

The Role of Income and Location in Racial/Ethnic Differences on Loan Denial in three Mississippi Counties

Okechukwu Anyamele¹, Gail Fulgham² & Jean-Claude Assad³

Abstract

This paper investigates the racial differences in loan denial rates in three Mississippi counties within the Jackson Metropolitan statistical area (MSA). The study examines the role of location, minority population of location, and the ratio of loan amount to income on loan denial rates. The study uses Home Mortgage Disclosure Data (HMDA) from 2007 to 2013 to capture the effects of the recent financial crisis on loan denial rates. The results show that the ratio of loan amounts to income is a significant determinant in loan denial rates. Moreover, residents in Rankin County are more likely to be denied loans than residents in Hinds and Madison counties over the study period. Residents in high minority population area are more likely to be denied loans than residents in low minority population areas. The researchers employed both logistic regression and Blinder-Oaxaca decomposition analysis. The results showed that 28.89% of the difference in loan denial rates between whites and African Americans is explained by endowments, while 64.94% is unexplained. Similarly, 12.87% of the difference in loan denial rates between Hispanics and Whites is explained by endowments, while 86.91% is unexplained.

Keywords: Loan Denial Rates; Race and Ethnicity; Loan amount to Income; Home Mortgage Disclosure Act; Blinder-Oaxaca decomposition; Mississippi Counties

JEL Classification D12 D14 G00 J15

Introduction

Homeownership is one of the major sources of wealth for American families. However, the lack of access for minority populations and especially African Americans to loan approvals for housing purchases have limited their ability to accumulate wealth from the housing stock. The issue of discrimination has been a prevalent and highly debated topic in American socio-economic literature. Discrimination occurs when there is evidence that certain social groups are denied benefits naturally extended to other privileged groups. It may be based on religion, gender, sexuality, race, ethnicity or other factors. The practice of discrimination affects numerous aspects of American life, ranging from education to political participation, to employment and housing. As a result, the pursuit and achievement of the “American Dream” may be out of reach for many American citizens through no fault of their own. For many individuals, the simple notion of purchasing a home in a desirable location or neighborhood can be an uphill task. Institutions controlled by the privileged class are usually manipulated to deny access to the other groups.

¹ Professor of Economics, Jackson State University, 1400 J R Lynch Street, Jackson, MS 39217, USA

² Professor of Economics, Jackson State University, 1400 J R Lynch Street, Jackson, MS 39217, USA
gail.g.fulgham@jsums.edu, 601-979-2617, 601-979-26901 (fax)

³ Associate Professor of Economics, Jackson State University, 1400 J R Lynch Street, Jackson, MS 39217, USA

In the housing industry, in particular, banking laws and processes are sometimes violated to deny prospective buyers access to funds necessary to acquire desirable properties. Historically, the southern region of the United States has been plagued by numerous incidents of discrimination. The state of Mississippi has often been cited as one of those southern states where the practice of discrimination is still rampant. Thus, several Mississippi banks have been investigated and sanctioned by the United States Department of Justice for violations of the Community Reinvestment Act (CRA) and for unfair banking practices. Generally, eligibility for loan financing requires that borrowers meet requirements of credit worthiness and ability to pay, regardless of race, ethnicity, gender and religion. According to the U.S. Census Bureau, between 1994 and 2013, home ownership among U.S. families rose from 63.9% in 1994 to 65.1% in 2013. However, when taking race into account, the rates of increase in home ownership revealed some distinct disparities. Home ownership rates among black families rose by 1.89%, from 42.3% to 43.1% between 1994 and 2013. Hispanic families saw an 11.89% increase, from 41.2% to 46.1% over the same period. While white families experienced an increase of 4.8%, from 70% to 73.35%. In absolute terms, the 2013 census data reveal ownership rates of 73.35% for white households, 43.1% for blacks or African Americans, and 46.1% for Hispanics. The appreciable increase in home ownership for Hispanics over that period may be attributed to the significant increase in the Hispanic population. Comparably, black households experienced the lowest rate of homeownership as well as the lowest ownership growth (U.S. Census Bureau, 2013).

The process of lending discrimination or loan denial based on location is generally referred to as redlining. In an effort to address this issue and to promote transparency and accountability, the United States Congress passed the Home Mortgage Disclosure Act (HMDA) of 1975, requiring lending institutions to disclose to the public, annually, detailed information about their home lending activities. Additionally, Congress passed the Community Reinvestment Act of 1977. The Act requires that commercial banks demonstrate through their activities that they meet the credit needs of their community, including low and moderate-income neighborhoods. As indicated previously, discrimination is evident when mortgage lending is denied to certain population groups based on race, gender, religion or other non-economic factors. Over the years, disparities in home ownership rates and in ownership growth have attracted the attention of economists, social scientists and government institutions, seeking to investigate the possible causes of this troubling phenomenon. As possible causes, some assertions refer to the concept of redlining, the propensity of financial institutions toward differential or unequal use of credit risk instruments for different racial and ethnic groups, the use of statistical discrimination, and the profit motive of banks and mortgage lenders. One of the early analyses on race and mortgage lending is attributed to John McKnight, a sociologist and community activist who, in the 1960s, brought special attention to the concept of redlining in residential mortgages. Thus this study examines the loan denial rate in the three counties within Jackson metropolitan statistical area (MSA). The three counties studied are Hinds, Madison, and Rankin counties. This study will examine loan approval rates and loan denial rates among the different racial and ethnic groups in three adjacent Mississippi counties with different ethnic and racial population distributions. The study examines the role of location, minority population of location, and the ratio of loan amount to income on loan denial rate.

