Racial Ethnic differences in Household Loan Delinquency Rate in recent financial crisis: Evidence from 2007 and 2010 Survey of Consumer Finances

Okechukwu D. Anyamele[1]

Abstract

This study examines the differences in household loan delinquency rates of the racial/ethnic groups. The study uses combined data from 2007 and 2010 SCF. The study employed Oaxaca decomposition analysis to investigate the source of differences in loan delinquency rates of the racial/ethnic groups. Our results show that 67.33% of the differences in loan delinquency between whites and African Americans is due to differences in endowments while 33.08% is unexplained or due to discrimination. The study also found that credit constrained, income, unemployment, and payday loan are the major source of explained differences in delinquency between whites and African-Americans. Also, the study found that 93.03% of the differences between whites and Hispanics is explained by differences in endowments while 7.36% is unexplained or due to discrimination. Similarly, income, credit constrained, unemployment, and college graduate are the major source of explained differences in delinquency between whites and Hispanics. The study shows that credit constrained households for all races have high risk of being delinquent. Similarly, households with high debt service ratios with the exception of Hispanics where the result is not significant are more likely to be delinquent on their loans.

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[1] College of Business, Jackson State University, USA

1 Introduction

U.S. households have seen their debt burden increased rapidly over the last decade. However, the differences in the rate of delinquency by race and ethnicity have not been adequately investigated. Between 2001 and 2004, the household debt service ratio (DSR) and the household financial obligations ratio (FOR) rose by 1.6% and 4.84% respectively (United States Census Bureau, 2012). DSR is a measure of the share of household after-tax income obligated to debt repayment. FOR is DSR plus rental payment on primary residence as well as other home related expenses to after-tax income (Dynan et al. 2003). SCF has a variable that measures the share of monthly income that is applied to debt repayment. It also has a variable that approximate financial obligation ratio. The variable total debt payment in the public data is a good proxy for FOR. DSR increased by 5.97 percent, while FOR increased by 7.44%. (US Census Bureau, Statistical Abstract of United States, 2012). Data from SCF shows that the rate of loan denial rose by 25.51% between 2007 and 2010, a significant increase. Between 2007 and 2010, the rate of loan denial increased. As correctly pointed out by Getter (2003), a monthly payments-to-monthly income ratio allows for a more accurate comparison of the immediate financial stress that households bear. However, the impact of debt service ratio, financial obligation ratio and increase in loan denial rate during this period on household's delinquency rate have not been fully examined.

Loan application declined for all races between 2007 and 2010. The overall decline between 2007 and 2010 SCF survey stood at 6.08%. Asian saw the highest rate of decline over the two survey period. The decline in loan application for whites, African-Americans, Hispanics, and Asians between 2007 and 2010 are 3.25%, 9.32%, 8.71% and 21.51% respectively.

Both permanent income hypothesis and the lifecycle income hypothesis posit that consumers will act over their life cycle to smooth their consumption, regardless of the fluctuations in their income. The question that is of interest to us here is what type of behavior will households, that find themselves in adverse financial position and are credit-constrained over a particular period, exhibit in meeting their debt service obligations. This is particularly important in understanding the loan delinquency behavior of the households during the recent financial crisis. To study this question, we draw from previous research works that have examined the burden of household debt on consumers. Olney (1999) found that households chose to default rather than reduce consumption during the 1938 recession.

Equally important is the pattern of loan delinquency by households in terms of racial and ethnic differences in periods of financial shock. Thus, we posit that households are likely to have loan delinquency problems if they have any unplanned changes in their income, employment, or adverse changes in their

family composition or credit constrained. Any of the above mentioned scenarios could lead to difficulties in loan repayment. This study combines the data from 2007 and 2010 to provide for robust estimation of the differences among the racial/ethnic groups in loan delinquency. Second, it examines the effect of the recent financial and economic crisis on household loan delinquency.

2 Literature Review

Godwin (1999) found that younger, nonwhite households with major real estate transactions were more likely to experience difficulty making payments. Canner and Lucket (1991) found that married households were less likely to have repayment problem than divorced or separated households. The delinquency rate of younger households is expected to be higher than the delinquency rate of older households. This can be explained from the fact that older households in general have more wealth and financial assets that can act as buffer in unforeseen changes in their economic and financial conditions than younger households. Peng et al. (2007) found personal finance courses offered in college improve adults' investment literacy. They also concluded that greater investment knowledge was gained from a college personal finance class than a high school personal finance class. Whitaker et al. (2013) found that women are equally likely as men to participate in a savings plan. Hancock et al. (2013) found that students who had parents who argued about finances were most likely to have $500 or more in credit card debt and two or more credit cards. Smith et al. (2012) concluded that more financially sophisticated households appeared to be more highly leveraged, less liquidity constrained, less risk averse, employed, married, have a child at home, less likely to be of minority, and have greater financial net worth.

Although previous studies have concluded that households headed by minorities and women were more likely to experience difficulties in loan repayment, none had studied the rate at which DSR and FOR affect the delinquency rates of these households. This study is an attempt to address this question. Cox and Jappelli (1993) concluded that credit constraint could affect leveraged purchases of durables and housing. Their study found that removing credit constraints would increase overall household liabilities by 9 percent.

Calem and Mester (1995) used the variable credit application turned down as an indicator of a household that is credit constrained. However, their study did not examine why these households were credit constrained. Canner et al. (2001) found the probability of loan delinquency to be inversely related to the age and liquid asset holdings of a household. Their study also concludes that loan delinquency is more likely for unemployed households, separated or divorced households with many children and households headed by a minority individual. These studies did not account for the fact that these households that are

unemployed might have experienced negative income shock from loss of employment income. This study accounts for the impact of unexpected effect of financial shocks and other unexpected events on loan delinquency. Getter (2003) investigated the impact of unanticipated economic shocks that reduce wealth or disrupts the income stream or if excessive spending causes households to become financially overextended. His study focused on 1998 SCF data.

