Bankruptcy Exemptions and the Market for Mortgage Loans*

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Abstract: The recent explosion in personal bankruptcy filings has motivated research into whether credit markets are being adversely affected by generous legal provisions. Empirically, this question is examined by comparing credit conditions and bankruptcy exemptions across states. We note that the literature has focused on aggregate household credit, making no distinction between secured and unsecured credit. We argue that such aggregation obscures important differences in forms of credit. Most significantly, property exemptions do not prevent the home mortgage creditor from foreclosing on the home if not fully repaid. This makes it unlikely that the home mortgage lender will be adversely affected by the exemptions. We argue further that some property exemptions may in fact have some beneficial effects for home mortgage lenders. Using both household-level data and state-level data, we show that in the 1990's high exemption levels have not tended to increase mortgage rates or increase the probability of being denied a mortgage.

I. INTRODUCTION

Personal bankruptcy is no longer an unusual phenomenon. Personal bankruptcy filings have risen over 500% in the last two decades and there were over 1.3 million filings in 1997 alone.[1] Moreover, these filing statistics may in fact understate the importance of personal bankruptcy as many more debtors may implicitly use the threat of filing to evade collection efforts by their creditors; it is default and not necessarily bankruptcy which creates losses for creditors (see White (1998)).

The possibility that these changes in bankruptcy patterns may affect the larger market for credit is of obvious importance to economists and the general public. Mortgage debt plays a central role in the portfolio of many households. Home mortgage loans represented 68% of the liabilities of households in 1995 (see Kennickell, Starr-McCluer and Sunden (1997)). Mortgage loans are also prominent in bankruptcy; in a sample studied by Sullivan, Warren and Westbrook (1989), 53% of bankrupt debtors were homeowners and, in this group, mortgage loans constitute more than half of their debts. Yet, to date there has been surprisingly little research in this area.

In this paper, we argue that the existence of several legal protections provided to the home mortgage lender in bankruptcy make it unlikely that homestead exemptions could adversely affect the mortgage credit market. Mortgage loans are (nearly always) fully secured by a combination of collateral, downpayment and mortgage insurance. Over 97% of the secured claims of Savings and Loans and private mortgage companies on bankrupt debtors are fully secured (Sullivan, Warren and Westbrook (1989).[2] The mortgage lender has an important legal remedy unavailable to other creditors, namely the right to foreclose on the home. The mortgage lender is senior to bankruptcy exemptions with respect to its collateral.

Moreover, it is possible that the home mortgage lender may gain from these exemptions and bankruptcy. Put simply, many debtors file for bankruptcy precisely so that they can pay their mortgage and keep their home by discharging other debts.[3]

For these reasons, we argue that much of the conventional wisdom (e.g., Gropp, Scholz and White (1997)) regarding bankruptcy does not apply to secured credit. Nor does it fully apply to aggregate household credit, which contains both secured and unsecured components. The effects of bankruptcy exemptions on aggregate credit may obscure important differences in the

underlying segments of household credit.

Our empirical investigation makes use of both time series and cross-sectional variation. The Home Mortgage Disclosure Act (HMDA) dataset and the Federal Housing Finance Board's Rates and Terms on Conventional Home Mortgages provide cross-sectional data over several years. To our knowledge, this paper is the first to use these large high-quality data sets to study of the effects of bankruptcy. We leave the effect of bankruptcy laws on unsecured loans to future work. In the next section, we provide some background on the treatment of mortgages in bankruptcy.

The remainder of the paper proceeds as follows. Section 2 discusses some aspects of the legal structure of the bankruptcy exemptions. Section 3 presents a framework for examining the effects of the exemptions on the supply of mortgages. Section 4 reports empirical estimates of the importance of exemption levels on the market for housing credit. Section 5 concludes.

II. BANKRUPTCY EXEMPTIONS LAWS

In Chapter 7, a debtor may exempt the equity in his assets up to the value specified in the exemptions.[4] Debt secured by exempt property, such as a mortgage, is senior to the exemption. The lender is not prevented from foreclosing by the presence of the exemption. In addition, the exemptions have significance outside of Chapter 7. In Chapter 13, the exemptions may affect the amount the debtor must repay through the "best interests of the creditors" test which states that the creditors are entitled to receive at least as much in Chapter 13 as they would have received in Chapter 7 (13 U.S.C. Section 1325(a)(4)).

While most states require their debtors to use the state property exemptions, other states allow debtors to choose the federal Section 522(d) exemptions. Therefore, this paper considers both the Section 522(d) bankruptcy exemptions and state property exemptions.

Finally, we note note that several bankruptcy provisions which threaten other secured creditors or other lien-holders do not affect mortgage lenders. For example, unlike other forms of secured credit, the mortgage is not split into secured and unsecured credit components by Section 506 and thus a debtor desiring to retain possession of his home must either convince the mortgage creditor to allow him to reaffirm the debt or pay the mortgage creditor in full. Likewise, the

mortgage creditor is not affected by Section 1322(b)(2) which allows the debtor to reschedule payments in Chapter 13 according to a judicially determined interest rate. Lastly, the debtor cannot make use of the lien avoidance provisions of Section 522(f) for a mortgage contract.

