A LOOK BEHIND THE NUMBERS

Home Lending in Hamilton County Neighborhoods

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KEY FINDINGS

Prior to the Great Recession, application rates for home mortgages were much higher in Hamilton County's low- and moderate-income (LMI) neighborhoods than in its non-LMI neighborhoods. Consistent with national trends, application rates fell sharply in the lower-income areas as the Great Recession took hold, falling below the rates in the non-LMI neighborhoods, a reversal of the prerecession trend.

From 2004 to 2010, the year immediately following the Great Recession, application rates fell by 67 percent in Hamilton County's low-income neighborhoods and by 61 percent in its moderate-income neighborhoods. Nationally, application rates fell more sharply, declining 77 percent in low-income neighborhoods and 73 percent in moderate-income neighborhoods during this same period. Application rates in Hamilton County's LMI neighborhoods increased in both 2012 and 2013, but the rates remain considerably lower than the prerecession rates.

During the 13-year period from 2004 through 2016, origination rates reached their highest point in 2015 in all but the low-income neighborhoods of Hamilton County, where origination rates reached their peak in 2016. Origination rates reached their low point for all neighborhood types in 2007 during the height of the Great Recession.

Since the Great Recession, homeowners living in high-income neighborhoods have been most able to take advantage of low interest rates to refinance their homes. In 2011, 57 percent of all refinance originations in Hamilton County occurred in high-income neighborhoods; by 2013, the share fell to 47 percent, but that is still higher than the prerecession average of 30 percent.

In every year examined, white LMI borrowers are proportionally more likely to get a home purchase loan than black LMI borrowers. In 2005, there were 70 home purchase loans by white LMI borrowers for every 1,000 white LMI households, compared to just 32 home purchase loans by black LMI borrowers for every 1,000 black LMI households. While the rates declined for both races from 2005 to 2010, the declines were significantly higher for black LMI borrowers than for white LMI borrowers: 60 percent compared to 42 percent, respectively.

OVERVIEW

In this series of reports, we examine home lending activity in some of the largest counties of the Fourth Federal Reserve District[1] using Home Mortgage Disclosure Act (HMDA) data. Enacted in 1975, the HMDA requires most mortgage lending institutions to report annually on their home mortgage lending activity. The specific data reported can be useful in identifying whether the institutions are meeting the housing finance needs of the communities in which they operate.[2] By law, lenders must provide information on the disposition of applications, including loan purpose and type, applicant income and race, and the geographic location of applications and originations. This detailed dataset, which is distributed by the Federal Financial Institutions Examination Council (FFIEC), allows us to track application and origination trends across time and by neighborhood income groups.

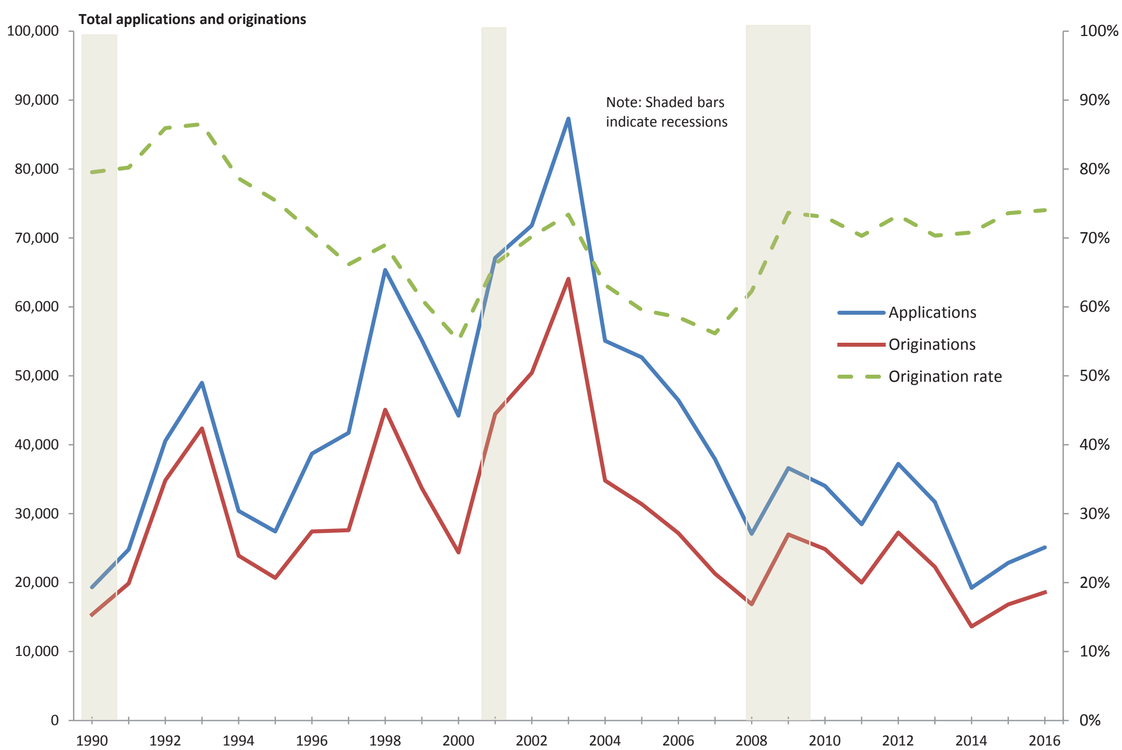
This report focuses on Hamilton County, Ohio, home to the city of Cincinnati. It takes a broad look at application and origination activity during the past 27 years (1990 through 2016) and then focuses on trends during the 13-year period from 2004 through 2016. Using figures, tables, and maps, we analyze mortgage lending during the 13-year period from both the neighborhood and individual borrower perspectives, with a particular focus on highlighting the differences observed in the pre- and post-Great Recession periods.

THE PAST 27 YEARS

During the 27-year period from 1990 through 2016, both loan applications and loan originations peaked in 2003 before falling through 2008, the height of the Great Recession (*Figure 1*). Applications for purchasing, refinancing, or improving a home dropped by 60,000 (69 percent) from 2003 to 2008, and originations declined by 47,000 (74 percent) during this same period. Both applications and originations fell to their lowest point in 2014 during the 27-year period before rebounding slightly in 2015 and increasing again in 2016.

During the 27-year period from 1990 through 2016, the *origination rate*—the share of loan applications approved by the lender and accepted by the borrower—reached a high of 87 percent in 1993 and a low of 55 percent in 2000. As we entered the Great Recession in 2007, the origination rate stood at 56 percent but increased sharply to 74 percent in 2009. Since the Great Recession ended, origination rates in Hamilton County have hovered around 70 percent.