Literature Review

Anyamele (2015) established that the recent financial crisis impacted minorities more than whites. The study used 2001, 2004, 2007, and 2010 Surveys of Consumer Finances (SCF) data. Ezeala-Harrison et. al (2008) found consistent high denial rates in housing loan decisions against minorities in Metro-Jackson, Southern Mississippi Corridor, and the Northern district of Mississippi. Their study used a combination of data from Western Economic Services (WES) and Home Mortgage Disclosure Act (HMDA) that covered 1993 to 2003 period. One of the major contributions of their study is that redlining still exist in Mississippi. Redlining is the uniquely American phenomenon where large areas of center city neighborhoods are deemed unsafe for home mortgage investments (Greer 2012). The word, redlining, is particularly fitting, because historically these agencies would draw red lines around the inner city areas and neighborhoods that were deemed "hazardous" or "definitely declining," which led to the creation of "Residential Security Maps" (Greer 2012). More importantly, these areas were predominantly occupied by non-whites and non-white Hispanics, which suggested some form of racial profiling. Redlining was not only a concept but also an action that was practiced on a regular basis as the interests of both public and private institutions merged. Furthermore, redlining was formulated greatly in response to the Great Migration of rural African Americans from the South to Northern cities (Greer 2012). This transition of people was inevitable, because it was believed that the redlined areas, or people living in those areas, would degrade the land and the neighboring areas.

According to Greer (2012), redlining emphasizes four main factors: the decline of inner city areas, the inability of non-whites to take on loans, the racial beliefs and actions of federal agencies, and the co-dependence of the financial and real-estate markets. As a result, the urban and rural dichotomy was forcefully formed not only through association but also through governmental pressures. In other words, the U.S. government implemented discriminatory acts that were carried out by the people. James Greer (2012), proposed that the racialization of the American real estate market is not wrong, but instead incomplete. He points out the fact that race is only one explanatory variable on the disinvestment of mortgage lending in the U.S. economy and although it may be a contributing factor, it is certainly not the sole factor that redlining rhetoric seems to suggest. Phillips-Patrick and Rossi (1995) observed evidence of red-lining in their analysis of mortgage loans approval and denials in the Washington, DC metropolitan area. Examining mortgage loan approvals within and across census tracts, they discovered that the ratio of mortgage originations in black neighborhoods was significantly lower than in non-black areas. They also found that as the percentage of black households in a neighborhood rises, the ratio of mortgage applications to units rises and that originations drop in neighborhoods as the percentage of black residents rises. The results could indicate redlining or it could reflect the omitted variables such as creditworthiness.

On the other hand, some researchers questioned the red-lining phenomenon in mortgage lending. For example, in challenging findings of redlining by other researchers, Carr and Megbolugbe (1993) cited the work of Benston and Horsky which found no differences between households in allegedly redlined areas and those in control areas in terms of their ability to secure mortgage financing in Cincinnati, Indianapolis, and Nashville. Carr and Megbolugbe also asserted that the Boston Fed study found no evidence that lenders in Boston denied loans to an area because it has a large proportion of minority residents. They further contended that a limitation of research which attempts to show redlining is that important information which contributes to the borrower's creditworthiness is disregarded. In an investigation of the determining factors to differential lending rates, Ferguson and Peters (1995) found that some commercial banks and mortgage lenders applied different credit standards to different population groups. Therefore, since credit risks were unequally assigned to different population segments, they concluded that "color blind" lending would not result in equal denial or default rates across different segments of the population. Other definitions of lending discrimination centered on the basis of the concept of statistical discrimination (Phelps, 1972; Han, 2004). According to Phelps, statistical discrimination is a practice in which a lender, lacking full information on a borrower's creditworthiness, applies group stereotypes to individual borrowers in evaluating loan applications. In Han's study, the reiteration of this type of discrimination was investigated and it was determined that since statistical discrimination implied higher rejection rates for minority applicants, rejection rates would not be a reliable measure of discrimination in lending. Han concluded that statistical discrimination would imply that loans to minority borrowers have smaller sizes than those to majority borrowers with the same characteristics observed by lenders at the time of loan originations. Also, Han (2004) found that loans to minority borrowers carried higher interest rates.

Ladd (1998) attributed a profit motive for financial institutions in discriminating against minority borrowers. Ladd asserted that, despite the efforts of the federal government through actions such as the Fair Housing Act of 1968 and Equal Credit Opportunity Act of 1974, to promote fairness and to combat discrimination in lending, lending institutions could still have a profit-oriented motive towards discriminating against minorities. In her study, if institutions expected minorities on average to have higher default rates than whites, then lenders might believe that discrimination against minorities in the labor market could make the income of minorities more volatile on average over the economic cycle than that of whites and hence making minorities more likely to default. The notion speculated by these lenders would be cheaper screening device than other ways which would be used to distinguish between the quality of similar applicants.

