Did bankruptcy reform lead to looser mortgage lending standards? Evidence from the U.S. mortgage market 2000-2007

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Abstract

This paper seeks to find an exogenous cause for deterioration in mortgage lending standards since 2005 that contributed to the subprime mortgage crisis in the U.S. We find that the new means test provision in the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005 was such an exogenous shock in the mortgage market. We show that the means test, which makes Chapter 7 bankruptcy unavailable to relatively better off borrowers, caused a shift in the supply of mortgage credit from better off borrowers to relatively poorer borrowers. Simultaneously, we found borrowers being charged higher interest rates, for all classes of income. Our findings imply that BAPCPA may be a contributing factor toward the deterioration of lending standards in the U.S. mortgage market.

Resumen

El presente trabajo intenta encontrar una causa exógena al deterioro, a partir de 2005, en los estándares de crédito hipotecario que contribuyeron a la crisis subprime en los Estados Unidos. Sostenemos que la nueva provisión de la prueba de medios de la ley *Bankruptcy Abuse Prevention and Consumer Protection Act* (BAPCPA) de 2005 fue dicho shock exógeno en el mercado hipotecario. Mostramos que la prueba de medios, que impide solicitar la bancarrota bajo *Chapter 7* a los deudores con mayores ingresos relativos, causó un desplazamiento de la oferta de crédito hipotecario de deudores con mayores ingresos a deudores con menores ingresos relativos. Simultáneamente, observamos que todos los deudores debieron pagar tasas de interés más altas, independientemente del nivel de ingresos. Nuestros resultados implican que la ley BAPCPA podría ser un factor que contribuyó al deterioro en los estándares de crédito en el mercado hipotecario de los Estados Unidos.

Keywords: Bankruptcy, means test, mortgage default, lending standards

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1. Introduction

After a period of rapid expansion beginning since the mid 1990s, the U.S. subprime mortgage market began showing signs of stress in mid-2006. By 2007 it was evident that trouble in the subprime mortgage market had reached crisis proportions, as seen from record mortgage delinquency rates and foreclosures. In the following months, the crisis has become more widespread, with foreclosures spreading across the near prime and prime market categories.

The turmoil in the U.S. mortgage market has been the subject of recent research. Gerardi *et al*. (2008) and Mayer *et al*. (2008) suggest that the decline in home prices beginning mid-2006 played an important part in driving foreclosures and mortgage delinquencies. Dell'Ariccia *et al.* (2008) link record delinquency rates to a trend of deteriorating lending standards apparent through higher loan to income ratios and declining mortgage denial rates during the rapid expansion of credit to the subprime market segment. Mian and Sufi (2008) show an expansion in the supply of mortgage credit to cause a decline in lending standards. Keys *et al.* (2008) find that securitization of mortgages affects the incentives of lenders to screen borrowers, leading to riskier loans being made.

Some researchers have noted a change in the mortgage market around 2005. Dell'Ariccia *et al.* (2008) observe, "*While denial rates in the prime mortgage market closely mimic the evolution of interest rates in the U.S., with denial rates increasing sharply in 2005 compared to 2004, this is not the case for the subprime market, where denial rates do not increase in 2005 compared to 2004*." Baily *et al.* (2008) observe "a *deterioration in lending standards generally dated to 2004 or 2005.*" Haughwaut *et al.* (2008) observe, "*beginning with the 2005 vintage the performance of nonprime mortgage loans became notably worse than previous vintages. The performance of the 2006 vintage deteriorated even further. By 12 months following origination, the 2005 vintage had a 90 day or more delinquency rate that was not reached by the 2003 vintage for 20 months...*"

Cagan (2006) shows the cumulative home equity for mortgages by year of origination. Of all mortgages originated in 2003, 13.1% mortgages homeowner equity in the home under 5%. By 2004, 17.6% of homeowners had equity below 5%; in 2005 the number jumped to 38.1% of all mortgages.

Other than falling house prices, securitization and easy availability of credit as sources for looser lending standards, we investigate for an exogenous shock that could have resulted in a significant deterioration in lending standards in 2005. Our paper examines the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) of 2005 as a possible exogenous cause that contributed to the loosening of lending standards in the subprime mortgage market.

Prior to BAPCPA, any household in financial distress could file for a Chapter 7 Bankruptcy and obtain discharge of unsecured debt, thus freeing up income to save their home from foreclosure, a fact noted by Berkowitz and Hynes (1998), Lin and White (2001) and Jacoby (2007). BAPCPA introduced a means test by which better off filers are compelled to file for Chapter 13, and consequently cannot obtain complete relief from their unsecured debt. This implies that better off filers were more likely to default on their mortgages after BAPCPA. As noted by Morgan *et al.* (2008), BAPCPA effectively transferred credit default risks from unsecured lenders to secured (mortgage) lenders.

Using HMDA data for mortgages originated in 2000-2007, this increase in expected mortgage default resulted in the reducing the supply of credit to better off borrowers, i.e. the borrowers affected by BAPCPA. Our results suggest that BAPCPA led to contraction in the supply of mortgage credit for borrowers with incomes above their state's median income- both in terms of lower mortgage application acceptance rates as well as higher spreads on mortgages. Our results also show a change in the supply of mortgage credit to borrowers with incomes below their state's median income, in terms of higher application acceptance rates, but we also find evidence of low income borrowers being charged higher spreads than before. We speculate that low income borrowers represented 'latent demand' as per Mian and Sufi (2008), and were induced to absorb the credit at higher spreads through innovative mortgage products and high loan to value ratios.

This paper is not the first to link BAPCPA to the subprime mortgage crisis. Focusing on foreclosures, Morgan *et al.* (2008) observe that by preventing better off filers from getting relief from unsecured debt under Chapter 7, BAPCPA led to a substantial increase in subprime foreclosures — over 32,000 more subprime foreclosures nationwide per quarter. Our paper analyses the effect of BAPCPA at the time of mortgage origination. Indeed, our findings suggest that credit was transferred to low income borrowers, who were more likely to default on their mortgages especially when home prices stopped rising. Moreover, it is likely that the increase in interest rates charged also had the effect of raising the net likelihood of mortgage default.