B. Demand Effects

We believe that the effect of the exemptions on the demand for mortgages is likely to be limited. To the extent that property exemptions do affect the market for home mortgage loans, we expect the effect to change the supply of mortgages. Indeed, a debtor's premeditated attempt to use exemptions to store wealth can result in a denial of the exemption or even a denial of the discharge if the court feels that this was indicative of an attempt to "hinder, delay or defraud a creditor" (*In re Armstrong*, 97 B.R. 569, 570 (Bankr. Neb. 1989), *aff'd* 931 F.2d 1233, (8th Cir. 1991)).[5]

Our premise is not that pre-bankruptcy planning is impossible or unimportant. We admit that we cannot rule out the possibility of a demand shift. Indeed, one commonly cited form of planning, paying down the mortgage, may benefit the mortgage lender. Rather, we think it unlikely that most debtors are cognizant of, or estimate, exemptions at the time of borrowing. In addition, if capital is mobile across states so that supply is flat in any one state, demand shifts will not affect equilibrium terms of credit unless the type of debtor changes. Finally, even if a demand shift changes the type of debtors who apply for a loan, the HMDA data set provides detailed information on the individuals who apply for the loan and we are able to control for this potential problem to a certain extent.

III. EXEMPTIONS AND THE SUPPLY OF CREDIT

We assume that the debtor will have four general alternatives: repay all of his creditors in full, default on his unsecured loans and force the creditors to use state collections proceedings, file under Chapter 7 or file under Chapter 13 of the bankruptcy code. We assume throughout that the debtor may only keep his home if he repays his mortgage creditor in full; the mortgage creditor will not renegotiate the mortgage.

Rather than trying to be explicit about the decision to file, we assume that the debtor will file with some probability that depends on the level of garnishment permitted, the exemptions, the

value of his home and the value of his human capital, $b(g, X_h, X_P, h, k)$, where g is the fraction of future income which is exempt from garnishment, X_h and X_P are the homestead and personal property exemptions, h is the value of the home and k is the debtor's human capital (equivalently, future income).[6]

Consider a debtor who decides not to repay his unsecured creditors but does not file for bankruptcy. His unsecured creditors (including the mortgage creditor if there is a deficiency judgment) will have the right to garnish his wages and seize any non-exempt property in satisfaction of their debt. In order to retain his home, the home equity (plus subjective value) must be worth more than the debt but not so valuable that the equity exceeds X_h. If the value of the home (including the subjective value) is less than the value of the mortgage, a debtor defaulting on his unsecured debt would have no reason to repay his mortgage. That is, he will retain his home if $M-v<h<M+X_h$, and $gk+X_P>M$, where v is the subjective value of the home and M is the amount of the mortgage loan.

Now consider a debtor filing under Chapter 7. The debtor may only keep his home if he has sufficient assets to repay the debt in full, $k+X_P>M$. As with simple default, the equity must be enough to make reaffirming the mortgage rational but not so much that it exceeds the exemption, $M-v<h<M+X_h$. If both of these conditions are met, the debtor's consumption is $X_P+h-M+v+k$. If not, the debtor wil have $X_P+Min[X_h, h-M]+k$.

Under Chapter 13 the debtor is permitted to retain all of his physical assets, including his non-exempt property, but must pay some of his future earnings, which we denote $R_{13}(k)$. The creditors must receive at least as much as they would have received in a Chapter 7 filing (which means that the debtor would never file for Chapter 13 unless it allows him to keep the home). Therefore the debtor must pay at least $(P-X_P)+Max[0, h-M-X_h]$ to unsecured creditors

B. Return to the Mortgage Lender

Transaction costs are taken to be inversely proportional to wealth (unless there is a foreclosure). The costs incurred by the mortgage lender are summarized in the first row of Table 1. Note that with zero transaction costs, exemptions have no effect on the lender's return at all.

We implicitly assume that foreclosure is equally costly in or out of bankruptcy. Mortgage lenders generally do not know (or do not record) whether the foreclosed debtor has filed or not.

Since inquiring is possible, but not routine, it seems that lenders do not attach great significance to bankruptcy given that foreclosure will occur. In most defaults, bankruptcy is filed a few months prior to the first missed mortgage payment. This pattern is consistent with debtors attempting to keep their home by filing but not succeeding.

Rows 2-4 of Table 1 show the returns to the lender from mortgage payments, foreclosure sales and from deficiency judgements (when the debt cannot be covered by sale of the home). The mortgage lender gets a fraction of the debtor's property from a deficiency judgement; the fraction is equal to the housing debt divided by total debt. The bottom row indicates the net return for each possible debtor action, with $F_7(h)$ and $F_n(h)$ denoting the returns from foreclosure and deficiency.

Given this accounting framework, we can write an explicit expression for the expected return from a mortgage conditional on two random variables, the future home and human capital values. Specifically, consider a two period rational expectations model. In the first period, the lender takes an application and decides whether to extend the loan. In the second period, h and k are realized and the debtor repays, files or defaults outside bankruptcy. Therefore, the lender's expected return will be:

$$E(R) = \text{return(repay)}\times\text{pr(repay)} + \text{return(ch. 7)}\times\text{pr(ch. 7)} + \text{return(ch. 13)}\times\text{pr(ch. 13)} \quad (1)$$
$$+ \text{return(default outside bankruptcy)}\times\text{pr(default outside bankruptcy)}.$$

The returns associated with each debtor action are shown in the bottom row of Table 1. In period 1, the lender does not know which action the debtor will take in period 2 -- it depends on the realized values, h and k. But, assuming rational expectations, the lender can assess the probability of each action. For example, full repayment will occur when $k>K_d(g,X_p,X_h,h)$, for any level of h. The probability of repayment, $\text{pr}(k>K_d(g,X_p,X_h,h))$, can be calculated as long as the lender knows the distributions of h and k. Similarly, the lender can calculate the probabilities associated with the other possible actions.