Getter (2003) found that delinquency risk is more likely to increase as a result of unanticipated shocks to household wealth and unexpected loss of income. The study further concludes that size of the monthly household payment burden is not significantly related to rising delinquency risk. This study extends Getter (2003) study on rising household loan delinquency with 2007 and 2010 SCF data, and thus contributes to the debate on household loan delinquency in the recent period. While this is not a longitudinal study, it gives insight into household delinquency at different time periods. Getter (2003) focused on whether poor payment performance can be linked to unanticipated economic shocks that reduce wealth and or disrupts income stream or if" excessive" spending causes households to become financially "overextended." Straight (2001) concluded that there is a large disparity in the net worth of black and white families with black families having about 12% of the net worth of white families. Anderson and Vanderhoff (1999) concluded that black households have higher marginal default rates than other racial groups. Coulibaly and Li (2009) found some evidence that households that are more financially constrained are more likely to prefer adjustable rate mortgage (ARM). Their study found no evidence that standard demographic variables such as race; family size or marital status play a role in mortgage choice. Dynan and Kohn (2007) argued that households with more education generally have steeper life-cycle income paths and therefore do more borrowing at young ages. Their study suggested that younger households tend to borrow more than older households, so an increase in the share of the population represented by younger households would be expected to raise aggregate debt.

Johnson and Li (2010) concluded that debt service ratio DSR was a good proxy to determine households that are borrowing constrained. They found that a household with a DSR in the top two quintiles of the distribution above or about 20% are more likely to be turned down for credit in the past 5 years. They also conclude that having access to credit in the past for the household in the top quintile, if they have a DSR above or about 30%, will likely be turned down for credit that is 8 percentage points higher than it is for a household without any debt at all. Johnson and Li (2011) found that households with ARM were not more likely to be borrowing constrained than households with fixed rate mortgage (FRM). They also concluded that using a low asset-to-income ratio as a measure of liquidity constrains that ARM borrowers do not appear more liquidity constrained than other borrowers. However, they found that households with

ARM have been turned down for credit in the past five years, hardly ever pay off their credit cards, and utilize a higher share of their credit limits.

Maggio and Kermani (2015) found that increases in supply of credit reduced mortgages' delinquency rates during the boom years, but results in higher delinquency rates during the best years. Thompson and Bricker (2014) concluded that families with an average level of student loans were 3.1% percentage points more likely to be 60 days late paying bills and 3 percentage points more likely to be denied credit. Mocetti and Viviano (2015) found that loan selection process after 2008 significantly reduced the delinquency rates for 5.4 to 2.6% in Italy. Grant (2007) found that the typical profile of a credit constrained household is a single white female college graduate who has just started their first well paid job. He further argues that a black male high school drop-out is far less likely to be credit constrained. While Grant (2007) used a consumer expenditure survey (CES) data which is a different dataset from SCF, Weller (2009) found that blacks were more likely to be turned down for credit. Anyamele (2015) concluded that African Americans and Hispanics were more likely to be credit constrained than whited. Also, Anyamele (2014) concludes that African Americans and Hispanics have higher payday loan participation rate than whites' and Asians. Clearly, this is an indication that these groups are credit constrained.

While the literature points to minorities having difficulties in their loan repayment or higher proportion of loan delinquency, after controlling for demographic and financial characteristics, we posit that higher liquidity constraint or borrowing constraint has more significant impact on loan delinquency rate on households than race.

3 Theoretical Framework and Methods

The decision to default is a rational one by the borrower based on comparison of the

financial costs and returns involved in continuing or discontinuing the periodic payments on their loans Jackson and Kasserman (1980).   The fundamental argument of whether equity or income is the basis for household decision to default has largely favored the equity theory proposition. Jackson and Kasserman (1980); Weagley (1988) concluded that equity theory more than income explained why households may default. Deng et al. (2000) used the option theory model to estimate household's default and concluded that household's exercised the default option if it is in the money. Vandell (1978) found that household's default decision is influenced by home equity. Campbell and Dietrich (1983) concluded that home equity played an important role in the default decisions of households. We saw this in the housing sector loans following the 2008 financial crisis that saw some homeowners opt for default because their

equity value has become negative. Campbell and Cocco (2011) found default to be likely for moderate levels of negative home equity when households are borrowing constrained. Bhutta et al. (2010) concluded that only one-in-five-equity defaults in their model are strategic defaults. McCarthy (2014) found negative equity and unemployment to be important in driving Irish mortgage arrears. Canner et al. (2001) found that minority homebuyers are less likely to use a conventional mortgage than a similar white household. Here we posit that households are more likely to be delinquent the higher the DSR and FOR. It is equally important to note that households that are credit constrained may be more likely to delinquent with their loans than the ones that are not. We combined the 2007 and 2010 SCF data to increase the robustness of our study on the differences in household delinquency rates among different races in order to determine, if any, the role of DSR and FOR in loan delinquency.

The conceptual framework is anchored on the backdrop that past studies have found that African American households and Hispanic households tend to have higher credit constraints than white households. Even during the credit deregulation periods of the late 1990s and early 2000s, non-white households were more likely to be turned down for credit than whites. Weller (2009) found that African-Americans were more likely than whites to be denied loans, and they faced a greater credit cost difference relative to whites in the later years than in the earlier years. Chatterji and Seamans (2012) concluded that black entrepreneurs used credit cards as a mechanism in overcoming discrimination based barriers in opening their own businesses. Thus, there is an inbuilt disadvantage for minority households when it comes to access to credit (Weller 2009).

There is no clear definition in terms of what constitutes a default or a delinquent loan. Some studies have argued that a loan is in default if the terms of the loan are not met. Others have used the 30 days' failure to make payment, while others have used 60 days and some have equally used 90 days as a benchmark for loan default (Avery at el. 2004; Clauretie and Sirmens 2003). Delinquency, which we define as being late for payment on a loan for 60 days or more over the past 12 months, is a stage before default in many cases. This definition is in line with the SCF question that asked if a household has been late in payment for 60 days or more over the last 12 months. The delinquency rate is based on SCF response about whether one has any late payment over 60 days during the past twelve months. Yes=1 if the household has any late payment over 60 days, otherwise, No=0.

The data for this study comes from the triennial survey of the consumer finances conducted by the Federal Reserve Board. To study the problem of household loan delinquency, we estimate the probability of loan delinquency; we estimate the probability of loan delinquency based on logistic regression. First, we examine the rate of loan delinquency for whites' non-Hispanics, blacks/African-Americans non-Hispanics, Hispanics and the overall sample.