Figure 1: Hamilton County Application and Origination Activity

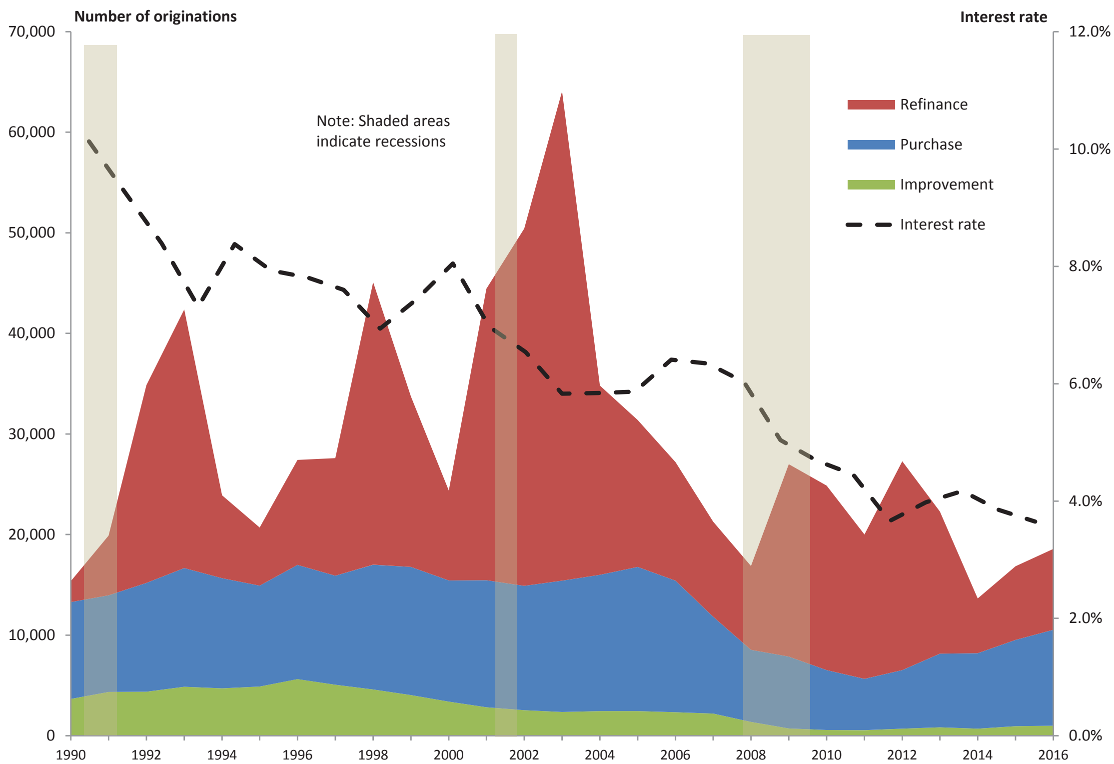


Source: Home Mortgage Disclosure Act (HMDA) data; includes applications and originations for owner-occupied, 1- to 4-family structures. Prepared by the Community Development Department at the Federal Reserve Bank of Cleveland.

To better understand these varying origination numbers, we separated the loans by purpose: home purchase, home refinance, and home improvement (*Figure 2*). Home purchase originations reached their peak in 2005 at just over 14,000 loans, a figure which comprised 46 percent of all originations in that year. Refinance originations reached their peak in 2003 at about 48,600 loans or 76 percent of all originations that year. Refinance originations drove the spikes in origination activity, and these spikes coincided with times of lower interest rates.

When looking at home purchase originations by loan type, we find that conventional loans comprised more than 90 percent of the home purchase activity in the years immediately preceding the Great Recession (2005 to 2007). However, by 2009, conventional loans made up only 48 percent of all originations in Hamilton County, while FHA-insured loans made up 49 percent and VA loans made up 3 percent. After 2009, the share of originations by conventional lenders increased each year—reaching 73 percent in 2014—until 2016, when it decreased to 69 percent. As of 2016, FHA-insured loans comprise about 25 percent of all home purchase originations, up from 22 percent in 2014.

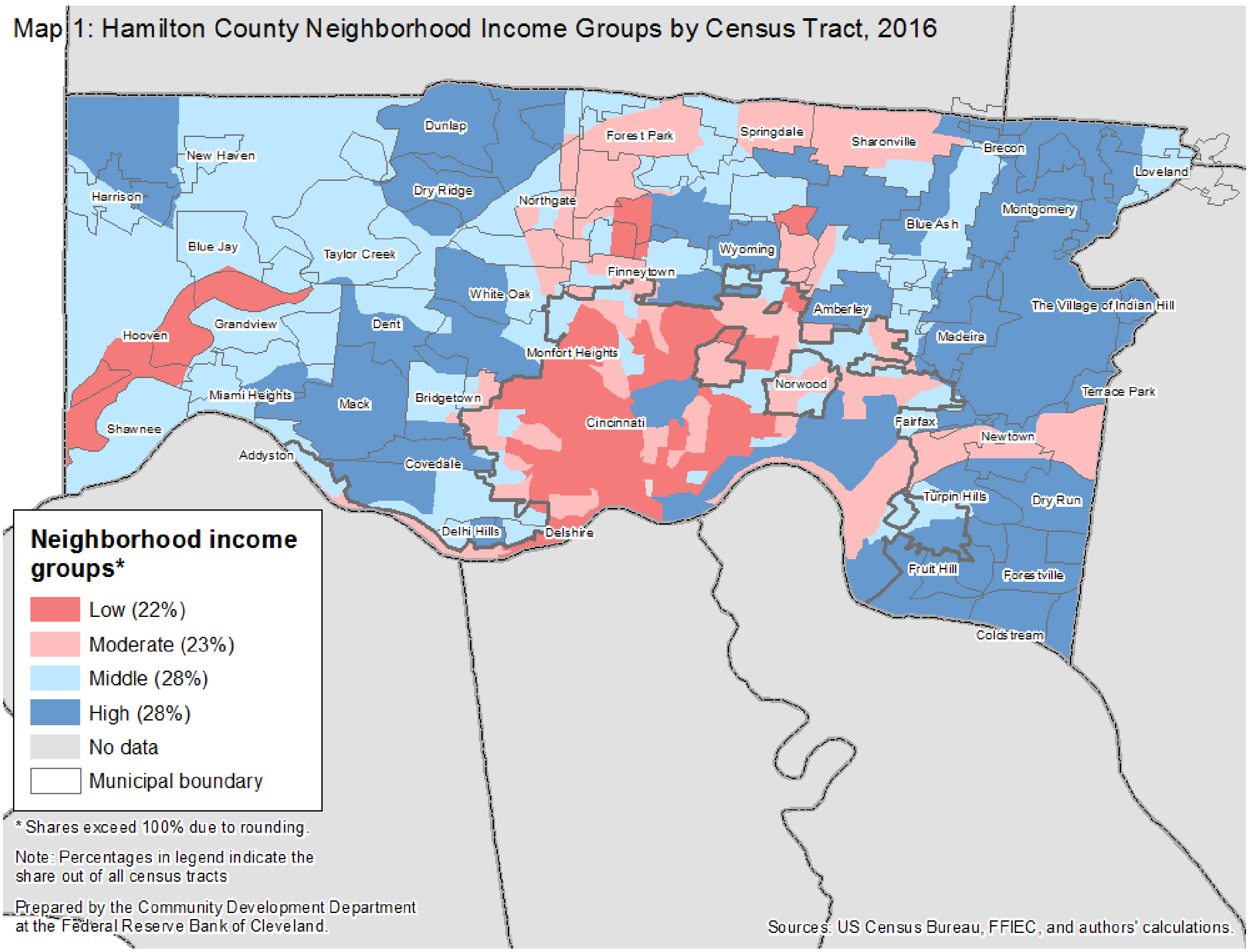
Figure 2: Hamilton County Originations by Loan Purpose



Sources: Home Mortgage Disclosure Act (HMDA) data and Freddie Mac Primary Mortgage Market Survey data (conventional, conforming 30-year fixed-rate mortgages); originations for owner-occupied, 1- to 4-family structures.
Prepared by the Community Development Department at the Federal Reserve Bank of Cleveland.