The rest of this paper is organized as follows: Section II provides a brief outline of bankruptcy law provisions and existing literature on the effect of bankruptcy laws on secured credit markets, Section III provides an analytical framework to predict the effect of BAPCPA on mortgage lenders, Section IV describes the dataset and introduces the econometric model, Section V reports the empirical results and Section VI concludes.

2. Bankruptcy Law in the United States: A Brief Overview

Historically, bankruptcy laws in the U.S. have been the most pro-debtor laws amongst developed nations. Bankruptcy filings in the U.S. steadily climbed from about 300,000 in 1980 to over 1.5 million in 2004, as personal bankruptcy filings increased from 1.4 per thousand of the working age population in 1970 to 8.5 in 2002 (Livshits et al. 2007). Figure 3 shows the annual non-business bankruptcy filings in the United States during 1980-2004.

As per U.S. bankruptcy provisions, an individual bankruptcy is filed under Chapter 7 or Chapter 13, while Chapter 11 is primarily used by corporations. In the years leading up to the bankruptcy law reform in 2005, around 71% of non-business bankruptcy filings were filed under Chapter 7.

Chapter 7 vs. Chapter 13

Under Chapter 7, the debtor's non-exempt assets are liquidated and the proceeds are sold by the bankruptcy trustee to pay the debtor's unsecured creditors. The debtor's future income is not used to repay creditors under Chapter 7 and the debtor is allowed to retain certain assets as exempt from liquidation, depending on state or federal exemption limits, as applicable. If the debtor's equity in the asset is less than the applicable exemption limit, the debtor retains the asset, and the creditors do not receive anything. As of mid 2002, about 96% of Chapter 7 cases were closed without any funds distributed to creditors (Flynn *et al.*, 2002). Under Chapter 13, a debtor's assets are protected from liquidation; however the debtor enters into a repayment plan

to pay all or part of unsecured debt over a period of three to five years. Moreover, creditors have to receive at least as much in Chapter 13 as they would under Chapter 7. Thus the debtor cannot obtain discharge of unsecured debt under Chapter 13.

Chapter 7 as a Strategy to Save the Home from Foreclosure

For a debtor with both unsecured and mortgage debt, the ability to file for Chapter 7 has provided a significant 'escape route' in financial distress. A debtor with both unsecured debt and a mortgage may not find it possible to borrow additional funds to tide over periods of sudden increases in expenditure or loss of income. If the debtor would find it difficult to meet monthly payments both the unsecured debt and the mortgage, filing for Chapter 7 would enable the debtor to get complete relief from unsecured debt, freeing up money to stay current on mortgage payments and thereby save the home from foreclosure.

The use of a Chapter 7 bankruptcy as a way to save a home from foreclosure has been discussed widely. Jacoby (2007) explains, *"Chapter 7, the more frequently utilized bankruptcy option for individuals, is also relevant to housing policy even though its primary function-the discharge-relates to unsecured debt. Consider a borrower who has not (yet) defaulted on a mortgage but is having serious financial trouble, or a borrower who has defaulted on a mortgage but has reached an agreement with her mortgagee. These borrowers might file chapter 7 to discharge unsecured debt, leaving them with more available income to make their mortgage payments and less likely to have their homes encumbered by judgment liens."* Berkowitz and Hynes (1999) observed that the benefit of using Chapter 7 to save a home from foreclosure was higher if the debtor's state allowed for high or 'unlimited' exemptions for homestead equity and personal property. Berkowitz and Hynes found that for states with high equity exemptions, mortgage supply was relatively greater — in terms of both lower interest rates and higher probability of a mortgage application being accepted.

The Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) was passed by Congress and signed into law on April 20, 2005. BAPCPA marked the first substantial overhaul of the Bankruptcy code in the United States since the Bankruptcy Reform Act of 1978, and was passed after a considerable lobbying effort by credit card companies as observed by White (2008). BAPCPA sought to address the escalating bankruptcy filings and resultant unsecured creditors' losses. It sought to make filing for bankruptcy more expensive in order to serve as deterrent and repeat bankruptcy filers. Among the various changes in bankruptcy law provisions as per BAPCPA, the introduction of a new means test to determine eligibility to file for Chapter 7 is important for our study.

Means Test for Eligibility to File Chapter 7

Post October 2005, debtors are no longer able to choose to file for bankruptcy under Chapter 7; eligibility to file for Chapter 7 is now established based on the outcomes of a 'means test'. As per the first stage of the means test, a debtor whose income is less than the median income for the state of residence will be eligible to file for Chapter 7 bankruptcy. Debtors whose income is above the state's median income are subject to the second stage of the means test; if the debtor's income less certain allowable expenditures is below $167 per month, the debtor qualifies for Chapter 7. If the bankruptcy petitioner 'fails' either stage of the means test, he or she is compelled to file for bankruptcy under Chapter 13.

In 2004, non business bankruptcy filings were about 1.5 million. In 2005 they rose to over 2 million, as people 'rushed to file' for bankruptcy before the BAPCPA came into effect in 2005. Consequently, in 2006 there was an abrupt fall in filings to 0.5 million. In 2007 filings climbed back up to 0.8 million and were about 1 million in 2008, indicating that the BAPCPA produced a downward shift in the trend in total bankruptcy filings in the United States.

BAPCPA took away the option of filing for Chapter 7 for those who failed the means test, i.e. people with income higher than their state's median income. While debtors who failed the means test could no longer use Chapter 7 as an escape route to save their homes from foreclosure, because they could no longer get rid of their unsecured debt, to free up income to continue repaying mortgages. Hence, post BAPCPA, 'better off' borrowers were more likely to default on their mortgages instead.