The SCF data is a cross-sectional data that is comprehensive in questions that it asks consumers. The SCF data has tended to oversample wealthy households which results in a lot of nonresponses, thus it applies multiple imputations to many variables to correct for missing values. Kennickell (2007) states that the structure of the over-sample provides a measure for correcting for nonresponse, which is differentially higher among the wealthy: thus multiple imputations provide a means of correcting for nonresponse bias in wealth estimates. This method has a tendency of biasing the standard errors in a regression. Kennickell (2011) argued that wealth in the U.S. is highly skewed with about two-thirds of all household net worth is held by the wealthiest 10 percent and about half of that is owned by the wealthiest 1 percent. SCF has provided the replicate weight that is applied in the procedure for correcting this bias during estimation. Montalto and Sung (1997) argued that researchers should use repeated-imputation inference (RII) techniques in empirical research when dealing with implicates to produce the best estimates where there is missing data issues.

None of the past studies have examined the effect on the likelihood of delinquency for households that borrowed from payday lenders. This question was first introduced in the 2007 SCF. This study will attempt to find the impact of payday lenders on households' delinquency rates. The 2007 question on "payday" loan is worded differently from the 2010 question, and thus, could be a source of confusion for consumers. This is evident from the 2010 wording of the question. The consumers were asked in 2007, during the past year, have you or anyone in your family living here borrowed money that was supposed to be repaid in full out of your next paycheck? In 2010, the question was improved upon: During the past year, have you or anyone in your family living here taken out a "payday loan," that is, borrowed money that was supposed to be repaid in full out of your next paycheck? Specifically, payday loan is mentioned in 2010 and not mentioned in 2007.

4 Definition Variables

The variables for our logistic regression are unemployment which is a categorical variable of yes =1 and no =0, credit constrained if denied credit in the last five years**.** Total monthly debt payment is used in this study as an approximation for the FOR. Debt service ratio which is a measure of the after-tax monthly income that is obligated to debt repayment. If the ratio is greater than 40%, we classify it as high. This ratio is similar to Johnson and Li (2010). Household educational status is measured by college degree or no college degree. Does the household have insurance? Does the household own a stock? Does the household save or not? These are variables that measure the ability of a household to meet unexpected loss of income or adverse financial loss. An adjustable rate

mortgage loan is a measure of the financial choice on the type of loan used by the household on its mortgage. Household payday loan participation measures the households that borrow from payday loan companies. We have demographic variables of age, income, health status, marital status, and environment, which represent the survey years.

The model is a measure of the probability of a household to be delinquent after obtaining a loan. This model is a variant from Greene's (1998) study.

$$Y_t = \beta X_t + \mu_t \tag{1}$$

Y_t is a binary variable that takes the value of 1 or 0. If the ith household is behind by 60 days over the last 12 months, Y_t is 1: otherwise, Y_t is 0. X is a vector of independent variables, and β is the vector of coefficients to be estimated, while μ is the error term. The independent variables consist of demographic variables, financial buffers, adverse financial and economic events, household debt burden, and credit constraint. Thus, we can write the delinquency equation as follows:

D = 1 if the household has been sixty days behind in payment over the past year or

D = 0 Otherwise.

The logistic equation to be estimated is generally expressed as

P (Delinquency = 1 | **x**) = **F** (**x, β**)

$$P \text{ (Delinquency} = 0 \mid \mathbf{x}) = 1 - \mathbf{F} \text{ (}\mathbf{x, \beta}) \tag{2}$$

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.

We apply the Heckman selection, alternative specifications for Robustness tests.

The Heckman's two-stage selection model is specified as follows:

$$y^* \text{ (unobserved)} = \text{ý} X + u^., \ldots u \sim N \text{ (0,1)} \tag{3}$$

$$y = 1 \text{ if } y^* > 0$$
$$y = 0 \text{ if } y^* \le 0$$

The general specification model based on Heckman is E (y1 |X, y2 =1) = X1β1 + ɣ1λ (Xδ2). An OLS regression of y1 on X1 using the selected sample omits the term λ (Xδ2) and leads to an inconsistent estimation of β1. As pointed out by Wooldridge (2002), when X1 =X, β1 is identified only due to nonlinearity of the inverse Mills ratio. We employ this based on its ability to reduce the problem of

collinearity when the explanatory variables on both equations are not equal as well as provide a stronger evidence of selection than the maximum likelihood estimator (Cameron and Trivedi, 2010). This is the two- step procedure of the Heckman model with the credit cards variable as the exclusion. The calculated Mills inverse ratio or lambda can be used to interpret evidence of independence of the outcome variable. Green (2012) argues that default is a behavioral model and thus has no standard for modeling it.

The Blinder-Oaxaca decomposition has been used to study labor market wage discrimination in gender and race. Nielsen (1998) found discrimination to be responsible for 26% of the gender difference in formal sector employment in Zambia, while qualification only accounted for 4.5 %.

Fairlie (2005) extended the Blinder-Oaxaca decomposition into non-linear model. The basic Blinder-Oaxaca decomposition is used to measure the gap or difference between Whites / African Americans or Whites / Hispanics delinquency rate. The average value of the dependent variable delinquency rate, Y, is expressed such that:

$$\bar{Y}^W - \bar{Y}^B = [(\bar{X}^W - \bar{X}^B)\,\hat{\beta}^W] + [\bar{X}^B\,(\hat{\beta}^W - \hat{\beta}^B)] \qquad (4)$$

Where $\bar{X}^j$ is a row vector of average values of the independent variables and $\hat{\beta}^j$ is a vector of coefficient estimates for race j. The decomposition of a nonlinear delinquency rate equation, $Y = F(X\hat{\beta})$, may be expressed as:

$$\bar{Y}^W - \bar{Y}^B = [(\sum_{i=1}^{N^W} F(X_i^W\,\hat{\beta}^w))/N^W - (\sum_{i=1}^{N^B} F(X_i^B\,\hat{\beta}^w))/N^B] + [(\sum_{i=1}^{N^W} F(X_i^W\,\hat{\beta}^w))/N^B - (\sum_{i=1}^{N^B} F(X_i^B\,\hat{\beta}^B))/N^B] \qquad (5)$$

Where N^j is the sample size for race j. The first term in brackets in both equation 4 and 5 is the part of racial delinquency 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 delinquency rate among the racial groups.