HAMILTON COUNTY MAP OF INCOME GROUPS

Map 1 shows the geographic distribution of income groups across Hamilton County in 2016. These groups are calculated by dividing the median family income of a census tract by the median family income of the metropolitan statistical area (MSA). As shown, the low- and moderate-income census tracts are located mostly in the city of Cincinnati and in the communities north of the city. The upper-income areas can be found mainly in the outer-ring areas of the county, with a few high-income communities found within the city boundary.



Map 1: Hamilton County Neighborhood Income Groups by Census Tract, 2016

A CLOSER LOOK AT NEIGHBORHOOD INCOME GROUPS BY APPLICATIONS

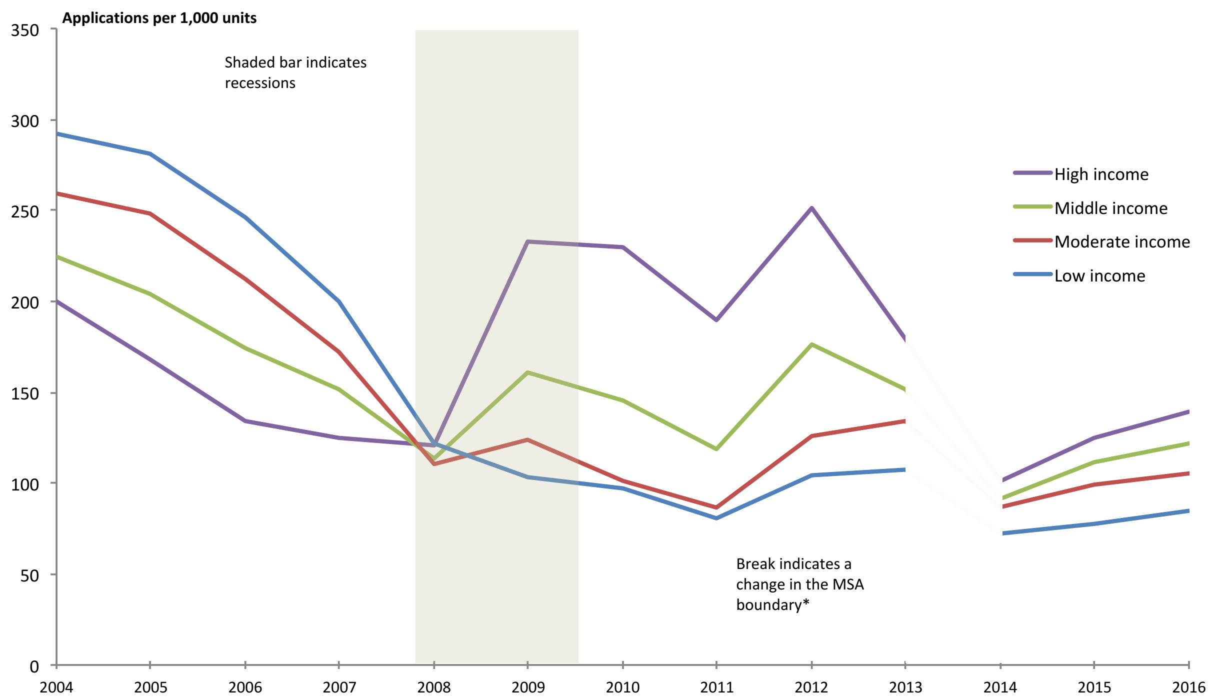
In this section, we examine application rates in Hamilton County from 2004 through 2016 by neighborhood income groups. We focus on these years (2004 through 2016) to highlight the differences observed in the pre- and post-Great Recession periods. In order to compare loan applications across time and income groups, we examine application rates, which we calculate as the number of applications per 1,000 owner-occupied housing units. This allows us to control for neighborhood size.

Importantly, the Cincinnati MSA boundary changed in 2013—Union County, Indiana, was added to and Franklin, Indiana, was removed from the MSA—and the new boundary was in effect beginning with the 2014 HMDA data. This change may impact the comparability of the neighborhood and borrower income groups before and after the boundary revision because the MSA income is used to calculate the neighborhood and borrower income groups. To better understand the potential impact of the boundary change, we estimated the MSA median family in consistent boundaries using interpolation methods and compared it to MSA median family income in the current boundaries. Between the MSA median family income in the new boundary (2013) and our estimated income, we found about a 1 percent difference; this suggests the boundary revision may have minimal impact on the neighborhood income groupings. Nonetheless, caution should be used when comparing pre-2014 data to the most recent data (2014 through 2016).

As illustrated in *Figure 3*, application rates were higher in the LMI neighborhoods than in the middle- and high-income neighborhoods in the years leading up to the Great Recession. In 2004, there were 292 applications for every 1,000 owner-occupied housing units in low-income neighborhoods, the high during the 13-year period. This was almost identical to the nation's 2004 application rate, which was about 291 applications in low-income neighborhoods for every 1,000 owner-occupied housing units.

But as the Great Recession took hold in 2008, the application rates in Hamilton County's LMI neighborhoods dropped below the rates in the high- and middle-income neighborhoods. By 2010, the year immediately following the Great Recession, there were just 97 applications for every 1,000 owner-occupied housing units in Hamilton County's low-income neighborhoods, a decline of 67 percent from 2004. Since 2009, the noticeable spikes in application rates, mostly found in the middle- and high-income neighborhoods, have been driven by refinancing activity and low interest rates; this pattern is observed nationally as well.

Figure 3: Hamilton County Loan Applications per 1,000 Owner-Occupied Units by Neighborhood Income Group



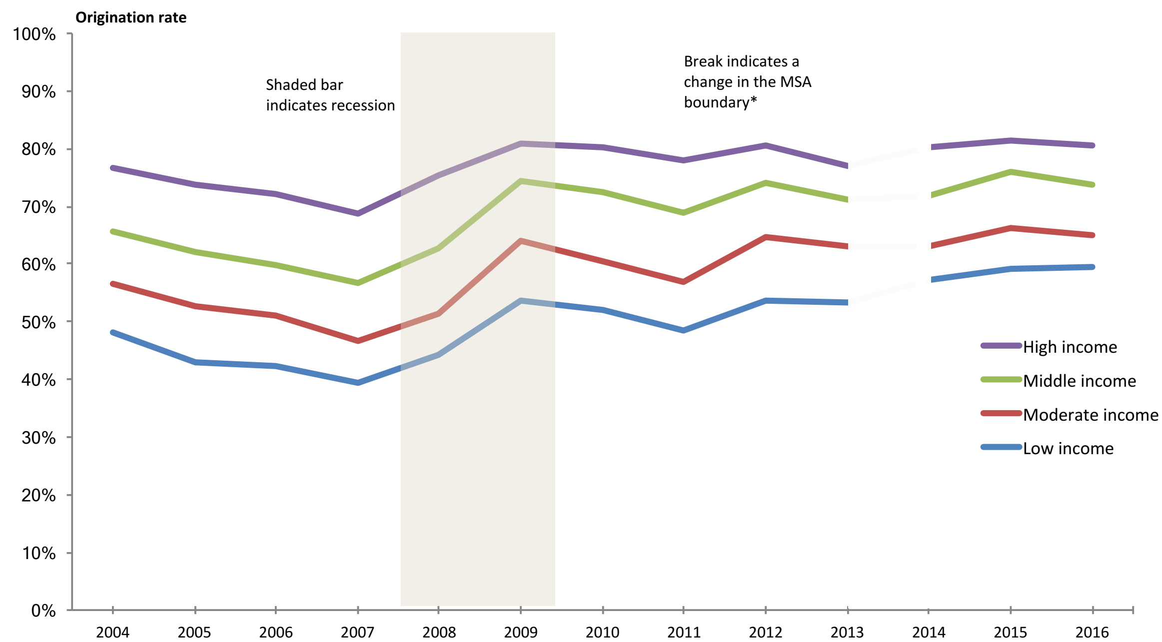
Sources: Home Mortgage Disclosure Act (HMDA) data and US Census Bureau; applications for first-lien, owner-occupied, 1- to 4-family units.
*The Cincinnati MSA boundary change was in effect with the 2014 HMDA. Given the MSA median family income is used in calculating borrower and neighborhood income groups, caution should be used when comparing pre-2014 data to the most recent data (2014 through 2016) .
Prepared by the Community Development Department at the Federal Reserve Bank of Cleveland.

