

The Effect of Income, Ethnicity/Race and Institutional Factors on Mortgage Borrower Behavior

Authors L. Jide Iwarere and John E. Williams

Abstract

Studies examining mortgage choice behavior generally assume a frictionless mortgage market in which borrower decisions are influenced only by economic variables. This study explores the interface between demographic and institutional factors inherent in mortgage market logistics and the information flow that affects borrower behavior. The efficiency of these processes is particularly important when studying inner city real estate markets, since these markets are disproportionately represented by low income and minority households. The effect of institutional factors was examined by conducting a survey of borrower behavior in metropolitan Washington, DC. The secondary data findings indicate that ethnicity/race and income are jointly sensitive to borrower decision, confirming the clientele effect. The primary data findings also indicate that institutional factors influence mortgage choice. Similarly, borrowers are influenced by the channel chosen to evaluate market information. However, income was not found to be a significant determinant of borrower behavior.

Introduction

This study examines borrower behavior by ethnicity/race and income with respect to market conditions and institutional factors. Particular emphasis is placed on low-to-moderate income minority residents found in inner city residential areas. The premise is that a proper understanding of the effect of market conditions on borrower decisions requires the analysis of financial market conditions, as well as the institutional environment underlying borrower choice.

The analysis of financial market conditions on borrower decisions involves an investigation of the clientele effect (ethnicity/race). Employing the thirty-year fixed-rate mortgage as a proxy for financial market conditions, its effect on borrower behavior is examined through segmenting mortgage market participants into categories defined by ethnicity/race and income.

An examination of the institutional framework for mortgage activity is undertaken by erecting a schema to chart the decision spectrum involved in mortgage origination from the borrower's perspective. This highlights the institutional environment that exists when borrowers apply for a loan. A questionnaire is developed and used to collect primary data to test for the impact of institutional factors on the minority borrowers' decisions to finance a housing purchase. The institutional effect on borrower decisions will be captured by using proxies that reflect the events generated by the mortgage search, decision and processing actions. These influences should capture the market conditions that the economic and financial variables omit. These institutional variables are: mortgage search agents, mortgage search intensity and mortgage choice approach (see the questionnaire in the Appendix).

This study tests the following hypotheses about institutional effects:

1. Institutional factors inherent in mortgage market logistics and informational flow exert significant influence on borrower behavior.
2. Institutional factors interact with income and race in the determination of mortgage choice.

Literature Review

While studies on the determinants of mortgage choice continue unabated, there seems to be some convergence on socioeconomic effects, loan price/attributes and market conditions as the major determinants (Sa-Aadu and Sirmans, 1995; and Sa-Aadu and Megbolugbe, 1995). Both Sa-Aadu and Sirmans and Sa-Aadu and Megbolugbe posit a framework of mortgage choice in which utility-maximizing borrowers operate within the context of a residential mortgage market that is efficient. This implies that all borrowers are as equally knowledgeable about the market conditions as other market participants, and incur limited transaction costs in the loan applications process. One difficulty with this premise is that there is no centrally-available medium of information that is accessible to all market participants. The market has sought to mitigate this in recent years through the provision of consumer education to some low-to-moderate income borrowers, as part of the approval process, with a view towards enhancing their homeownership rate, as well as diminishing their probability of default on mortgage loans.

The basic premise in this study is that the organization of the mortgage market gives ample room for frictional cost. However, the magnitude of this cost appears to be skewed against market segments that are dominated by low-income and minority borrowers. For these borrowers, the mortgage search process appears to exert significant influence on the ultimate choice of mortgage instrument.¹ This conditioning operates partly via access to information about the mortgage lending process and partly by the perceptions of minority borrowers. The information constraint could result from limited access due to cost or lack of knowledge. It may also be a result of the differential interpretation of available information about

market phenomena by market participants. The Institutional Framework for Mortgage Origination presented in this paper traces the decision path for the typical borrower.

This framework highlights the preliminary steps for a loan application—from tenure choice to ownership timing and the initiation of the purchase contract—that triggers the mortgage search process. This process incorporates: mortgage search, borrowing decision (choice of mortgage) and application processing. Ratner's (1996) ethnographic synthesis of homeownership behavior calibrates this process into presearch, search, purchase-finance and post-purchase phases. He notes in his cross-cultural, multi-ethnic analysis that "Researchers have found that some families were not looking for homes because they believed that, even if they found one they could afford, financing would not be available. . . More than any other aspect of the loan process, community members saw credit approval process as mysterious and capricious."²

In the light of the most recent market developments, some caveats are in order here. First, the introduction of automated underwriting (AU) along with risk-based pricing models have the potential to revolutionize information flow to market participants. However, online originations are still a very small but growing proportion of total originations. LaCour-Little (2000) estimated this to be of the order of 1% in 2000.³ McWilliams (2002) reported estimates of online originations by the TowerGroup of Needham, Massachusetts as having risen from 0.8% or \$11 billion in 1999 to 4.6% or \$110 billion in 2002. Beier (2002) also reported the latter's projection for 2003 and 2005 as 6.1% and 12.8%, respectively, while noting, "It turns out that consumers are increasingly visiting on-line mortgage sites to get pricing and product information, but at the end of the day not many are buying online or even submitting an application." Moreover, the "digital divide" is likely to preclude online participation by the majority of the inner city residents. Quercia and Wachter (1996) while observing that the efficacy of consumer education has been mixed also noted that "post-purchase" financing counseling tend to produce positive effects on mortgage performance.