Jann (2008) developed the Oaxaca command in Stata to implement the Blinder-Oaxaca decomposition for linear regression models. He also showed how the process can be applied in logit or probit models. Sinning et al. (2008) developed both linear and nonlinear Stata commands to implement the Blinder-Oaxaca decomposition.

5 Descriptive Statistics

The 2010 SCF survey showed that white households constitute (4759/6482) or 73.42% of the sample size and accounted for 61.57% of the delinquencies in 2010. The delinquency for white households in 2010 is 6.09%. It

is also worth knowing that African American households accounted for (790/6482) or 12.19% of the sample size but had a delinquency of 12.66% in 2010. Hispanic households represented (640/6482) or 9.87% of the sample size but had a delinquency of 10.47% in 2010. Asian and others households make up (293/6482) or 4.52% of the sample size and had a delinquency of 4.78% in 2010. The above statistics on delinquency rates are within racial groups. However, Table 1 shows the delinquency composition for all the races. It is evident that whites accounted for 69.02% of all delinquencies in 2007 and 61.57% in 2010. In 2007, African-Americans, Hispanics, and Asians recoded delinquencies of 19.02%, 10.33%, and 1.63% respectively. However, they all saw an increase in their delinquencies in 2010 with African-Americans, Hispanics, and Asians having delinquencies of 21.23%, 14.23%, and 2.97% respectively.

Table 1 show that Asians and whites had the highest loan application rate in 2007 while African American and Hispanics had the lowest loan application rate in 2007. In 2010, loan application declined for all the races. The rate for whites declined from 67.74% in 2007 to 65.54% in 2010. For African Americans, Hispanics, and Asians, the loan application decline from 57.29% to 51.95%, 58.66% to 53.55%, and 75.68% to 59.40% respectively. Table 1 shows that between 2007 and 2010 surveys, white household loan denial rate increased by 32.09% the highest among all races. African Americans and Hispanics saw loan denial increases over the same period of 3.53% and 11.21% respectively. Asians where the only group that saw loan denial rate decreased by 15.63% over the same period. However, the denial rate differed significantly for African-Americans and Hispanics. Table 1 show that the loan denial rate for African-Americans is slightly more than twice the loan denial rate for whites in 2007. Table 1 also shows that the loan denial rate for Hispanics to be almost twice of that of whites in 2007. Whites and Asians have similar loan denial rates in 2007. The loan denial rates for whites, African-Americans, Hispanics, and Asians in 2007 are: 13.65%, 27.45%, 24.35%, and 16.96% respectively.

By 2010, the loan denial rate increased to 18.03%, 28.42%, 27.08%, and 14.31% for whites, African-Americans, Hispanics, and Asians respectively. Table 1 shows the combined sample of 2007 and 2010 surveys to be 10,900. White households constitute 8,277 or 75.94% of the sample. African-American households in the sample are 1,200 or 11.01%; Hispanic households in the sample are 953 or 8.74% of the combined sample while Asian households in the sample are 470 or 4.31%. From Table 1, the combined delinquency rate from the two surveys is 6.01% for all the households. The delinquency rate for whites is 5.31%, 11.25% for African- Americans, 9.02% for Hispanics, and 3.62% for Asians. The number of people who reported being delinquent increased between 2007 and 2010 from 184 to 471. This is 2.56 times the level of 2007. However, the rate of delinquency rose from 4.16% to 7.27%, an increase of 74.76%. This is a very high significant increase in the tri-annual cross-sectional survey of SCF.

Table 1 shows that loan delinquency rate increased for all races. African American and Hispanic households had their loan delinquency rates increased by 48.24% and 72.49% respectively from 2007 to 2010. Between the 2007 and 2010 survey period, the loan delinquency rate increased for white households. For white households, the loan delinquency rate increased by 68.70%. Asian and others households saw an increase in their loan delinquency rate between 2007 and 2010.

In 2010, the rate of payday loan participation increased from the 1.7% rate of 2007 to 3.6% in 2010, an increase of 111.8%. Of the 6,482 sample size in 2010, 236 or 3.6% participated in payday loans. White households accounted for 133 or 56.27%, African American households accounted for 70 or 29.75%, Hispanic households accounted for 25 or 10.59% while Asian and others households accounted for 5.08%.

Among white households that were delinquent, 10.25% participated in payday loans in 2010. However, this rate was 7.35% in 2007. This represents an increase of 39.46%. For African American households that participated in payday loans, 6.30% were delinquent in 2010. The delinquency rate was only 3.46 percent for African Americans who participated in payday loans in 2007. Hispanic households that participated in payday loans in 2010 accounted for 6.38% of the delinquency rate. In 2007 this rate increased from a 3.69% delinquency rate.

Table 2 shows that participation in payday loans increased for all races in 2010 from the 2007 loan delinquency rate. While African-American and Hispanic household participation in payday loans increased from 2007 to 2010, the delinquency rate increased by 82% and 73% respectively. Participation in payday loans increased for white households by 39.46% over the same period. Overall, 74.71% of all households held credit card debt between 2007 and 2010. Among whites, 81.48% had credit card debt, 45.08%, 49.79% and 81.53% of African Americans, Hispanics, and Asian households had credit card debt respectively.

Table 2 shows the delinquency rate on different types of loans. The overall household delinquency rate on credit cards is 3.43% between 2007 and 2010. However, for whites, the rate is 2.98% and 7.39%, 5.70%, and 2.76% for African Americans, Hispanics, and Asians respectively. African Americans are 2.48 times and 2.68 times more likely than whites and Asians respectively to be delinquent on their credit cards and 1.3 times more likely than Hispanics to be delinquent on their credit card loans. Hispanics are 2 times more likely to be delinquent on their credit card loans than whites and Asians. Table 2 shows that African Americans have higher delinquency rate than whites, Asians and Hispanics. As pointed out earlier, African Americans have lower debt holdings than all the other racial/ethnic groups, while Asians and whites have the highest debt holdings.