A CLOSER LOOK AT ORIGINATIONS BY NEIGHBORHOOD INCOME GROUPS

Looking at origination rates from 2004 through 2016, we see large gains in the rates from 2007 to 2009, particularly in the LMI and middle-income neighborhoods (*Figure 4*). From 2007 to 2009, origination rates increased 17 percentage points in moderate- and middle-income neighborhoods and 14 percentage points in low-income neighborhoods.

Those applying for mortgage loans in Hamilton County were more likely to have them originated during the post-Great Recession period (2009–2016) than during the period prior to the Great Recession. This is true across all neighborhood income groups.

Figure 4: Hamilton County Origination Rates by Neighborhood Income Group



Sources: Home Mortgage Disclosure Act (HMDA) data and US Census Bureau; originations for first-lien, owner-occupied, 1- to 4- family structures.
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Origination rates vary depending on the purpose of the loan. Loan applications for the purpose of purchasing a home are more likely to be approved than applications for the purpose of refinancing a home. Borrowers must meet loan-to-value standards, among other requirement, to refinance their homes—a threshold that may be particularly difficult to meet in areas with stagnant or falling home values. *Table 1* shows origination rates by loan purpose for three years: 2005, the year prior to the Great Recession; 2010, the year immediately following the Great Recession; and 2016, the most current year of data available.

Table 1: Hamilton County Origination Rates by Loan Purpose and Neighborhood Income Group, percent

	2005		2010		2016*	
	Home purchase	Refinance	Home purchase	Refinance	Home purchase	Refinance
Low income	59.9	35.5	65.3	46.3	79.0	43.7
Moderate income	68.5	44.0	75.9	54.5	83.5	48.4
Middle income	78.8	52.1	82.4	69.5	86.9	61.5
High income	83.8	66.0	87.0	79.2	89.6	73.6

Sources: Home Mortgage Disclosure Act (HMDA) data and US Census Bureau; includes purchase and refinance originations for first-lien, owner-occupied, 1- to 4-family units.

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Examining these data, we find that home purchase origination rates increased from 2005 to 2010 across all neighborhood income groups, ranging from a 3 percentage point increase in high-income neighborhoods to a more than 7 percentage point increase in moderate-income neighborhoods. While applicants were more likely to receive a home purchase loan when applying for one in 2010, there were considerably fewer individuals applying for loans in 2010 than there were in 2005. Home purchase applications fell by more than 56 percent from 2005 to 2010 in Hamilton County, with large declines in applications occurring in each of the neighborhood income groups. In the LMI neighborhoods of the county, the number of home purchase applications dropped by 70 percent.

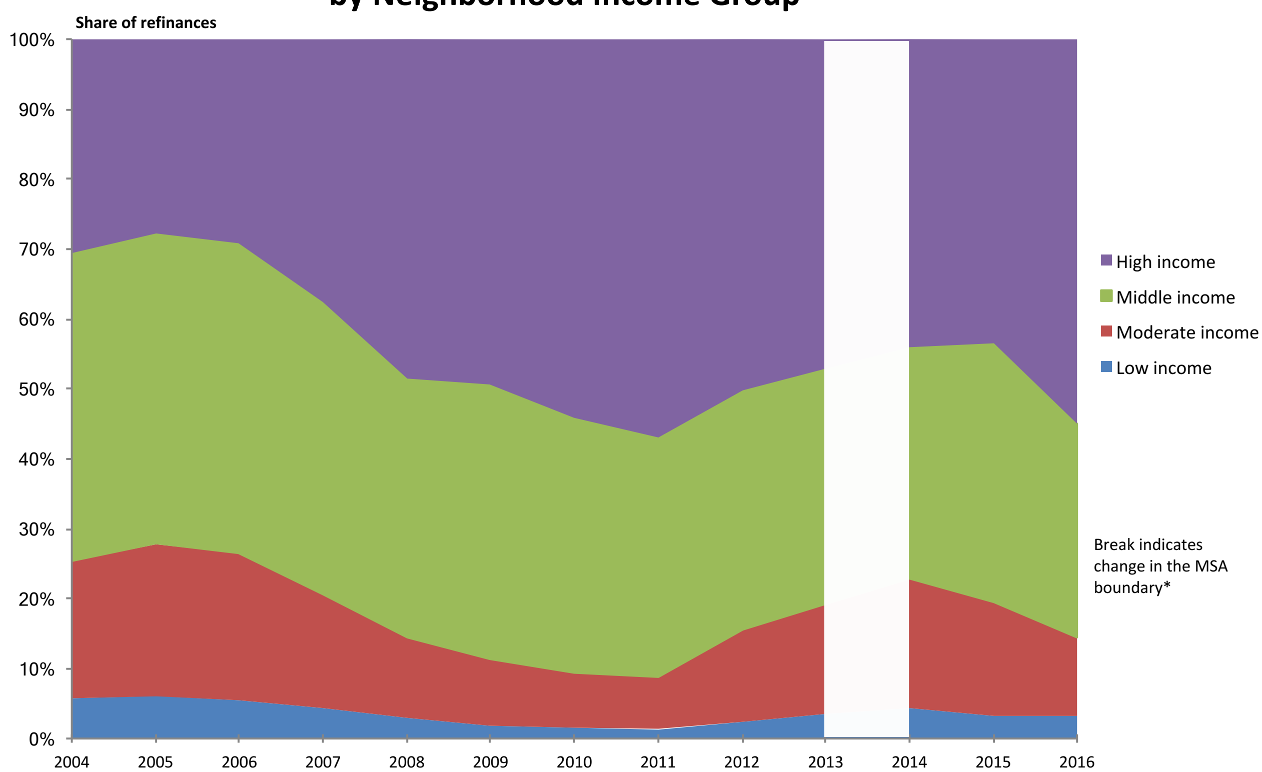
Refinance origination rates also increased from 2005 to 2010 across all neighborhood income groups, with the largest percentage point increase (17 percent) occurring in the middle-income neighborhoods of the county. Unlike home purchase applications, however, the overall number of refinance applications in Hamilton County remained virtually unchanged from 2005 to 2010. Yet when looking at refinance applications by neighborhood income group, we find the high-income neighborhoods experienced a 129 percent increase in applications from 2005 to 2010, while each of the other neighborhood income groups experienced declines in applications.

Looking at the 2016 data, we find that less than half (44 percent) of the homeowners living in low-income neighborhoods were able to refinance their homes compared to 74 percent of the homeowners living in the high-income neighborhoods of Hamilton County. When looking at home purchase loans in 2016, we find that more than 79 percent of those who applied for a loan in 2016 received one, regardless of neighborhood income group.

