OHIO HOUSING FINANCE AGENCY

HARDEST HIT FUND REPORT

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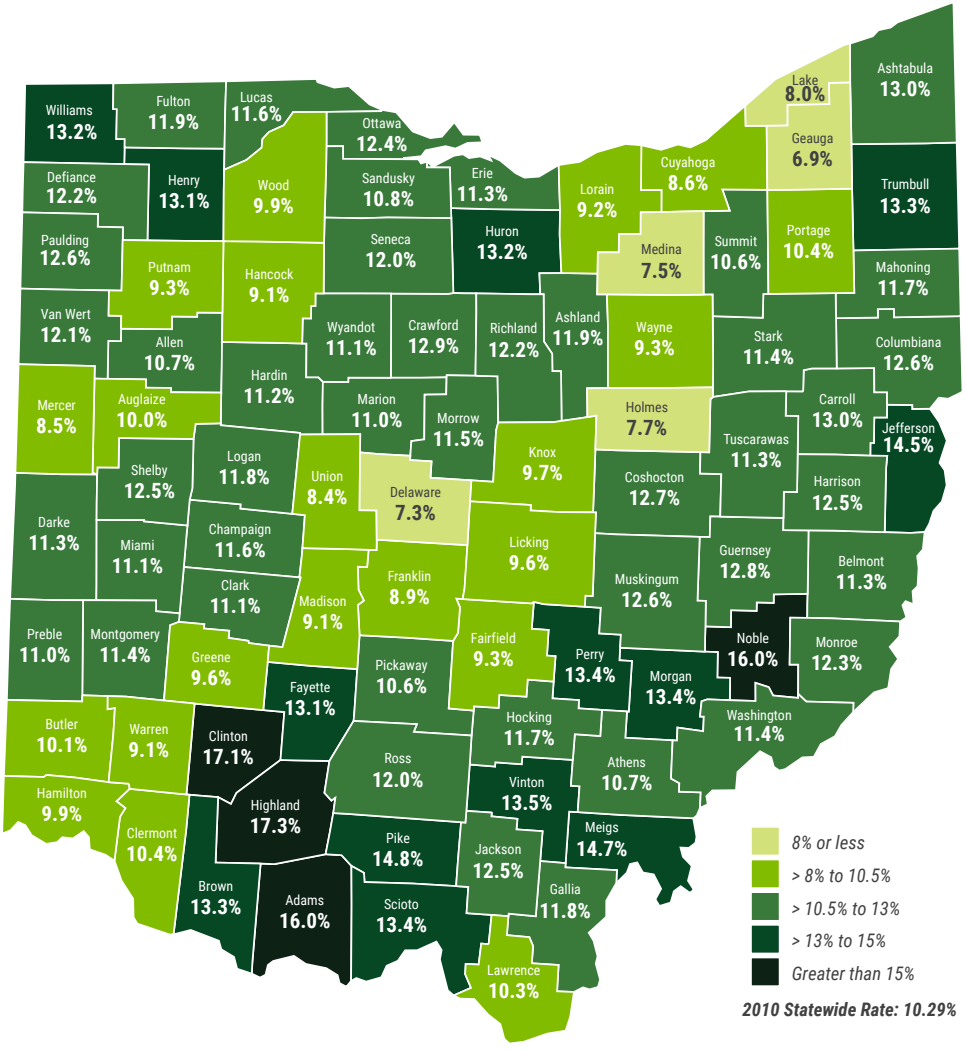
Written by Chelsea Buckwalter and Andi Clark
Designed by Paige Dixon
Edited by Dorcas Jones

SECTION I: INTRODUCTION

In the wake of the 2007-2008 U.S. mortgage crisis, Ohioans faced a tough economic climate. Businesses and factories were closing down and laying off hundreds of workers. As a result, jobs were scarce and the statewide unemployment rate rose sharply to over 10%, which was even higher in many counties. Families were struggling to pay their bills and foreclosure and mortgage delinquency rates, which had been steadily increasing for over a decade, were at an all-time high. Combined with a weak housing market and a decline in home values, the recession left one in five Ohio homeowners underwater on their mortgages.

FIGURE 1: UNEMPLOYMENT RATES BY COUNTY, 2010



Source: 2010 Local Area Unemployment Statistics, U.S. Bureau of Labor Statistics

In response, state and local agencies took steps to mitigate the rise in foreclosures and delinquencies. In 2008, Governor Ted Strickland launched *Save the Dream Ohio*, a multi-agency foreclosure prevention effort that connected homeowners to U.S. Department of Housing and Urban Development-approved housing counseling agencies, legal aid societies and pro bono attorneys through a toll-free hotline and website.

In early 2010, the U.S. Treasury Department announced that the Hardest Hit Fund (HHF) had been established as an extension of the Troubled Asset Relief Program (TARP) to address the foreclosure crisis throughout the nation. Over the course of several rounds of funding, Ohio was awarded $570 million, the third largest allocation among the 18 selected states and the District of Columbia. In September 2010, OHFA launched *Save the Dream Ohio* (SDO), which utilized HHF funds to help homeowners who were at risk of mortgage loan default or foreclosure. After holding focus groups and getting feedback from inter-agency stakeholders, OHFA developed five programs to assist homeowners and prevent foreclosure.

- **Rescue Payment Assistance** (RPA) provided a payment to a participating homeowner's servicer to help bring the homeowner current on a delinquent mortgage.
- **Partial Mortgage Payment Assistance** (PMPA) provided partial mortgage payments which were combined with homeowner funds and sent to mortgage servicers on behalf of unemployed homeowners as they searched for a job or took part in training.

  **Eventually replaced by the Mortgage Payment Assistance (MPA) program*
- **Mortgage Modification with Principal Reduction** (MMPR) incentivized servicers to reduce a homeowner's mortgage principal to achieve a loan modification.

  **Eventually replaced by the Modification with Contribution Assistance (MCA) program*
- **Transition Assistance** incentivized servicers to complete a short sale or a deed-in-lieu agreement and provided homeowners with a stipend that would allow the homeowner to exit their home gracefully.
- **Short Refinance** provided funds to lenders/servicers on behalf of homeowners in good credit standing who wished to refinance their mortgage in order to lower their monthly payment.

As SDO grew and more data was collected, these five programs evolved or were replaced with other programs that better addressed homeowner needs.

Additional Homeowner Programs:

- **Mortgage Payment Assistance** (MPA) replaced the original PMPA and provided full payments to mortgage servicers on behalf of unemployed homeowners.
- **Modification with Contribution Assistance** (MCA) replaced the MMPR program and paid down the principal balance to bring the delinquency current, then re-amortized the remaining principal balance or modified the interest rate/loan term to achieve a lower monthly payment.
- **Lien Elimination Assistance** (LEA) extinguished the first lien with a lump-sum payment that was combined with principal forgiveness by the servicer.
- **Homeownership Retention Assistance** (HRA) provided funds on behalf of homeowners to pay principal reduction on subordinate mortgages and pay property-related expenses.
- **Homeowner Stabilization Assistance** (HSA) leveraged HHF funds with commercial financing to purchase delinquent loans at a discounted price from the Federal Housing Agency (FHA) and modify to an affordable monthly payment for the homeowner.

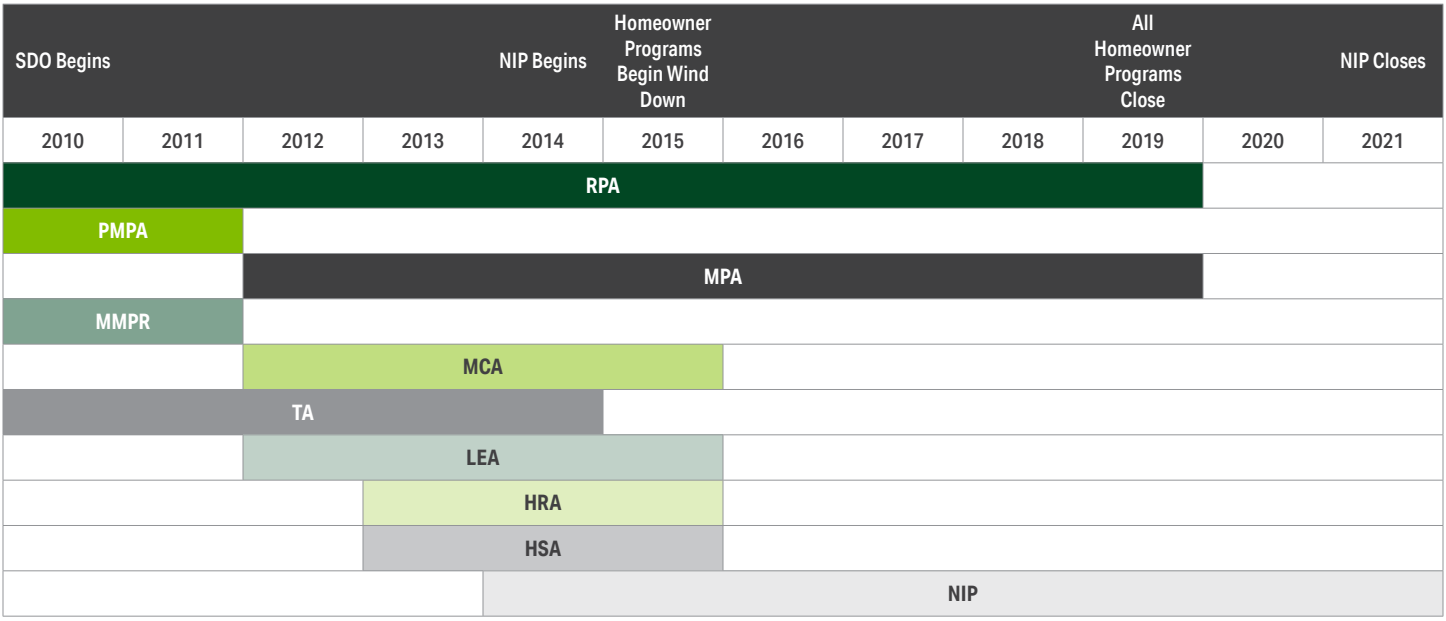
From 2014 to 2016, Ohio received an additional $192 million, bringing the total award for the state to $762.8 million. By this time, unemployment rates had begun to stabilize and delinquencies and foreclosures were returning to pre-crisis levels. Most homeowner programs had wound down (with the exception of MPA and RPA), and Ohio was focused on targeting blighted and vacant properties through the Neighborhood Initiative Program (NIP). By reimbursing land banks for the removal of blighted, vacant, and abandoned residential properties, NIP helped to prevent foreclosure in neighborhoods across the state. Communities that were experiencing a mass exodus because of the crime and unsanitary conditions that accompany vacant, crumbling houses began to see a renaissance of redevelopment. Basketball courts and pocket parks replaced former drug and prostitution houses, infill housing uplifted streets, and residents were reinvigorated to stay and make improvements.