Although much of the research conducted concerning lending discrimination was based on denial and default rates, discrimination can also exist by lenders refusing to service a particular area which is within their servicing area typically known as redlining. Numerous studies have indicated evidence that discrimination may have been committed through the use of this tool as well. In a comprehensive study of lending behavior, Schafer and Ladd (1981) analyzed lending data on commercial banks, Mutual Savings banks, and Savings and Loan companies in California and New York, and tested for discrimination against a wide variety of groups based on race, gender, and marital status.

From their investigation, they found evidence of discrimination based on races. In 18 of the 32 California areas and six of the ten New York areas, black applicants had significantly higher chances of loan denials than similar white applicants. Furthermore, they found that black applicants were 1.58 to 7.82 times as likely to be denied as whites. Ladd (1998) found that the issue with loan denials stemmed around setting higher cutoffs in terms of creditworthiness for minorities than for whites so that the minorities who received loans would be more creditworthy than the whites who received loans. The situation places a standard higher than the requirements set forth by the lending company.

The Model

Similar to previous studies, we posit that loan denial rates will be higher for minority populations in the three Jackson Metropolitan counties of Hinds, Madison, and Rankin in Mississippi. Also, we expect higher loan denial rates for individuals with lower income, high loan amount to income ratio, and individuals who live in high minority population. The analysis will rely primarily on (HMDA) data. Furthermore, this study is the first attempt to examine the loan denial rate in these counties post the 2008 financial crisis. Thus, it makes a significant contribution in appraising and documenting the loan denial rate in Jackson (MSA) post the great recession. The results derived from this analysis will then be compared with other national studies previously conducted in other regions of the country. The analysis will rely primarily on census data and banking data for the three adjacent counties.

The loan denial rate equation can be written as follows:

$$Y_{it} = \beta X_{it} + \mu_{it} \quad (1)$$

Where Y_{it} is a binary variable that takes the value of 1 or 0. If the i th loan application is denied, Y_{it} is 1; otherwise, it is 0. X is a vector of independent variables, and β is the vector coefficients to be estimated, while μ is the error term. Thus, we can write the loan denial equation as follows: $D=1$ if the loan application is denied, or $D=0$ otherwise. $P(\text{Denied} = 1 | x) = F(x, \beta)$ or $P(\text{Denied} = 0 | x) = 1 - F(x, \beta)$ (2)

Where x represents a vector of economic and demographic characteristics, β represents a vector of the estimated coefficients, and F is the cumulative distribution function.

Definition of Variables

The variables for the logistic regression are applicant's race (White, African American, Hispanics, and Asians); the ratio of loan amount to applicant's income; this is transformed into a categorical variable of normal or high. It is normal if it is ≤ 3 , it is high if it is > 3 . Income level, which has six categories $< \$45,000 = 1$, $\$45,000$ to $\$75,000 = 2$, $\$75,001$ to $\$85,000 = 3$, $\$85,000$ to $\$95,000 = 4$, and $> \$95,000 = 5$; loan total variable has six categories $< \$100,000 = 1$, $\$100,000$ to $\$200,000 = 2$, $\$200,000$ to $\$300,000 = 3$, $\$300,000$ to $\$400,000 = 4$, $\$400,001$ to $\$500,000 = 5$ and $> \$500,000 = 6$.

Other variables are loan purpose which has three categories namely home purchase, home improvement, and home refinance. Loan type has four categories conventional loan, Veterans Administration loan, Federal Housing Administration loan, and Farm Service Agency or Rural Housing Service loan. Therefore, the variable ratio of minority population in a census tract is divided into two categories: low minority population in the census tract or high minority population in the census tract. This ratio is considered high if it is ≥ 50 percent and low minority if it is < 50 percent. Location is represented by the three counties. The survey years of HMDA data represents the environment.

Model Results

Table 1 present the results of the logistic regression for loan denial in three Mississippi counties of Hinds, Madison, and Rankin from the years 2007 to 2013. Compared with Asian Americans, African Americans are 1.54 times more likely to be denied loan. Whites are 32.06% less likely to be denied loans than Asian Americans while Hispanics are 1.55 times more likely to be denied loans when compared to Asian Americans. Living in a high minority population area has a 1.34 times likelihood of being denied loans. Moreover, having a high loan ratio to income increases the likelihood of denial. The probability of loan denial is inversely related to the level of income and appears to have a gradient. Loan denial is 3.62 times higher for loans for home improvement compared to home purchase. The figure is also high for loans on home refinance. Compared to loans for home purchases, loans for home refinances is 1.88 times higher. On the basis of county, loans from Madison County are 14.18% less likely to be denied when compared to Hinds County while loans from Rankin County are 1.03 times likely to be denied as compared to Hinds.

Loans that range from \$200,000 to \$500,000 are more likely to be approved while loans that are greater than \$500,000 are 1.33 times more likely to be denied compared to loans of \$100,000 or less. Loan type compared to conventional loan, such as FHA loans, VA loans, and FSA/RHS loans are more likely to be approved.