A CLOSER LOOK AT ORIGINATIONS BY INCOME GROUPS AND LOAN PURPOSE

Refinance activity in Hamilton County's LMI neighborhoods peaked in the pre-Great Recession years (*Figure 5*). More than 25 percent of all refinance originations occurred in the county's LMI neighborhoods in each year prior to 2007, exceeding national refinance shares by more than 10 percentage points. By 2016, the share of refinances in the LMI neighborhoods of Hamilton County was comparable to the national share—14 percent compared to 13 percent, respectively. From 2004 to 2007, the largest share of refinances occurred in the middle-income neighborhoods of Hamilton County; however, beginning in 2008 and continuing through 2016, the majority of refinances took place in the county's high-income neighborhoods.

Figure 5: Share of Refinance Loans in Hamilton County by Neighborhood Income Group



Sources: Home Mortgage Disclosure Act (HMDA) data and US Census Bureau; refinance originations for first-lien, owner-occupied, 1- to 4-family structures.
*The Cincinnati MSA boundary change was in effect beginning with the 2014 HMDA data. Given the MSA median family income is used in calculating borrower and neighborhood income groups, caution should be used when comparing the pre-2014 data to the most recent data (2014 through 2016).
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Map 2 illustrates the percent change in the number of refinance originations from the period right before the Great Recession and the period immediately following the Great Recession. As shown, refinancing activity increased mainly in the communities at the outer edges of Hamilton County. The largest declines in refinancing activity occurred mostly in Cincinnati and in the communities north and east of the city.

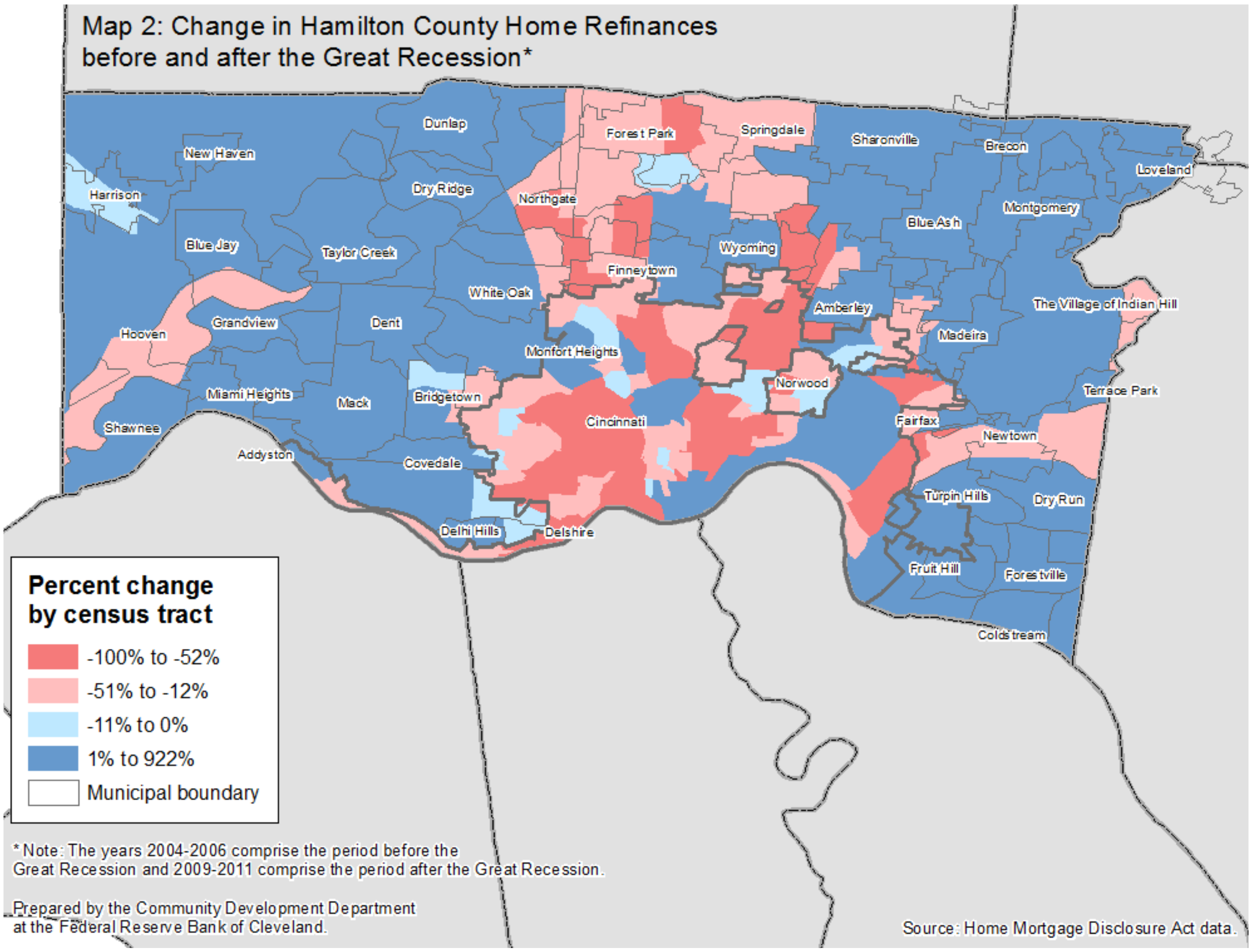
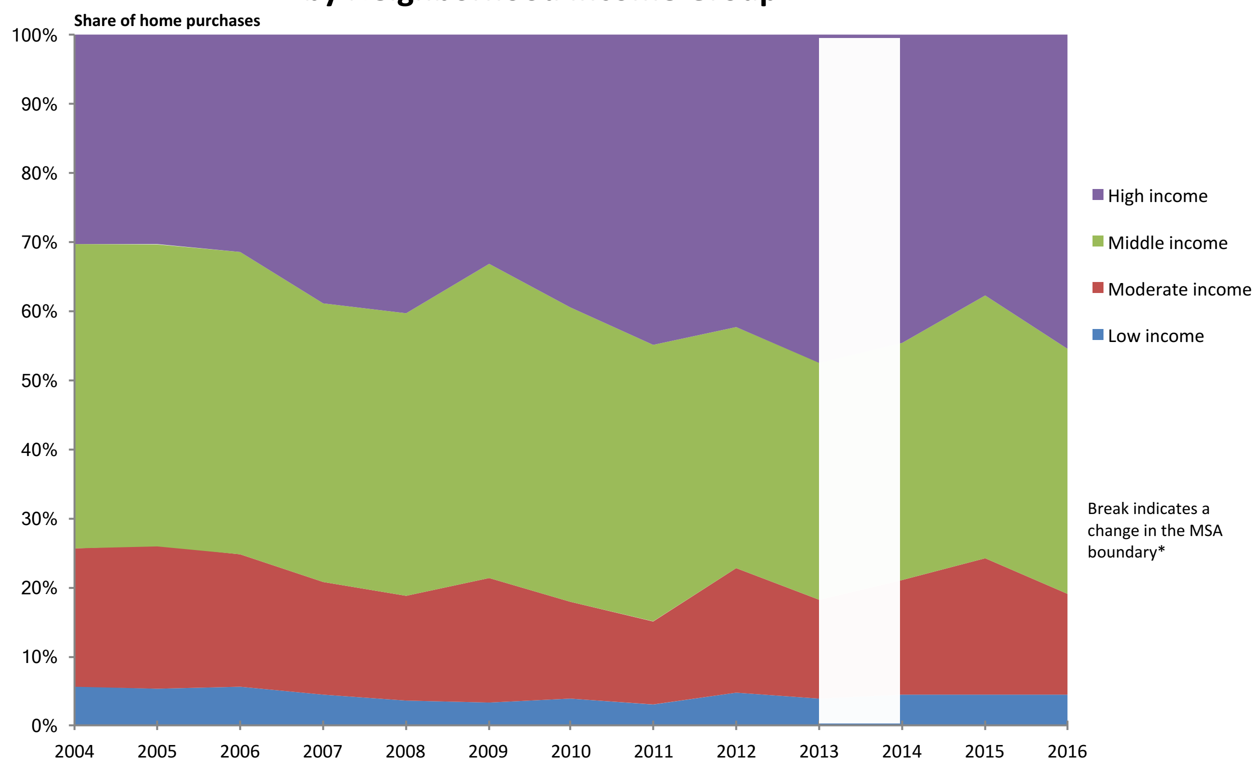