Table 2 shows the delinquency rates of the different races with college education. From Table 2, we see that for all households, the mortgage

delinquency rate is 5.80%. When we examine the rates for the different races, we see that white households' mortgage delinquency rate stood at 4.72% while African Americans, Hispanics, and Asian mortgage delinquency rates were 16.04%, 8.52%, and 5.53% respectively. African Americans and Hispanics are 3.4 times and 1.8 times more likely than whites to be delinquent on their mortgage loans respectively. African Americans are 1.9 times more likely to be delinquent on their mortgage loans than Hispanics. African Americans and Hispanics are 2.9 times and 1.5 times more likely than Asians to be delinquent on their mortgage loans respectively. On car loans, African Americans are 2.1 times more likely than whites to be delinquent. The delinquency rate for whites is 7.16% and 15.37% for African Americans and 12.44% for Hispanics. Further examination of Table 2 shows that African Americans who have adjustable rate mortgage loans have a delinquency rate of 38.89% compared with Hispanics whose delinquency rate on adjustable rate mortgage loans stood at 14.58%. The adjustable rate mortgage loans delinquency rate for whites and Asians are 5.77% and 3.13% respectively. The overall delinquency rate for households with adjustable rate mortgage loans is 7.99%. This rate is 1.4 times higher than the overall mortgage loan delinquency rate. When these loans are weighted, as we see in Table 3, there is no statistically significant difference in delinquency among the different races on credit card, payday loan, and car loan. African-Americans and Hispanics are more likely to be delinquent than whites on (ARMs). ARM delinquency for Hispanics is not statistically significant. African-American and Hispanic college graduates are more likely to be delinquent on their loans than whites and Asians. The results are quite significant.

6 Estimation Results

Table 4 is the result of the logistic regression for the demographic variables, the adverse economic and financial events or triggers, and financial buffers. Unemployment is highly correlated with delinquency rate and statistically significant except for African Americans. Given that one is more likely to obtain credit when employed than when he or she is unemployed, it is not surprising for such unexpected loss of income to increase the probability of delinquency significantly for all races with the exception of African-Americans. Being credit constrained increases the probability of delinquency for all races and highly statistically significant. Having high financial obligation ratio did not increase the risk of delinquency except for Hispanic households. High debt service ratio increases the risk of delinquency and highly statistically significant for all races with the exception of Hispanics. Saving which is one of the financial buffers in the model reduces the risk of delinquency for whites and not for African Americans and Hispanics. Households that are headed by someone with a college graduate reduced the risk for delinquency for the overall sample, and white households. The

result for African-Americans is not statistically significant, but has the expected sign. The result has the opposite sign for Hispanic households. ARM increases the likelihood of delinquency for both whites and African Americans and statistically significant except for Hispanics. The log of income is significant for whites, but not for African Americans, and Hispanics although it has the hypothesized sign. The age variable is consistent with the lifecycle hypothesis. Owing a stock reduced the risk for delinquency for the combined sample and whites and is statistically significant but not for African-Americans and Hispanics, although it has the expected sign. Having a payday loan increased the risk for delinquency for all the races and is statistically significant. This result is similar to the findings of (Anyamele 2014). The year variable highlights the increased risk of delinquency for whites, African-Americans during these survey periods.

The likelihood for delinquency increases with poor health for both whites and African Americans, although the results are not statistically significant for Hispanics. It is important to note the differences among the racial/ethnic groups.

Table 5 shows the Heckman selection bias model. When we model loan delinquency with conditional late payment, we found that based on Mills inverse ratio, we cannot reject the null for delinquency for whites and African Americans. Our results from Table 4 seem to confirm the descriptive statistics on Tables 1 and 2 as mentioned elsewhere. The results show that whites with adjustable rate mortgage loans are less likely to be delinquent while those with high financial obligation ratio are more likely to be delinquent and the results are statistically significant. African Americans with payday loan have high risk of being delinquent. African Americans who have life insurance are less likely to be delinquent. Using late payment as dependent variable, we found that both white and African Americans who have college degree are less likely to have late payment on their loans. Similarly, both whites and African-Americans who have assets have lower risk of late payment on their loans. For both whites and African Americans, having payday loan increases the risk of late payment. High debt service ratio increases the likelihood of late payment for only whites. This result is consistent with the conclusion reached on commercial mortgage borrowers' default rate by (Ciochetti et al. 2003). Having a college degree was not significant in reducing the likelihood of delinquency on all races, although college degree has the correct or expected sign. Being credit constrained increased the chance of being delinquent for whites and not for African Americans. Being unemployed increased the chance of delinquency for whites but not for African Americans.

Table 6 shows that the mean delinquency rate of whites is 5.35%. The mean delinquency rate of African Americans is 11.10% resulting in a difference of minus 5.75%. The negative 5.75% difference between African Americans and whites has two components. The two components are explained delinquency differences arising from differences in endowments between African Americans and whites and the unexplained delinquency differences arising from

discrimination. 67.33% of the difference between African Americans and whites is explained while 33.08% of the difference is unexplained. The major contributing factors to the explained delinquency differences between African Americans and whites are income, credit constrain, unemployment, payday loan, and college graduate. Logan and Weller (2009) concluded that payday loan borrowers were more likely to be minorities and single women than non-payday loan borrowers. The mean delinquency rate for non-Hispanics is 5.70% and the mean delinquency rate for Hispanics is 9.06%, this resulted in a difference of 3.36%. Income, credit constrain, unemployment, and college graduate are the major source of the explained differences between Hispanics and whites.

The Blinder-Oaxaca decomposition allowed us to find the major sources of the differences in household loan delinquency rate among the different races. The variation in delinquency that is unexplained is similar to the result obtained when we apply the method suggested by Neumark (1998) and Oaxaca and Ransom (1994). The results obtained showed that 63.67% is explained, 36.33% is unexplained. 24.07% differences between Hispanics and non-Hispanics are explained by endowment while 75.93% is unexplained. Income, credit constrained, and unemployment are the three sources of delinquency differences between Hispanics and non-Hispanics. College graduate and payday loan also explained the differences between Hispanics and non-Hispanics differences in loan delinquency. Blinder (1973) concluded that 40% to 70 % of wage differentials between whites and Blacks were due to discrimination. The limitations of Blinder-Oaxaca decomposition have centered on the index number problem which is the choice of reference group in the model and how that affects the results. The intercept and indicator variable coefficients are also influenced by the reference group, and thus care must be taken in interpreting the results obtained from decomposition. However, this method is an additional tool to use in examining the differences that are accounted by differences in endowment.