3. Hypothesis BAPCPA and the Effect on the Demand and Supply of Mortgage Credit

If BAPCPA raised the probability of mortgage default for those applicants who failed the means test, we can expect to witness a contraction in the supply of credit to such borrowers. We argue that while we expect a supply side effect, we do not expect the BAPCPA to produce a simultane-ous demand shift. As is observed by White (2007), since mortgage payments are 'deductible' ex-penses in calculating the bankruptcy petitioners' disposable income for the means test, it may be that an individual filing for bankruptcy would find it beneficial to get a new mortgage simply to pass the means test. However, such 'bankruptcy planning' will only affect an individuals' demand for a mortgage at the point of filing for bankruptcy, and we have no reason to believe that BAP-CPA in any way raised actual filing rates; in fact, BAPCPA reduced overall bankruptcy filings by raising filing costs. We stress that the new means test raised the probability of mortgage default *given* bankruptcy post-2005, which is of concern to the mortgage lender. We expect a change in the supply of credit to be apparent in two ways- in terms of a change in 'quantity' and change in 'price', given demand does not change.

1. We examine whether the probability of an individuals' mortgage application being accepted (quantity of mortgages supplied) is lower post-BAPCPA, for borrowers who would be ex-pected to 'fail' the means test in the event of bankruptcy.
2. We examine whether borrowers who fail the means test are charged a higher interest post-BAPCPA.
    With regard to the borrowers who would be still eligible for Chapter 7, we do not hypothesize a direct effect of BAPCPA on credit supply. However, we believe that if supply of mortgage credit to above-median income borrowers was reduced, below-median income borrowers would receive more mortgage credit than before; however, we speculate that as the underly-ing risk characteristics of the below-median borrowers would be unchanged, lenders would compensate for the risks of any such increase in supply of credit to low income borrowers by charging higher interest rates. Figures 4 and 5 provide a graphical depiction of our predicted outcomes in the mortgage market.

4.

Empirical Methodology

In this section we test for any effect of BAPCPA on mortgage credit allocation. We believe that any general change in the supply of credit by mortgage lenders would be sufficiently captured by examining the effects of the first stage of the BAPCPA means test. The outcome of the second stage of the means test, which involves the process of deduction of certain expenditures from the debtor's monthly income, would vary largely depending on a debtor's specific economic situation. The bias in examining our hypothesis solely on the outcome of the first stage of the means test works against us, as those who fail the first stage of the test will be a subset of all those who actually fail the test.

Description of the Data

Our primary source of Data is the HMDA Loan Application Registry from the years 2000 through 2007. The dataset includes individual level economic and demographic information about mortgage applicants that mortgage lenders are required to collect under the Home Mortgage Disclosure Act. From this dataset, we removed applications with missing data for dates of application or action, income or loan amount (applications for manufactured homes drop out at this stage because they do not report income). We then eliminated applications with loan amounts smaller than $1,000, as loan amounts are expressed in terms of thousands of dollars and such applications show up in the dataset with a loan amount of 0. We also removed applications where the action was the loan being purchased, following Dell'Aricca *et al.* (2008) who note that such applications are reported by both the originating and purchasing institution and including them would amount to double-counting. Applications that are classified as federally insured are also eliminated because of their distinct risk profile. Finally, we removed applications for Home Improvement or Refinancing, as these are not relevant to our hypothesis.

In addition to this application level data, we also used state-level data on economic indicators from various sources. This includes quarterly state unemployment data from the Bureau of Labor Statistics (BLS), quarterly state per capita income from the Bureau of Economic Analysis (BEA) and quarterly state Housing Price Indices from the Office of Federal Housing Enterprise Oversight (OFHEO) and annual data on the number of bankruptcy filings by state from the American Bankruptcy Institute.

The estimates of median state income used in U.S. individual bankruptcy proceedings for means testing are published by the U.S. Census Bureau, post October 2005. These median estimates vary as per the size of the bankruptcy petitioner's family. The HMDA dataset does not contain information on the loan applicant's family size. We approximate for this lack of information by using the median four- person family income by state as published by the Census Bureau, in order to apply the means test. The drawback of this approximation is that there may be several mortgage applicants of family size less than four, who will pass the means test with our generous threshold, but would fail it in a bankruptcy court. However, if this approximation results in biased estimates, again the bias works against us, as our hypothesis is concerned with people who fail the approximated means test, which is a subset of the people who would fail actual means test. For dates prior to October 2005 we again use 4 person family median income data from the Census Bureau.

Table 1 describes the data descriptions and sources used in the empirical estimation, while Table 2 gives the summary statistics for the variables.

Test 1

We investigate the effect of BAPCPA on mortgage originations by analyzing the probability of a mortgage application being accepted with the following logit specification:

$$probapp_i = s_i + t_i + q_i + \beta_1*I_i + \beta_2*E_i + \beta_3*reld2 + \beta_4*reld3 + \beta_5*reld4 + \beta_6*reld5 + \beta_7*bar2dummy + \beta_8*reld2bar2 + \beta_9*reld3bar2 + \beta_{10}*reld4bar2 + \beta_{11}*reld5bar2 + \varepsilon_i$$

The dependent variable *probapp* is a binary variable that takes the value 1 if the mortgage application is approved and the value 0 if the application is denied.

To incorporate the means test in our model, we divide the loan application observations into 5 groups according to the relationship between the applicant's income and the median income of the state where the property was located. We create 4 dummy variables to represent the classification of observations in the 5 groups. We refer to the control group as *reld1* (for which there is no dummy variable) comprising those applications for which the applicant's income is lower than 0.5 times the state median. The dummy variable *reld2* takes the value 1 for the applicants whose income is between 0.5 times and 1 time the state median, the dummy variable *reld3* takes the value 1 if the applicant's income is between 1 and 1.25 times the state median, the dummy variable *reld4* takes the value 1 if the applicant's income is between 1.25 and 2 times the state median and the dummy *reld5* takes the value 1 if the applicant's income greater than 2 times the state's median income. Thus the dummies *reld3, reld4* and *reld5* comprise those 'above state median income' observations that will serve as a rough estimate of applicants who will 'fail' the means test. We introduce a dummy variable *bar2dummy* for the bankruptcy reform which takes the value 1 if the loan application date was after BAPCPA was passed, i.e. after April 20, 2005, the value 0 otherwise. We introduce interaction terms *reld2bar2, reld3bar2, reld4bar2* and *reld5bar2* which are the product of *bar2dummy* and each *reld** dummy variable.