To obtain comparative statics for changes in X_h, it is not necessary to specify actual distributions for k and h. Rather, we simply assume the densities are continuous and strictly positive. This allows us to write the expected return in terms of integrals with respect to the two

random variables. The full expression for E(R) is somewhat tedious and is relegated to a mathematical appendix.

In order to determine the effect of an increase in the homestead exemption, we need to evaluate the sign of the derivative of E(R) with respect to X_h. First we make the following assumptions about the transactions costs.

Assumption 1

The functions $b(\cdot)$, $C_{13}(\cdot)$, $C_{7r}(\cdot)$,$C_{nr}(\cdot)$, and $C_r(\cdot)$ are differentiable in X_h

Assumption 2

Reaffirmed mortgages are less costly than foreclosures, $C_{13} < C_f$, $C_{7r} < C_f$ and $C_{nr} < C_f$.

Assumption 3

Mortgage lenders prefer that the debtor file under Chapter 13 and thereby partially discharge the unsecured debt rather than repay the unsecured debt in full, $C_{13} < C_r$.

Assumption 4

Debtors with non-exempt equity in their home and a relatively high value of human capital are likely to file under Chapter 13 to avoid foreclosure; $b(g, X_h, X_p, h, k)$ is close to one in this region.

Assumption 4 asserts that debtors who face good job prospects, but are unable to meet all their current debt payments, are likely to file Chapter 13 in order to keep their houses. As detailed above, there is both empirical and anecdotal support for a high probability of Chapter 13 in these circumstances.

Proposition 1

Under assumptions 1-4, the expected mortgage return to the lender is increasing in the homestead exemption, $\frac{\partial E(R)}{\partial X_h} > 0$.

Proof

See Appendix 1.

Mathematically, this result is driven primarily by the wealth effect. Although higher exemptions may induce a debtor to file, doing so will raise her wealth level. Increased wealth may, in turn, allow the debtor to continue paying the mortgage.

It is worth mentioning why this result differs from that predicted by Gropp, Scholz and

White (1997). The difference arises because those authors aggregate secure and unsecured debt. This assumption is based on the view that secured and unsecured debts are fungible. If so, the debtor can maximize the exemption (by, for example, paying down the mortgage with credit cards). Higher homestead exemptions hurt the unsecured lender. In our model, we do not consider the unsecured lender at all. The two results can be reconciled if the harm to unsecured lenders outweighs any benefits to secured lenders, so that, on net, *aggregate* supply tightens.

Following Stiglitz and Weiss (1981), Longhofer (1996), and Williamson (1986, 1987), we note that a shift in the supply of credit may manifest itself in reduced credit rationing or lower interest rates. Intuitively, changes to the interest rate may not necessarily clear the market because they have effects on the type of loan and the probability of repayment. For example, higher interest rates will 1) decrease the ability of a given debtor to repay; 2) change the pool of applicants by decreasing the number of high quality applicants and 3) cause some debtors to engage in riskier behavior. Longhofer (1996) explicitly examines the effect of exemptions on the probability of denial in a costly state verification model. He shows that if one considers credit generally, larger exemptions should lead to greater credit rationing as the creditors cannot make up for the reduced return in default by increasing the interest rate.

IV. EMPIRICAL TESTS AND RESULTS

We first investigate whether the probability of being denied credit, in the form of a mortgage, is increasing in the homestead or personal property exemption level. The Home Mortgage Disclosure Act (HMDA) data contains a summary of every mortgage application taken by qualifying mortgage lenders in the United States from 1990-1995. Because of the enormity of this data set (about 3.8 million in 1995 alone), we select a random subset of approximately 100,000 applications per year. Each application contains information on the type of loan (conventional, FHA or VA), the purpose of the loan, the outcome (approved, denied or incomplete), as well as the race, gender and location of applicant and any co-applicants. We then exclude FHA, VA and Farmers' Home Administration loans. We also exclude home improvement loans. Each application includes the income, race, sex, and state of residence of the applicant and co-applicant (if any) as well as the size of the loan requested and the decision of

whether the application was accepted or rejected.

We study the probability of denial by estimating a logit regression of the form:

$$y_{it}=\alpha_i+\beta_1 X_{h,it}+\beta_2 X_{p,it}+\gamma Z_{it}+\varepsilon_{it}, \qquad y_{it}=(0,1), \tag{2}$$

where y_{it} =1 for denied and 0 for approved. Z_{it} is a vector of individual characteristics including the loan-to-income ratio, race, marital status, income, income squared, as well as the state unemployment rate as a proxy for regional business cycle conditions (taken from the Selective Access Service of the Bureau of Labor Statistics).

We assume that the exemption of interest is that available to a debtor who does not qualify for special treatment due to age, infirmity, veteran's status or occupation. Because our analysis predicts that the homestead and personal property exemptions may have very different implications, we construct two measures. First, we construct a measure of the homestead exemption which includes the amount of equity a debtor may exempt as well as any wildcard exemption which may be used on the home. We ignore any limitations on the lot size. This measure is relatively straightforward to calculate. In addition, we construct a measure for the personal property exemptions which again includes any wildcard exemption as well as the equity in a car that a debtor may exempt and the amount of jewelry that a debtor may keep other than wedding and engagement rings.[7] Perhaps surprisingly, the two exemptions categories are statistically uncorrelated, with a point estimate of -0.05.