A cursory look at the home-buying process and the mortgage market segments will throw light on these issues. It appears that there is a segment of the market for which market rigidities inherent in the organization of the mortgage market exert considerable influence on financing behavior. This latter aspect has not received adequate treatment in studies on mortgage choice. Sa-Aadu and Sirmans (1995) and Sa-Aadu and Megbolugbe (1995) found market conditions a significant determinant of mortgage choice and the level of income to be insignificant. Market conditions were measured by two variables: the "yield curve" and "mortgage differential."

The Clientele Effect

While observing that the level of income is not significant in mortgage choice determination, Sa-Aadu and Megbolugbe (1995) concluded that "Borrower

heterogeneity and affordability constraints create clientele effects in mortgage markets.” In analyzing the sensitivity of mortgage market participants to changes in the thirty-year fixed-rate mortgage, Iwarere and Williams (1997) observed that the 18.5% decline in the 1993 mortgage rate produced differential responses by various income groups as well as among ethnic/racial groups in the low to moderate income category relative to the overall response. This section extends their analysis to zero-in further on the clientele effect arising from the joint influence of income and ethnicity/race.

Mortgage Market Sensitivity Analysis

Mortgage market sensitivity analysis is conducted using 2000 and 2001 HMDA data that covers the Washington, DC metropolitan area. This geographic emphasis in the HMDA sample was made to achieve consistency with the geographical area represented by the survey. Specifically, the sample data include the District and its surrounding counties (Prince George, Montgomery, Fairfax and Arlington). The data set includes Asians (9%), Blacks (32%), Hispanics (6%) and Caucasians (53%). The breakdown by income class is: low-to-moderate income, 36%; moderate income, 26%; and upper income, 38%.

As shown in Exhibit 1, corresponding to an 8.2 percentage increase in the fixed-rate thirty-year mortgage (FRM) between 1999 and 2000, the total increase in the volume of mortgage applications across racial groups was 4.3%. When the total change in volume is segmented by race and income class, the volume for Caucasian mortgage applicants declined (-9.5%) following the increase in the FRM, while the volume for Blacks, Asians and Hispanics increased by 17.1%, 26.1% and 26.7%, respectively. Mortgage participation behavior by income classes revealed that the upper income group only increased mortgage applications by 4.5%, whereas the middle and lower-to-moderate income classes increased their respective mortgage volume by 14.5% and 14.9%. Moreover, within the lower-to-moderate income class, Caucasians (-11.1) and Asians (-15%) recorded a decrease in applications, whereas, Blacks (33.3%) and Hispanics (26.1%) increased their mortgage activity volume.

Analyses of mortgage activity data for 2001 shows that a negative (-13.42%) change in the FRM coincided with a negative (-9.3%) change in mortgage volume. By racial comparison, the volume for Caucasians (-10.5%) and Blacks (-24.1%) decreased, whereas the volume for Asians (13.8%) and Hispanics (17.5%) increased. When viewed by income class, although by different magnitudes, the mortgage volume decreased for all income groups (lower-to-moderate income, -1.4%; middle income, -10.6%; upper income, -21.5%) following the decline in the FRM. While the 2001 percentage change (1.23%) in the mortgage volume for lower-to-moderate income Asians indicates a very large increase; the magnitude of the percentage change reflects the affect of a modest absolute change on the small representative sample of this racial group.

Exhibit 1 | Volume of Conventional Home Purchase Loans by Race and Income Group;
and Movements in Interest Rates

	Percentage Change	
	2000	2001
Interest Rate Movement		
Change in 30-year conventional mortgage rates	8.2	-13.4
Loan Volume Movement		
Change in loan volume (all income groups)		
Asian	26.1	13.8
Black	17.1	-24.1
Hispanic	26.7	17.5
Caucasian	-9.5	-10.5
Total	4.3	-9.3
Change in loan volume (low-to-moderate income group)		
Asian	-15.0	123.5
Black	33.3	-35.7
Hispanic	26.1	6.9
Caucasian	-11.1	-15.2
Total	14.9	-1.4
Total middle income group	14.5	-10.6
Total upper income group	4.5	-21.5

Sources: Federal Financial Institutions Examination Council (FFIEC), Home Mortgage Disclosure Act Data (HMDA), Freddie Mac.