In December 2019, MPA and RPA concluded and NIP was the sole program. By May 2020, program funds were nearly expended when Ohio was authorized to credit over $8 million recycled dollars from returns and recaptures to program funds. In August 2020, Treasury authorized Ohio to credit an additional $1.5 million in earned interest income to program funds. After careful consideration of the need in Ohio, the decision was made to continue targeting blight elimination and not reopen any homeowner programs.

SECTION II: SUMMARY OF PROGRAMS

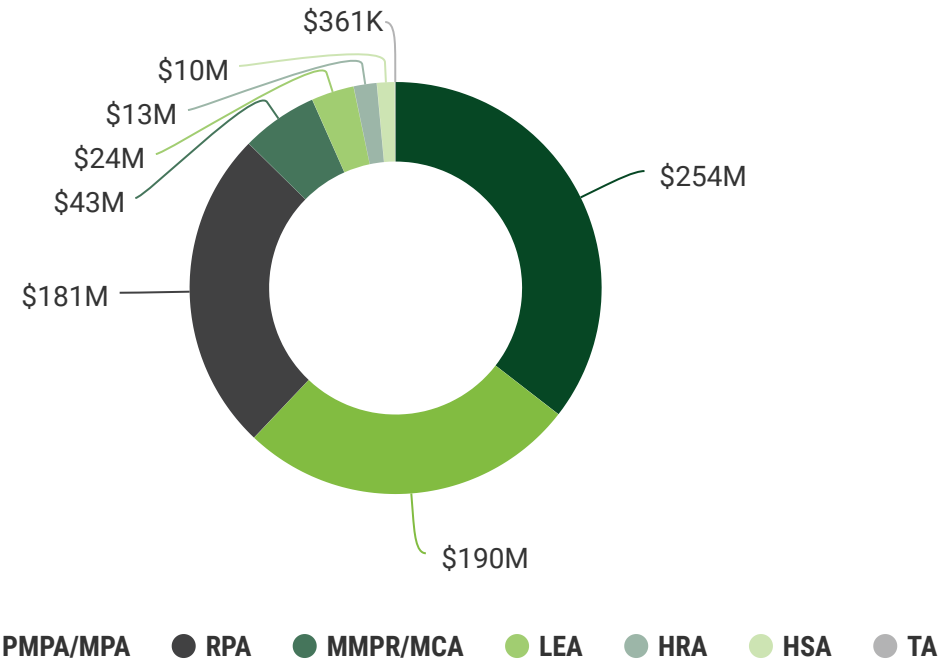
From 2010 to 2021, ten homeowner programs and one blight elimination program were implemented to help Ohioans avoid foreclosure and stabilize communities that had been severely impacted by the mortgage crisis and resulting recession. As changes were made to HHF program eligibility requirements and funding allocations, or programs were added/removed, the term sheets were amended accordingly. This occurred 13 times over the life of the program.

FIGURE 2: TIMELINE OF HHF PROGRAMS



Through these 11 programs, OHFA distributed $715 million in HHF funding, including over $10 million in recycled payments, to assist 27,300 Ohioans.

FIGURE 3: FUNDS DISTRIBUTED BY PROGRAM



RESCUE PAYMENT ASSISTANCE

A. Program Implementation and Evolution

Homeowners dealing with a financial hardship who had already missed one or more mortgage payments were at high risk of foreclosure. The RPA program was designed to provide a one-time payment to mortgage servicers and/or county treasurers to bring eligible homeowners current on delinquent first mortgage payments, taxes, escrow shortages and corporate advances to third parties. The goal of this program was to prevent avoidable foreclosure for homeowners who experienced a temporary hardship by reinstating their past due mortgage loans.

Homeowners had to meet overall eligibility criteria plus the monthly mortgage payment (PITIA) requirements. Initially, this was 38% or less of gross monthly household income, but later changed to 45% or less. If the homeowner also applied for assistance on a subordinate lien through the Homeownership Retention Assistance program (HRA), the combined monthly mortgage payment had to be 48% or less of gross monthly income or the homeowner had to qualify to receive at least six months of assistance under the Mortgage Payment Assistance program. Homeowners who were more than $25,000 delinquent were not eligible for RPA unless they provided additional funds to their servicer or to OHFA to be combined with HHF funds.

Originally, the maximum amount of RPA available per homeowner was $12,000 or $15,000 depending on the hardship and whether the homeowner lived in a county of concentrated economic distress. OHFA later determined that using need-based formulas effectively achieved the goal of targeting assistance to areas of concentrated economic distress and changed the maximum benefit to $15,000, regardless of hardship or location. At the end of 2011, the maximum benefit was increased again for the last time to $25,000.

B. Program Results

RPA was one of five original HHF programs and began accepting applicants in September 2010. Its allocation was $16.5 million, and it was projected to assist 2,313 homeowners. As Ohio received additional funding, the amount allocated to RPA increased, as did the estimated number of homeowners that could be assisted. By the close of the program in December 2019, $181,094,237 had been disbursed to help 22,909 homeowners avoid foreclosure at an average cost of $7,905 per homeowner.

FIGURE 4: SUMMARY OF RPA ALLOCATION CHANGES AND OUTCOMES

Amendment Date	Funds Allocated	Funds Disbursed by Close of Program	Projected Homeowners Assisted	Homeowners Assisted by Close of Program	Estimated Average Assistance	Average Assistance by Close of Program
8/3/2010	$16.5 million	$181 million	2,313	22,909	$7,800 - $8,200	$7,905
9/29/2010	$59.7 million		8,700		$6,856	
12/16/2010	$107 million		17,835		$5,994	
12/14/2012	$159 million		18,022		$10,000	
8/28/2013	$167 million		19,000		$8,750	
6/28/2016	$177 million		23,000		$8,750	

C. Lessons Learned

Sustainability was a significant factor in the success of this program, and RPA was a tremendous help for homeowners whose hardship was temporary. However, families with a permanent loss of income had trouble making the mortgage payments after reinstatement. Many homeowners relied on MPA for sustainability but then struggled again when that assistance ended. Homeowners at or over the RPA cap at both $15,000 and $25,000 who could not get MPA often did not meet the 38% ratio and were declined. The subsequent change to 45% helped with this issue, but certainly did not resolve it. Determining the appropriate cap for RPA was a moving target.

Often, homeowners over the RPA cap had to negotiate with their servicers to contribute the funds or put the arrearage on the back of the loan as a modification. OHFA assisted in these negotiations and accepted homeowner funds, added them to HHF funds, and sent a full reinstatement to servicers. The drawback of this approach was that it took time and was an administrative burden. Many times, modifications to capitalize arrearage increased the homeowner's monthly payment and made the loan even more unaffordable.

The best scenario to avoid foreclosure seemed to have been RPA combined with monthly mortgage payments for a defined time period.

PARTIAL MORTGAGE PAYMENT ASSISTANCE & MORTGAGE PAYMENT ASSISTANCE

A. Program Implementation and Evolution

Homeowners who lost their jobs were at high risk of mortgage delinquency and foreclosure. The PMPA program was developed to provide partial mortgage payments to unemployed homeowners as they searched for a job or took part in job training. The goal of this program was to help unemployed homeowners remain in their homes and avoid delinquency and foreclosure. This was a short-term solution, and the hope was that homeowners could obtain a sustainable payment through loan modification from their servicer after they had regained employment.

Homeowners had to meet overall eligibility criteria. Originally, at least one wage earner in the household had to be receiving unemployment compensation or had exhausted unemployment compensation benefits within the last 12 months. Later, this changed to all homeowners. Homeowners had to pay an affordable monthly payment of at least 25% of their total monthly mortgage principal, interest taxes and insurance (PITIA) payment and PMPA paid the rest. This was later reduced to 20%. Homeowners who become reemployed within the 15 to 18 month period could receive additional assistance for up to two months after reemployment but not to exceed the term of 15 or 18 months.

In January of 2012, PMPA was replaced by the MPA program, which provided a full mortgage payment so that unemployed and underemployed homeowners could make on-time, monthly mortgage payments. PMPA required homeowners to have "skin in the game" by contributing a portion of the monthly payment, but this was eliminated with MPA.

Other changes that were made included raising the assistance cap from $15,000 to $25,000, extending the term to 18 months, and increasing the timeframe for receiving assistance after reemployment from two months to three months but not to exceed the term of 18 months.

Homeowners participating in an active Home Affordable Modification Program (HAMP) modification were ineligible, unless they had experienced a new, eligible hardship after entering the HAMP agreement. Underemployed homeowners with a total PITIA payment of less than 31% of current gross income were also not eligible. However, unemployed homeowners who became reemployed through a temporary or seasonal job were permitted to remain in the MPA program, even if their monthly mortgage payment was less than 31% of income, as long as the temporary or seasonal job was three months or fewer.

