates, loan contract, macroeconomic and bank variables. For reasons of focus and parsimony we suppress the control variables in our reporting of the results but include our key default, commitment, collateral and float variables. The regression shown in column 1 of Table 2 has the real interest rate on the right hand side (*realbase*) and its squared term (*rbase2*), the commitment, collateral and float variables together with the previously identified control variables. We observe that both real interest rates and the squared term are empirically significant but of opposite signs. Importantly the former is positively correlated with bank margins and the latter negatively which strongly supports the notion of non-linearity's in the interest rate structure.

Of vital importance to the credit rationing debate is whether bank margins are sticky. In fact they move in line with base rates initially but the magnitude of the coefficient on the squared term ensures that for most non-negative real interest rates the overall effect is negative. For example if we calculate the predicted change in bank margins for a doubling of real interest rates from its mean value of 3.425 to 6.85, then we estimate that bank margins will fall by 76.34 basis points. This represents a significant degree of stickiness in loan rates. Repeating the calculation for nominal interest rates (shown in column 1 of Table 3) we find that a doubling of nominal rates from their sample mean of 6.16 to 12.32 gives a

predicted fall in bank margins of 108.88 basis points. Thus the measured stickiness of nominal rates is substantially larger than that on real rates. Somewhat reassuringly the results are broadly in line with those reported by Berger and Udell, although a little higher than theirs of 59 and 99 basis points respectively for a doubling of real and nominal rates.

We now turn our focus of attention to relative stickiness for loans with different contract features. Here we faithfully adhere to the estimation of Berger and Udell by including three interaction terms, com-float, com-fixed, and noncom-float which are interacted with realbase and identified as rb-com-float, rb-com-fixed and rb-nocom-float. In a similar vein we simply replace rb with br to reflect the cases where nominal interest rates were used. The base category which is excluded from the regressions is nocom-fixed which permits us to identify different rates of stickiness across different types of loan contract terms.

Definitions of Contract Parameter Interaction Terms

Interaction Term	*Definition*
com-float	floating rate loan under commitment
com-fixed	fixed rate loan under commitment
nocom-float	floating rate loan not under commitment
nocom-fixed	fixed rate loan not under commitment

The results in column 2 of Table 2 shows that commitment loans have virtually identical stickiness to non-commitment loans for given rate type. However, they are far less sticky than the coefficients identified in the US study. The results also strongly suggest that fixed rate loans are far more sticky than floating rate loans. In fact the coefficient on commitment lending at fixed rates is significant and negative which also implies that fixed rate non-commitment loans are less sticky. The equivalent regression for nominal rates is presented in column 2 of Table 3. Here we find contrasting results. In particular we note that stickiness across all loan contract terms is greater than was apparent for real interest rates. Once again however, we find that non-commitment and commitment loans of comparable rates are of equal stickiness. Yet in this case we also find that

commitment loans with fixed rates are less sticky then their variable rate equivalents and more sticky than the control group of non-commitment fixed rate loans.

The finding that stickiness on commitment loans is identical to that on non-commitment loans of the same rate type accords with the findings of Berger and Udell for the US, and implicitly questions whether the association of stickiness with credit rationing is as robust as previously believed. Crucially the use of commitment loans insulates the borrower from credit rationing. On balance our results might imply that information asymmetries are not the fundamental determinant of rate stickiness.

The regression results shown in column 3 of Table 2 simply substitute in collateral for our commitment variables in all the interaction terms. Firstly we find that fixed rate loans are stickier than their variable rate equivalents. The key finding is that secured loans are more sticky than unsecured loans and substantially so on variable rate loans. This might imply that borrowers pledging collateral are subject to greater information problems than those who do not. Furthermore, even the pledging of collateral cannot fully negate such problems. These results also hold across our real and nominal rate regressions and appear of similar magnitude.

Finally we can use our *ex post* default variable to examine loan rate stickiness with respect to borrower risk in the vein of Riley (1987) who predicts that should rationing be empirically observed it should be most prevalent amongst the highest risk classes of borrower. In our case we have observed in real time which borrowers have defaulted on their loans and can trace this back to the point of loan issue. Thus we might expect to observe more stickiness amongst our defaulting loans should credit rationing be empirically significant. In fact only in our real interest rate regressions were defaulters found to pay higher bank margins. Yet even this result suggests that the highest risk class of borrowers (the defaulters) have less sticky margins than safer borrowers (non-defaulters).

These findings appear to contradict Riley's model with greater robustness than was apparent in the earlier Berger and Udell study.