7 Discussions

Delinquency rates in total loans in the United Stated fell from 5.33% in 1990 to 1.57% in 2005 and 2006 (U.S. Census Bureau, Statistical Abstract of United State, 2012). By 2007, the delinquency rate has gone up to 2.06% and steadily increased to 6.97% by 2010. The 2007 SCF data showed that 4.16% of the households were delinquent on their loans. By 2010, the delinquency rate has increased to 7.27%. This represents an increase of 74.76%. This increase is the highest increase in the triennial survey of SCF data over the last decade.

Overall, delinquency rate and age are inversely related. This is consistent with both permanent income and the life cycle hypothesis. While the delinquency rates are higher for African-Americans and Hispanics, they, however, follow the same pattern as whites. From all the Tables, we see that the delinquency rate for

African Americans is higher at every level of income, education, and loan type. Obviously, the evidence points to some unexplained factors that will cause the delinquency rate for African Americans with the same level of education or income to be higher than that of other racial or ethnic groups. Overall, the delinquency rate for those with college degree is 3.29% compared with 8.35% for those without college degree.

As noted by Kau et al. (2012) lenders do not behave as competitive markets would predict, rather they charge higher contract rates to black neighborhoods than could be justified in a competitive market. Canner et al. (2001) found unemployment to be more likely to increase the chance of a household being delinquent. Having liquid assets reduced the likelihood that a household would be delinquent. These findings are consistent with (Canner et al. 2001).

8 Conclusion and Policy Implications

This paper has investigated the differences in delinquency rate among the racial/ethnic groups during the recent financial crisis. The study combined data from two SCF survey years to ensure that results obtained are robust. The found that being credit constrained increases the probability of delinquency for all races. Also, the study found that having high financial obligation ratio did not increase the risk of delinquency except for Hispanic households. However, high debt service ratio increases the risk of delinquency for all races with the exception of Hispanics.

The study found that differences in delinquency between African-Americans and whites are largely explained by payday loan, assets, and credit constrained. Also, our result showed that saving and income explained the differences between non-Hispanics and Hispanics. Furthermore, the study found that only 67.33% of the differences between African-Americans and whites are explained while 33.08% is unexplained or due to discrimination. Equally important is that 93.03% of the differences between whites and Hispanics is explained by differences in endowments while 7.36% is unexplained or due to discrimination.

Similar results were obtained by (Lee and Hanna 2012; Getter 2003; Godwin 1999; Straight 2001; and Canner and Lucket 1991). The findings of this research points to the need for further investigation of these differences in delinquencies between the different ethnic groups. Despite having the lowest debt holding, as well as having the least applications for loans during this period, African-Americans are more likely to be delinquent with their loans than whites, Hispanics, and Asians. Also revealing is the fact that African-Americans are more likely to be denied loans than other racial/ethnic groups. This finding is similar to

Weller (2009). This calls for adequate monitoring of the type of loans that financial institutions make to African-Americans and Hispanics and the charges or the costs of these loans to African Americans.

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Table 1: Households Racial/Ethnic Loan Application and Denial Rate, Loan Delinquency
and Composition for 2007 and 2010 SCF Surveys

	White	African Americans	Hispanic	Asians & Others	Total Sample
2007 Loan Application Rate %	67.74	57.29	58.66	75.68	66.45
2010 Loan Application Rate %	65.54	51.95	53.55	59.40	62.41
2010-2007 Loan Application % Change	-3.25	-9.32	-8.71	-21.51	-6.08
2007 Loan Denial Rate %	13.65	27.45	24.35	16.96	15.82
2010 Loan Denial Rate %	18.03	28.42	27.08	14.31	20.02
2007 Delinquency Rate %	3.61	8.54	6.07	1.69	4.16
2010 Delinquency Rate %	6.09	12.66	10.47	4.78	7.27
2010-2007 % Change in Delinquency Rate	68.70	48.24	72.49	182.84	74.76
2007 Non Delinquent Households	3391	375	294	174	4234
2007 Delinquent Households	127	35	19	3	184
2007 % Delinquency Composition	69.02	19.02	10.33	1.63	100
2010 Non Delinquent Households	4469	690	573	279	6011
2010 Delinquent Households	290	100	67	14	471
2010 % Delinquency Composition	61.57	21.23	14.23	2.97	100
2007 % Sample Size	79.63	9.28	7.08	4.01	100
2010 % Sample Size	73.42	12.19	9.87	4.52	100
2007 and 2010 % Pooled Sample Size	75.94	11.01	8.74	4.31	100
2007 and 2010 % Pooled Delinquency Rate	5.04	11.25	9.02	3.62	6.01

Table 2: Racial/Ethnic Delinquency Rates by type of loans and Household Credit Card
Debt for 2007 and 2010 SCF

Type of Loan	White %	African America %	Hispanic %	Asian & Others %	Total Sample %
2007 and 2010 Pooled Payday Loan	24.57	26.44	25.71	14.29	24.76
2007 and 2010 Pooled No Payday Loan	4.63	10.06	8.39	3.29	5.47
2007 and 2010 Pooled Credit Card	2.98	7.39	5.70	2.76	3.43
2007 and 2010 Pooled No Credit Card	14.09	14.39	12.21	8.14	13.64
2007 and 2010 Pooled Mortgage Loan	4.72	16.04	8.52	5.53	5.80
2007 and 2010 Pooled No Mortgage Loan	5.32	9.47	9.26	2.27	6.17
2007 and 2010 Pooled ARM Loan	5.77	38.89	14.58	3.13	7.99
2007 and 2010 Pooled No ARM Loan	4.99	10.37	8.69	3.75	5.89
2007 and 2010 Pooled Car Loan	5.11	12.14	8.28	3.65	6.03
2007 and 2010 Pooled No Car Loan	4.79	8.66	10.41	3.85	5.96
2007 Household Credit Card Debt	85.05	49.76	56.23	88.70	79.88
2010 Household Credit Card Debt	78.84	42.66	46.56	77.47	71.18
2010-2007 % Change in Credit Card Debt	-7.3	-14.27	-17.13	-12.66	-10.89
2007 and 2010 Pooled Credit Card Debt	81.48	45.08	49.74	81.70	74.71