Given this data, we construct both continuous and dummy variables. If a state has an "unlimited" exemption, we set the exemption variable equal to one million dollars in the continuous analysis.[8] We express the continuous variables in units of $100,000. Our second approach, following GSW, is to group the exemption levels into quartiles with the fourth quartile containing only those states with unlimited exemptions.

Table 2 reports some summary statistics for the datasets to be used in the regression analysis.[9] The top panel shows the number of observations, mean and standard deviations of the HMDA variables. The lower panel displays summary statistics for state-level variables. The average state wage rate is taken from the BLS Selective Access Service. We also use average annual mortgage rates and loan-to-vale ratios of borrowers in each of the 50 states and the

District of Columbia. These data are taken from Rates & Terms on Conventional Home Mortgages, 1995 compiled by the Federal Housing Finance Board. Since we have 6 years of data, this gives 306 state-level observations. State-level demographic data is taken from the Census Bureau.

Just as the exemptions vary across states, there is a fair amount of state-level variation in other aspects of the law which could directly affect the price and quantity of credit. For example, several states allow a debtor (or junior creditor) to redeem the home even after it has been sold at an auction. In addition, states have adopted varying restrictions on the ability of a creditor to garnish his debtors wages. While such statutes could be used to form additional legal variables, they are beyond the scope of this paper. Rather than attempt to specify all legal and cultural variables that might affect the credit market.[10] We estimate a fixed-effects model which allows the intercept to vary across states (at the cost of a reduction in degrees of freedom). Thus, we do not make the dubious assumption -- implicit in pooled regressions -- that there are no systematic differences in credit denials, except those related to the regressors. Our results are driven by the effects of changes in the state exemptions. Such changes were not uncommon over our sample period.

The top panel of Table 3 presents maximum likelihood estimates based on the continuous specification of the homestead exemption. Columns 1 to 3 show the raw coefficients, standard errors and p-values allowing for fixed state effects. The coefficients on the fixed state effects are omitted from the table.

As predicted by proposition 1, the coefficient on the homestead exemption is significantly negative. The signs of the coefficients associated with the other variables are consistent with what we would expect. The probability of denial appears to decrease with higher incomes, and increases for higher state unemployment rates and larger loan requests. African-american applicants appear to have a higher probability of denial, as do single applicants. The dummy variable for female applicants should be interpreted with caution as this indicates only that the primary applicant was female. Four of five annual dummies are significantly different from zero, suggesting that the overall probability of denial changes markedly from year to year.

The lower panel of Table 3 shows the results based on grouping the homestead exemption

into quartiles. Again, the quartiles take the expected negative sign implying that larger exemptions lead to a lower probability of denial as the mortgage lenders prefer large homestead exemptions.

Loan approval, y_{it}, is the outcome of a lender's judgement of the applicant's credit-worthiness. If the loan-to-income ratio is also dependent on credit-worthiness, then an element of Z_{it} is a function of y_{it}. This would imply that $\text{cov}(Z_{it}, \varepsilon_{it}) \neq 0$ and the coefficient estimates would not be consistent. To examine the impact of this potential problem, we re-estimated the regressions without loan-to-income ratios and found that the results were qualitatively unchanged.

An additional specification issue is whether the mortgage rate should be included in the regression. It might reasonably enter into lenders' decisions so that its absence could induce omitted variable bias. We therefore ran the logit model with the mortgage rate as an additional explanatory variable. Again, the sign and significance of the coefficients on the exemptions remained the same.[11]

In Table 4, we include the personal property exemption in addition to the continuous homestead. The coefficient on the homestead exemption is little altered, remaining significantly negative. However, the personal property exemptions are positively correlated with the probability of denial, although only at a significance level of 75%.

It is possible that the negative coefficient on the homestead exemption is a result of simultaneity bias in the selection of the exemptions -- states with more restrictive credit markets may choose lower exemptions. Nevertheless, even if this interpretation were accurate, any negative effect that the homestead exemption has on the supply of mortgages is insufficient to overcome the effect of this bias.

We also examine whether, as we have suggested, large bankruptcy exemptions tend to drive down mortgage rates (presumably by encouraging supply). We use the state-level annual mortgage data compiled by the Federal Housing Finance Board. All series extend from 1990 to 1995 and are state-level averages for each of the fifty states plus the District of Columbia, which yields 306 observations. The data indicate a surprising degree of state-level variation in contract terms. In our sample, the average cross-sectional standard deviation of mortgage rates was about .3% while that of LTV ratios was 3.4.

The coefficient estimates from fixed-effects panel regressions are shown in Tables 5. The top panel of Table 5 reports coefficient estimates from a fixed-effects panel data regression of mortgage rates on the homestead exemption, the unemployment rate and average hourly wage rate, annual dummies and the two demographic variables, percentage African-american and percentage senior citizen. The homestead exemption variable enters negatively with a t-statistic of -1.5 or a confidence level of about 87% -- a result inconsistent with higher homestead exemptions tightening mortgage credit. Personal property exemptions enter insignificantly. An F-test of the joint significance of the fixed effects indicates a p-value of .00, suggesting strong evidence in favor of differential state effects. In addition, we calculated the Hausman (1978) specification test of random effects model against the alternative of the fixed-effects model. The associated p-value is .52 which indicates no evidence in favor of either.