B. Program Results

PMPA was one of five original HHF programs and began accepting applicants in September 2010. Its allocation was $74.1 million, and it was projected to assist 6,475 homeowners. In January 2012, it was replaced by MPA, which had an allocation of $165 million and was expected to assist 23,500 homeowners. As Ohio received additional funding, the amount allocated to MPA fluctuated, as did the estimated number of homeowners that could be assisted through the program. By the close of the program in December 2019, $189,952,642 had been disbursed to help 16,761 homeowners avoid foreclosure at an average cost of $11,333 per homeowner.

FIGURE 5: SUMMARY OF PMPA/MPA ALLOCATION CHANGES AND OUTCOMES

Program	Amendment Date	Funds Allocated	Funds Disbursed by Close of Program	Projected Homeowners Assisted	Homeowners Assisted by Close of Program	Estimated Average Assistance	Average Assistance by Close of Program
PMPA	8/3/2010	$74.1 million	$190 million	6,475	16,761	$9,000 - $11,000	$11,333
	9/29/2010	$190 million		16,200		$11,700	
	12/16/2010	$300 million		31,900		$9,390	
MPA	12/8/2011	$165 million		23,500		$7,000	
	8/23/2013	$149 million		9,375		$16,000	
	6/28/2016	$189 million		17,000		$12,000	

C. Lessons Learned

The PMPA requirement that homeowners have "skin in the game" turned out to be problematic. Homeowners were required to authorize OHFA to debit their checking account every month for their 20% copayment. This copayment was then combined with the other 80% from HHF funds to make a full payment to the servicer. The issue was that homeowners often did not have the funds in their bank account, so the debit created an overdraft, resulting in bank charges of up to $33 per day. Paying partial payments also caused administrative challenges and placed the burden on OHFA's customer service to handle calls from distressed homeowners.

MPA was the most prolific of Ohio's HHF homeowner programs. Switching from making partial payments through PMPA to full payments through MPA rectified the overdraft issue and was much easier to handle administratively. It also made more sense to pay the full mortgage and allow the family time to save some money. MPA gave homeowners peace of mind so they could concentrate on finding gainful employment or

retraining for another career. Many also said they took this opportunity to get caught up on other bills or make much needed repairs to their houses. Staff had several discussion about the ideal number of MPA months – initially it was six, then 12, 18, and finally, back to 9 months.

For some homeowners, MPA was still a short-term solution to a permanent hardship because in many cases they did not regain employment at their former compensation level and therefore could not meet the underwriting criteria for loan modification. Servicers were overwhelmed with loss mitigation applications, documents were often lost, trial periods lasted well beyond the typical three months and modifications did not become permanent.

An operational challenge of MPA was that homeowners who became reemployed did not always report the new income in a timely manner, despite the disclosures at application and closing plus a robust MPA quarterly recertification process. In 2016, OHFA instituted monthly email reminders to homeowners, reminding them to report income changes (in addition to the regular quarterly recertification process).

MORTGAGE MODIFICATION WITH PRINCIPAL REDUCTION & MODIFICATION WITH CONTRIBUTION ASSISTANCE

A. Program Implementation and Evolution

Homeowners with severe negative equity were at high risk of mortgage delinquency and foreclosure. The MMPR program paid down the principal balance on mortgages for homeowners who did not qualify for existing loan modification programs due to severe negative equity. The goal of this program was to help homeowners achieve an affordable monthly loan payment and reduce the probability of re-default after the loan modification. Lenders and servicers were incentivized to provide a dollar-for-dollar match of the MMPR funds as a principal reduction.

Lien Elimination was originally part of MMPR as a substitute for a loan modification and could be achieved when the servicer agreed to accept up to $15,000 in HHF funds in return for extinguishing the existing lien. This occurred mostly where the property was valued at $60,000 or less. Homeowners had to demonstrate the ability to stay current on their property taxes and homeowner's insurance with payments not exceeding 31% of gross monthly household income. Lien Elimination later became a standalone program.

In 2013, the Mortgage Contribution Assistance (MCA) program replaced MMPR. MCA could be used to modify the interest rate and loan term or pay down principal balance and re-amortize for a lower payment with the same rate over the remaining term of the mortgage. In both cases, the delinquency was brought current, and the balance was used for the modification or recast. Similar to MMPR, the goal of the MCA program was to help homeowners achieve affordable, long-term mortgage payments.

Homeowners had to meet the overall eligibility criteria and have a mortgage payment that exceeded 31% of gross household income. The modification or re-amortization achieved with MCA had to result in a more affordable monthly payment, but that payment could not be less than 20% unless the household gross income was $20,000 per year or less.

Other changes that were made included raising the assistance cap from $25,000 to $35,000 and reducing

the new mortgage payment by at least $20/month. MCA also did not require the non-amortizing, zero-percent interest, five-year loan if the servicer matched the assistance dollar for dollar with principal reduction or forbearance. Although MCA could serve as a gateway into the Home Affordable Modification Program (HAMP), homeowners already participating in the program were excluded from MCA, unless they had experienced a new, eligible hardship after entering the HAMP agreement.

B. Program Results

MMPR was one of five original HHF programs and began accepting applicants in September 2010. Its allocation was $46.2 million, and it was projected to assist 4,255 homeowners. In January 2012, it was replaced by MCA, which had an allocation of $124 million and was expected to assist 5,400 homeowners. As Ohio received additional funding, the amount allocated to MPA decreased, as did the estimated number of homeowners that could be assisted through the program. By the close of the program in 2015, $42,990,522 had been disbursed to help 1,569 homeowners avoid foreclosure at an average cost of $27,400 per homeowner.

FIGURE 6: SUMMARY OF MMPR/MCA ALLOCATION CHANGES AND OUTCOMES

Program	Amendment Date	Funds Allocated	Funds Disbursed by Close of Program	Projected Homeowners Assisted	Homeowners Assisted by Close of Program	Estimated Average Assistance	Average Assistance by Close of Program
MMPR	8/3/2010	$46.2 million	$43 million	4,255	1,569	$10,000 - $12,500	$27,400
	9/23/2010	$22.7 million		2,350		$9,667	
MCA	12/8/2011	$124 million		5,400		$23,000	
	8/28/2013	$75.5 million		4,600		$17,500	
	12/18/2014	$45 million		1,300		$26,500	

C. Lessons Learned

The narrow criteria for modification and the requirement that servicers match assistance with dollar-for-dollar forgiveness made MMPR difficult. MCA Recast seemed to fix these issues as the criteria was less stringent and no match was required. The optimal situation for recast was a low loan amount and minimal delinquency, so the maximum $35,000 was applied to the principal to lower the payment significantly and provide relief for cost-burdened homeowners. Often the reinstatement amount was so large that not much principal was paid down and monthly payments did not significantly decrease. Homeowners expected much lower payments and were often disappointed. Although MCA helped bring them current on their mortgage, homeowners still voiced that they experienced difficulties making their monthly mortgage payments after assistance. LEA will be discussed in the LEA section; it became a separate program.

TRANSITION ASSISTANCE

A. Program Implementation and Evolution

The TA program was designed to help homeowners avoid foreclosure, minimize any negative impact to their credit report, and save money to put toward their next home. The servicer was paid an incentive to agree to a short sale or deed-in-lieu of foreclosure without a deficiency judgment, and the homeowner received a stipend for leaving the property in "broom-swept" sellable condition. The goal of this program was to help people gracefully exit their homes.

Homeowners had to meet the overall eligibility criteria and have a mortgage payment that exceeded 31% of gross household income. In addition, they had to meet an IRS relocation requirement that their new job was at least 50 miles farther from their former residence than their old job and that it was located in the U.S. Exceptions were made for active duty military personnel. Homeowners had to first apply for the Home Affordable Foreclosure Alternative (HAFA) program and either be denied or have no response from the lender/servicer within 30 days.

The program was structured so that upon receipt of an executed short sale or deed-in-lieu agreement, a one-time payment of $3,000 was sent to the servicer who forwarded $1,500 to the homeowner and kept $1,500 as an inducement. When applicable, payments were also made to second lien holders for 10% of the second lien balance up to $2,500 if a recordable Lien Satisfaction was issued and they agreed not to pursue a deficiency judgment for any remaining balance. Both first and second mortgage holders had to accept less than full payoff.

Later in the program, the one-time payment was increased to $4,000, which sent $3,000 to the homeowner and $1,000 to the servicer. Further term changes increased the homeowner benefit to $5,000 and preserved $2,500 for second lien balances. Eventually, the servicer inducement was dropped.

Originally, the following groups were ineligible for the TA program: homeowners who received HAFA funds and homeowners whose net proceeds from the home sale were sufficient to pay off the mortgage balance. This was later changed and HAFA was permitted to be combined with TA. Homeowners who were part of the Homeowner Retention Assistance (HRA) program were not allowed to use TA funds.

B. Program Results

TA was one of five original HHF programs and began accepting applicants in September 2010. Its allocation was $11.1 million, and it was projected to assist 2,313 homeowners. As Ohio received additional funding, the amount allocated to TA was reduced, as was the estimated number of homeowners that could be assisted through the program. By the close of the program in 2014, $360,966 had been disbursed to help 75 homeowners avoid foreclosure at an average cost of $4,813 per homeowner.

FIGURE 7: SUMMARY OF TA ALLOCATION CHANGES AND OUTCOMES

Amendment Date	Funds Allocated	Funds Disbursed by Close of Program	Projected Homeowners Assisted	Homeowners Assisted by Close of Program	Estimated Average Assistance	Average Assistance by Close of Program
8/3/2010	$11.1 million	$361,000	2,313	75	$4,000	$4,813
12/16/2010	$18 million		4,900		$3,676	
12/8/2011	$1.3 million		200		$6,400	
12/14/2012	$616,000		100		$6,400	
2/27/2014	$316,000		63		$5,000	

C. Lessons Learned

TA was the lowest performing HHF program but worked well for those homeowners willing to relocate to find work. Most homeowners wanted to stay in their home, so participation in this program was minimal. People didn't want to uproot their children, change schools, leave churches, and abandon their communities. Some homeowners that received other HHF assistance programs resorted to TA when they realized their best option was to relocate.