The vector *Ii* includes individual characteristics at the loan level that have been shown to be good predictors of lending decisions: *income* denotes the income of the applicant, *income2* denotes squared income and *loanamt* denotes the loan amount of the mortgage. To account for race and sex of the applicant, we include *blackdummy,* a dummy variable that takes the value 1 if the applicant is black, the value 0 otherwise and *femdummy* is a dummy variable that takes the value 1 if the applicant is female, the value 0 otherwise.

Controlling for changes in the economic environment at the state level that may affect lenders' behaviour, the vector *Ei* includes the variable s*tunemp,* which is the unemployment rate of the applicant's state of residence and s*tpci* which is the state per capita income. To control for home price appreciation, we include *stHPIch*, the change in the home prices for the state where the property is located.

In addition, we control for time invariant state specific factors and for time variant national factors, by including state and time fixed effects. Therefore, we are allowing for systematic differences in credit acceptance in addition to those related to the regressors. Because states are likely to experience other differential influences, we estimate a fixed-effects model which allows the

intercept to vary across states. We also allow intercepts to vary over time and quarters. To correct for within state and time dependence we use robust standard errors estimations.

We augment the base model one at a time, with the variables loan to income ratio *(lti)*, the number of bankruptcy filings in the previous year for the applicant's state (*bfl*) and the quarterly growth rates in the volume of loan applications for each income group (*appgrowth*), that captures any effect of changes in the application volumes across income groups that may influence the lender's decision. While we use April 20, 2005 in our model as the day BAPCPA was signed into law, we also estimate the model using October 17, 2005 as the date when BAPCPA came into effect.

For loan applications received before April 20, 2005, the coefficients on each of the *reld** dummy variables will indicate any variation in the probability of an individual's loan application being accepted relative to the control group *reld1*. We expect positive coefficients for each of the *reld** variables, as we expect applicants from the *reld** groups to have a higher chance of securing a mortgage, as they have higher incomes relative to the control group.

The coefficient on *bar2dummy* indicates the estimated change in the probability of application acceptance for the control group *reld1* due to the bankruptcy reform. If our hypothesis implies that credit was diverted from higher income to lower income borrowers post BAPCPA, we expect a positive coefficient on *bar2dummy*.

The coefficients on *reld2bar2*, *reld3bar2*, *reld4bar2* and *reld5bar2* represent the difference in the probability of application acceptance due to BAPCPA for each group *relative* to the change in probability for the control group reld1. Since we are interested in looking at whether the application acceptance probability for each *reld** group has changed specifically post- BAPCPA, we need to account for change across groups and across time implied in each *reld*bar2* coefficient. Therefore rather that looking at the signs of the *reld*bar2* dummy variables in isolation, we are interested in the sum of the coefficients on the dummy variables *bar2dummy* the relevant *reld*bar2*. If BAPCPA resulted in reduction in the supply of mortgage credit to the borrowers who were expected to fail the means test, we expect the sum of the coefficients of *bar2dummy* and the relevant *reld*bar2* to be negative for *reld3, reld4* and *reld5*. Consequently, for group *reld2*, which comprises below median income borrowers, we would expect the sum of the coefficients of *bar2dummy reld2bar*2 to be positive.

Test 2

As we stated in our hypothesis we need to analyze a change in mortgage lenders' behaviour in not only in terms of a change in 'quantity' but also a change in 'price'. For this purpose, we run an OLS regression for the rate spread of mortgage applications:

$$spread_i = s_i + t_i + q_i + \beta_1*l_i + \beta_2*E_i + \beta_3*reld2 + \beta_4*reld3 + \beta_5*reld4 + \beta_6*reld5 + \beta_7*bar2dummy + \beta_8*reld2bar2 + \beta_9*reld3bar2 + \beta_{10}*reld4bar2 + \beta_{11}*reld5bar2 + \varepsilon_i$$

The dependent variable *spread* is the difference between the annual percentage rate (APR) on the originated loan and the rate on Treasury securities of comparable maturity. The estimation period in this case is 2004-2007, since there is no information about spreads before 2004. Moreover, the dataset only includes loans having spreads in excess of 3%. The variables in the spread regression are the same as included in the logit regression. We however add a new variable to account for the applicant's ethnicity, which is recorded in the HMDA dataset post 2004; *latdummy* is a

dummy variable that takes the value 1 if the applicant ethnicity is Hispanic, 0 otherwise. We did not use this variable in Test 1, as data on ethnicity is not reported prior to 2004. We estimate alternative models by adding the variables on loan to income ratio, bankruptcy filings and group-wise application growth rates. We use robust standard errors to correct for within state and time dependence.

The coefficients for the dummy variables *reld2*, *reld3*, *reld4* and *reld5*, reflect the change in the spread for each reld* group relative to the spread for the control group before BAPCPA. Here, we expect the coefficients to be negative as higher income borrowers are likely to be charged lower spreads. If we expect a contraction in the supply of credit to above median income borrowers, post-BAPCPA, we expect higher mortgage spreads fo these borrowers. Thus, we expect that the sum of the coefficients on the relevant *reld*bar2* dummy variable and the *bar2dummy* dummy variable to be positive in the case of reld3, *reld4* and *reld5*. Since the underlying risk characteristics of the low income borrower pool remain unchanged post-BAPCPA, any increase in higher mortgage application acceptance rates implied by our hypothesis would be expected to be accompanied by an an increase the interest rate spread. Thus we would expect the sum of the coefficients of *reld2bar2*, and *bar2dummy* to be positive.