We emphasize that these results, while consistent with our view that homestead exemptions do not shrink supply, are not conclusive. The state-level regressions model the change in observed market rates and LTV's and hence are reduced-form. The coefficient estimates can be interpreted only as indicating the equilibrium correlation between mortgage terms and exemptions. Nevertheless, our results contradict the hypothesis that higher exemptions reduce the supply of credit and/or increase the demand for credit. We do not observe a positive correlation between X_h and rates.

The lower panel of Table 5 replicates the analysis for the loan-to-value ratio. Although not significant, it is interesting to note that the coefficient on the personal property exemption is -1.1. This is consistent with the estimation of the probability of denial; it is plausible that the personal property exemptions reduce the supply of mortgage loans.

Quite apart from whether bankruptcy exemptions exert a statistically significant effect on credit conditions, are they economically important? Table 6 presents fitted values from the logit regression for typical debtors in four states. The middle panel shows estimated probabilities of denial for white, married consumers in low, middle and high income brackets and median loan-to-income ratios in 1995.[12] South Carolina and Delaware are shown in columns 1 and 2. Delaware's exemptions are about twice that of South Carolina. At the same time, the implied probability of denial for South Carolinians is about 1% to 1.5% higher. Column 3 shows fitted values for West

Virginia which has higher homestead and personal property exemptions compared to Delaware. Given our estimates, denial is more likely in West Virginia than in Delaware for each income bracket. In Mississippi which allows a homestead exemption *ten times* that of West Virginia, we estimate that denial is over 1% less likely. Such sensitivities are economically small, as might be expected.

Such differences cannot be solely attributed to the exemption levels. The predicted state denial rates condition on fixed state effects -- which may reflect other cultural and legal variables. In order to focus on the importance of exemptions in isolation, the bottom panel of Table 6 reports the difference that would be predicted from quadrupling either the homestead or personal property exemption. Clearly, the economic impact from increasing the bankruptcy exemptions are small in states with currently small exemptions. Typical responses are a reduction in denials of about 8 to 10 basis points. Interestingly, the sensitivity to bankruptcy exemptions is higher for low income debtors. Gropp, Scholz and White (1997) similarly find greater sensitivity in auto loan rates paid by low income borrowers in response to increases in the homestead exemption.[13]

Turning to mortgage rates, Table 7 shows estimated terms on fixed rate mortgages typical consumers in the same four states. Again the lower panel displays the implied change in the dependent variables that would result from quadrupling either exemption category. As with denial rates, large increases to the homestead exemption imply relatively small changes, less than 20 basis points in mortgage rates. A fourfold increase in personal property exemptions, yields mortgage rate increases in the range of .1 percent. Changes in downpayments are somewhat larger -- although not as a percentage of the average LTV ratio. In addition, it should be noted that the loan-to-value ratio regressions indicated that these changes are not statistically significant.

On balance, the changes in exemption levels are associated with relatively small changes in the probability of denial and mortgage rates. Nevertheless, these results confirm the essential theme we have outlined -- the mortgage lender is unlikely to be <u>adversely</u> affected by a large homestead exemption.

V. CONCLUSION

Existing research into bankruptcy property exemptions has found significant adverse

consequences for consumer credit markets, raising interest rates and reducing access to credit. We find that these results do not hold for the homestead exemption and the mortgage loan market. Indeed, the probability of being turned down on a mortgage application appears to be marginally reduced as homestead exemption levels increase. In addition, mortgage rates appear to decline with higher homestead exemption levels. The results are reversed if one considers the personal property exemptions.

The discrepancy between the results of our paper and those of the previous research may result from the important differences between secured and unsecured credit. More research is necessary to determine the effects of property exemptions on purely unsecured and undersecured credit. Such research is particularly needed in light of the recent renewed calls for overhauling federal bankruptcy exemptions.

The National Bankruptcy Review Commission conducts a periodic review of the bankruptcy process creating the possibility that academic research could lead to significant reform. Despite the apparent need for research on personal bankruptcy, the number of academic papers on this topic is quite limited when compared to the literature on its more seductive cousin, the Chapter 11 reorganization. We hope that this paper, to our knowledge the first to study the effects of personal bankruptcy on mortgages, motivates additional research in this area.

APPENDIX

THE EFFECT OF CHANGES IN THE PROPERTY EXEMPTION

A. Expected Return on a Mortgage Loan

Let f(h) and j(k) represent the densities of h and k, respectively. Suppressing the dependence of b on X_p, X_h, g, h, and k for notational simplicity, the mortgage creditor's expected return can be now written as follows:

$$E(R) = \int_{h=0}^{M-v} \left(\int_{k=0}^{K_d(X_h,X_p,g,h)} ((b(F_7-C_f)+(1-b)(F_n-C_f))j(k)dk + \int_{k=K_d}^{k=K} M-C_r(k-U-M)j(k)) \right) f(h)\ dh +$$

$$\int_{h=M-v}^{M+X_h} \left(\int_{k=0}^{M-X_p} (b(F_7-C_f)+(1-b)(F_n-C_f)j(k)dk + \int_{k=M-X_p}^{(M-X_p)/g} (b(M-C_{7r}(k+X_p-M))+(1-b)(F_n-C_{nf})j(k)dk \right) f(h)\ dh + \quad (3)$$