Table 1: Logistic Regression on Loan Denial 2007-2013

Independent Variables	Combined All Races Model 1	White Model 2	African Americans Model 3	Asian Americas Model 4	Hispanics Model 5
No Race	-0.107 (-1.50)				
Asian Americans	Referent 1.00				
African Americas	0.434** (6.16)				
White	-0.386** (-5.57)				
Hispanics	0.436** (6.26)				
High Minority Pop	0.297** (15.66)	0.415** (13.00)	0.184** (6.52)	0.0876 (0.49)	0.266 (1.24)
HLV to income	0.0695** (3.37)	-	-	-	-
Income <\$45,000	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
\$45,001<=\$75,000	-0.421** (-21.79)	-0.497** (-16.63)	-0.388** (-13.03)	-0.419* (-2.34)	-0.382 (-1.96)
\$75,001<=\$85,000	-0.639** (-18.59)	-0.676** (-13.84)	-0.565** (-9.58)	-0.405 (-1.45)	-0.556 (-1.66)
\$85,001<=\$95,000	-0.679** (-17.46)	-0.770** (-14.15)	-0.625** (-8.83)	-0.572 (-1.65)	-0.507 (-1.40)
>\$95,000	-0.930** (-34.27)	-0.999** (-25.64)	-0.775** (-16.50)	-0.944** (-3.82)	-0.584* (-2.40)
Home Purchase	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
Home Improvement	1.287** (46.82)	0.989** (22.33)	1.108** (27.80)	1.232** (4.94)	1.874** (6.50)
Home Refinance	0.630** (35.15)	0.537** (20.22)	0.528** (18.84)	0.401* (2.45)	0.920** (5.65)
Hinds County	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
Madison County	-0.153** (-7.41)	-0.180** (-5.84)	-0.0562 (-1.64)	-0.0890 (-0.46)	-0.132 (-0.72)
Rankin County	0.0342 (1.66)	0.0992** (3.53)	0.0293 (0.69)	0.101 (0.51)	-0.173 (-0.87)
Loan <\$100,000	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
\$100,001<=200,000	-0.348** (-18.14)	-0.460** (-16.42)	-0.253** (-7.93)	-0.693** (-3.89)	-0.549** (-2.65)
\$200,001<=300,000	-0.300** (-9.93)	-0.358** (-8.60)	-0.236** (-4.25)	-0.0486 (-0.18)	-0.379 (-1.36)
\$300,001<=400,000	-0.217** (-4.63)	-0.327** (-5.12)	-0.112 (-1.24)	-1.072 (-1.95)	-0.0306 (-0.08)
\$400,001<=500,000	-0.362** (-5.36)	-0.518** (-5.80)	-0.102 (-0.71)	-0.0735 (-0.10)	-0.0421 (-0.09)

>\$500,000	0.315*** (3.99)	0.180 (1.81)	0.480** (2.63)	0.335 (0.53)	-0.680 (-0.82)
Conventional Loan	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
FHA Loan	-0.303*** (-14.13)	-0.0155 (-0.46)	-0.694*** (-21.53)	-0.615** (-2.90)	0.157 (0.71)
VA Loan	-0.0625 (-1.24)	0.178* (2.31)	-0.487*** (-6.34)	-0.175 (-0.41)	1.078 (1.59)
FSA/RHS Loan	-0.939*** (-13.67)	-0.527*** (-5.69)	-1.543*** (-14.45)	-0.577 (-1.00)	-0.662 (-0.64)
Year 2007	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
2008	0.0533* (2.36)	0.0911* (2.55)	0.134*** (3.79)	0.382 (1.83)	-0.00623 (-0.02)
2009	-0.273*** (-10.30)	-0.317*** (-7.35)	-0.0367 (-0.89)	0.0525 (0.21)	-0.348 (-1.32)
2010	0.0237 (0.73)	0.00812 (0.16)	-0.0139 (-0.30)	0.269 (0.83)	-0.264 (-0.69)
2011	0.00317 (0.12)	-0.162*** (-4.09)	0.0509 (1.15)	0.216 (0.85)	-0.324 (-1.24)
2012	-0.0566* (-2.19)	-0.201*** (-5.31)	-0.0152 (-0.36)	-0.00278 (-0.01)	-0.394 (-1.52)
2013	-0.00951 (-0.37)	-0.0934* (-2.48)	0.00370 (0.09)	0.0889 (0.37)	-0.435 (-1.72)
NLV to Income	-	-0.0180 (-0.57)	-0.128*** (-3.89)	-0.138 (-0.69)	-0.801*** (-4.07)
Constant	-1.237*** (-16.84)	-1.424*** (-31.28)	-0.567*** (-12.72)	-0.734** (-2.74)	-0.707* (-2.37)
N	138802	78775	36965	1638	1333

Thus, the Environment can be captured in the different survey years. From Table 1, we see that loan denial was more likely to occur in 2008 compared to 2007 and less likely to occur in 2009, 2010, 2011, 2012, and 2013. Models 1, 2, 3, 4, and 5 in Table 25 is the logistic regression of loan denial rates for all races, White, African Americans, Hispanics, and Asians from 2007 to 2013. Model 1, suggests that Whites who apply for loans in high minority areas are 1.51 times more likely to be denied loans. The higher your income the less likely you will be denied loan. Compared with home purchase applications, home improvement loans, and home refinance loans are more likely to be denied for White applicants over the study period. Model 2 shows that Whites who live in Madison are less likely to be denied loans compared to Whites who live in Rankin County and more likely to be denied loan compared to Whites in Hinds County. These results are significant both in magnitude and coefficients on loan total or amounts. The results are consistent with the results from model 1 that shows that loan amounts greater than \$500,000 are more likely to be denied. However, Whites who apply for VA loans are more likely to be denied loans.