Figure 6 shows the share of home purchase originations by neighborhood income group. The share of home purchase originations in LMI neighborhoods reached a high of 26 percent in both 2004 and 2005 before falling to a low of 15 percent in 2011. However, since 2011 the share of home purchases in the county's LMI neighborhoods has increased and has lingered around 20 percent.

Conversely, the share of home purchase originations occurring in middle- and high-income neighborhoods (non-LMI) is higher in the post-Great Recession years than in the years leading up to the Great Recession. In 2011, 85 percent of all home purchases occurred in the non-LMI neighborhoods of Hamilton County, the high during the 13-year period.

Figure 6: Share of Home Purchase Loans in Hamilton County by Neighborhood Income Group



Sources: Home Mortgage Disclosure Act (HMDA) data and US Census Bureau; purchase originations for first-lien, owner-occupied, 1- to 4-family structures.
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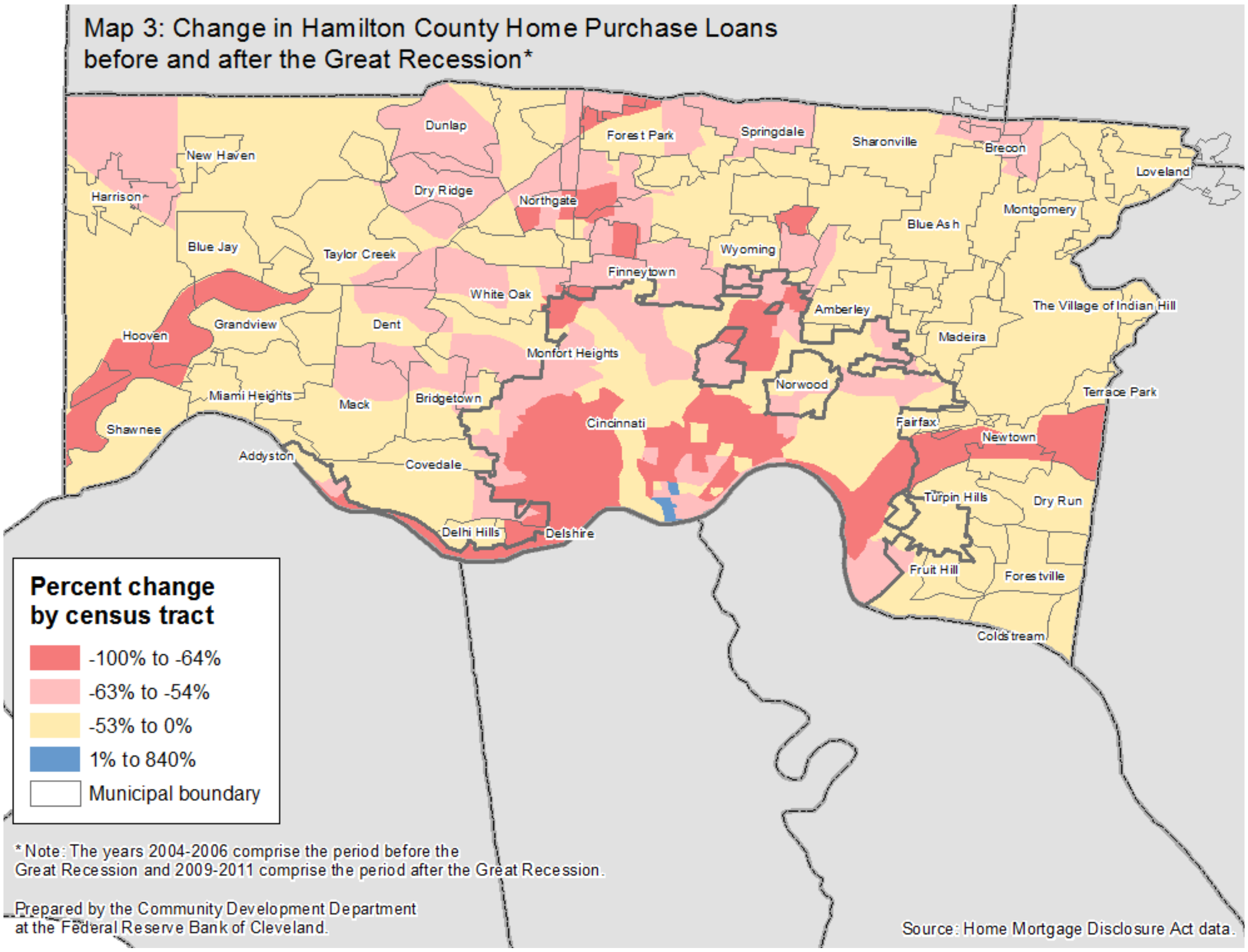
Map 3 displays the percent change in the number of home purchase originations from the pre-Great Recession period to the post-Great Recession period. The majority of areas in Hamilton County experienced declines in home purchase loans; the largest decreases occurred in and around the city of Cincinnati and a few areas in the far north, east, and west of the county.



WHO'S PURCHASING AND WHERE

Next, we look at who is purchasing homes (with a loan) by borrower income and race and in what neighborhoods.[3] We compared three years: 2005, the peak year for home purchases prior to the beginning of the Great Recession; 2010, the year immediately following the Great Recession; and 2016, the most current year of data in our analysis.

Home Purchase Loan Rates per 1,000 Households

Figure 7 shows the home purchase loan rate for non-Hispanic white and non-Hispanic black borrowers by income group.[4] We calculate the home purchase loan rate by dividing the number of home purchase originations in each race and income group by the total number of households with that same race and income group. We can then compare the differences across race and income categories while accounting for the size of the population in each group. We focus on non-Hispanic black and non-Hispanic white borrowers only since they account for the majority of home purchase loans originated in Hamilton County in every year in our analysis.

Figure 7: Home Purchase Loans by Race and Income of Borrowers per 1,000 Households in Hamilton County

Sources: Home Mortgage Disclosure Act (HMDA) data and US Census Bureau; purchase originations for first-lien, owner-occupied, 1- to 4-family units.
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In each of the three years examined, we found that non-Hispanic white borrowers are *proportionally* more likely to get a home purchase loan than non-Hispanic black borrowers. This was true for both LMI and non-LMI borrowers in Hamilton County. For example, in 2005 there were 70 home purchase loans made to white LMI borrowers for every 1,000 white LMI households compared to just 32 home purchase loans made to black LMI borrowers for every 1,000 black LMI households. Put another way, white LMI borrowers were 2.2 times more likely to obtain a home purchase loan in 2005 than black LMI borrowers. In 2010, the rate differences widened: White LMI borrowers were about 3.1 times more likely than black LMI borrowers to acquire a home purchase loan that year. The rate difference broadened even more in 2016, when white LMI borrowers were more than 3.6 times as likely as black LMI borrowers to obtain a home purchase. For non-LMI borrowers, the rate differences across the races are not as great, but white non-LMI borrowers are still nearly 2 times more likely than black non-LMI borrowers to get a home purchase loan.