$$\int_{h=M-v}^{M+X_h} \left(\int_{k=(M-X_p)/g}^{K_d} (b(M-C_{7r})+(1-b)(M-C_{nr}(gk+X_p-M)))j(k)dk + \int_{k=K_d}^{K} (M-C_r)j(k)dk \right) f(h)\ dh +$$

$$\int_{h=M+X_h}^{H} \left(\int_{k=0}^{h-X_h-X_p} (b(F_7-C_{7f})+(1-b)(F_n-C_f))j(k)dk + \right.$$

$$\left. \int_{k=h-X_h-X_p+R_{13}}^{K_d} (b(M-C_{13}(k+X_p+X_h-h-M-R_{13}))+(1-b)(M-C_f))j(k)dk + \int_{k=K_d}^{K} (M-C_r(k-U))j(k)dk \right) f(h)\ dh$$

B. Proof of Proposition 1

By straightforward application of Leibniz' rule, the derivative of the lender's expected return, E(R), with respect to X_h can be written as

$$\int_{h=M+X_h}^{H}\left[\int_{k=0}^{h-X_h-X_p} b_{X_h}(F_7-F_n)j(k)dk+\int_{k=h-X_h-X_p}^{K_d} b_{X_h}(M-F_n+C_f-C_{13})+b(dC_{13}/dX_h)j(k))f(h)\ dk\right]\ dh+$$

$$\int_{h=M+X_h}^{H}[j(R_{13}+h-X_h-X_p)b(M-F_7+C_{7f}-C_{13})+j(K_d)(dK_d/dX_h)((1-b)(M-F_n)+C_r-bC_{13}-(1-b)C_{nf})]f(h)dh+ \quad (4)$$

$$f(M+X_h)[\int_{k=M-X_p}^{M-X_P+R_{13}} b(M-F_7+C_{7f}-C_{7r})j(k)dk+\int_{M-X_P+R_{13}}^{K_D} b(C_{13}-C_{7r})j(k)dk+\int_{k=(M-X_P)/g}^{K_D}(1-b)(M-F_n+C_{nf}-C_{nr})j(k)dk]$$

It remains now to sign the terms of the derivative. We maintain throughout that $b_{Xp}>0$, the probability of filing is increasing in the exemption. Assumptions one through three imply that every term from above is positive save one, $(1\text{-}b)(M\text{-}F_N)+C_r$ -b C_{13}-$(1\text{-}b)C_f$.

The positivity of this term follows from assumption four. To see this, note that if $F_n<M$, $(dK_d/d\ X_h)=0$ as the debtor will only consider the homestead exemption if the mortgage creditor is repaid in full and he will receive some distribution after foreclosure. Therefore, the sign of this term depends again on the relative transactions costs. Because $C_{13}<C_r$, this is positive as long as b is sufficiently close to one. QED.

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ENDNOTES

1. Taken from the Administrative Office of the U.S. Courts, Annual Report of the Director 1997.

2. As a consequence, while losses on personal loans amounted to about 2% of total, losses on second mortgages were only 0.2% in 1992 (Installment Credit Report (1992)).

3. Sullivan, Warren and Westbrook (1989) report that 10% of homeowners in bankruptcy do not even report their mortgages to the court. They estimate that 40% of debtors in bankruptcy reaffirm some form of secured debt.

4. The exemptions vary substantially across states. For example, a debtor in Maryland may only use a $5,500 wildcard exemption to try to keep both his car and his home under Chapter 7. In Texas, a bankrupt debtor may exempt his home regardless of its value as long as it is on a lot of less than one acre (200 acres if outside a municipality) and could potentially exempt automobiles worth $60,000. Exemptions cover objects as diverse as a leased organ (Delaware) to dead bodies (Rhode Island) (see Elias,Renauer and Leonard (1995)).

5. For related research, see Sieger, Vadner and Watkins (1994).

6. The federal garnishment exemption is the greater of 75% or thirty times the minimum wage per week.

7. Numerous states have unlimited exemptions for wedding and engagement rings.

8. We also estimated the regressions with alternative values of "unlimited" as $750,000, $500,000 and $250,000. The results were unaffected by the change to $750,000, $500,000. However, if we posit a value of $250,000, some t-statistics are no longer significant at conventional levels.

9. Demographic data are available on the internet at http://www.census.gov/.

10. If omitted legal variables changed at the same time as the exemptions levels, our results would be biased. At least for wage garnishment laws, however, we know that almost no changes took place during our sample period.

11. However, with mortgage rates on the right-hand side, the unemployment rate is no longer significant. This is not surprising given that both variables represent good proxies for business cycle conditions.

12. Income levels are defined as less than $24,999, between $25,000 and $49,999, and more than $50,000. Each income category contains roughly one third of U.S. families.