SHORT REFINANCE

A. Program Implementation and Evolution

Homeowners with negative equity who were unable to refinance their mortgage to lower their monthly payments were at high risk of mortgage delinquency and foreclosure. The Short Refinance program was created to help homeowners with a qualifying hardship who were current on their mortgage and employed with good credit but had negative equity. The goal of this program was to help them refinance their loan to get a more affordable payment, provide assistance to homeowners who could not refinance due to a decline in their home's value, and reduce the number of homeowners with negative equity to stabilize communities.

The program was structured to use HHF funds to pay down the principal balance and leverage other resources to incentivize servicers to match dollar-for-dollar principal forgiveness and reduce the homeowner's loan-to-value necessary to qualify for a refinance. The refinance originated by the homeowner's lender was to result in an affordable monthly payment, including all subordinate mortgage loans, lower than 31% of homeowners' gross monthly household income. All late fees and other non-out-of-pocket collections costs had to be waived by the servicer and could not be capitalized.

Homeowners had to meet the overall eligibility criteria, qualify for a refinance under their lender's underwriting guidelines, and have a loan-to-value ratio of 100% or more. Initially, the assistance cap was $15,000, but this was later raised to $25,000.

B. Program Results

The Short Refinance program was one of five original HHF programs and began accepting applicants in September 2010. Its allocation was $50 million, and it was projected to assist 6,500 homeowners at an average of $7,692 per homeowner. The program never gained traction and was closed in 2012. As a result, no funds were disbursed.

C. Lessons Learned

Servicers did not show interest in this program, presumably because the short refinance was too time consuming or costly and the amount provided by HHF wasn't a large enough incentive. Also, this program likely would have competed against the popular Home Affordable Refinance Program (HARP) which was part of the Making Home Affordable program

LIEN ELIMINATION ASSISTANCE

A. Program Implementation and Evolution

Homeowners who had fallen behind on their mortgage payments and had a lien on their home were at high risk of foreclosure. The LEA program extinguished a first lien (and second lien if possible) with a payment of up to $25,000 that was combined with principal forgiveness by the servicer. Most cases involved properties with values of $60,000 or less, and OHFA encouraged servicers to do an assistance to forgiveness match of at least a one-to-one. The goal of the program was to help homeowners achieve an affordable monthly housing payment and reduce the probability of re-default after the lien elimination.

Homeowners had to meet overall eligibility criteria and demonstrate sustainability of remaining liens, property taxes, and insurance equal to or less than 31% of gross monthly household income. The sustainability requirement was later removed. In addition, a homeowner's servicer had to agree to lien elimination. The maximum amount of LEA available per homeowner was $25,000. Homeowners who were part of the Homeowner Retention Assistance (HRA) program were not allowed to use LEA funds.

B. Program Results

LEA launched in January 2012 with an original allocation of $14 million and was projected to assist 700 homeowners. As Ohio received additional funds, the amount allocated to LEA fluctuated, as did the estimated number of homeowners that could be assisted. By the close of the program in 2015, $23,521,470 had been disbursed to help 1,210 homeowners avoid foreclosure at an average cost of $19,439 per homeowner.

FIGURE 8: SUMMARY OF LEA ALLOCATION CHANGES AND OUTCOMES

Amendment Date	Funds Allocated	Funds Disbursed by Close of Program	Projected Homeowners Assisted	Homeowners Assisted by Close of Program	Estimated Average Assistance	Average Assistance by Close of Program
12/8/2011	$14 million	$24 million	700	1,210	$20,000	$19,439
12/14/2012	$19 million		955		$20,000	
8/28/2013	$13 million		700		$20,000	
2/27/2014	$23 million		1,150		$20,000	

C. Lessons Learned

LEA was a successful and highly sought after program. Homeowners loved the thought of getting rid of their mortgage and were distraught if servicers did not approve LEA, meaning homeowners had to use RPA and MPA instead. One downside was that those who received LEA sometimes remortgaged the house, then contacted OHFA for more assistance. Other homeowners gave up their insurance since they no longer had a mortgage but still could not pay taxes resulting in foreclosure. Many homeowners could not demonstrate sustainability for the taxes and insurance monthly payments and relied on gifts from family.

HOMEOWNERSHIP RETENTION ASSISTANCE

A. Program Implementation and Evolution

The HRA program provided funds to servicers, taxing authorities, and associations, on behalf of eligible homeowners to extinguish, reinstate or pay a principal reduction on subordinate mortgages and pay property-related expenses such as non-escrowed property taxes, association fees, and homeowner's insurance. The goal of this program was to help homeowners who experienced a qualifying hardship achieve a long-term and affordable housing solution.

Homeowners had to meet overall eligibility criteria and demonstrate sustainability. When HRA was used to reinstate delinquent property taxes or association fees, the monthly mortgage payment had to be 38% or less of gross monthly household income or the homeowner had to qualify for six months of MPA. When HRA was used to eliminate or reinstate a subordinate lien, the homeowner had to be current or brought current on all liens with a higher position using RPA. The combined monthly mortgage payment on the first and any subordinate lien(s) for which the homeowner sought assistance had to be 48% or less of gross monthly household income or the homeowner had to qualify for six months of MPA.

The maximum amount of assistance per homeowner was $25,000. In addition, HRA could not be combined with TA.

B. Program Results

HRA launched in February 2013 with an original allocation of $51 million and was projected to assist 3,100 homeowners. As Ohio received additional funds, the amount allocated to HRA fluctuated, as did the estimated number of homeowners that could be assisted. By the close of the program in 2015, $13,338,855 had been disbursed to help 1,929 homeowners avoid foreclosure at an average cost of $6,915 per homeowner.

FIGURE 9: SUMMARY OF HRA ALLOCATION CHANGES AND OUTCOMES

Amendment Date	Funds Allocated	Funds Disbursed by Close of Program	Projected Homeowners Assisted	Homeowners Assisted by Close of Program	Estimated Average Assistance	Average Assistance by Close of Program
12/14/2012	$51 million	$13 million	3,100	1,929	$16,400	$6,915
3/22/2013	$32.5 million		1,982		$16,400	
8/28/2013	$5 million		900		$5,000	
2/27/2014	$11.3 million		1,738		$6,500	

C. Lessons Learned

HRA was a more holistic approach to improving a homeowner's overall financial situation. Many times, homeowners had become delinquent on several housing-related expenses, in addition to their first mortgage. Second mortgages could usually be worked through the same common data file secure data exchange used for the first mortgage, but taxes, insurance, and association fees required a lot of manual administrative work. Tax bills required phone calls to county treasurers for verification, insurance bills required direct contact with an insurance agent, and homeowners/condominium associations were extremely difficult to communicate with to obtain the necessary documents. The best use of this program seemed to be extinguishing the second and third mortgages on the home to make more funds available to pay the first mortgage.

HOMEOWNERSHIP STABILIZATION ASSISTANCE PROGRAM – MORTGAGE RESOLUTION FUND

A. Program Implementation and Evolution

The Homeowner Stabilization Assistance program leveraged HHF funds with commercial financing to purchase delinquent loans at a discounted price from the Federal Housing Agency through the Distressed Asset Stabilization Program's (DASP) Neighborhood Stabilization Outcomes (NSO). The goal was to keep families in their homes and stabilize neighborhoods and housing markets. The MRF Ohio program was holistic in its approach by bringing each qualifying household's mortgage debt into alignment with current home values while also requiring the household to bring all forms of debt in line with traditional and sustainable debt-to-income ratios.

The Mortgage Resolution Fund, LLC and its subsidiary MRF Ohio One, LLC (MRF Ohio) purchased pools of distressed mortgage loans in the hardest hit neighborhoods where unemployment was high, job growth

stagnant, and property values were declining. The program restructured the monthly mortgage and sold the performing mortgages once they were sufficiently seasoned. MRF Ohio's high-quality resolution specialists determined qualifying households for a permanent, affordable and sustainable modification of their former debt. Households not eligible for modification received support through property disposition and transition to new housing, while assuring the final disposition of the property supported local community stabilization goals.

This program had stringent requirements for purchase, servicing transfer, qualifications, and replacement of ineligible loans. Program funds were to be repaid to HHF. Homeowners had to meet overall eligibility criteria plus have an eligible program outcome. These included loan modification down to a payment of 31% of gross monthly income, lien elimination without deficiency judgment, short sale or deed-in-lieu without deficiency judgement, and transition assistance. Homeowners could meet one of the HHF hardships to qualify or have an unpaid mortgage balance significantly over market value.

B. Program Results

MRF launched in April 2013 with an original allocation of $30 million and was projected to assist 900 homeowners. As Ohio received additional funds, the amount allocated to MRF decreased, as did the estimated number of homeowners that could be assisted. By the close of the program in 2015, $4,262,000 had been disbursed to help 123 homeowners remain in their homes.

FIGURE 10: SUMMARY OF MRF ALLOCATION CHANGES AND OUTCOMES

Amendment Date	Funds Allocated	Funds Disbursed by Close of Program	Projected Homeowners Assisted	Homeowners Assisted by Close of Program
3/23/2013	$30 million	$4 million	900	123
2/27/2014	$15 million		450	

C. Lessons Learned

MRF Ohio leveraged $15 million in Ohio HHF funds with approximately $14 million in private capital from various sources to purchase 626 delinquent mortgage loans. The original MRF program was planned for an OHFA investment of $30 million in HHF funds, but it was scaled back to make certain the program would show results.