We find home purchase loan rates declined from 2005 to 2010, but the declines were larger for black borrowers. The home purchase loan rate fell by 60 percent for black LMI borrowers compared to a drop of 42 percent for white LMI borrowers. For non-LMI borrowers, the declines were even larger: 73 percent for black non-LMI borrowers and 53 percent for white non-LMI borrowers.

Home Purchase Originations (Loans) by Race and Borrower Income and Neighborhood Income Groups

Next we take a closer look at origination rates and categorize them by race, income, and location for the same three years: 2005, the peak year for home purchases prior to the beginning of the Great Recession; 2010, the year immediately following the Great Recession; and 2016, the most current year of data in our analysis.

We see that home purchase origination rates increased over time for LMI and non-LMI borrowers by race and neighborhood income group (*Table 2*). At the same time, origination rates are higher for white borrowers than for black borrowers applying for a home purchase loan across each year and within the borrower and neighborhood income groups.[5] Yet, the origination rates for black borrowers increased more from 2005 to 2010 than did the origination rates for white borrowers in the same years, shrinking the gaps in the rates by race.

As shown in *Table 2*, about 58 percent of black LMI borrowers who applied for a home purchase loan in Hamilton County's LMI neighborhoods in 2005 received that loan, compared to 73 percent for their white counterparts, a difference of 15 percentage points. By 2010, the rate difference fell to 9 percentage points. Looking at non-LMI black borrowers in 2005, we find that 64 percent of those who applied for a home purchase loan in an LMI neighborhood received one, compared to 77 percent of white non-LMI borrowers, a difference of 13 percentage points. In 2010, the difference in rates dropped to just 8 percentage points.

Table 2: Home Purchase Origination Rates by Race, Income, and Location of Purchases in Hamilton County, percent

	2005	2010	2016*
LMI BORROWERS			
Home purchase origination rates in LMI neighborhoods			
Black LMI borrowers	58.2	67.4	75.9
White LMI borrowers	72.9	76.8	86.1
Home purchase origination rates in non-LMI neighborhoods			
Black LMI borrowers	63.5	70.7	76.2
White LMI borrowers	81.0	83.4	86.6
NON-LMI BORROWERS			
Home purchase origination rates in LMI neighborhoods			
Black non-LMI borrowers	64.3	72.5	77.2
White non-LMI borrowers	76.8	80.8	87.8
Home purchase origination rates in non-LMI neighborhoods			
Black non-LMI borrowers	66.4	71.1	82.7
White non-LMI borrowers	87.2	89.1	91.3

Sources: Home Mortgage Disclosure Act (HMDA) data and US Census Bureau; includes purchase originations for first-lien, owner-occupied, 1- to 4-family units.

Race categories include non-Hispanic white and non-Hispanic black borrowers.

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Black non-LMI borrowers applying for home purchase loans in non-LMI neighborhoods are less likely to get the loan than are white LMI borrowers when applying for loans in non-LMI neighborhoods. For example, 71 percent of black non-LMI borrowers in 2010 received the home purchase loan they applied for in a non-LMI neighborhood. In this same year, 83 percent of white LMI borrowers received the loan they applied for in a non-LMI neighborhood. Information that may be helpful in explaining these differences, such as a borrower's credit score, debt, or employment history, is not currently available in the HMDA data.

Where Borrowers are Purchasing Homes

We take the analysis one step further and look at where LMI and non-LMI borrowers are using loans to purchase homes and how this activity has changed over time. *Table 3* shows the share of home purchase loans in each neighborhood income group by race and income of borrower.

Home purchase loans fell for both races and borrower income groups from 2005 to 2010, but the declines were considerably higher for black borrowers (65 percent) than for white borrowers (49 percent). The number of home purchase loans did increase from 2010 to 2016 for both black borrowers and white borrowers, with both experiencing similar percentage gains.

Table 3: Home Purchases in Hamilton County by Race and Income of Borrower and Location of Purchase

	2005	2010	2016*	% Change 2005–2010	% Change 2010–2016*
Home purchases by all black borrowers	1,612	565	887	-65.0	57.0
Purchases in LMI neighborhoods	56.2%	45.8%	46.7%		
Purchases in non-LMI neighborhoods	43.8%	54.2%	53.3%		
Home purchases by black LMI borrowers	1000	397	511	-60.3	
Purchases in LMI neighborhoods	64.5%	52.6%	52.4%		
Purchases in non-LMI neighborhoods	35.5%	47.4%	47.6%		
Home purchases by black non-LMI borrowers	612	168	376	-72.5	
Purchases in LMI neighborhoods	42.6%	29.8%	38.8%		
Purchases in non-LMI neighborhoods	57.4%	70.2%	61.2%		
Home purchases by all white borrowers	8,882	4,535	7,181	-48.9	58.3
Purchases in LMI neighborhoods	20.0%	14.8%	15.2%		
Purchases in non-LMI neighborhoods	80.0%	85.2%	84.8%		
Home purchases by white LMI borrowers	3,508	1,963	2,458	-44.0	
Purchases in LMI neighborhoods	30.2%	23.8%	21.4%		
Purchases in non-LMI neighborhoods	69.8%	76.2%	78.6%		
Home purchases by white non-LMI borrowers	5,374	2,572	4,723	-52.1	
Purchases in LMI neighborhoods	13.3%	8.0%	12.0%		
Purchases in non-LMI neighborhoods	86.7%	92.0%	88.0%		

Sources: Home Mortgage Disclosure Act (HMDA) data and US Census Bureau; includes purchase originations for first-lien, owner-occupied, 1- to 4-family units. Race categories include non-Hispanic white and non-Hispanic black borrowers.

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When looking at where borrowers are purchasing homes, we find that white borrowers, regardless of income, are less likely to purchase homes in LMI neighborhoods. In 2005, about 20 percent of white borrowers purchased homes in Hamilton County's LMI neighborhoods compared to 56 percent of black borrowers. While fewer borrowers of both races purchased homes in LMI neighborhoods in 2010, still 46 percent of black borrowers did in that year compared to just 15 percent of white borrowers. Stated another way, black borrowers are three times as likely as white borrowers to purchase homes in an LMI neighborhood; this is true in every year we examined.

Focusing specifically on LMI borrowers, we find that just 36 percent of black borrowers purchased homes in non-LMI neighborhoods in 2005, but this figure increased to 47 percent in 2010. For white LMI borrowers, the share of home purchase loans in non-LMI neighborhoods increased from 80 percent to 85 percent in 2010. Stagnant and falling housing prices following the Great Recession may have contributed to the increasing share of home purchases in non-LMI neighborhoods by LMI borrowers. Home prices fell by 6 percent from 2005 to 2010; lower home prices may have made homes more affordable in the non-LMI neighborhoods of the county.[6]

SUMMARY OF ANALYSIS

During the past 27 years, the number of applications and originations has fluctuated with mortgage interest rates and economic recessions, notably the Great Recession. Application rates declined considerably across all neighborhood income groups as we entered the Great Recession, but the decline was more dramatic in low-income neighborhoods. There were notable spikes in application activity in 2012 in all neighborhoods; these spikes were driven mainly by refinance applications due to low interest rates. However, since 2012, application rates have remained lower than the rates in the years leading up to, and into, the Great Recession.