5. Empirical Results

Table 3 reports the results of the logit model for the probability of acceptance for a mortgage application. Model 1 is the base model. Model 2 includes information about the loan to income ratio *lti*. Model 3 adds the lagged bankruptcy filings *bft* for the state where application was received. Model 4 includes these last two variables and also controls for the demand effect by including *appgrowth*. Table 8 is estimated using October 17, 2005 as the date for BAPCPA,

The coefficients on *reld2*, *reld3*, *reld4* and *reld5* are also significant with the expected positive sign, meaning that before BAPCPA, applicants in any of the four income bands had a higher probability of acceptance than those applicants in the lower income group, *reld1*. The coefficient on *bar2dummy* is significant and positive in all four models, implying that for those applicants in the control group *reld1*, the bankruptcy reform increased the probability of applications being accepted after controlling for all other factors. Also, the sum of the coefficients for *bar2dummy* and the *reld*bar2* variables, (as reported in Table 4 with corrected standard errors), is positive and significant for group *reld2* and negative and significant for *reld3, reld4 and reld5*. This confirms our hypothesis, that BAPCPA led to an increase in the probability of a loan application acceptance for below-median income borrowers and a decrease in the application acceptance probability for above-median income borrowers, after controlling for other factors.

The results also show that the probability of acceptance decreases for black people, while the probability of acceptance increases for female applicants. Contrary to our expectations however, *Income* has a negative and significant coefficient; moreover, the loan to income variable *lti* is significantly positive in models 2 to 4, both contrary to what would be expected. However, we believe this could be indicative of the change in lenders' reaction to income after BAPCPA in 2005. Of the economic controls, house prices have an expected positive significant coefficient – an increase in house prices raises the probability of application acceptance. The bankruptcy filing variable, *bfl*, is positive and significant. The variable *appgrowth* is significant and positive; suggesting that growth in volumes of applications received by lenders affects the mortgage supply decision. State per capita income has a negative impact on acceptance, while the state unemployment rate appears to have positive impact on the acceptance.

Table 5 shows the results on the regression model for the rate spread. The coefficients on *reld2*, *reld3*, *reld4* and *reld5* are in this case negative and highly significant, implying that before BAP-CPA, applicants in any of the four (higher) income bands were able to get a lower mortgage rate than those applicants in the lower income group, *reld1*. The coefficient on *bar2dummy* is significant and positive in all four models, implying that for those applicants in the subgroup *reld1*, the bankruptcy reform increased the rate spread that they had to pay on their loans. This finding confirms our hypothesis of a shift along the supply curve: when the underlying risk characteristics of the below-median borrowers are unchanged, an increase in the quantity supplied must be accompanied by higher interest rates. The four interaction terms are also significant and have a positive sign, meaning that increase in the spread after BAPCPA was higher for applicants from the groups *reld2*, *reld3*, *reld4* and *reld5*, relative to those applicants in group *reld1*. We add the estimated coefficients for *bar2dummy* and the estimated coefficients of the interaction terms (*reld2bar2* to *reld5bar2*) and we report the coefficients and corrected standard errors in Table 6. All are positive and significant, confirming our hypothesis that BAPCPA had an effect in mortgage lenders' behaviour not only in terms of a change in 'quantity' but also in a change in 'price' for above median income borrowers. The four models on the rate spread show that the mortgage spreads are higher for black, female and Hispanic applicants. The coefficient for home prices is negative and significant, suggesting that rising home prices result in smaller spreads. *Appgrowth* has a negative impact on the spread. Income variables are not significant in any of the four models. The coefficient for *stpci* is positive and the coefficient for state unemployment has a negative coefficient, contrary to expectations while the *bfi* variable is not significant.

6. Conclusion

This paper sheds light on the effect of a change in bankruptcy laws on the secured mortgage market. Specifically, we show that the means test provision of the Bankruptcy Abuse Prevention and Consumer Protection Act caused a reduction in the supply of credit to relatively higher-income borrowers, through a decline in loan application acceptance rates and higher spreads. Further, we find that borrowers with income lower than their state's median income saw an increase in the supply of mortgage credit, accompanied with an increase in interest rates. We speculate that low income borrowers absorbed the increas in supply of credit at higher spreads through incentives like low loan to value ratio requirements, innovations like hybrid adjustable rate mortgages with 'teaser rates', and expectations of future house price appreciation. The transfer of credit from relatively better off borrowers to poorer borrowers due to the 'exogenous shock' of BAPCPA appears to be a contribution factor to the deterioration of lending standards in the U.S. mortgage market.

7. Appendix

Figure 1- Annual Bankruptcy Filings in the United States, 1980-2004.
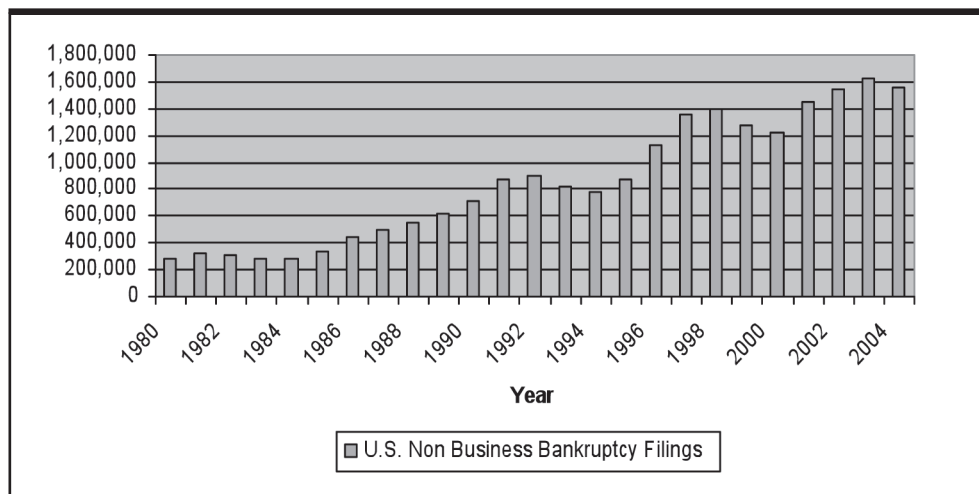
Source: American Bankruptcy Institute