This result is not consistent with the result from model 1 that shows that VA loans are more likely to be approved compared to conventional loans. Further, the results on environment in model 2 is similar to the results from model 1. Model 3 represents the results for African Americans. African Americans who live in high minority tract population are 1.2 times more likely to be denied loans. It is interesting to note that African Americans who have loan to income ratio that is three times or less are 11.98% more likely to be approved for a loan compared with those with loan to income ratio that is more than 3 times the loan amount. The result on income is consistent and appears to show that there is a gradient in loan denial with income. The result on loan purpose is consistent with both Models 2 and 3 that show that loan applications for home improvement and home refinance are more likely to be denied compared to home purchase. Although not significant at 5% significant level, African Americans who live in Madison are less likely to be denied loans compared to Hinds County and African Americans who live in Rankin County are more likely to be denied loans compared to Hinds County. The results on loan amount are consistent with both the results from models 2 and 3, respectively.

However, the results on types of loans in model 3 is similar to the results from model 1 and different from Model 2 which showed VA loans to be more likely to be denied for Whites. Environment is similar for both Models 1 and 2 with the exception of 2008, which is significant in loan denial for African Americans. Model 4 shows the results for Hispanics on loan denial. The result seems to follow a similar pattern, however some of the variables are insignificant although the signs are consistent with results from Models 1, 2, 3, 4, and 5. Further, Model 4 shows that income is consistent in determining loan denial. Model 4 also shows that loans for home improvement and home refinance are more likely to be denied compared to loans for home purchase for Hispanics. Model 5 which represent the logistic regression for Asian Americans also show that income, loan to income ratio, and purpose for the loan are significant in determining loan denial over the study period. These results are similar to the findings of Anyamele (2015) and Weller (2009) that showed that African Americans are more likely to be credit constrained. To further understand the impact of location or county on loan denial in Mississippi, a logistic regression is ran for each county. Table 2, Models 6, 7, 8 and 9 represent results for all three counties combined, Hinds, Madison, and Rankin counties, respectively.

Table 2: Logistic Regression on Loan Denial in Jackson MSA 2007-2013

Independent Variables	Model 6 Combined	Model 7 Hinds	Model 8 Madison	Model 9 Rankin
No Race	-0.0145 (-1.52)	0.0143 (0.77)	-0.0230 (-1.68)	-0.0181 (-1.07)
Asian Americas	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
African Americans	0.0820*** (8.68)	0.0940*** (5.12)	0.103*** (7.55)	0.111*** (6.45)
White	-0.0473*** (-5.12)	-0.0451* (-2.46)	-0.0519*** (-3.98)	-0.0198 (-1.21)
Hispanics	0.0634*** (6.23)	0.0398* (2.21)	0.0690*** (4.08)	0.0792*** (4.64)
High Minority Pop	0.0557*** (20.42)	0.0737*** (18.93)	0.0320*** (7.33)	0.0747 (0.71)
NLV to income	0.00378 (1.31)	0.00291 (0.60)	0.00134 (0.26)	0.0314*** (6.32)
Income <\$45,000	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
\$45,001<=\$75,000	-0.0747*** (-26.49)	-0.0713*** (-15.95)	-0.0768*** (-13.40)	-0.0682*** (-14.14)
\$75,001<=\$85,000	-0.106*** (-23.23)	-0.114*** (-14.72)	-0.0941*** (-11.24)	-0.0949*** (-12.40)
\$85,001<=\$95,000	-0.111*** (-22.14)	-0.130*** (-14.93)	-0.0952*** (-10.62)	-0.0926*** (-10.89)
>\$95,000	-0.141*** (-38.66)	-0.157*** (-27.09)	-0.120*** (-16.96)	-0.131*** (-20.39)
Home Purchase	Referent 1.00			
Home Improvement	0.234*** (55.23)			
Home Refinance	0.0797*** (35.77)			
Loan <\$100,000	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
\$100,001<=\$200,000	-0.0474*** (-17.65)	-0.0522*** (-12.22)	-0.0869*** (-16.49)	-0.0859*** (-19.32)
\$200,001<=\$300,000	-0.0314*** (-8.15)	-0.0436*** (-6.39)	-0.0745*** (-11.58)	-0.0649*** (-9.65)

\$300,001<=\$400,000	-0.0228*** (-3.99)	-0.0209 (-1.83)	-0.0684*** (-8.31)	-0.0627*** (-5.49)
\$400,001<=\$500,000	-0.0347*** (-4.69)	-0.0630*** (-4.17)	-0.0649*** (-6.64)	-0.0742*** (-4.30)
>\$500,000	0.0352** (3.26)	0.00942 (0.42)	0.00803 (0.60)	0.0256 (0.91)
Hinds County	Referent 1.00			
Madison County	-0.0176*** (-6.50)			
Rankin County	0.00545* (2.00)			
Year 2007	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
2008	0.00732* (2.29)	0.0353*** (6.71)	-0.000118 (-0.02)	0.0200*** (3.72)
2009	-0.0332*** (-9.48)	0.00164 (0.29)	-0.0298*** (-5.32)	-0.0626*** (-8.09)
2010	0.00193 (0.42)	0.0137* (2.27)		0.112*** (11.97)
2011	-0.00170 (-0.46)	0.0325*** (5.01)	0.00466 (0.74)	0.0171** (2.90)
2012	-0.00887* (-2.54)	0.0105 (1.70)	-0.000757 (-0.12)	0.0213*** (3.82)
2013	-0.00144 (-0.41)	0.0125* (2.01)	0.000346 (0.06)	0.0213*** (3.73)
Conventional Loan	Referent 1.00	Referent 1.00	Referent 1.00	Referent 1.00
FHA Loan	-0.0433*** (-15.67)	-0.120*** (-27.62)	-0.0128* (-2.37)	-0.0489*** (-10.79)
VA Loan	-0.0117 (-1.83)	-0.0688*** (-5.94)	-0.0388*** (-3.32)	-0.0241* (-2.49)
FSA/RHS Loan	-0.0997*** (-15.31)	-0.227*** (-17.71)	-0.120*** (-11.39)	-0.116*** (-12.12)
Constant	0.241*** (24.24)	0.301*** (15.88)	0.305*** (20.88)	0.260*** (15.08)
N	138802	61556	35642	41604