The total interest elasticity (Exhibit 2) for all races is less than unity (0.52) for 2000. When segmented by race, however, only Caucasians (-1.16) exhibit interest elasticity of less than unity. Also, the upper income group recorded an interest elasticity of less than unity (0.55), whereas the elasticity for both the lower-to-moderate income (1.82) and middle income (1.77) classes was greater than unity.

An examination of the relative elasticity of mortgage applications as measured by the racial sensitivity index, reveals a large dispersion from the total (0.52) for all racial groups: Asians, 6.12; Blacks, 4.0; Hispanics, 6.27; and Caucasians, -2.23.

The total interest rate elasticity for 2001 is less than unity (0.69). The less than unity elasticity holds true for all races excepting Blacks (1.8). The upper income group displayed a higher elasticity (1.6) than both the middle income (0.79) and lower-to-moderate income (0.1) groups. The racial sensitivity indexes calculated from the 2001 data were higher for Blacks (2.6) and Hispanics (1.9) than for Caucasians (1.1) and Asians (-1.5).

Exhibit 2 | Responsiveness of the Volume of Conventional Home Purchase Loans to Movements in Interest Rates by Race and Income Group

	Percentage Change	
	2000	2001
Index by Race (all income groups) ^a	3.18 (6.12)	-1.03 (-1.49)
Asian		
Black	2.08 (4.00)	1.79 (2.57)
Hispanic	3.26 (6.27)	-1.30 (-1.88)
Caucasian	-1.16 (-2.23)	0.78 (1.13)
Total	0.52 (1.00)	0.69 (1.00)
Index by Race (low-to-moderate income group)		
Asian	-1.83 (-1.01)	-9.20 (-88.21)
Black	4.07 (2.24)	2.66 (25.50)
Hispanic	3.18 (1.75)	-0.51 (-4.90)
Caucasian	-1.4 (-0.77)	1.13 (10.83)
Total	1.82 (1.00)	0.10 (1.00)
Total middle income group	1.77	0.79
Total upper income group	0.55	1.60

Notes:
^aInterest-Elasticity Index (Racial Sensitivity Index). Interest Elasticity Index is a measure of the sensitivity of the loan application volume to changes in interest rates. It is calculated as a percentage change in the conventional mortgage rate to the percentage change in loan volume. Racial Sensitivity Index is computed as the ratio of interest-elasticity for a racial category to the elasticity for all races.
Source: Authors' computation from Exhibit 1.

Among the lower-to-moderate income group, an observation of the interest elasticity by race for the year 2000 reveals a wide variation from the total (1.82). The elasticity measures for Asians (-1.82) and Caucasians (-1.4) were less than unity, whereas the measures for Blacks (4.07) and Hispanics (3.18) were greater than unity. The corresponding (2000) racial sensitivity measures were -0.77 and -1.0 for Caucasians and Asians respectively, while Blacks (2.24) and Hispanics (1.75) exhibited greater and positive sensitivities.

Continuing with the lower-to-moderate income group, in 2001 the interest elasticity for Asians (-9.2) represented a large dispersion from the total (0.10). The elasticity for Hispanics (-0.51) was nearer unity; Blacks (2.7) and Caucasians (1.13) recorded elasticity measures greater than unity. Accordingly, the racial sensitivity calculations for Asians (-88.21) and Blacks (25.5) were larger than those calculated for Hispanics (4.9) and Caucasians (10.83).

The above analyses examined 2000 and 2001 HMDA data and provide inter-temporal results that support the findings by Iwarere and Williams (1997), which also concluded that a change in volume of mortgage applications with respect to the change in the cost of the thirty-year FRM is effected by race and income. Whether or not other demand side factors inherent in the institutional forces within the mortgage market are manifest in the race and income variables is a research question that is further explored below.

The Anatomy of Mortgage Origination

The thrust of this scheme is to trace the path of consumer decision making in the lower-to-moderate income mortgage submarket from its inception at the tenure choice juncture to loan closing. The journey runs through the housing and mortgage market segments, although more emphasis is placed on the latter. The decisions are classified into primary, secondary and tertiary stages. This provides a measure of market conditions in terms of the institutional environment that underlies borrower choice. This metric for the institutional dimension of the mortgage market environment is needed to test its effect on borrower choice.