**Figure 2- Inward shift in the supply of mortgage credit
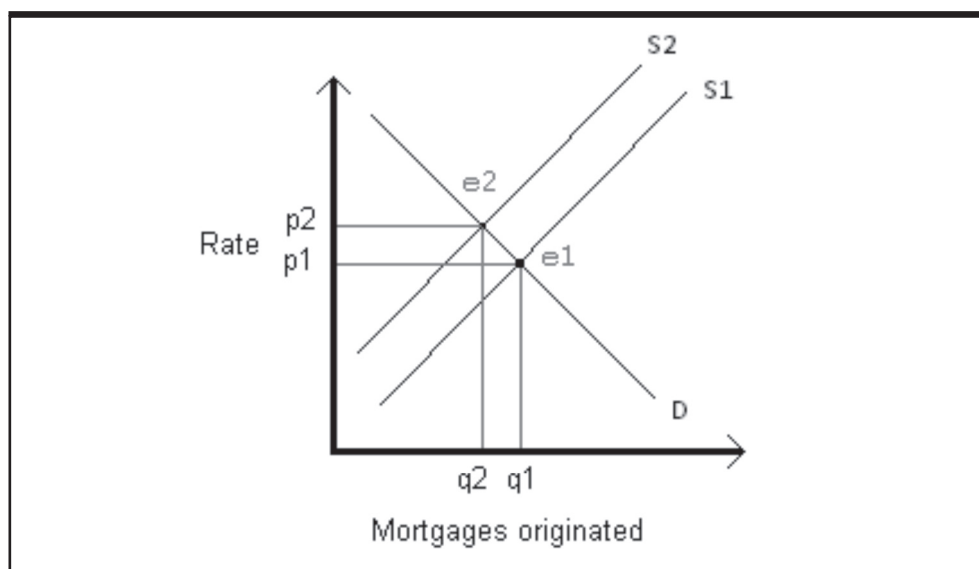for borrowers with income above state median.**

**Figure 3- Shift along the supply curve for borrowers
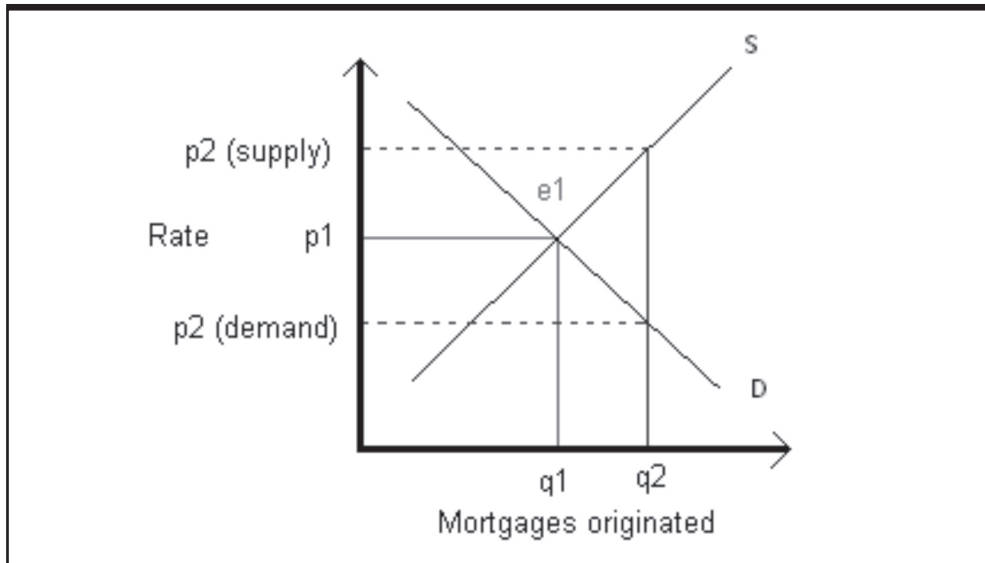with income less that the state's median income**.

Table 1- Data Description and Sources

Variable	Description	Type	Source
Probapp	Dummy variable taking the value 1 if the loan is originated and 0 otherwise	Loan level	HMDA
Spread	Spread between mortgage rate and Treasury security of comparable maturity (only reported if the spread is greater than 3%).	Loan level	HMDA
Blackdummy	Dummy variable taking the value 1 if the applicant is black and 0 otherwise	Loan level	HMDA
Latdummy	Dummy variable taking the value 1 if the applicant is of Hispanic ethnicity and 0 otherwise	Loan Level	HMDA
Femdummy	Dummy variable taking the value 1 if the applicant is female and 0 otherwise	Loan Level	HMDA
Loanamt	Principal amount of the application (in thousands of dollars)	Loan Level	HMDA
Income	Applicant's income (in thousands of dollars)	Loan Level	HMDA
Stunemp	State unemployment rate	Quarterly	BLS
Stpci	State per capita income	Quarterly	BEA
stHPIch	Change in state HPI since last period	Quarterly	OFHEO
Bfl	Bankruptcy filings by state, lagged one period	Annual	ABI
Appgrowth	Growth in applications in the period of the action since the last period. Not defined for 2000 Q1 as application data for the preceding quarter is incomplete.	Quarterly	HMDA
Reld1	Dummy variable taking the value 1 if the applicant's income in the quarter of the action is less than half his state's median income and 0 otherwise.	Loan Level	MDA, Census Bureau
Reld2	Dummy variable taking the value 1 if the applicant's income in the quarter of the action is between his state's median income and half his state's median income and 0 otherwise.	Loan Level	HMDA, Census Bureau
Reld3	Dummy variable taking the value 1 if the applicant's income in the quarter of the action is between his state's median income and 1.25 time his state's median income and 0 otherwise.	Loan Level	HMDA, Census Bureau
Reld4	Dummy variable taking the value 1 if the applicant's income in the quarter of the action is between 1.25 times and twice his state's median income, and 0 otherwise.	Loan Level	HMDA, Census Bureau
Reld5	Dummy variable taking the value 1 if the applicant's income in the quarter of the action is more than twice his state's median income, and 0 otherwise.	Loan Level	HMDA, Census Bureau
Bar2dummy	Dummy variable taking the value 1 if the action for the application occurred after 20th April 2005, and 0 otherwise	Loan Level	HMDA