t statistics in parentheses

*p< 0.05, **p< 0.01, ***p< 0.001

From Model 6 in Table 2, African Americans and Hispanics are more likely to be denied loans compared to Asian Americans while Whites are less likely to be denied loans compared to Asian Americans over the study period. From Model 7, we see that census tracts with high minority populations are more likely to be denied loans. Income, purpose of loan, loan to income ratio, loan amount and environment all are significant and consistent with results from earlier tables. Model 8 is the logistic regression result for Madison County. The result is similar and consistent with the results from Models 6 and 7 in Table 26. Model 9 presents the logistic regression results for Rankin County. With the exception of 2010 loan denial, all the other results are similar. Although high minority population tract is not significant, the sign is consistent with models 6, 7, and 8. The result is consistent with the results of Ezeala-Harrison et al (2008).

Blinder-Oaxaca Decomposition and Loan Denial Discrimination

To further understand the burden imposed by discrimination on loan denial to different ethnic groups we employ the Blinder-Oaxaca decomposition method to analyze the loan denial rates in the counties of Hinds, Madison and Rankin from 2007 to 2013. Oaxaca and Ranson (1994) concluded that the pooled method of decomposition provides the best estimate of the combined effects of pure nepotism and pure discrimination.

Nielson (1988) found discrimination to be responsible for 26% of the greater difference in formal sector employment in Zambia. Anyamele (2015) found that 32.17% of the differences in loan delinquency rates are attributable to discrimination either legally or illegally. Blinder (1973) concluded that 40% of age differences between Whites and African Americans came from discrimination of different sorts. Jann (2008) and Sinning et al (2008) showed how to interpret the results of both linear and non-Oaxaca decomposition regression models. Fairlie (2005) extended the Blinder-Oaxaca decomposition into a non-linear model. This study employs the Blinder-Oaxaca decomposition to measure the difference between the Whites/African Americans and Whites/Hispanics loan denial rate. We express the average value of the dependent variables denial rate, Y , is expressed such that

$$\bar{Y}_W - \bar{Y}_B = [(\bar{X}_W - \bar{X}_B) \beta_W] + [\bar{X}_B (\beta_W - \beta_B)] \tag{3}$$

Where \bar{X}_j is a row vector for of average values of the independent variables and β_j is a vector of coefficient estimates for race j . The decomposition for a non-linear loan denial rate equation, $Y = F(X\beta)$, may be written as:

$$\bar{Y}_W - \bar{Y}_B = \left[\frac{\sum_{i=1}^{N_W} [F(X_i) \beta_W]}{N_W} - \frac{\sum_{i=1}^{N_B} [F(X_i) \beta_W]}{N_B} \right] + \left[\frac{\sum_{i=1}^{N_B} [F(X_i) \beta_B]}{N_B} - \frac{\sum_{i=1}^{N_B} [F(X_i) \beta_B]}{N_B} \right] \tag{4}$$

Where N_j is the sample size for race j . Both equations 3 and 4 show that the first term in brackets represents the part of the racial loan denial difference that is due to group differences from the independent variables. The second term is the group differences from unobserved endowments or unexplained difference in loan denial rates among the different racial groups. This is the part that some researchers have attributed some part of it as discrimination. The data shows that the group mean for non-Whites loan denial rates is 0.272 while the group mean for Whites is 0.129, yielding a loan denial differences of 0.143. Further, 31.18% of the differences in loan denial between Whites and non-Whites comes from differences in endowments. Thus, 56.15% is the change in loan denial rate if non-White characteristics apply to Whites and 12.31% is the simultaneous effect of the loan denial differences from both the endowments and non-White characteristics. Similarly, for African Americans, the group mean for the loan denial for Whites is 0.141 while the group mean for loan denial of African Americans is 0.329 yielding a loan denial rate of 0.188. Furthermore, 28.19% of the differences in loan denial comes from endowments difference between African Americans and Whites, while 63.30% is the change in loan denial rate that will occur if White characteristics apply to African Americans and 8.51% is from both endowments and non-African American characteristics.

For Asians, the group mean for loan denial for Whites is 0.191 and the group mean of loan denial difference of 112.8% of the differences in loan denial rate comes from endowments between Asians and Whites; while 54.91% is the change in loan denial rates that will occur if White characteristics apply to Asians. Moreover, 42.08% of the loan denial rate is from endowments and non-Asian characteristics. For Hispanics, the group mean for loan denial of Whites is 0.1904 and the group mean for the loan denial for Hispanics is 0.2431 resulting in a denial difference of 8.02% of the difference is loan denial come from endowments between Hispanics and Whites while 92.41% is the change in loan denial rate that will occur if White characteristics apply to Hispanics.