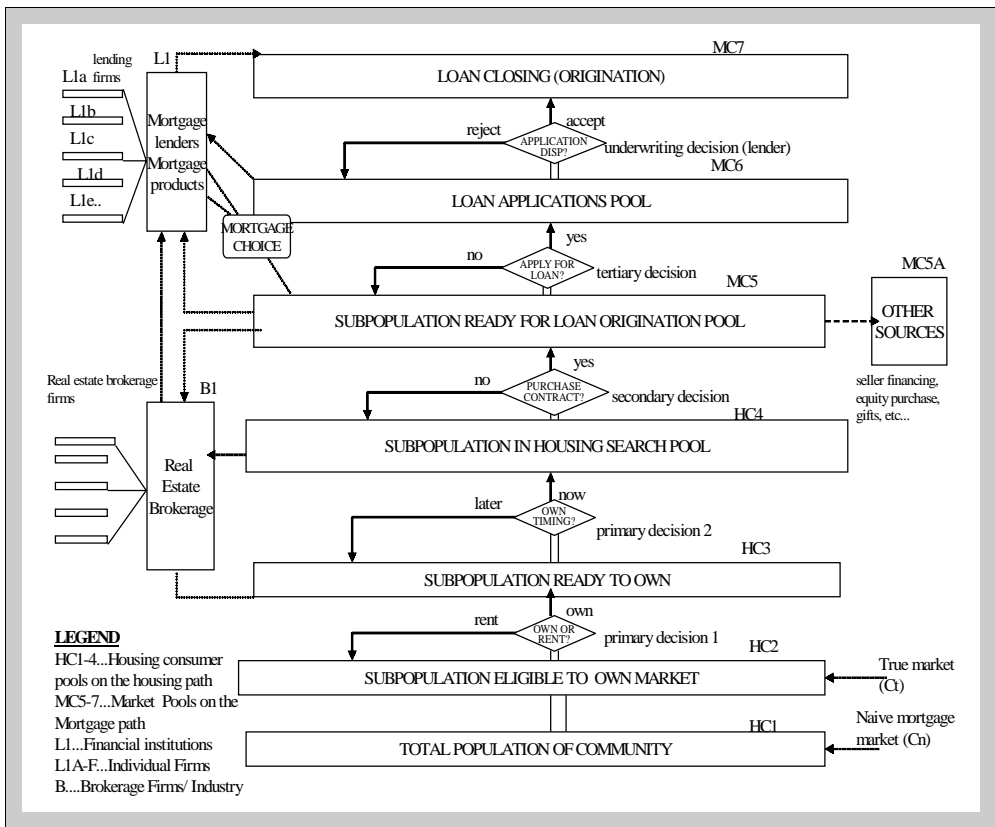
Borrower Decisions within the Housing Market Segment

The “primary decision 1,” which is a determination of whether to own or not is made by the sub-population that has the potential for owning or is made eligible by virtue of affordability schemes (see Exhibit 3). This segment is referred to as the “True Mortgage Market” [Ct] largely because purchasers overwhelmingly utilize debt for housing purchase. Numeric reconfiguration occurs due to tenure choice and timing decisions. Further leakages occur due to all-equity purchases and non-market means of debt capital sourcing [MC5A]. The decision on ownership timing, (primary decision 2), generates the Housing Search Pool (HC4) from which the pipeline Subpopulation for Loan Origination is established (see MC5). Other decisions made along this path include which brokers to patronize (B1) and when.

Decisions within the Mortgage Market Segment

The borrowers “tertiary decision” involves the timing of loan application, the channel for selecting the lender (shopping via brokers, direct lender shopping, others), the choice of mortgage instrument and the choice of closing agent. The latter is made in conjunction with the home purchase contract. Borrowers go through a search process that involves an investigation of the mortgage market environment and mortgage instruments through formal and informal sources. These were referred to earlier as mortgage search agents. In the formal arena, the borrower employs the help of agents who operate in the housing and mortgage

Exhibit 3 | Institutional Framework for Mortgage Origination



markets. These include real estate brokers, mortgage brokers, financial institutions, etc. The informal sources include friends, neighbors, and more recently, credit counseling agents. Most applicants for a loan, particularly those in the low-income or minority population, have limited knowledge of the process, making them vulnerable to aggressive merchandizing efforts of agents or the predatory lending practices of sub-prime lenders.

Based on the information gathered, borrowers proceed to acquire product-specific information from lenders directly or by tapping into a network of information sources electronically or otherwise. This search is the mortgage search intensity. The greater the number of borrowing choices consulted by the borrower, the greater would be the scope of publicly-available information reflected in the decision and hence the more informed the mortgage choice. The semi-strong market efficiency hypothesis presupposes that all publicly-available information is reflected in loan pricing. However, negotiated effective cost of the loan may differ

from the quoted rates due to information asymmetry between the lender and borrower. The intensity of search becomes crucial for closing this gap.

Borrowers then evaluate this information to make a choice of mortgage instrument and lender. The evaluation could be on their own accord, by reliance on informal agents, or by falling back to formal agents as real estate brokers, mortgage brokers, etc. The agent-advisors are capable of tilting borrower decisions sub-optimally. This is the *mortgage choice approach*. Submission of an application to the lender completes the search process and ushers in the mortgage loan application processing stage.

Survey Data

Sampling Design and Procedure

The data for testing for the impact of the institutional factors on minority mortgage borrowers' decision was generated through primary data collection from the District of Columbia and four major counties in the Washington, D.C. metropolitan area in March and April of 1996. These are Arlington and Fairfax counties in Northern Virginia; and Montgomery and Prince Georges Counties in Maryland. Based on the 1990 Census, the metropolitan population was 25.4% Black, 6.2% Asian and 6.8% Hispanic. Exhibit 4 gives the population distribution by ethnicity for these component counties. The sampling frame is defined as homeowners in the five jurisdictions noted above. A stratified sampling procedure along the jurisdictional lines was employed.