MRF Ohio discovered that the characteristics of the pool differed significantly from what was expected. MRF Ohio anticipated that a large percentage of homeowners would either have remained in their home or would agree to a short sale or deed in lieu of foreclosure; however, over half of the 626 properties were vacant or occupied by households other than the owner. In many instances, contact had not been made with the homeowner for over three years.

In April 2014, MRF Ohio represented that 88% of the homeowners (550 of 626) had not made a payment since 2011, 54% (336 of 626) had not made a payment since 2010, and 137 properties were already in Real Estate Owned status. MRF Ohio stated that about 11% of the properties carried junior liens ranging in size from $800 to $142,100, with an average lien amount of $34,276. MRF Ohio contended that market values were much lower, property conditions far worse, and lien statuses more complex and challenging than disclosed in FHA pre-auction tapes.

MRF Ohio recognized it could not achieve the estimated number of program outcomes and that programmatic and carrying costs would be greater than expected. MRF Ohio and OHFA worked together on a solution to achieve as many neighborhood stabilizing outcomes as possible and maximize the value of liquidating the remaining program assets.

NEIGHBORHOOD INITIATIVE PROGRAM

A. Program Implementation and Evolution

Neighborhoods with large numbers of vacant and blighted properties are often linked to increased crime rates, increased foreclosure filings, and declining property values. NIP was created to reimburse county land banks for environmental remediation, demolition, greening, maintenance, and administrative expenses to remove blighted, vacant, and abandoned residential properties in target areas defined by a comprehensive local strategy plan approved by OHFA. The goal was to stabilize property values, preserve existing neighborhoods, and prevent future foreclosures for adjacent homeowners.

To qualify for NIP, properties had to be owned by the local land bank, secured by a loan of non-federal funds, and have a lien that could be extinguished. Mixed-use properties were eligible if there was proof of residential units within the structure. All reimbursements were provided as one payment per property. No match was required of partners, but other public and private investments were made in target areas.

NIP required Land Banks to execute a three-year, non-recourse, non-amortizing, zero-interest loan with a mortgage for each property parcel receiving funds. The outstanding balance on the loan was due on sale, transfer, or unauthorized use of the property. Liens could be released early if the property was transferred to a local government or non-profit entity that contributed to stabilizing existing home values and/or promoted positive economic development within the community.

Commercial properties and those listed on a state or national historic register were excluded from NIP as were any properties that had previously been assisted with Hardest Hit Funds. Initially, multifamily properties with more than four units were excluded, but that was later amended to allow these properties to receive reimbursements. For dwellings with up to four families, the cap on assistance was $25,000; for multifamily housing with five or more units, the cap was $75,000.

Land banks chose their target areas based on neighborhood definitions that took into account occupancy rates, property values, foreclosure rates, proximity to amenities, etc. "Healthy areas" required only spot demolitions; "tipping point areas" had some decline but were still vital and required a mix of demolition and rehabilitation; "revitalization areas" had experienced sustained decline and needed significant demolition for infill housing; and, "redevelopment areas" had years of persistent decline and needed large-scale demolition and rebuilding. NIP suggested a focus on neighborhoods classified as "tipping points".

B. Program Results

NIP launched in January 2014 with an original allocation of $60 million and was projected to fund 5,000 demolitions. As Ohio received additional funds, the amount allocated to NIP increased, as did the estimated number of demolitions that could be completed. By the close of the program in June 2021, $253,604,609 had been disbursed to remove 17,588 vacant and blighted properties at an average cost of $14,419.

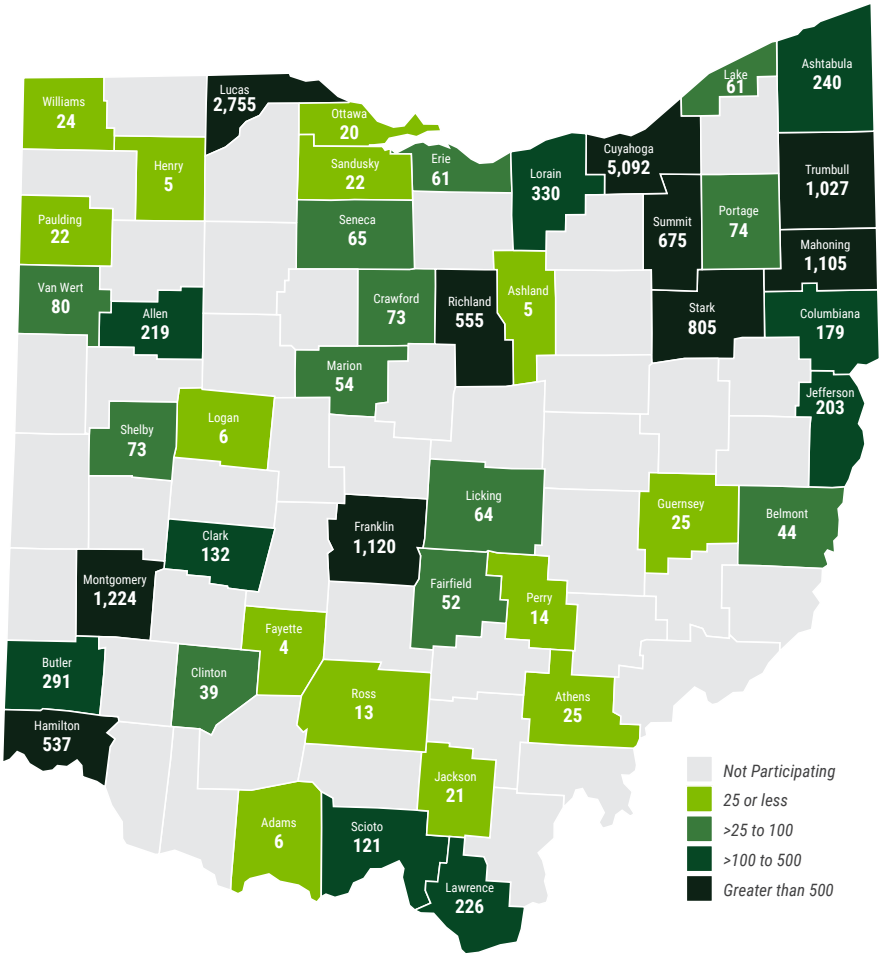
At the end of the program, each land bank was asked to submit a final performance report using the template provided by OHFA in Appendix B. These reports provided qualitative and quantitative data to measure the success of NIP in target areas, including challenges that were overcome, partnerships that were formed and the impact of NIP on the county as a whole. Many land banks reported a reduction in crime, an increase in home values, and a new sense of community pride as buildings that had long been eyesores were removed.

OHFA also commissioned dynamo metrics to carry out a mid-program analysis of NIP in 2016 to assess the impact of the program. One of the key findings was that "census tracts where demolition activity [was] taking place [had] mortgage foreclosure rates that [were] lower and declining faster than areas without demolition intervention." The full report can be found in Appendix C.

FIGURE 11: SUMMARY OF NIP ALLOCATION CHANGES AND OUTCOMES

Amendment Date	Funds Allocated	Funds Disbursed by Close of Program	Projected Homeowners Assisted	Homeowners Assisted by Close of Program	Estimated Average Assistance	Average Assistance by Close of Program
8/28/2013	$60 million	$254 million	5,000	17,588	$12,000	$14,419
4/24/2017	$238 million		15,000		$13,500	

FIGURE 12: NIP DEMOLITIONS BY COUNTY



C. Lessons Learned

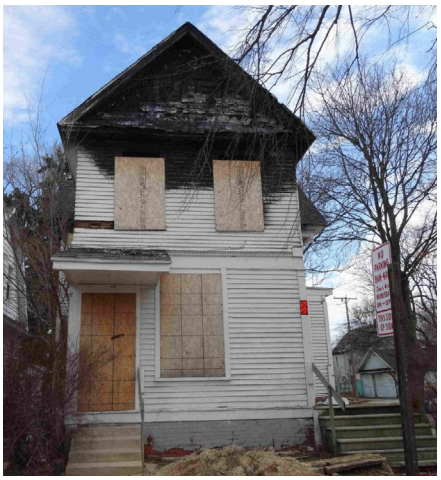
NIP spent the most HHF funds of an individual program, had the highest visibility, and generated the most conversation of all the programs. Homeowner advocates did not initially see the value of demolishing blighted homes when they felt HHF funds should be used exclusively to pay servicers on behalf of homeowners. Gradually, stakeholders began to see how impactful it was to remove these deteriorating buildings, restore the integrity of neighborhoods, and draw community reinvestment for the benefit of homeowners who stayed in their homes. Property values increased, infill housing was constructed, community gardens were developed, and side lots were granted to neighbors -- all of which increased the value of these neighborhoods dramatically.

NIP was not without its challenges. In areas with an aging housing stock, asbestos removal was extremely expensive, and the program cap did not accommodate for it. Land banks reported they spent significantly more money than they could receive reimbursement for on asbestos removal.

The note and mortgage of non-federal funds that had to be attached to the parcel and corresponding payoff and lien release was cumbersome, costly, and time-consuming. Land banks thought HHF had too many requirements that cost them more money than necessary. They wanted NIP to be more like the Moving Ohio Forward program, which was less strict with its requirements.

NIP BEFORE AND AFTER PHOTOS


Cuyahoga County




Lucas County

SECTION III: HOMEOWNERSHIP RETENTION UNDER HHF

The Homeowner Retention tables capture the outcomes of HHF borrowers within two years after program exit. All programs are included except for Transition Assistance and Blight Elimination because the intent of these programs was not to keep the homeowner in the home.