Table 3 is the pooled, Blinder-Oaxaca decomposition that show the contribution of the independent variables used. First, for all the races, income explains the differences in loan denial rates with the exception of Hispanics, high minority population explains the differences in loan denial rate in the three counties between the years 2007 to 2013. This result is consistent with both the descriptive statistics and the logistic regression that shows that loans from high minority tract population are more likely to be denied. Furthermore, it also gives credence to the findings of previous studies that redlining exists in the housing market in Mississippi (Ezeala-Harrison et al.2008).

Table 3: Blinder-Oaxaca Decomposition of Loan Denial in Jackson MSA 2007-2013

	White Loan Denied		African American Loan Denied		Asian Loan Denied		Hispanic Loan Denied	
Differential								
Prediction_1	0.272*** (149.67)		0.141*** (129.19)		0.191*** (180.07)		0.190*** (179.80)	
Prediction_2	0.129*** (108.15)		0.329*** (134.60)		0.166*** (18.06)		0.243*** (20.69)	
Difference	0.142*** (65.55)		-0.188*** (-70.30)		0.0251** (2.72)		-0.0527*** (-4.46)	
Explained		% Explained		% Explained		% Explained		% Explained
HM Pop	0.0231*** (27.78)	16.24	-0.0240*** (-23.82)	12.75	0.0148*** (15.54)	58.79	-0.000768 (-0.59)	1.46
NLV to income	-0.000124 (-1.05)	-0.09	0.0000041 (0.06)	-0.02	0.000083 (0.58)	0.33	0.000017 (0.49)	-0.03
Post Crisis	0.00136*** (4.48)	0.96	-0.00109*** (-7.36)	0.58	0.00253*** (7.20)	10.05	-0.000459 (-1.58)	0.87
Income	0.0244*** (36.03)	17.14	-0.0271*** (-35.01)	14.41	0.0127*** (8.42)	50.33	- 0.00558*** (-3.53)	10.59
Loan Amount	0.00388*** (8.60)	2.72	-0.00470*** (-8.78)	2.50	0.00329*** (7.24)	13.09	- 0.00118*** (-3.60)	2.24
Conventional	-0.0118*** (-19.78)	-8.28	0.0124*** (19.98)	-6.60	-0.0116*** (-11.08)	-46.01	0.000108 (0.09)	-0.20
FHA loan	0.00567*** (11.36)	3.98	-0.00566*** (-12.48)	3.01	0.00501*** (7.76)	19.93	0.000130 (0.19)	-0.25
VA loan	0.000736** (7.44)	0.52	- 0.000897*** (-7.43)	0.48	0.00169*** (6.29)	6.71	-0.00116* (-2.21)	2.20
Home improvement	0.0122*** (26.97)	8.58	-0.0192*** (-31.03)	10.22	0.00742*** (5.18)	29.50	0.000591 (0.31)	-1.12
Home refinance	-0.00508*** (-19.80)	-3.56	0.00627*** (21.11)	-3.33	0.00299** (3.02)	11.88	0.00140 (1.29)	
Total	0.0544*** (47.94)	38.19	-0.0640*** (-47.98)	34.01	0.0389*** (14.92)	154.61	-0.00689* (-2.16)	13.09
Unexplained		Unexplained		Unexplained		Unexplained		Unexplained
HM Population	0.00552*** (3.95)		0.0112*** (4.71)		0.00510 (1.32)		0.0173* (2.30)	
NLV to income	-0.0106* (-2.42)		0.0224*** (4.30)		0.0800*** (4.32)		0.00554 (0.23)	
Post Crisis	0.0182*** (7.08)		-0.00267 (-0.87)		0.0124 (0.84)		-0.00546 (-0.40)	
Income	-0.0370*** (-7.93)		0.0237*** (4.41)		-0.0723** (-3.27)		0.00325 (0.14)	

Loan Amount	-0.00196		0.00899		-0.0197		0.0111	
	(-0.37)		(1.34)		(-0.89)		(0.39)	
Conventional	0.0744***		-0.119***		0.0105		0.00861	
	(10.35)		(-15.41)		(0.18)		(0.14)	
FHA loan	0.00616**		-0.00994***		-0.00375		0.0180	
	(2.96)		(-3.97)		(-0.42)		(1.12)	
VA loan	0.00124**		-0.00148**		-0.00118		0.00236	
	(3.22)		(-3.12)		(-0.94)		(0.67)	
Home improvement	0.0133***		-0.00261*		-0.00411		-0.00245	
	(16.71)		(-2.35)		(-1.46)		(-0.61)	
Home refinance	0.0312***		-0.0138***		-0.0141		0.00853	
	(12.84)		(-4.78)		(-1.52)		(0.66)	
Constant	-0.0123		-0.0404**		-0.00664		-0.112	
	(-1.14)		(-3.15)		(-0.10)		(-1.38)	
Total	0.0881***	61.81	-0.124***	65.99	-0.0137	-54.61	-0.0458***	86.91
	(38.73)		(-43.77)		(-1.52)		(-4.02)	
N	78775		36965		1638		1333	