Sampling was done by a combination of door-to-door contacts and contacts in public places such as neighborhood centers. This is because the telephone list that constitutes the most comprehensive sampling frame available is ordered alphabetically by county thus obscuring desired lower level geographical breakdowns. Some respondents preferred to fill out the survey questionnaire on their own, in which case the interviewer made an appointment to pickup the response or have it mailed in. Mail-in responses were relatively fewer.

The results of the survey are presented in the summary statistics in the Appendix and the geographic distribution of the sample (Exhibit 5). One-hundred fifty responses were obtained in the final analysis, a 19% response rate. Blacks, who constitute about two-thirds of the minority population in the five jurisdictions at that juncture, were over-represented in the sample at 75%. Prince Georges County was similarly over-represented in the sample (55%) relative to its share of minority population in the jurisdictions (38%) while Fairfax was under-represented at 4% relative to its share of minority population, 14.1%. The geographic coverage of the sample is very broad for the District of Columbia, Montgomery and Prince Georges counties but rather limited for Arlington and Fairfax counties. There are significant item non-responses as indicated by the summary in the Appendix.

Exhibit 4 | Washington D.C. Metropolitan Area (& MSA) Population Distribution

County	Washington DC & Vicinity Population ^a				Wash-Balto MSA(DC-MD-VA WV) Population Distribution ^b (%)				
	Total	Caucasian	Black	Other	Caucasian	Black	Asian	AI ^c	Hisp ^d
D.C. (City)	543,213	184,692	340,594	17,927	34.0	62.7	3.0	0.3	6.9
Arlington	175,334	139,916	19,287	16,131	79.8	11.1	8.7	0.4	16.9
Fairfax	902,492	727,411	74,907	100,174	80.6	8.3	10.8	0.3	8.2
Montgomery	816,999	612,749	117,647	86,603	75.0	14.4	10.3	0.3	9.4
Prince Georges	773,810	301,786	433,334	38,690	39.0	56.0	4.6	0.3	4.8
TOTAL	3,211,848	1,966,554	985,769	259,525	69.2	25.7	4.8	0.3	4.9

Notes:

^aThe population of Washington, D.C. and vicinity reported here includes the District of Columbia and the abutting counties covered by our survey. It is a subset of Washington, D.C. Primary Metropolitan Statistical Area (DC PMSA), which also includes Calvert, Charles and Frederick Counties in Maryland; Loudon, Prince William and Stafford Counties in Virginia and Cumberland County in West Virginia.

^bThe Washington-Baltimore Metropolitan Statistical Area extends beyond the immediate focus. With a 1996 population of 7,164,519, it consists of Baltimore PMSA (2,474,118), Hagerstown PMSA (127,278), and Washington (DC-MD-VA-WV) PMSA (4,563,123).

^cAI stands for American Indian.

^dThe Hispanic population is reflected among the other races. Their percentages are not to be added to the percentages for other races in calculating the overall total for each county. Their percentages are isolated for comparison purposes only.

Source: 1998 County and City Extra: Annual Metro, City and County Data Book. The numbers represent 1996 population estimates extrapolated from the 1990 census.

Exhibit 5 | Minority Population Distribution and the Geographic Distribution of the Sample

County	Minority Population / %	Sample Distr. (%)	Geographic Coverage of Sample (Cities / Neighborhoods spotted)
Washington, D.C.	358,521 28.8	24	Bening, Brightwood / Cresswood, Capitol Hill, Chevy Chase, Congress Heights, Edgewood, Fort Lincoln, Palisade / Friendship, Shaw
Arlington	35,418 2.8	2	City of Arlington
Fairfax	175,081 14.4	4	Alexandria
Montgomery	204,250 16.4	15	Bethesda, Burtonsville, Colesville, Gaithersburg, Germantown, Silver Spring, Wheaton
Prince Georges	472,024 37.9	55	Beltsville, Bowie, Capitol Heights, Forestville, Fort Washington, Glenn Dale, Greenbelt, Hyattsville, Landover, Lanham, Laurel, Oxon Hill, Riverdale, Temple Hills, Upper Malboro
Total	1,245,294 100.0	100	

Source: 1998 County & City Extra: Annual Metro, City and County Data Book; Survey Results.

Nearly half of the respondents (46%) reported having selected their mortgage loans for reasons other than the lowest available rate. The 24% of respondents whose choice of mortgage was a result of “convenience” could have done so to circumvent the tedious search process while the 21% who responded as “My only option” might either have had to deal with some credit problems, or been dissuaded by the frictions of the search process.