The data is reported cumulatively as well as for each individual program. Homeowner outcomes fall into one of the following categories:

- Foreclosure Sale
- Deed in Lieu
- Short Sale
- Traditional Sale
- Borrower Still Owns Home

Please note that the retention tables do not include 91 borrowers who received HHF assistance because they are under the two-year exit window. In addition, 178 homeowners exited the program prior to the end of their scheduled funding because of bankruptcy, non-response or failed recertification, death and/or full price home sales. They are also not included in the retention tables. Due to the method used to calculate retention, the cumulative total of borrowers as well as the borrowers for each individual program do not match cumulative numbers elsewhere in this report.

Total All Programs	
Foreclosure Sale	
Number	759
Deed in Lieu	
Number	70
Short Sale	
Number	242
Traditional Sale	
Number	712
Borrower Still Owns Home	
Number	25,850
Homeownership Retention	
Number	26,562
%	**96.12%**

Rescue Payment Assistance (RPA)	
Foreclosure Sale	
Number	721
Deed in Lieu	
Number	51
Short Sale	
Number	171
Traditional Sale	
Number	259
Borrower Still Owns Home	
Number	21,535
Homeownership Retention	
Number	21,794
%	**95.85%**

Mortgage Payment Assistance (MPA)	
Foreclosure Sale	
Number	421
Deed in Lieu	
Number	51
Short Sale	
Number	162
Traditional Sale	
Number	482
Borrower Still Owns Home	
Number	15,524
Homeownership Retention	
Number	16,006
%	**96.19%**

Lien Elimination Assistance (LEA)	
Foreclosure Sale	
Number	4
Deed in Lieu	
Number	1
Short Sale	
Number	0
Traditional Sale	
Number	12
Borrower Still Owns Home	
Number	1,189
Homeownership Retention	
Number	1,201
%	**99.59%**

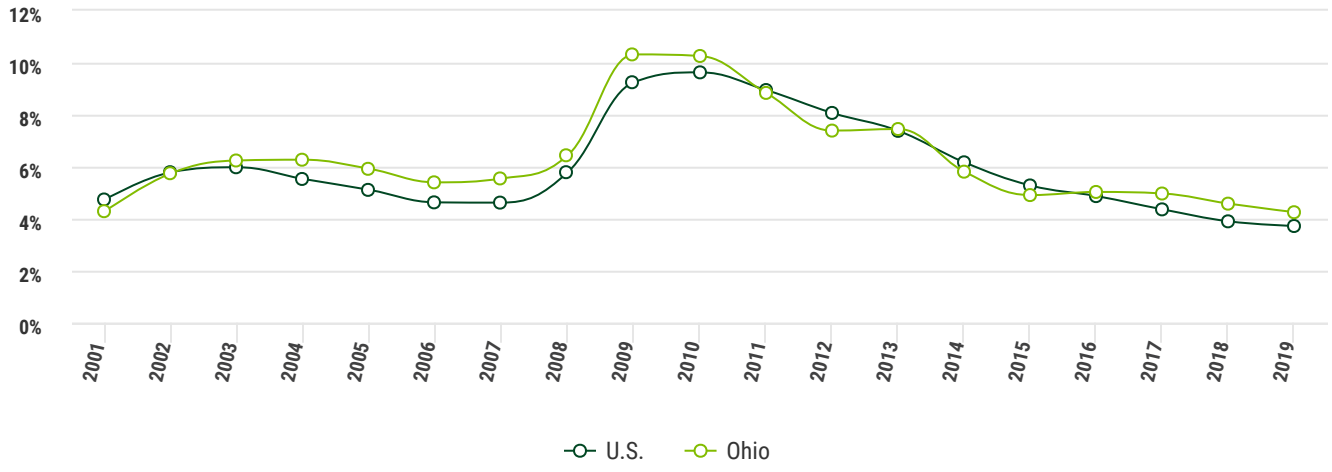
Modification with Contribution Assistance (MCA)	
Foreclosure Sale	
Number	18
Deed in Lieu	
Number	2
Short Sale	
Number	10
Traditional Sale	
Number	48
Borrower Still Owns Home	
Number	1,475
Homeownership Retention	
Number	1,523
%	**98.07%**

Homeowner Retention Assistance (HRA)	
Foreclosure Sale	
Number	21
Deed in Lieu	
Number	1
Short Sale	
Number	10
Traditional Sale	
Number	17
Borrower Still Owns Home	
Number	1,876
Homeownership Retention	
Number	1,893
%	**98.34%**

SECTION IV: CONCLUSION

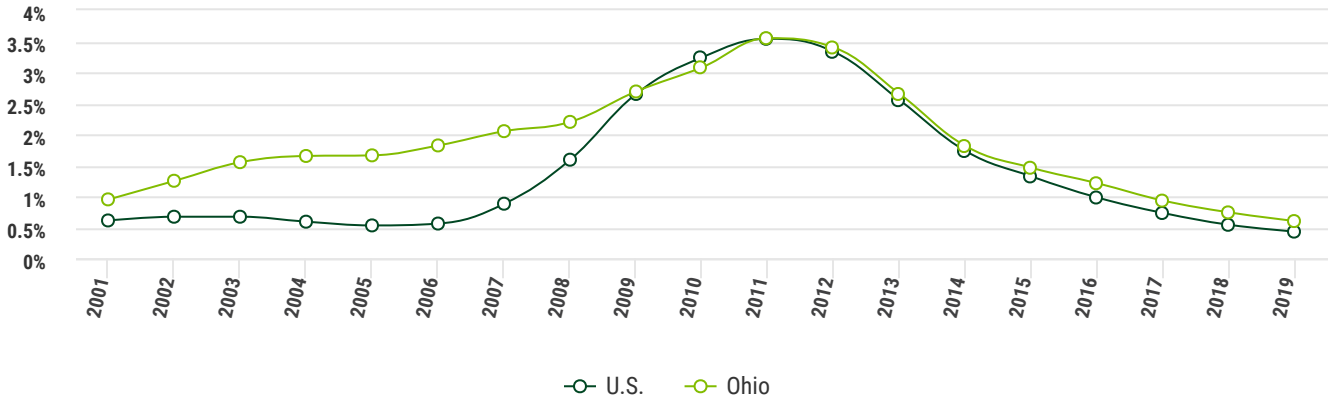
In the years since the mortgage crisis, Ohio has made a strong economic recovery. The HHF program helped to speed this recovery and stabilize the housing market by distributing much-needed funds to homeowners and neighborhoods across the state to keep people in their homes and avoid foreclosure. The charts below show the dramatic spike in unemployment, foreclosure, mortgage delinquency, and negative equity rates during the peak of the crisis and how they have since returned to pre-crisis levels.

FIGURE 13: UNEMPLOYMENT RATES, 2001 – 2019



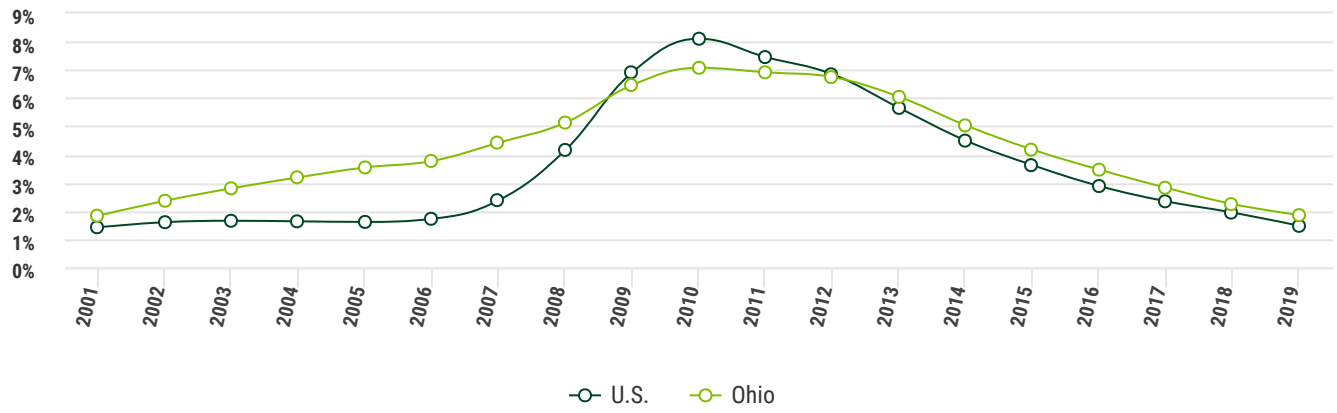
Source: Local Area Unemployment Estimates, U.S. Bureau of Labor Statistics (annual averages)

FIGURE 14: FORECLOSURE RATES, 2001 – 2019



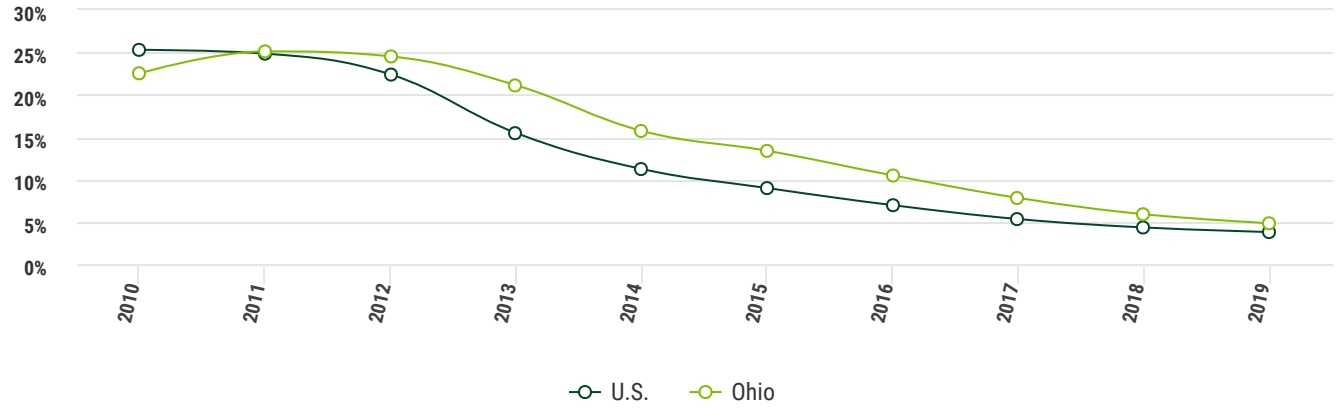
Source: Real Estate Analytics Suite, CoreLogic (based on 12-month averages)

FIGURE 15: DELINQUENCY RATES, 2001 – 2019



Source: Real Estate Analytics Suite, CoreLogic (based on 12-month averages)

FIGURE 16: NEGATIVE EQUITY RATES, 2010 – 2019



Source: Real Estate Analytics Suite, CoreLogic (based on four-quarter averages)

As would be the case with any new program, there were many challenges and much to learn throughout HHF. Staff compared developing the program to building an airplane while flying it. The following are some recommendations and key takeaways when implementing large-scale homeownership stability programs. OHFA used many of these lessons learned in creating the new Housing Assistance Fund (HAF) to assist homeowners impacted by the COVID-19 pandemic.