Table 2- Summary Statistics

	2000	2001	2002	2003	2004	2005	2006	2007
	Variable Means							
probapp	0.58	0.63	0.70	0.70	0.66	0.63	0.63	0.62
spread	-	-	-	-	4.97	5.36	5.77	4.98
blackdummy	0.07	0.06	0.05	0.07	0.08	0.10	0.11	0.09
latdummy	-	-	-	-	0.12	0.15	0.16	0.12
femdummy	0.24	0.23	0.24	0.27	0.29	0.30	0.31	0.29
loanamt ['000]	117.71	127.99	152.24	166.82	175.92	181.47	188.14	209.63
income ['000]	75.87	80.75	90.11	93.84	95.95	102.01	112.94	118.64
effmedian	49899.2	51289.5	52927.2	53371.2	54882.6	64759.8	66725.9	69355.2
stunemp	4.04	4.78	5.86	5.99	5.49	5.04	4.59	4.60
stpci	25297.6	26181.5	27369.8	28209	29801.4	30781.9	32329.9	33633.1
stHPIch	0.04	0.05	0.05	0.06	0.11	0.17	0.06	-0.01
lti	1.83	1.89	2.04	2.18	2.26	2.15	2.06	2.27
bfl	51272.4	50216.39	60982.49	62609.33	65811.31	60938.48	79320.34	20694.33
appgrowth	-9.12	0.83	-0.37	5.60	10.47	5.93	-1.67	-17.34
Actions	62923	58034	48214	55524	84230	102521	104679	64701

Table 3- Determinants of loan application approval

VARIABLES	Probapp (1)	Probapp (2)	Probapp (3)	Probapp (4)
blackdummy	-0.613***	-0.612***	-0.614***	-0.614***
	[0.0101]	[0.0101]	[0.0101]	[0.0102]
femdummy	0.0174***	0.0175***	0.0179***	0.0183***
	[0.00640]	[0.00640]	[0.00640]	[0.00648]
loanamt	8.58e-05***	1.15e-05	1.93e-05	2.49e-05
	[2.12e-05]	[3.21e-05]	[3.21e-05]	[2.96e-05]
income	-0.000159***	-9.65e-05**	-9.86e-05**	-0.000101**
	[3.72e-05]	[4.27e-05]	[4.26e-05]	[4.15e-05]
income2	8.19e-09	2.13e-09	2.30e-09	2.48e-09
	[5.66e-09]	[5.95e-09]	[5.95e-09]	[5.88e-09]
stunemp	0.0177***	0.0178***	0.0162***	0.0172***
	[0.00629]	[0.00629]	[0.00629]	[0.00645]
stpci	-7.39e-05***	-7.38e-05***	-6.57e-05***	-6.18e-05***
	[4.63e-06]	[4.63e-06]	[4.68e-06]	[4.79e-06]
stHPIch	0.361***	0.357***	0.295***	0.367***
	[0.0523]	[0.0523]	[0.0525]	[0.0528]
reld2	0.691***	0.704***	0.702***	0.693***
	[0.0142]	[0.0147]	[0.0147]	[0.0152]
reld3	1.027***	1.044***	1.041***	1.020***
	[0.0163]	[0.0171]	[0.0171]	[0.0175]
reld4	1.250***	1.271***	1.267***	1.240***
	[0.0151]	[0.0164]	[0.0164]	[0.0166]
reld5	1.350***	1.377***	1.370***	1.340***
	[0.0167]	[0.0188]	[0.0188]	[0.0188]
bar2dummy	0.275***	0.272***	0.267***	0.275***
	[0.0249]	[0.0250]	[0.0250]	[0.0252]
reld2bar2	-0.209***	-0.206***	-0.203***	-0.193***
	[0.0215]	[0.0215]	[0.0215]	[0.0219]
reld3bar2	-0.383***	-0.379***	-0.371***	-0.348***
	[0.0244]	[0.0245]	[0.0245]	[0.0248]
reld4bar2	-0.524***	-0.520***	-0.510***	-0.486***
	[0.0223]	[0.0224]	[0.0224]	[0.0227]
reld5bar2	-0.614***	-0.609***	-0.595***	-0.574***
	[0.0230]	[0.0231]	[0.0231]	[0.0234]
lti		0.0122***	0.0121***	0.00954***
		[0.00424]	[0.00422]	[0.00365]
bfl			2.39e-06***	2.19e-06***
			[2.07e-07]	[2.13e-07]
appgrowth				0.00348***
				[0.000347]
Constant	2.414***	2.374***	2.151***	2.163***
	[0.198]	[0.198]	[0.199]	[0.204]
Observations	580826	580826	580826	565778
Pseudo R square	0.0342	0.0343	0.0345	0.0323
Correctly classified	65.61%	65.61%	65.65%	65.67%

Note: Logistic regression on dummy variable taking value 1 if the loan was originated and 0 otherwise. All regressions include state, time and seasonal fixed effects (not reported). For variable definitions, see Table 1. Robust standard errors are in brackets. * denotes significance at 10%; **significance at 5%; *** significance at 1%. Model 4 has fewer observations that the others as app growth is not defined applications with action taken in 2000 Q1.

Table 4- Net Effect of BAPCPA for each income group

VARIABLES	(1) probapp	(2) probapp	(3) probapp	(4) probapp
reld2bar2	0.066***	0.066***	0.064***	0.082***
	[0.0187]	[0.0187]	[0.0187]	[0.0188]
	-	-	-	-
reld3bar2	0.108***	0.107***	0.104***	0.073***
	[0.0220]	[0.0220]	[0.0220]	[0.0221]
	-	-	-	-
reld4bar2	0.249***	0.248***	0.243***	0.221***
	[0.0196]	[0.0197]	[0.0197]	[0.0198]
	-	-	-	-
reld5bar2	0.339***	0.337***	0328***	0.299***
	[0.0205]	[0.0205]	[0.0205]	[0.0206]

Note: Models 1, 2, 3 and 4 correspond to the same models in Table 3. Corrected robust standard errors are in brackets. *denotes significance at 10%; **significance at 5%; *** significance at 1%.