Thirty-two percent of the respondents obtained their loans directly from commercial banks, 50% through brokers and 6% from savings and loan institutions. The corresponding distribution reported in the total HMDA data set for 1994 was 32.4%, 46.4% and 17.4%, respectively.

An average of two potential borrowing sources was consulted before making the borrowing decision, indicating a low mortgage search intensity. There does not appear to be a significant preference for any single mortgage search agent since information for advice on the mortgage market and loan search process was distributed fairly evenly among real estate brokers (20%), mortgage brokers (17%) and lending officers of financial institutions (17%) with slightly less proportion seeking advice from friends and neighbors (13%). Forty percent relied on real estate agents and friends/neighbors combined. About the same proportion also

Exhibit 6 | Results of Chi-Square Tests of Independence Among the Variables

Variables (# categories)	d.f.	$\chi^2_{\text{calc.}}$	$\chi^2(\alpha, \text{d.f.})^a$	p-value	Decision About H_0
1. RACE(2), MCA(3), FRM(2)	7	13.099	12.0*	.0697	Reject H_0 : Variables Statistically Dependent
2. RACE(2), MSA(6), FRM(2)	16	14.908	23.5	.5312	Accept H_0 : Variables Independent Statistically
3. RACE(2), MSI(2), FRM(2)	4	3.253	7.8	.5165	Accept H_0 : Variables Independent Statistically
4. INCOM(3), MCA(3), FRM(2)	12	8.941	18.5	.7080	Accept H_0 : Variables Independent Statistically
5. INCOM(3), MSA(6), FRM(2)	27	35.381	36.7	.1295	Accept H_0 : Variables Independent Statistically
6. INCOM(3), MSI(2), FRM(2)	7	2.334	12.0	.9390	Accept H_0 : Variables Independent Statistically
7. INCOM(3), RACE(2), FRM(2)	7	11.037	12.0	.1370	Accept H_0 : Variables Independent Statistically
8. MCA(3), MSI(2), MSA(6), FRM(2)	62	94.905	92.28**	.0045	Reject H_0 : Variables Statistically Dependent

Notes:

^a α = significance level; d.f. = degree of freedom.

*Significant at the 10% level.

**Significant at the 5% level.

relied on agents and brokers combined. Twenty percent employed three or more search agents.

The distribution of mortgage choice approaches, which reflect the channels by which borrowers evaluate market information to select the lender and mortgage instrument, is split almost equally among mortgage institutions, real estate agents and informal approaches (self, and friends/neighbors).

More borrowers appeared to select lenders and instruments through real estate agents (33%) than actually relied on their advice for garnering market information (20%). This suggests that the real estate agents have more influence on borrowers' ultimate choice of mortgage than their knowledge of the mortgage market would dictate.

Hypotheses

The test for the joint effect of race (*RACE*) or income (*INCOM*) and each of the three institutional variables (*MSA*, *MSI* and *MCA*) on borrower choice between variable or fixed-rate mortgage (*FRM*) employs the chi-square test, a non-parametric test of independence among variables. The hypothesis for each of the joint tests typically is (*e.g.*, for ethnicity, mortgage choice approach or mortgage choice):

H_0 : *RACE*, *MCA* and *FRM* are independent (*i.e.*, statistically unrelated).

H_A : *RACE*, *MCA* and *FRM* are statistically dependent.

H_0 and H_A are the null and alternative hypotheses respectively for the chi-square statistic, $\chi^2(\alpha, df)$, with a confidence level of α , and df degree of freedom. The tests for joint effect of race, institutional variables and mortgage choice were all at 10% confidence level as they were not found to be significant at the 5% level. The degrees of freedom were determined as $[(p.q.r.) - 1 - v]$ where p , q and r are the number of categories for the variables and v is the number of parameters estimated. The calculated values of chi-square (χ^2_{calc}) are compared to $\chi^2(.10, df)$ such that for:

$$(\chi^2_{\text{calc}}) \leq \chi^2(.10, df). \quad (1)$$

The null hypothesis of independence among the variables is accepted. However, concluding statistical independence among the variables would imply that the indicated institutional effects do not affect mortgage choice.

The chi-square test is not as robust as parametric tests and yields only approximate results. Its merit is in its simplicity and the fact that it does not require that its underlying population parameter follow any particular distribution. These premises

were most appropriate for the data due to the limitations surrounding the sampling procedure.