1. **Allow for flexibility**: One of the main reasons Ohio's HHF program was so successful is because it was flexible. Other states that had strict guidelines ultimately had trouble getting money out the door quickly. Flexible guidelines allowed OHFA to modify term sheets and program definitions internally as situations arose that hadn't previously been considered. OHFA was also able to adjust program limits if it was clear that the current limits weren't working.

2. **Assume there will be a beta phase for the first few months**: It took time for OHFA to learn what worked well for homeowners and what didn't. In addition, OHFA needed time to hire and train internal housing staff, create servicing agreements, and develop counseling manuals and underwriting guidelines. In NIP, the longer the land bank was part of NIP, the more efficient and streamlined the process became.

3. **Involve all necessary servicers, providers, and partners in the program's design**: Banks, servicers, and legal aid were not included as part of the national HHF program start-up. This was challenging since OHFA was working at a state level, while many partners and banks were working at a national scale. Ohio had trouble engaging organizations, clarifying rules, and onboarding them, which could have been avoided if those partners were included in the beginning.

4. **Have periodic stakeholder meetings to get feedback**: Engaging stakeholders of all levels is critical for assessing what parts of the program are successful and what parts need to be improved upon. It is also helpful to keep all partners engaged which creates institutional knowledge, and maintains consistency throughout the program.

5. **Aim for clear, consistent data collection practices**: To assess the impact and success of a program, it is important to develop well-defined metrics at the beginning that can be tracked throughout the entire program. All agencies and organizations collecting data should understand these metrics and enter data consistently using uniform technology as defined in a codebook.

Ohio's final allocation of HHF totaled $762.8 million, but with additional dollars recycled back into the program, this amount was closer to $775 million. Of that amount, $451 million was disbursed to 27,300 unique homeowners in all 88 Ohio counties and 96% of families could remain in their homes for at least two years following the end of assistance. Across 45 counties, $254 million funded 17,588 demolitions that were carried out to remove vacant and blighted properties and reinvigorate communities. Out of the states that received HHF funding, Ohio had one of the lowest administrative budgets at 7.99% ($60 million) of the total award.

FIGURE 17: TOTAL HHF FUNDS SPENT, 2010–2021

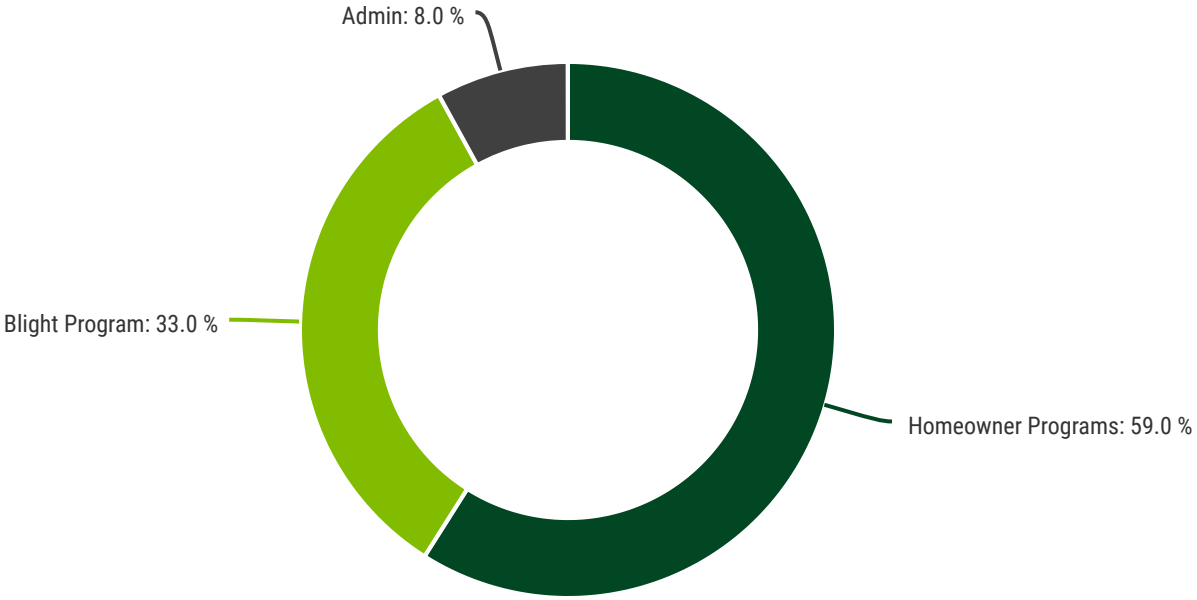
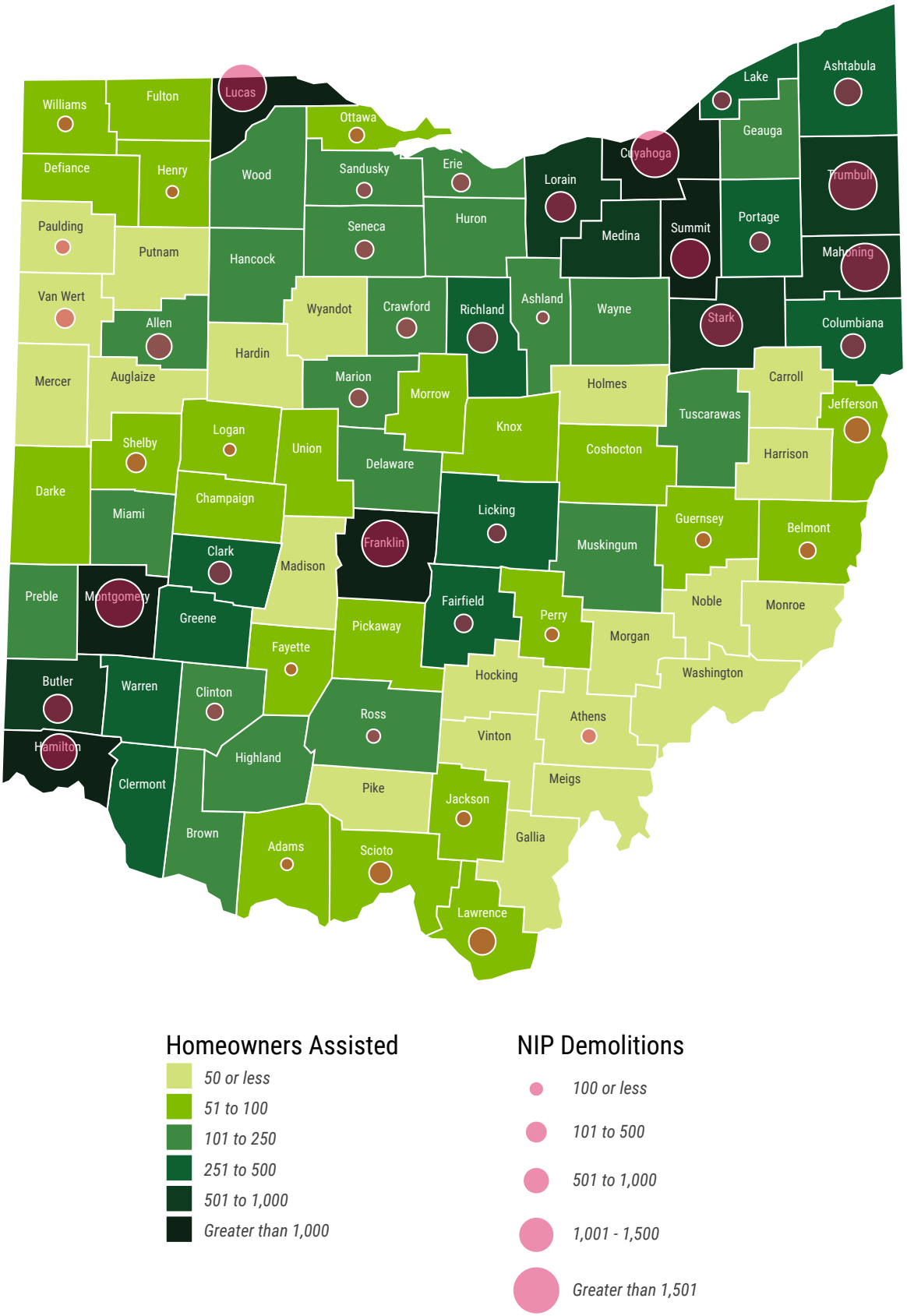