During this 27-year period, originations in Hamilton County reached a high point in 2003 and a low point in 2014. The fluctuations in originations, as with application rates, are driven mainly by refinance loans, which comprised 76 percent of total origination activity in 2003. After decreasing annually since 2005, home purchase loans ticked up in 2012 and continued to do so through 2016. In 2014, home purchase loans exceeded refinance loans for the first time in the post-Great Recession period. Taking a look at lending activity from 2004 through 2016 by neighborhood income groups, we find that in the years preceding the Great Recession (2004–2006), more than 26 percent of the refinancing loans in Hamilton County occurred in the LMI neighborhoods; by 2016, the percentage of Hamilton County's refinance loans occurring in LMI neighborhoods stood at 14 percent. In 2011, a high of 91 percent of the refinances in Hamilton County occurred in middle- and high-income neighborhoods; these homeowners were able to take advantage of the low interest rates and refinance their homes.

Similar to the share of refinancing loans, we find that the share of home purchase loans occurring in LMI neighborhoods was highest in the years before the Great Recession. Nearly 26 percent of the home purchase loans in 2005 occurred in Hamilton County's LMI neighborhoods, but that share fell to a low of 15 percent by 2011. Looking at the three most recent years of data, 2014 through 2016, the percent of home purchase loans occurring in LMI neighborhoods reached a high of 24 percent in 2015 but declined to 19 percent in 2016.

When comparing lending activity across race and borrower incomes, we find white borrowers are proportionally more likely than black borrowers to obtain a home purchase loan; when they apply for a home purchase loan, white borrowers are approved at higher rates. While home purchase loan originations declined from 2005 to 2010 for both race groups, the declines were greater for black borrowers when compared to their white counterparts.

DATA DETAILS AND CAVEATS

The data we used in the charts showing the 1990 to 2016 trends include applications and originations for owner-occupied and 1- to 4-family properties and both first and junior liens. First liens are those that are in the first or priority position to receive proceeds from the liquidation of the collateral (the home) that secures the loan. The Consumer Financial Protection Bureau (CFPB) defines a junior lien "as a loan you take out using your house as collateral while you still have another loan secured by your house." Junior liens are subordinate to first liens in terms of receiving proceeds from liquidation. Charts focusing on the 2004 to 2016 period also include owner-occupied units and 1- to 4-family structures; however, this subset includes only loans secured by a first lien. When we refer to *applications* we mean all of the following: loan applications that were approved by a financial institution and accepted by the applicant (i.e., originated), applications that were approved but not accepted by the applicant, and applications that were denied by a financial institution. When we refer to *originations*, we mean the loans that were approved by a lender and accepted by the applicant.

The data for 2004 to 2011 are based on a different set of census tracts than the data for 2012 to 2016 because of changes in census tract boundaries between decennial census years. While data from the earlier period are based on 2000 census tract boundaries, data from 2012 to 2016 are based on boundaries from the 2010 census. Therefore, caution should be used when comparing data from the earlier time period to the current time period because differences *may* be attributable to changing tract definitions rather than to changing lending patterns. In addition, the Office of Management and Budget (OMB) released new metropolitan statistical area (MSA) definitions in 2013 for the Cincinnati-OH-KY-IN MSA. Specifically, Franklin County, Indiana, ceased being part of the Cincinnati MSA, and Union County, Indiana, became part of the Cincinnati MSA. The MSA boundary change was in effect beginning with the 2014 HMDA data. Given that the MSA median family income is used in calculating the borrower and neighborhood income groups, caution should be exercised when comparing pre-2014 groups to 2014 through 2016 groups because the counties included in the MSA have changed. However, we estimated the MSA median family in consistent boundaries using interpolation methods and compared it to MSA median family income in the current boundaries. Between the MSA median family income in the new boundary (2013) and our estimated income we found about a 1 percent difference, suggesting the boundary revision may have minimal impact of the neighborhood income and borrower groupings.

In *Figure 3*, owner-occupied housing units are used in the application rate calculation. The housing unit counts we used in generating rates for the 2004 through 2011 time period are based on the 2000 census and the 2010 census. We use linear interpolation to obtain annual housing unit estimates between 2004 and 2011. For the years 2012 through 2016, we use the owner-occupied housing unit estimates from the 2010 to 2014 American Community Survey (ACS).

The tract median family income used to categorize the neighborhood income groups for the 2004 through 2011 years is obtained from the 2005 to 2009 ACS and is adjusted annually for inflation using the Bureau of Labor Statistics' consumer price index research series (CPI-U-RS). For the 2012 through 2016 years, the tract median family income is from the 2010 to 2014 ACS and is adjusted annually for inflation using the CPI-U-RS. The annual MSA median family income used in the neighborhood income group calculations is obtained from the Federal Financial Institutions Examination Council (FFIEC).

The estimates of households by income and race of householder used in the calculation of the home purchase loan rates (*Figure 7*) come from the Public Use Microdata Sample (PUMS) data. PUMS provides individual and household-level data with weights from the various Census Bureau surveys. The ACS 2005 to 2009 and 2010 to 2014 microdata were extracted from the IPUMS-USA, University of Minnesota, found at ***www.ipums.org***. We used family income by race of householder and adjusted it annually for inflation as we did with the tract income described above. We then compared the inflation-adjusted family income to the MSA median family income in each year and grouped the households into the four income groups as we did with the neighborhood income groups.

NEIGHBORHOOD AND BORROWER INCOME GROUPS[7]

- **Low-income**: Median family income for the census tract (or borrower income) is less than 50 percent of the MSA's median family income
- **Moderate-income**: Median family income for the census tract (or borrower income) is greater than or equal to 50 percent but less than 80 percent of the MSA's median family income
- **Middle-income**: Median family income for the census tract (or borrower income) is greater than or equal to 80 percent but less than 120 percent of the MSA's median family income
- **High-income**: Median family income for the census tract (or borrower income) is greater than or equal to 120 percent of the MSA's median family income

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[1] The Cleveland Fed serves the Fourth Federal Reserve District, which comprises Ohio, western Pennsylvania, eastern Kentucky, and the northern panhandle of West Virginia.

[2] For additional information about HMDA, see https://www.ffiec.gov/hmda/default.htm.

[3] This report only includes those home purchases for which the borrower took out a mortgage loan. Homes purchased with cash are not reflected in our analysis.

[4] It has been well documented that in the years prior to the Great Recession, some loan applications may have overstated income of the borrowers seeking to purchase or refinance a home. Therefore it is possible that borrowers categorized as middle- and high-income borrowers in 2005 may have been misclassified.

[5] With the HMDA data, it is not possible to identify what might help explain these differences, since these data do not include information used in lending decisions such as a borrower's credit score, debt, and employment history.

[6] Author's calculations using Hamilton County House Price Index data from the US Federal Housing Finance Agency; extracted from https://fred.stlouisfed.org.

[7] In 2016, the median family income in the Cincinnati MSA was $68,800. Therefore a low-income neighborhood or borrower is one with a median family income of less than $34,400; a moderate-income neighborhood or borrower is one with a median family income of greater than or equal to $34,400 and less than $55,040; a middle-income neighborhood or borrower is one with a median family income of greater than or equal to $55,040 and less than $82,560; and a high-income neighborhood or borrower is one with a median income of greater than or equal to $82,560.