Variable Definitions

The six variables employed in the tests are:

- MSA*: Mortgage Search Agents. The sources consulted for the purpose of gathering information about the mortgage market. *MSA* is coded as: 1 = real estate agents; 2 = friends and neighbors; 3 = mortgage bankers and brokers; 4 = depository institutions; and 5 = multiple sources.
- MCA*: Mortgage Choice Approach. The sources relied upon for making the final decision about the mortgage instrument after information evaluation. *MCA* is coded as: 1 = mortgage institutions (lenders and brokers); 2 = informal sources (self, friends/neighbors); and 3 = real estate agents
- MSI*: Mortgage Search Intensity. The number of borrowing sources consulted prior to making the loan decision. An average of two sources was consulted. *MSI* is calibrated as: 0 = 0–2 sources; and 1 = >2 sources.
- RACE*: Ethnicity of the borrower. Due to sample size problem, this was classified as Black and non-Black with Caucasians dominating the latter group. *RACE* is calibrated as: 1 = Black; and 0 = Other.
- FRM*: Borrower's choice between fixed and variable rate mortgages. *FRM* is calibrated as 0 = adjustable-rate mortgage; and 1 = fixed-rate mortgage.
- INCOM*: Income of borrower. This was broken into: 1 = lower-to-moderate income; 2 = middle income; and 3 = upper income. This nomenclature was built around the 1996 median income of \$45,900 for the DC-PMSA. Lower-to-moderate income group consisted of borrowers with incomes less than 80% of this median (<\$40,000). The middle income group earned 80%–120% (\$40,000–\$55,000) and the rest were upper income (>\$55,000).

Tests for Joint-Effects of Ethnicity/Race (or Income) and Institutional Variables

The results of the tests on the joint influence of borrower's race (*RACE*) or income (*INCOM*) and the institutional variables (*MCA*, *MSI* and *MSA*) on mortgage choice are tabulated in Exhibit 6. The test for the joint effect of race (*RACE*) and mortgage choice approach (*MCA*) on mortgage choice (*FRM*) was found to be significant at the 10% level. The power of the test was 0.0697, indicating that the probability of incorrectly rejecting the null hypothesis of dependence among the variables is 6.97%. This implies that ethnicity (*RACE*) interacts with the channels by which borrowers evaluate market information (*MCA*) in borrowers' mortgage

choice. These channels include mortgage institutions, real estate agents or informal approaches. The joint effect of race and the other two institutional variables (*MSI* and *MSA*) were not found to be significant in this regard. Similarly, the hypothesis that ‘institutional forces interact with income in the determination of mortgage choice’ is rejected as indicated by the results of the tests relating income (*INCOM*) to the institutional variables (*MCA*, *MSI* and *MSA*). This latter result is contrary to the conclusions from the analysis of HMDA data. The test for the joint effect of race and income in mortgage choice determination also indicates an absence of any relationship among the variables. This might be a consequence of the sampling distribution.

Test for the Composite Effect of Institutional Variables on Mortgage Choice

The test for the joint-effect of all three institutional variables (*MCA*, *MSI* and *MSA*) on borrower choice between FRM and VRM was found to be significant at the 5% level. Individually, none of the variables exerted any influence on the borrowing decision while only the mortgage choice approach (*MCA*) influenced this decision when interfaced with *RACE*.

Conclusion

This study examined the intricacies associated with the influence of demographic and institutional forces on mortgage choice through an inter-temporal analysis of the HMDA data coupled with 1996 survey data on borrowers in the Washington D.C. Primary Metropolitan Statistical Area. The exploration of the institutional factors inherent in the mortgage market logistics and information flow in this area leads to the conclusion, based on a chi-square test at the 5% level of significance, that these forces exert a significant influence on borrower behavior. Race in conjunction with the channel by which borrowers evaluate market information to select a lender and mortgage instrument was also found significant in this decision while income alone or interfaced with the institutional forces was not significant. The latter confirms earlier studies by Sa-Aadu and Sirmans (1995) and Sa-Aadu and Megbolugbe (1995).

Institutional variables were constructed after a close evaluation of the path that borrowers in the mortgage market have to navigate in making borrowing decisions, providing another dimension to the measurement of market conditions. The findings indicate that the mortgage market is not frictionless. Cultural, demographic and institutional forces interact to affect the availability and use of information. Hence, borrower choice, such as the choice between fixed and variable rates, is made within the institutional context defined by the market environment of the lending and borrower decision paths. The friction along this decision path (*MSA*, *MSI* and *MCA*) is able to filter out some of the available information for borrower decision making, depriving them of utility-maximizing

outcomes. This will tend to occur more in the sub-prime mortgage market or under predatory lending practices particularly for some low-to-moderate income, minority borrowers. This suggests that such borrowers face an imperfect market and require assistance with clearing the frictions to information flow along the borrower's decision path to optimize their borrowing decision. Automation and risk-based pricing would help only as the wall of digital divide breaks down. Since this study is regional in scope, an expanded study of the broader, national audience employing more robust sampling techniques will be needed to validate the impact of the institutional constraints.