In keeping with Berger and Udell we offer one final piece of evidence concerning loan rate stickiness by referring to the raw data on bank margins (see Figs 1a ,1b). Here we observe that banks, without exception, never lend at rates below the prevailing market rate. In fact the lowest bank margin recorded was 0.25 over base. This evidence is consistent with banks earning a non-negative expected profit on each individual loan if we assume that bank margins are sufficient to cover expected losses incurred through default. In fact earlier estimation of banks net revenues from the SFLGS indicate that large positive profits were earnt over the full sample period (see KPMG,1999). In this respect the data are consistent with credit rationing theory, although alternative interpretations are plausible[2].

At this juncture we find a reassuring degree of consistency with the earlier US work of Berger and Udell in terms of our overall results. Like the previous authors we also find a significant degree of stickiness, but on further, more detailed examination of loan contract terms we also broadly support their conclusions that observed stickiness does not necessarily equate to credit rationing. In particular our results *vis a vis* commitment lending offer strong evidence against the case for credit rationing. However, this is counteracted to a degree by the large and positive profits earnt from the loan pool by banks and the lack of below risk free borrowing costs. If we return to the cause of our empirically observed stickiness, we note that our findings support the view that the greater share of stickiness cannot be attributed to information problems as evidenced by the equality of stickiness on commitment and non-commitment loans. Further, we also note that loans issued to new firms are substantially less sticky than those issued to existing firms. This finding appears to strengthen the case against informational problems causing loan rate stickiness for without doubt new firms with no track record are far more likely to be subject to this type of problem when dealing with financial markets. In fact one might rationally

[2] I thank Colin Mayer for this observation.

expect that if credit rationing did exist at any significant level in the UK it would be at its most prevalent amongst new borrowers/firms. This does not appear to be the case.

Table 2

Regressions of Bank Margins (bmargin) on Real Interest Rates, Loan Contract Terms and Controls

Variable	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
	(1)		(2)		(3)	
realbase	1.220	9.069	0.5575	4.207	0.579	4.396
rbase2	-2.288	-11.777	-1.917	-10.131	-1.977	-10.487
rb-com-float			0.6723	27.239		
rb-com-fixed			-0.0686	-2.445		
rb-nocom-float			0.6753	28.395		
rb-col-float					0.477	18.754
rb-col-fixed					-0.027	-0.896
rb-nocol-float					0.799	37.472
commit	-0.0346	-3.543			-0.0296	-3.131
collateral	-0.0611	-4.736	-0.0430	-3.423		
float	-1.5258	-155.04				
com-float			-3.858	-45.167	-3.209	-36.436
com-fixed			0.2134	2.168	-0.0058	-0.055
nocom-float			-3.841	-46.702	-4.295	-57.978
default	0.0235	2.095	0.0285	2.610	0.0257	2.369
new	0.3953	39.27	0.4064	41.480	0.401	41.067
R2	**0.522**		**0.547**		**0.551**	
F stat	**1754.7**		**1576.8**		**1598.8**	

Table 3

Regressions of Bank Margins (bmargin) on Nominal Interest Rates, Loan Contract Terms and Controls

Variable	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
	(1)		(2)		(3)	
baserate	-0.805	-4.082	-0.814	-4.274	-0.715	-3.758
baserate2	0.0327	2.061	0.0044	0.029	-0.109	-0.711
rb-com-float			0.695	31.266		
rb-com-fixed			-0.0492	-1.975		
rb-nocom-float			0.7043	33.156		
rb-col-float					0.5916	25.956
rb-col-fixed					0.0708	2.630
rb-nocol-float					0.819	42.602
commit	-0.0382	-3.931			-0.0325	-3.473
collateral	-0.0655	-5.102	-0.0795	-6.024		
float	-1.5209	-154.912				
com-float			-5.837	-42.461	-5.199	-37.047
com-fixed			0.280	1.1811	-0.5308	-3.157
nocom-float			-5.858	-44.654	-6.599	-55.408
default	0.00696	0.621	0.0072	0.668	0.0594	0.551
new	0.3931	39.217	0.400	41.395	0.396	41.027
R2	**0.525**		**0.499**		**0.561**	
F stat	**1780.8**		**1516.8**		**1661.2**	

In terms of answering our fundamental research question as to whether the existence of a loan guarantee scheme has alleviated a binding credit constraint faced by a subset of smaller firms in the UK, the results thus far are generally

supportive in the sense that there is little evidence of further credit rationing once firms are on the scheme. By implication the SFLGS must be seen as an important and corrective scheme that broadly fulfils its objectives, those of promoting access to finance for small firms with ex ante viable lending propositions. In its absence it is likely that credit rationing would be rather more prevalent than it is in the UK.