13. However, GSW find that rates increase for low income borrowers.

Table 1

Returns to the Mortgage Lender

Debtor Action Return to Lender	Chapter 7 Foreclosure	No Filing Foreclosure	Chapter 7 Reaffirm	No Filing Reaffirm	Chapter 13	Full Repayment
Costs	C_f	C_f	$C_{7r}(k+X_P-M)$	$C_{nr}(gk+X_P-M)$	$C_{13}(k+X_h+X_P-h-R_{13})$	$C_r(k-U-M)$
Mortgage Return			M	M	M	M
Foreclosure Return	Min[h, M]	Min[h, M]				
Deficiency Judgement	$(P-X_P)$ Max[M-h, 0] /(U+Max[M-h, 0])	$((1-g)k+P-X_P)$ Max[M-h, 0] /(U+Max[M-h, 0])				
Net Return	$F_7(h)-C_f$	$F_n(h)-C_f$	$M-C_{7r}(k+X_P-M)$	$M-C_{nr}((1-g)k+X_P-M)$	$M-C_{13}(k+X_P+X_h-h-R_{13})$	$M-C_r(k+P-U-M)$

Notes: Gross and net returns to the mortgage lender as a function of debtor action. See text for details.

Table 2. Summary Statistics:

Home Mortgage Disclosure Act and Federal Housing Finance Board Data, 1990-1995.

Variable	Mean	Std. Deviation
HMDA Data: 434,863 observations		
Level Variables (1,000's of Dollars)		
Income	73.757	144.61
Loan Amount	115.30	361.28
Homestead Exemption	172.31	335.78
Property Exemption	19.697	98.366
Ratio and Dummy Variables		
Loan-to-Income Ratio	1.9332	12.048
Application Denied (yes=1)	0.1557	0.3626
African-American (yes=1)	0.0423	0.2014
Female (yes=1)	0.1703	0.3759
Single (yes=1)	0.2708	0.4444
FHFB Data: 306 Observations		
State Mortgage Rate	8.1646	1.0322
State Loan-to-Value Ratio	77.089	3.8033
State Unemployment Rate	5.9219	1.6277
State Wage Rate	11.458	1.3883
Percentage of State African-American	10.910	11.969
Percentage of State Senior Citizen	12.612	2.0653

Notes: Table 2 reports the number of observations, the sample mean and sample standard deviation of the HMDA and FHFB Data used in the regression below. All variables are annual and span 1990-1995. Exemptions that are nominally "unlimited" are set equal to one million dollars. For dummy variables, the mean value may be interpreted as the unconditional probability that the variable equals one.

Table 3. The Probability of Being Denied Credit and the Homestead Exemption

Variable	Estimated Coefficient	Error	P-Value
Constant	-1.5742	0.1877	0.0001
Exemption	-0.0320	0.0001	0.0003
Loan-to-Income Ratio	0.0020	0.0008	0.0105
Year91	0.1183	0.0196	0.0001
Year92	-0.0737	0.0179	0.0001
Year93	-0.2096	0.0178	0.0001
Year94	0.0218	0.0185	0.2367
Year95	0.2854	0.0179	0.0001
Income	-0.3310	0.0001	0.0001
Income Squared	3.6e-05	0.0001	0.0001
Dummy for African-American	0.7129	0.0176	0.0001
Dummy for Female	-0.0290	0.0122	0.0173
Dummy for Single	0.2783	0.0105	0.0001
Unemployment	0.8114	0.3312	0.0143

Model Fitting Information
Concordant Pairs = 63.7%
Discordant Pairs = 35.4%
Tied Pairs = 0.9%
LR Test for Regressors: 13392.76
(p=0.0001)

Constant	-1.4643	0.1902	0.0001
2nd quartile exemption	-0.1039	0.0283	0.0002
3rd quartile exemption	-0.2053	0.0481	0.0001
4th quartile exemption	-0.1658	0.0716	0.0206
Loan-to-Income ratio	0.0020	0.0008	0.0106
Year91	0.1200	0.0196	0.0001
Year92	-0.0734	0.0179	0.0001
Year93	-0.2100	0.0178	0.0001
Year94	0.0227	0.0185	0.2202
Year95	0.2864	0.0180	0.0001
Income	-0.3331	0.0001	0.0001
Income squared	3.6e-05	0.0001	0.0001
Dummy for African-American	0.7126	0.0176	0.0001
Dummy for female	-0.0287	0.0122	0.0182
Dummy for single	0.2828	0.0105	0.0001
Unemployment	0.5638	0.3337	0.0911

Model Fitting Information
Concordant Pairs = 63.7%
Discordant Pairs = 35.4%

Tied Pairs = 0.9% LR Test of Regressors: 13121.96 (p=0.0001)

Notes: Table 3 presents binary logit estimates for the probability of being turned down on a mortgage application. The data are taken from the Home Mortgage Disclosure Act database for 1990-1995 and contain 433,699 observations. See text for descriptions of the exemption variable. A pair of observations is defined as concordant (discordant) if the observation with the larger (smaller) response has a larger predicted probability. LR test indicates the chi-square statistic for joint significance of all regressors. Standardized estimates are normalized by the sample standard deviation of the associated regressor.