Table 5- Determinants of Spreads

VARIABLES	(1) spread	(2) spread	(3) spread	(4) spread
blackdummy	0.328***	0.345***	0.345***	0.344***
	[0.0212]	[0.0213]	[0.0213]	[0.0213]
latdummy	0.134***	0.150***	0.150***	0.149***
	[0.0155]	[0.0158]	[0.0158]	[0.0158]
femdummy	0.0582***	0.0620***	0.0621***	0.0617***
	[0.0146]	[0.0145]	[0.0145]	[0.0145]
loanamt	-0.00462***	-0.00267***	-0.00267***	-0.00268***
	[0.000138]	[0.000384]	[0.000384]	[0.000384]
income	0.000863***	-7.95e-05	-7.96e-05	-8.79e-05
	[0.000195]	[0.000216]	[0.000216]	[0.000216]
income2	-5.47e-08	3.60e-08	3.61e-08	3.74e-08
	[4.44e-08]	[3.47e-08]	[3.47e-08]	[3.46e-08]
stunemp	-0.0486**	-0.0513***	-0.0528***	-0.0440**
	[0.0200]	[0.0196]	[0.0196]	[0.0196]
stpci	3.67e-05**	3.63e-05**	3.63e-05**	3.54e-05**
	[1.46e-05]	[1.44e-05]	[1.44e-05]	[1.44e-05]
stHPIch	-0.662***	-0.555***	-0.544***	-0.590***
	[0.108]	[0.110]	[0.109]	[0.110]
reld2	-0.0634	-0.258***	-0.258***	-0.329***
	[0.0581]	[0.0671]	[0.0671]	[0.0680]
reld3	0.0163	-0.274***	-0.274***	-0.374***
	[0.0624]	[0.0811]	[0.0811]	[0.0825]
reld4	0.0766	-0.276***	-0.276***	-0.399***
	[0.0617]	[0.0888]	[0.0888]	[0.0906]
reld5	0.224***	-0.225**	-0.225**	-0.358***
	[0.0748]	[0.110]	[0.110]	[0.111]
bar2dummy	0.397***	0.410***	0.410***	0.309***
	[0.0707]	[0.0712]	[0.0712]	[0.0734]
reld2bar2	0.203***	0.193***	0.192***	0.261***
	[0.0717]	[0.0721]	[0.0721]	[0.0733]
reld3bar2	0.232***	0.219***	0.218***	0.316***
	[0.0769]	[0.0771]	[0.0772]	[0.0794]
reld4bar2	0.250***	0.221***	0.220***	0.348***
	[0.0728]	[0.0735]	[0.0735]	[0.0774]
reld5bar2	0.218***	0.145*	0.144*	0.294***
	[0.0783]	[0.0792]	[0.0793]	[0.0842]
lti		-0.240***	-0.240***	-0.240***
		[0.0470]	[0.0470]	[0.0470]
bfl			-7.89e-07	-5.68e-07
			[5.90e-07]	[5.89e-07]
appgrowth				-0.00581***
				[0.000938]
Constant	3.668***	4.191***	4.167***	4.042***
	[0.615]	[0.616]	[0.616]	[0.616]
Observations	54211	54211	54211	54211
R-squared	0.159	0.182	0.182	0.183

Note: OLS regression on Spreads over Treasury of comparable maturity for years 2004-2007. All regressions include state, time and seasonal fixed effects (not reported). For variable definitions, see Table 1. Robust standard errors are in brackets. * denotes significance at 10%; **significance at 5%; *** significance at 1%.

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Table 6- Corrected Coefficients for spreads from Table 5

VARIABLES	spread (1)	spread (2)	spread (3)	spread (4)
reld2bar2	0.600***	0.603***	0.602***	0.570***
	[0.0337]	[0.0326]	[0.0327]	[0.0330]
reld3bar2	0.629***	0.629***	0.628***	0.625***
	[0.0416]	[0.0405]	[0.0404]	[0.0404]
reld4bar2	0.647***	0.631***	0.630***	0.657***
	[0.0362]	[0.0355]	[0.0356]	[0.0361]
reld5bar2	0.615***	0555***	0.554***	0.603***
	[0.0466]	[0.0469]	[0.0470]	[0.0480]

Note: Models 1, 2, 3 and 4 correspond to the same models in Table 5. Corrected robust standard errors are in brackets. * denotes significance at 10%; **significance at 5%; *** significance at 1%.

Table 7- Test 1 Results with the date of BAPCPA October 2005.

Variables	probapp(1)	Variables	spread (1)
blackdummy	-0.613***	blackdummy	0.342***
	(0.0102)		(0.0213)
latdummy	N/A	latdummy	0.149***
	N/A		(0.0159)
femdummy	0.0175***	femdummy	0.0624***
	(0.00648)		(0.0146)
loanamt	1.93e-05	loanamt	-0.00266***
	(3.00e-05)		(0.000384)
income	-0.000116***	income	-7.45e-05
	(4.16e-05)		(0.000216)
income2	4.53e-09	income2	3.55e-08
	(5.90e-09)		(3.42e-08)
stunemp	0.0185***	stunemp	-0.0819***
	(0.00643)		(0.0195)
stpci	-6.40e-05***	stpci	2.12e-05
	(4.78e-06)		(1.44e-05)
stHPIch	0.248***	stHPIch	-0.412***
	(0.0531)		(0.112)
bardummy	0.217***	bardummy	0.279***
	(0.0273)		(0.0696)
reld2bar	-0.161***	reld2bar	0.0985
	(0.0230)		(0.0684)
reld3bar	-0.296***	reld3bar	0.218***
	(0.0262)		(0.0745)
reld4bar	-0.434***	reld4bar	0.121*
	(0.0239)		(0.0699)
reld5bar	-0.514***	reld5bar	0.0267
	(0.0245)		(0.0732)
lti	0.00989***	lti	-0.241***
	(0.00375)		(0.0471)
bfl	2.41e-06***	bfl	-9.24e-07
	(2.12e-07)		(5.90e-07)
appgrowth	0.00223***	appgrowth	-0.00408***
	(0.000348)		(0.000855)
Constant	2.266***	Constant	4.793***
	(0.203)		(0.613)

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