Appendix

Residential Mortgage Search Survey

Item #	Item Responses			Item Responses	
	#	%		#	%
3. Loan Purpose			9. Your application was submitted to a		
Home Purchases	113	78	Commercial bank	47	32
Refinancing	28	19	Savings and Loan	9	6
Other	5	3	Credit Union	10	7
TOTAL	146	100	Mortgage Broker	74	50
			Other	7	5
			TOTAL	147	100
4. Loan Type			10. Your choice of lender was made through		
FHA/VA	49	38	Lender's Advert	17	12
Conventional	75	57	Mortgage Broker's Advert	31	21
Other	7	5	Referral by a real estate agent	48	33
TOTAL	131	100	Friends/Neighbor	28	19
			Own self search	17	12
			Other	4	3
			TOTAL	145	100
5. Type of Instrument			15. Type of House		
Fixed Rate	103	79	Single Family	79	59
1-year Adjustable	14	11	Townhouse	48	36
3-year Adjustable	13	10	Apartment/Condominium	7	5
TOTAL	130	100	TOTAL	134	100
7. Is it a First-Time Home Loan ?			18. Your Household Type		
Yes	88	64	Husband-Wife	90	71
No	50	36	Single Parent	19	15
TOTAL	138	100	Single Individual	18	14
			TOTAL	127	100
			20. Ethnic Origin		
			Black	81	75
			Hispanic	3	3
			White	18	17
			American Indian	0	0
			Asian	5	5
			TOTAL	107	100

Appendix (continued)

Residential Mortgage Search Survey

Item #

11.	In your loan search, which of the following did you consult for advice or direction?		
		Size (#)	Percent
	a. Real estate agents only	22	20%
	b. Friends and Neighbors only	14	13%
	c. Mortgage brokers only	18	17%
	d. Depository institutions (banks, S&L, Credit Union)	19	17%
	e. Agents/Friends (a. + b.)	8	7%
	f. Friends/Mortgage broker (b. + c.)	4	4%
	g. Agents/Mortgage broker (a. + c.)	4	4%
	h. Three or more sources (a. + b. + c. + d.)	20	20%
	TOTAL	109	100
13.	Why did you chose your current loan among others?		
	a. Lowest interest rate	65	48%
	b. Convenience	33	24%
	c. My only option	28	21%
	d. Lowest rate / Convenience (a. + b.)	10	7%
	TOTAL	136	100%

CONTINUOUS VARIABLES

	Mean	Std Dev.	#obs.
2. Loan Amount	\$125,790	\$53,860	147
12. Potential borrowing sources considered	1.99	1.55	139
14. House Price	\$148,168	\$65,875	142
16. Length of time in current residence (years)	8.03	6.02	136
17. Approximate household income	\$76,640	\$58,417	132
19. Number of Children under 18 yr. Living at home	0.92	0.97	128
20. Age of oldest child living at home (years)	\$14	6.6	67

Residential Mortgage Search Survey

1. Loan Application Date _____ Loan Closing Date _____
2. Loan Amount \$_____ Interest_____ # Points_____
3. Loan Purpose: Home Purchase () Refinancing () Other ()
4. Loan Type: FHA/VA () Conventional () Other ()
5. Type of Instrument: Fixed-Rate () 1-Year Adjustable () 3-Year Adjustable () Other ()
6. If adjustable, is it convertible? Yes () No ()
7. Is it a first-time home loan? Yes () No ()
8. Lenders Name/Address _____
9. Your loan application was submitted to a: Commercial Bank () S&L () Credit Union () Mortgage Broker () Other () _____
10. Your choice of lender was made through.....(check all applicable)
Lender's Advert () Mortgage Broker's Advert. () Referral by real estate agent () Friends/Neighbors () Your Own Self Evaluation () Other () _____
11. In your loan search, which of the following did you consult for advice or directions?
Commercial Bank () Savings & Loan () Credit Union () Mortgage Broker () Real estate agent () Newspaper Advert. () Friends and Neighbors () Other ()
12. How many potential borrowing sources did you consult prior to your decision? _____
13. Why did you choose your current loan, among others?
Lowest Interest Rate () Convenience () My Only Option ()
14. House Price _____ Location (zip code only) _____
15. Type of House: Single Family () Townhouse () Apartment Condominium ()
16. How long have you lived in your current residence? _____
17. Approximate household annual income? _____
18. Your household type: Husband-Wife () Single Parent () Single Individual ()
19. Number of children under age 18 living at home? _____ Age of Oldest Child _____
20. Ethnic Origin: Black () Hispanic () Caucasian () American Indian () Asian ()

Endnotes

- ¹ Courchane, Nebhut and Nickerson (2000) explained this thus: “The decision to approve or deny a loan is based primarily on the applicant’s credit but also may include demographic, economic and property-specific attributes.”
- ² Ratner (1976), pages 121 and 125. Ignorance, cultural attitude to debt, lack of understanding of the application and mortgage finance system prompted these perspectives.
- ³ In the light of the digital divide, this development potentially creates mortgage market frictions for low-to-moderate income minorities who have disproportionately lower access to the information superhighway.

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L. Jide Iwarere, Howard University, Washington, DC 20059 or liwarere@fac.howard.edu.

John E. Williams, Morehouse College, Atlanta, GA 30014 or jwilliam@morehouse.edu.