Table 3 Racial/Ethnic Delinquency by Type of Loans 2007 and 2010 SCF

Delinquency by Race	Weighted	Delinquency by Race	Weighted	Delinquency by Race	Weighted
Race		White ARM	Reference (1.00)		
Asian	-0.708 (-1.16)	African-American ARM	1.048* (2.29)		
White	Reference (1.00)	Hispanic ARM	0.550 (1.09)	Car loan	0.155 (1.19)
African-American	-0.202 (-0.82)	Payday loan	1.240*** (6.33)	Asian Car loan	-0.103 (-0.18)
Hispanic	0.106 (0.46)	Asian Payday loan	0.333 (0.42)	White Car loan	Reference (1.00)
		White Payday loan	Reference (1.00)	African-American Car loan	0.170 (0.64)
Credit Card debt	-1.466*** (-12.42)	African-American Payday loan	-0.0913 (-0.27)	Hispanic Car loan	-0.374 (-1.38)
Asian Credit Card debt	0.0971 (0.15)	Hispanic Payday loan	0.0727 (0.16)	College graduate	-0.612*** (-4.99)
White	Reference (1.00)	Mortgage loan	0.342** (2.92)	Asian College graduate	0.120 (0.21)
African-American Credit debt	0.353 (1.35)	Asian Mortgage loan	1.056^{+} (1.80)	White College graduate	Reference (1.00)
Hispanic Credit debt	0.419 (1.38)	White Mortgage loan	Reference (1.00)	African-American College graduate	0.477^{+} (1.78)
ARM	0.353^{+} (1.75)	African-American Mortgage loan	0.462^{+} (1.74)	Hispanic College graduate	1.138*** (3.38)
Asian ARM	-0.846 (-0.77)	Hispanic Mortgage loan	-0.284 (-0.90)	Constant	-2.061*** (-16.46)
N				10900	

t statistics in parentheses
$^{+}$*p <0.10,* * *p* < 0.05, ** *p* < 0.01, *** *p* < 0.001

Table 4: Racial / Ethnic differences in loan delinquency rate 2007 and 2010 SCF

	Combined delinquency	White delinquency	African-American delinquency	Hispanic delinquency
Independent Variables				
Unemployed	0.701***	0.772***	0.442	1.044***
	(6.39)	(5.71)	(1.67)	(3.42)
Credit Constrained	1.076***	1.235***	0.644**	0.622*
	(10.69)	(9.76)	(2.83)	(2.15)
HFOR	-0.0356	0.0194	-0.199	0.479+
	(-0.28)	(0.12)	(-0.71)	(1.68)
DSR	0.450**	0.413*	1.207*	0.683
	(3.07)	(2.36)	(2.18)	(1.44)
College Graduate	-0.294*	-0.293*	-0.397	0.414
	(-2.49)	(-2.02)	(-1.46)	(1.13)
Saves	-0.414**	-0.537**	-0.137	-0.145
	(-3.28)	(-3.24)	(-0.53)	(-0.44)
ARM	0.709***	0.580**	1.662***	0.162
	(4.12)	(2.68)	(4.24)	(0.30)
Own Stocks	-0.327**	-0.408**	-0.178	-0.120
	(-3.20)	(-3.23)	(-0.76)	(-0.42)
Life Insurance	-0.121	-0.268+	-0.201	0.0509
	(-1.13)	(-1.94)	(-0.78)	(0.17)
Poor Health	0.724***	0.690**	1.029**	0.349
	(4.24)	(3.18)	(2.64)	(0.67)
Payday Loan	0.897***	0.908***	0.791**	0.821+
	(5.41)	(3.89)	(2.60)	(1.88)
Married	-0.0341	0.0999	-0.0907	-0.158
	(-0.32)	(0.72)	(-0.37)	(-0.58)
Log of Income	-0.273***	-0.305***	-0.0320	-0.252
	(-4.11)	(-3.49)	(-0.20)	(-1.30)
Age	0.141***	0.157***	0.117*	0.0497
	(6.20)	(5.36)	(2.43)	(0.77)
Age^2	-0.00164***	-0.00183***	-0.00138**	-0.000607
	(-6.74)	(-5.78)	(-2.78)	(-0.85)
Year	0.372***	0.356**	0.452*	0.288
	(3.74)	(2.87)	(1.97)	(0.94)
Constant	-3.179***	-3.173**	-5.021**	-1.775
	(-4.22)	(-3.19)	(-2.85)	(-0.92)
N	10780	8173	1196	947

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Heckman Racial Ethnic Loan Differences 2007 and 2010 SCF

	White	African-American		White	African-American
Delinquency			**Late pay**		
unemployed	0.0934^{**}	0.17449	unemployed	0.18068^{***}	-0.0320
	(2.74)	(1.07)		(3.60)	(-0.19)
Credit constrained	-0.1964^{***}	0.36613^{**}	Credit constrained	0.68140^{***}	0.1959
	(-4.91)	(3.07)		(17.17)	(1.56)
HFOR	0.0622^{**}	0.0094	HFOR	-0.03292	0.1604
	(2.51)	(0.01)		(-0.98)	(1.22)
DSR	-0.0025	0.09905	College graduate	-0.1008^{***}	-0.40087^{***}
	(-0.14)	(0.44)		(-3.52)	(-3.47)
College graduate	0.0293	-0.08903	Saves	-0.0955^{***}	-0.21117^{+}
	(1.31)	(-0.57)		(-3.32)	(-1.80)
Saves	0.00481	-0.0757	ARM	0.18128^{***}	1.592^{***}
	(0.22)	(-0.66)		(3.71)	(7.26)
ARM	-0.07634^{**}	0.63447	Payday loan	0.99864^{***}	0.8235^{***}
	(-2.20)	(1.54)		(6.93)	(3.19)
Payday loan	0.10826	0.779534^{**}	Credit debt	-0.3845^{***}	-0.0788
	(1.44)	(3.13)		(-8.66)	(-0.60)
Married	0.03100	0.06745	Married	0.09633^{**}	-0.53987^{***}
	(1.38)	(0.39)		(3.10)	(-4.44)
Log of income	-0.0160^{+}	0.015536	Log of income	0.02586^{**}	-0.06313
	(-1.82)	(0.19)		(2.33)	(-0.83)
Age	0.01682^{***}	0.06829^{+}	Age	0.0066	0.11552^{***}
	(4.52)	(1.76)		(1.30)	(4.07)
Age^2	-0.0001497^{***}	-0.000772^{+}	Age^2	-0.000115^{**}	-0.001299^{***}
	(-4.42)	(-1.82)		(-2.49)	(-4.28)
Year	0.24533^{***}	0.54682^{**}	Year	-0.30223^{***}	0.57713^{***}
	(9.88)	(2.97)		(-11.63)	(4.93)
Life insurance	0.00433	-0.580244^{***}	Life insurance	-0.0717^{**}	-0.48565^{**}
	(0.19)	(-3.26)		(-2.31)	(-2.65)
Poor health	0.31543^{***}	-0.15207	Poor health	0.08829	-0.65193^{+}
	(5.82)	(-0.46)		(1.07)	(1.69)
Log of assets	0.00417	-0.04796	Log of assets	-0.0696^{***}	-0.0984^{***}
	(0.79)	(-1.25)		(-11.55)	(-3.99)
Constant	0.2630^{*}	-2.2883^{+}	Mortgage loan	-0.3943^{***}	0.2459
	(2.23)	(-1.86)		(12.86)	(1.64)
			DSR	0.09566^{***}	-0.4251
				(4.57)	(-1.17)
			Constant	0.06625	-0.588
				(0.43)	(-0.85)
N	21673	1012		21673	1012
Wald χ^2	252.91	69.21			
t statistics in parentheses	$+ p< 0.10, * p< 0.05,$ $** p < 0.01$	$*** p < 0.001$	Mills lambda	-0.4377^{***} (-7.69)	0.7344^{+} (1.93)