Table 4. The Probability of Being Denied Credit
Homestead and Property Exemptions

Variable		Estimated Coefficient	Standard Error	P-Value
Constant	-1.5803	0.1878	0.0001	
Homestead exemption	-0.0321	0.0001	0.0003	
Property exemption	0.1102	0.0010	0.2538	
Loan-Income ratio	0.0020	0.0008	0.0105	
Year91	0.1180	0.0196	0.0001	
Year92	-0.0730	0.0179	0.0001	
Year93	-0.2092	0.0178	0.0001	
Year94	0.0219	0.0185	0.2349	
Year95	0.2835	0.0180	0.0001	
Income	-0.3332	0.0001	0.0001	
Income squared	3.6e-05	0.0001	0.0001	
Dummy for African-American	0.7131	0.0176	0.0001	
Dummy for female	-0.0290	0.0122	0.0171	
Dummy for single	0.2817	0.0109	0.0001	
Unemployment	0.8414	0.3322	0.0113	

Model Fitting Information
Concordant Pairs = 63.7%
Discordant Pairs = 35.4%
Tied Pairs = 0.9%
LR Test of Regressors: 13111.9 (p=0.0001)

Notes: Table 4 presents binary logit estimates for the probability of being turned down on a mortgage application. Exemption refers to the homestead exemption available in bankruptcy in the relevant state. A pair of observations is defined as concordant (discordant) if the observation with the larger (smaller) response has a larger predicted probability. LR test indicates the chi-square statistic for joint significance of all regressors.

Table 5. State-level Regressions

Variable	Estimated Coefficient	Standard Error	t-statistic
Mortgage Rates			
Homestead exemption	-0.036	0.023	-1.542
Property exemption	-0.182	0.486	-0.374
Unemployment rate	-0.628	0.908	-0.692
Wage rate	-0.076	0.059	-1.301
Percent African-American	1.714	5.923	0.289
Percent senior	17.03	8.933	1.906
Year91	-0.641	0.047	-13.68
Year92	-1.896	0.056	-33.73
Year93	-2.769	0.069	-40.05
Year94	-2.353	0.081	-28.94
Year95	-1.991	0.094	-21.11
Std. error of regression = 0.217			
R-squared = 0.964			
Adjusted R-squared = 0.956			
F test of A,B=Ai,B: F(50,244) = 6.259, P-value = [.000]			
Hausman test: $\chi^2(6)$ = 5.170, P-value = [.522]			
Loan-to-Value Ratio			
Homestead exemption	-0.079	0.267	-0.296
Property exemption	-0.636	0.554	-1.147
Unemployment rate	-12.14	10.36	-1.172
Wage rate	2.332	0.669	3.487
Percent African-American	11.41	67.57	0.169
Percent senior	325.6	101.9	3.195
Year91	-0.744	0.534	-1.393
Year92	-0.631	0.641	-0.984
Year93	-1.394	0.789	-1.767
Year94	0.362	0.927	0.391
Year95	0.112	1.076	0.104
Std. error of regression = 2.480			
R-squared = 0.659			
Adjusted R-squared = 0.334			
F test of A,B=Ai,B: F(50,244) = 4.340, P-value = [.000]			
Hausman test: $\chi^2(6)$ = 32.27, P-value = [.000]			

Notes: Linear regression model estimates of state-level mortgage rates and average mortgage loan to value ratios. Hausman (1978) test indicates specification test of random effects model against the alternative of the fixed effects model.

Table 6
Probabilities of Denial of a Mortgage Application
for Typical Consumers

		South Carolina	Delaware	West Virginia	Mississippi
Homestead Exemption		5,000	10,000	15,000	150,000
Personal Property Exemption		5,400	10,000	19,200	20,000
		Estimated Probabilities			
	Low Income	22.4%	20.8%	22.2%	19.9%
	Middle Income	21.1%	19.5%	20.9%	18.7%
	High Income	14.6%	13.4%	14.4%	12.8%
		Estimated Percentage Changes in Probabilities			
Quadruple Homestead Exemption	Low Income	-.084%	-.158%	-.249%	-2.20%
	Middle Income	-.080%	-.151%	-.238%	-2.10%
	High Income	-.060%	-.111%	-.177%	-1.52%
Quadruple Property Exemption	Low Income	.312%	.550%	1.12%	1.08%
	Middle Income	.299%	.525%	1.07%	1.03%
	High Income	.223%	.388%	.801%	.754%

Notes: Probabilities are fitted values from logit regression results shown in Table 4. Income levels are defined as less than $24,999, between $25,000 and $49,999 and more than $50,000. Each income category contains roughly one third of U.S. families (see Kennickel, Starr-McCluer and Sunden (1997). Loan-to-income ratios are set equal to the median values taken from the 1995 HMDA data for each income level.

Table 7
Rates and Terms of a Mortgage Application
for Typical Consumers

		South Carolina	Delaware	West Virginia	Mississippi
Homestead Exemption		5,000	10,000	15,000	150,000
Personal Property Exemption		5,400	10,000	19,200	20,000
		Estimated Rates and Terms			
	Rates	7.79%	7.54%	7.91%	8.23%
	LTV Ratios	84.3	83.0	79.5	81.0
		Estimated Percentage Changes in Rates and Terms			
Quadruple Homestead Exemption	Rates	-.005%	-.011%	-.016%	-.163%
	LTV Ratios	-.012	-.024	-.036	-.356
Quadruple Property Exemption	Rates	.029%	.054%	.104%	.109%
	LTV Ratios	-1.03	-1.91	-3.66	-3.82

Notes: Mortgage Rates and Loan-to-Value ratios are fitted values from logit regression results shown in Table 4. Income levels are defined as less than $24,999, between $25,000 and $49,999 and more than $50,000. Each income category contains roughly one third of U.S. families (see Kennickel, Starr-McCluer and Sunden (1997). Loan-to-income ratios are assumed equal to the median calculated from the 1995 HMDA data.