Proportions Tests Results

In Table 4 we report the results of our three proportions tests using real interest rates on the right hand side. Table 5 shows the equivalent results when using nominal rates. The dependent variables in each of the three cases are coded in binary form [1,0] indicating that an individual loan is either under commitment, collateralised, or floating rate (coded 1) or not under commitment, not secured, or fixed rate (coded 0). The remaining right hand side variables are identical to those used in the stickiness regressions with the omission of the interaction terms. The estimation in this case uses a probit model to reflect the nature of the dependent variables and in each case the marginal effects estimates are also calculated. Column 1 of Tables 4 and 5 show the results concerning the probability that a given loan will be under commitment as a function of real and nominal interest rates. For credit rationing to be a significant real world phenomenon it must be the case in these two models that the probability of a loan being under commitment rises with open market rates. In fact we observe in both cases that the reverse is true. Here the probability of a loan being issued under commitment declines by 0.81% for a 1% increase in real or nominal rates respectively when evaluated at their means. This might imply that rationing is most prevalent on non-commitment loans. A further issue is whether this finding offers evidence that is inconsistent with information based rationing.

We now turn our focus of attention to the collateral tests reported in column 2 of Table 4 and Table 5. Here we observe that the probability of a loan being secured declines by 0.15% for a 1% increase in real open market rates. The magnitude of the downward shift in the probability of loan collateralisation is

even greater for nominal interest rates at -0.34% for an equivalent 1% increase in nominal rates. These results are of surprisingly similar magnitude (and sign) to those of Berger and Udell. In terms of their implications, they confirm our earlier stickiness results regarding collateral in that borrowers who pledge collateral are typically those most likely to be subject to information problems even after they have pledged security. As such we might conclude that where rationing does occur it is most likely to fall upon secured than unsecured borrowers.

Next we turn to our third proportions test, that relating to the probability that a given loan will be floating rate as opposed to fixed rate. These results are reported in column 3 of Table 4 and Table 5 respectively. Using real interest rates we find that the probability of a floating rate loan increases by 0.35% for a given 1% increase in real rates. The equivalent figure for nominal rates is 1.32% (for a 1% rise in nominal rates). These sorts of results strongly reject the implicit interest rate insurance hypothesis given that offering fixed rate loans is a far more effective way to insulate borrowers from deteriorating macroeconomic conditions and high open market rates.

Regarding loan defaulters, we note that riskier borrowers are equally likely to be offered commitment loans and unsecured loans, although they were marginally more likely to be offered floating rate loans in the models using real open market rates. In the equivalent nominal rate models we find that defaulters are slightly less likely to be offered commitment loans, equally likely to be offered unsecured loans and once again more likely to be offered floating rate loans. For new firms we note that they have a 39% lower probability of being offered commitment loans, a 2.8% lower probability of being offered an unsecured loan and a 3.4% higher probability of being given a floating rate loan using real market rates. On nominal rates we find identical effects.

Table 4

Probit Estimates of Probability of Different Loan Contract terms on Real Interest Rates and Controls

	Commit		Collateral		Float	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Variable	(1)		(2)		(3)	
realbase	-2.082	-8.511	-0.473	-1.491	0.942	3.833
rbase2	3.046	8.618	0.526	1.146	-1.491	-4.205
commit			-0.11	-4.859	0.150	8.383
collateral	-0.168	-7.198			0.089	3.751
float	0.144	8.054	0.0516	2.185		
new	-1.075	-61.987	-0.0857	3.659	0.093	5.048
default	-0.031	-1.516	0.0345	1.312	0.050	2.440
Pseudo R2	**0.127**		**0.0466**		**0.104**	
Chi-sq	**4758.69**		**15642.11**		**3765.24**	

Table 5

Probit Estimates of Probability of Different Loan Contract terms on Nominal Interest Rates and Controls

	Commit		Collateral		Float	
	Coeff	t-stat	Coeff	t-stat	Coeff	t-stat
Variable	(1)		(2)		(3)	
baserate	-2.074	-5.743	-1.051	-2.280	3.558	9.860
baserate2	1.707	5..859	0.752	2.000	-2.934	-10.084
commit			-0.112	-4.862	0.152	8.515
collateral	-0.168	-7.213			0.0902	3.778
float	0.146	8.197	0.054	2.287		
new	-1.072	-61.897	-0.085	-3.646	0.0957	5.195
default	-0.0397	-1.923	0.025	0.953	0.0597	2.881
Pseudo R2	**0.127**		**0.466**		**0.106**	
Chi-sq	**4758.69**		**15649.33**		**3841.12**	

IV. Conclusions

This paper has empirically examined the extent to which information-based, equilibrium credit rationing is prevalent amongst small business customers of financial institutions in the UK over the period 1993 to 1998. By adopting the methodology of an important earlier US study, that of Berger and Udell, we are able to provide comparable results for another country by focusing on specific features of loan contracts which have direct implications drawn from theory. In addition we are able to add a number of key innovations, in particular the use of a variable which captures subsequent loan default.