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Table 6: Blinder-Oaxaca decomposition of Racial/Ethnic loan delinquency rate 2007 and 2010 SCF

Component	(2) White only Sample	Percent of Explained difference	(3) African-America only Sample	Percent of Explained difference	(4) Hispanic only Sample	Percent of Explained difference
Differential Prediction_1	0.0904*** (35.99)		0.0535*** (52.06)		0.0570*** (54.50)	
Prediction_2	0.0502*** (46.48)		0.111*** (27.35)		0.0906*** (21.72)	
Actual Difference	0.0402*** (14.69)	%	-0.0577*** (-13.76)	%	-0.0336*** (-7.82)	%
Explained						
Unemployed	0.00757*** (14.10)	18.83	-0.00864*** (-12.79)	14.97	-0.00643*** (-10.53)	19.14
Credit Constrained	0.00737*** (14.62)	18.33	-0.00949*** (-13.56)	16.45	-0.00725*** (-10.52)	21.58
HFOR	0.00000322 (0.32)	.01	-0.00000221 (-0.28)	.04	-0.00000456 (-0.33)	.01
DSR	-0.0000469 (-0.64)	-.12	0.000536*** (3.84)	-.93	-0.000313** (-2.64)	.93
Payday Loan	0.00386*** (9.03)	9.60	-0.00614*** (-8.87)	10.64	-0.00111** (-3.01)	3.30
College Graduate	0.00335*** (7.18)	8.33	-0.00362*** (-7.07)	6.27	-0.00472*** (-7.23)	14.05
Saves	-0.000699*** (-5.44)	-1.74	0.000354* (2.22)	-.61	-0.0000876 (-0.52)	.26
ARM	-0.000506*** (-4.27)	-1.26	0.000774*** (4.48)	-1.34	0.000278** (3.02)	-.83
Age	-0.0334*** (-10.71)	-83.08	0.0226*** (9.99)	-39.17	0.0401*** (10.70)	-119.35
Age^2	0.0364*** (12.96)	90.55	-0.0245*** (-11.90)	42.46	-0.0435*** (-13.00)	129.46
Log of Income	0.00851*** (13.27)	21.17	-0.00923*** (-13.19)	16.00	-0.00795*** (-13.70)	23.66
Married	0.00105** (2.60)	2.61	-0.00147* (-2.02)	2.55	-0.000275* (-2.48)	.82
Total Explained	0.0335*** (30.93)	83.23	-0.0389*** (-27.47)	67.33	-0.0312*** (-23.26)	93.03

Unexplained

Unemployed	-0.00590^{***}	-14.68	0.00799^{**}	-13.85	0.000657	-1.96
	(-3.72)		(3.19)		(0.25)	
Credit Constrained	-0.00531^{**}	-13.21	0.00792^{**}	-13.73	0.00482	-14.35
	(-3.10)		(2.92)		(1.74)	
HFOR	0.000931	2.32	-0.000442	.77	-0.00258	7.68
	(0.76)		(-0.24)		(-1.26)	
DSR	0.0126^{***}	31.34	-0.0191^{***}	33.10	-0.00803^{*}	23.90
	(6.11)		(-5.58)		(-2.48)	
Payday Loan	0.000749	1.86	-0.0000786	.14	-0.000527	1.57
	(0.88)		(-0.05)		(-0.42)	
College Graduate	0.000830	2.06	0.00222	-3.85	-0.00805^{**}	23.96
	(0.36)		(0.77)		(-2.97)	
Saves	0.000438	1.09	-0.000697	1.21	-0.00147	4.38
	(0.26)		(-0.27)		(-0.58)	
ARM	0.00357^{***}	8.88	-0.00748^{***}	12.96	-0.000600	1.79
	(4.47)		(-6.11)		(-0.52)	
Age	0.175^{***}	435.32	-0.197^{**}	341.42	-0.0233	69.35
	(3.86)		(-3.13)		(-0.32)	
Age^2	-0.0876^{***}	-217.91	0.101^{***}	-175.04	0.0238	-70.83
	(-4.02)		(3.36)		(0.71)	
Log of Income	-0.0309	-76.87	0.00953	-16.52	0.0845	-251.49
	(-1.09)		(0.19)		(1.63)	
Married	-0.00393	-9.78	0.0000488	-.08	0.00431	-12.83
	(-1.35)		(0.02)		(0.87)	
Constant	-0.0542	-134.83	0.0770	-133.45	-0.0760	226.19
	(-1.79)		(1.48)		(-1.50)	
Total	0.00668^{*}	15.59	-0.0189^{***}	33.08	-0.00238	7.36
	(2.32)		(-4.39)		(-0.54)	
N	53900		53900		53900	

t statistics in parentheses

$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$