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Conclusion

Income has a significant impact in denial rate in the three counties. This finding suggest that this increases the likelihood of one obtaining a loan approval in the state of Mississippi. Anyamele (2015) found income to be significant in explaining loan delinquency rate. Previous studies have found that African Americans and Hispanics tend to have higher credit constraints than Whites (Crook 1996, 2001; and Weller 2009). Rugh and Massey (2010) concluded that housing segregation was an important predictor of the number and rate of foreclosures across US metropolitan areas. Their study found that Hispanics and African Americans bore the brunt of the recent financial crisis. Philips (2010) concluded that the housing and the related economic crisis that disproportionately affected African American communities are inextricably linked to the persuasive forces of inequality and uneven investment in African American communities. As shown from the results of decomposition, high minority population tract contributes more to loan denial rates in the three counties studied. This result points to the existence of redlining in loan denial in the counties and which is similar to previous findings on this subject (Rugh and Massey, 2010). Moreover, this paper has investigated the loan denial rates in three counties of Mississippi. This study used HMDA data from 2007 to 2013. The study found that African Americans and Hispanics are more likely to be denied loans compared to Asians, while Whites are less likely to be denied loans compared to Asians. Also important, loans from high minority population tracts are more likely to be denied compared to loans from low minority population tracts. This result is consistent in Hinds, Rankin, and Madison counties. This finding is a strong indication that redlining exists in all three counties. This finding may lead to policymakers and the regulatory agencies to quickly act to redress the situation. As noted earlier, loan denial due to discrimination reduces the ability of African Americans and Hispanics to acquire wealth through the housing stock which has been a historical investment for many in America, especially minorities.

References

Anyamele, Okechukwu. 2015. Racial/Ethnic Differences in Household Loan Delinquency Rates. *Review of Black Political Economy* 42 (4): 415-442.

- Carr, James H. & Issac F. Megbolugbe. 1993. "The Federal Reserve Bank of Boston study on mortgage lending revisited." Fannie Mae Office of Housing Policy Research.
- Crook J. 1996. Credit constraints and US households. *Applied Financial Economics* 6:477-85.
- Crook J. 2001. The demand for household debt in the USA: Evidence from the 1995 Survey of Consumer Finances. *Applied Financial Economics*. 11:83-91.
- Ezeala-Harrison, Fidel. 2008. Determinants of Housing Loan Patterns Towards Minority Borrowers in Mississippi. *Journal of Economic Issues* 35 (1): 43-54.
- Ferguson, Michael F. & Peters, Stephen R. 1995. What Constitutes Evidence of Discrimination in Lending? *The Journal of Finance* 50 (2): 739-748.
- Greer, James. 2012. Race and Mortgage Redlining in the United States. Western Political Science Association Meetings. Portland, Oregon. March 22 -24, 2012.
- Han, Song. 2004. Discrimination in Lending: Theory and Evidence. *Journal of Real Estate Finance and Economics* 29 (1): 5-46.
- Home Mortgage Disclosure Act of 1975. Section 301 of title III of the Act of December 31, 1975 (Pub. L. No. 94--200; 89 Stat. 1125), effective June 28, 1976.
- Housing and Community Development Act of 1977. Section 801 of title VIII of the Act of October 12, 1977 (Pub. L. No. 95--128; 91 Stat. 1147), effective October 12, 1977.
- Jann B. 2008. The Blinder-Oaxaca Decomposition for Linear Regression Models. *Stata Journal* (4):453-79.
- Ladd, Helen. 1998. Evidence of Discrimination in Mortgage Lending. *Journal of Economic Perspective* 12 (2): 41-62.
- Oaxaca R, Ransom M. 1994. On discrimination and decomposition of wage differentials. *Journal of Econometrics* 61:5-21.
- Phelps, E.S. 1972. The Statistical Theory of Racism and Sexism. *American Economic Review* 64 (4): 659-661.
- Phillips S. 2010. The Subprime Crisis and African Americans. *Review of Black Political Economy* 37:223-9.
- Phillips-Patrick and Rossi, Clifford. 1996. Statistical Evidence of Mortgage Redlining? A Cautionary Tale. *The Journal of Real Estate Research* 11 (1): 13-23.
- Phillips-Patrick and Rossi, Clifford. The Effects of Community Reinvestment on Local Communities. Consumers Bankers Association, Arlington, VA, 1995.
- Rugh JS, Massey DS. 2010. Racial segregation and the American foreclosure crisis. *American Sociological Review* 75(5):629-51.
- Schafer R, Ladd HF. 1981. *Discrimination in Mortgage Lending*. Cambridge, Massachusetts: MIT Press.
- Sinning M, Hahn M, Bauer TK. 2008. The Blinder-Oaxaca Decomposition for Nonlinear Regression Models. *Stata Journal* 4:480-92.
- Surveys of Consumer Finances. Board of Governors of the Federal Reserve System. Washington, D.C. 2001-2010.
- U.S. Census Bureau. Housing Vacancies and Ownership. Final Report: Washington Government Printing Office, 2013.
- Weller CE. 2009. Credit access, the Cost of Credit and Credit Market Discrimination. *Review of Black Political Economy* 36:7-28.
- Western Economic Services. Mississippi: Analysis of Impediments to Fair Housing. Report Submitted to the Mississippi Development Authority, April 2004.