Our key empirical results and their implications for credit rationing are presented in Table 6. Our first finding is consistent with the majority of previous studies in that we also find a substantial degree of stickiness on bank margins with respect to open-market rates. This much is consistent with credit rationing, perhaps more so than in earlier studies given the large number of loans issued to new firms who by implication cannot be distressed borrowers or recontracting borrowers. However, when we examine specific loan contract features we find a much greater degree of consistency with the results of Berger and Udell, particularly with respect to the equality of stickiness across commitment and non-commitment loans. Despite this comparability between many of our results and theirs, we also find evidence that tends not to favour the implicit interest rate insurance hypothesis as an alternative explanation for what we observe. On some tests we also find evidence generally supportive of credit rationing. For example, the lack of non-negative bank margins and the collateral results in particular. Without doubt our findings generally support the notion that borrowers who pledge collateral are the most problematic in an information sense for banks and are probably the riskiest type of borrowers. However, the reverse is true if we consider loan defaulters who are very unlikely to be rationed and more likely to be offered loans at higher rates to reflect their riskier status. This is strong evidence is favour of rejecting credit rationing as a significant phenomenon.

Perhaps the final piece of evidence to decide which side of the fence we fall on relates to the commitment loan proportions test. Here the fact that the probability of a loan being made under commitment decreases with real and nominal open-

market rates is very strong evidence against credit rationing. This is crucial as only non-commitment borrowers can be rationed. However, the role that loan withdrawal clauses might play may mitigate some of the essential theoretical arguments *vis a vis* commitment lending and rationing. We conclude that on balance credit rationing is not an explanation consistent with the loan market for most small businesses in the UK. However, there is a pool of small firms who, due to informational problems, will always find it more difficult to raise funds from the credit market when macroeconomic conditions are worsening, even when collateral is available.

Table 6

SUMMARY OF KEY EMPIRICAL FINDINGS AND THEIR IMPLICATIONS

Result	Implication
A. Stickiness Tests	
1. Bank margins are sticky and fall substantially as open-market rates rise. Stickiness is greater on nominal rather than real rates.	Generally supports credit rationing theory. Also could be explained by implicit interest rate insurance or recontracting with troubled borrowers, although both these explanations are less likely given the large proportion of new borrowers.
2. Commitment loan rates equally as sticky as non-commitment rates.	Observed stickiness cannot be attributed to credit rationing since commitment loans cannot be rationed.
3. No negative margins. Banks make substantial net profits from their portfolios over the entire sample period.	Consistent with credit rationing in the sense that banks expected profits are non-negative. However, the role that the government backed guarantee plays in reducing the banks cost of default cannot be ignored.
4. Fixed rate loans stickier than floating rate loans.	Consistent with implicit interest rate insurance hypothesis.
5. Loans which subsequently end in default (the highest risk class of borrowers) have less sticky margins than safer risk classes of borrowers.	Inconsistent with credit rationing of the Riley (1987) type.
6. Secured loans are stickier than unsecured loans.	Consistent with credit rationing as collateral is associated with higher risk borrowers and information problems.
B. Proportions Tests	
1. Commitment loans decrease with increases in real and nominal open-market rates.	Inconsistent with credit rationing as only non-commitment borrowers can be rationed.
2. Loan collateralisation decrease with open-market rates.	Consistent with credit rationing of riskier borrowers.
3. Fixed rate loans decline with open-market rates.	Strongly rejects implicit interest rate insurance hypothesis.

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Figure 1a. Bank Margins and Real Interest Rates

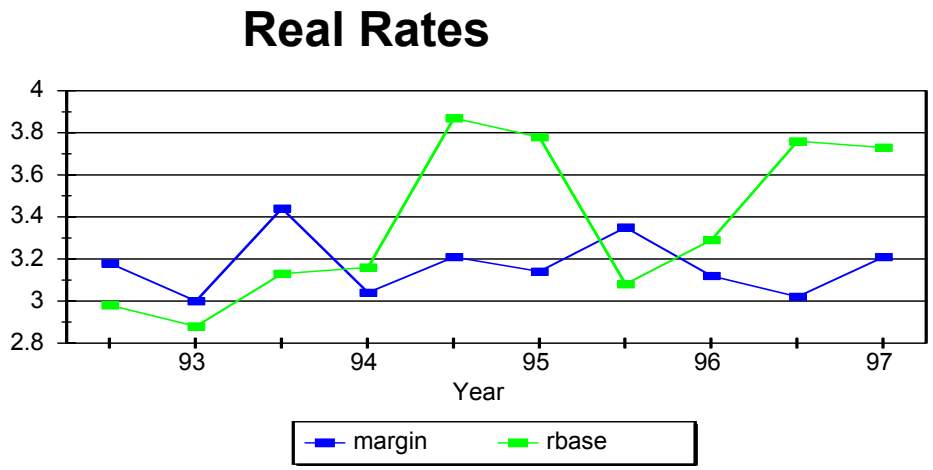

Figure 1b. Bank Margins and Nominal Interst Rates