FIGURE 18: IMPACT ACROSS OHIO



SECTION V: APPENDIX

APPENDIX A: QUARTERLY PERFORMANCE REPORT (QPR) Q2 2021

Ohio HHF Performance Data Reporting- Program Performance Neighborhood Initiative Program		
	QTD	**Cumulative**
Program Evaluation		
Approved/Funded		
Number of Structures Demolished/Removed	181	17,588
% of Total Number of Submissions	N/A	99.94%
Denied/Cancelled		
Number of Structures Denied/Cancelled	0	1
% of Total Number of Submissions	N/A	0.01%
Withdrawn		
Number of Structures Withdrawn	0	10
% of Total Number of Submissions	N/A	0.06%
In Process		
Number of Structures In Process	N/A	0
% of Total Number of Submissions	N/A	0.00%
Total		
Total Number of Structures Submitted for Eligibility Review	N/A	17,599
Program Characteristics		
Assistance Characteristics		
Total Assistance Provided	$2,322,111	$253,680,672
Median Assistance Spent on Acquisition	$564	$825
Median Assistance Spent on Demolition	$8,785	$9,187
Median Assistance Spent on Greening	$600	$600
Total Assistance Reserved	N/A	$429,219
Geographic Breakdown (by city/county)		
Approved/Funded Number of Structures		
Adams	0	6
Allen	0	219
Ashland	0	5
Ashtabula	0	240
Athens	0	25
Belmont	5	44
Butler	2	291
Clark	0	132
Clinton	0	39
Columbiana	0	179
Crawford	0	73
Cuyahoga	71	5,092

Erie	0	61
Fairfield	0	52
Fayette	0	4
Franklin	0	1,120
Guernsey	0	25
Hamilton	3	537
Henry	0	5
Jackson	0	21
Jefferson	3	203
Lake	0	61
Lawrence	5	226
Licking	0	64
Logan	0	6
Lorain	0	330
Lucas	14	2,755
Mahoning	0	1,105
Marion	0	54
Montgomery	3	1,224
Ottawa	0	20
Paulding	0	22
Perry	0	14
Portage	0	74
Richland	0	355
Ross	0	13
Sandusky	0	22
Scioto	0	121
Seneca	0	65
Shelby	0	73
Stark	0	805
Summit	0	675
Trumbull	69	1,027
Van Wert	6	80
Williams	0	24

Line 18 Cumulative Total Assistance Provided Funds. There is a difference of $10,803,346.27 between the QFR and QPR as a result of funds from all programs consolidated into one account on the QFR.

Line 22 Total Assistance Reserved includes recycled funds.

APPENDIX B: LAND BANK FINAL PERFORMANCE REPORT TEMPLATE

OHIO HOUSING FINANCE AGENCY

Mike DeWine Governor of Ohio | **Sean W. Thomas** Executive Director

57 East Main Street | Columbus OH 43215

FINAL PERFORMANCE AND FINANCIAL REPORT FOR LAND BANKS

Please complete the following and return to nip@ohiohome.org:

- Name of the land bank:
- Name and title of the person completing this report:
- List the U.S. census tracts that correspond to the land bank target areas:
- Contact information for at least 2 citizens (OHFA may reach out to for a personal account of how the NIP program impacted their communities):
- Data tracked at the target area level (optional):
    - Number of building permits:
    - Infrastructure investments made:

1. Describe generally how HHF funds were used during the term of the NIP agreement:

2. Explain how your land bank's program evolved between the initial NIP agreement and the completion of demolitions and greening. Please include any changes in:

    a) Scope

    b) Number of target areas

    c) Number of demolitions projected versus completed

    d) Approach

    e) Partnerships

3. At the outset of the program, what were the biggest challenges that the land bank faced?

    a) How did the challenges change over time?

    b) Did any other challenges emerge during the program?

4. How was your target area or county unique from other regions in Ohio?

    a) How did this impact the program and its implementation in your region?

5. If the land bank applied to expand target areas during the program, what were the reasons for that expansion? How was that need identified and measured?

6. What are the most significant partnerships that helped the land bank achieve its mission?

7. Provide a brief narrative of the overall success of the program throughout the county and describe how the county has been transformed. Please include:

    a) Any known land reutilization.

    b) Economic and community benefits realized (i.e. reduction in drugs/crime, decrease in delinquent taxes, increase in investment).

    c) Environmental benefits realized.

    d) Any data that supports these observations (that OHFA has not yet collected).

8. What outcomes were achieved from the expenditure of HHF funds in the target areas?

9. What was learned throughout the NIP program?

10. If the program was redone, what, if anything, would the land bank do differently?

11. (If not previously stated) Overall, what was the impact of the program on the community and economy?

12. Provide any additional comments or data that help document how the NIP program impacted your county:

APPENDIX C: DYNAMO METRICS IMPACT REPORT

Estimating Demolition Impacts in Ohio, Mid-Program Analysis of the Ohio Housing Finance Agency's Neighborhood Initiative Program

ESTIMATING DEMOLITION IMPACTS IN OHIO

Mid-Program Analysis of the Ohio Housing Finance Agency's Neighborhood Initiative Program

June 23rd, 2016

Abstract

This study is a mid-program analysis of the Ohio Housing Finance Agency's (OHFA) Neighborhood Initiative Program (NIP). Research investigates specific measures of impact associated with home value protection and homeownership preservation as a result of OHFA NIP demolition activity between the beginning of the program in first quarter (Q1) 2014 through the beginning of the second quarter (Q2) of 2016. Given the broad scope of estimating statewide OHFA NIP demolition impacts, a benefits transfer research design was employed that imputes findings from an observational study area (within Cuyahoga County) with rich data resources and high utilization of the OHFA NIP demolition funds into 18 other participating Ohio counties. Considerable limitations exist and are addressed associated with the precision of benefit estimates outside of Cuyahoga County because such estimates rest upon a benefits transfer analysis and not direct observation.

The statewide impact from OHFA NIP demolition is estimated at $121.4 million in home value protection with a demolition cost of just over $28.2 million (2,248 demolitions total), or $4.30 in increased home values for every dollar spent. Appendix 10 displays these home value impact results by county submarket. Further, evidence suggests census tracts where demolition activity is taking place have mortgage foreclosure rates that are lower and declining faster than areas without demolition intervention. Visualizations of these trends start at page 34. Both relationships appear to have the strongest impact in the middle value submarket identified in the study.

NEIGHBORHOOD INITIATIVE PROGRAM
AN OHIO HARDEST HIT FUND PROJECT

dynamo metrics
data.analytics.policy
www.dynamometrics.com

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Purpose of the Project

The Economic Emergency Stabilization Act of 2008 (EESA) authorized the Secretary of the Treasury to purchase troubled financial assets to protect home values, preserve homeownership, promote economic growth, and maximize the return on these investments. The program born out of EESA was the Troubled Asset Relief Program (TARP). TARP eventually included about $38 billion for foreclosure prevention programs. Initially, $7.7 billion was set aside for the Hardest Hit Fund. The Hardest Hit Fund provided additional support to 18 states "hardest hit" by the foreclosure crisis. Ohio is one of them. Hardest Hit Fund is administered by U.S. Department of the Treasury, and has recently been augmented by $2 billion.

By its design Hardest Hit Fund is an innovation program: state governments have proposed what they think will work best for their communities. Ohio, among others, asked U.S. Treasury for permission to use some of its allocation to demolish vacant and abandoned houses in quasi-public ownership. U.S. Treasury allowed blight demolition on the strength of data and analysis conducted by the Griswold Consulting Group, the predecessor of Dynamo Metrics (Dynamo), in the greater Cleveland marketplace.[1] The Cleveland Study analyzed the effects of blight demolition in greater Cleveland from 2009 to 2013. The Cleveland Study showed that blight demolition in that period had an overall positive effect on home values, and was strongly associated with preservation of homeownership (i.e., reduction in mortgage foreclosure rate).

Building on the Cleveland Study and a subsequent study in Detroit[2], this project asks if the Hardest Hit Fund blight demolition in Ohio administered by the Ohio Housing Finance Agency's (OHFA) Neighborhood Initiative Program (NIP) is furthering the intent of Congress in EESA. Specifically, is blight demolition in Ohio protecting the value of surrounding homes, and; is blight demolition strongly associated with the preservation of homeownership through the lowering of localized mortgage foreclosure rates. Recent criticism of the Hardest Hit Fund suggests that the state governments do not know if Hardest Hit Fund demolitions are effective in furthering Congressional intent. Through this study, the Ohio Housing Finance Agency has measured to what extent early Hardest Hit Fund expenditures have achieved EESA's legislative goals of protecting home values and preserving homeownership.

Further, this study is designed to provide decision support to leaders at OHFA and its local partners who must choose which structures to demolish in the months to come. Because rich property data was not available in any county but Cuyahoga, we have adapted existing econometric methods and models to provide OHFA and its local partners outside Cuyahoga with what we think is the best information available for decision support. We welcome professional feedback on the methods employed in this exercise in the emerging discipline of property intervention decision support.

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[1]Griswold, N., Calnin. B., Schramm, M., Anselin, L. and P. Boehnlein. 2014. Estimating the Effect of Demolishing Distressed Structures in Cleveland, OH, 2009-2013: Impacts on Real Estate Equity and Mortgage-Foreclosure. Publication of the Western Reserve Land Conservancy: Thriving Communities Institute. See: http://www.neighborhoodindicators.org/library/catalog/estimating-effect-demolishing-distressed-structures-cleveland-oh-2009-2013.

[2] Dynamo Metrics. 2015. Estimating the Home Equity Impacts from Rapid, Targeted Residential Demolition in Detroit, MI: Application of a Spatially-Dynamic Data System for Decision Support. Collaborative publication of Rock Ventures and the Skillman Foundation. See: http://www.demolitionimpact.org/#thereport.

Background

Policy

Federal housing policy focuses on building new units. The well-established pathways of federal participation in housing finance - from the Low Income Housing Tax Credit (LIHTC), to Community Reinvestment Act (CRA) financing, to the programs of the Federal Housing Administration (FHA) and the Government Sponsored Entities, among others – focus on putting more Americans in more houses. America's population is growing, and the creation of good, and often owner-occupied, housing remains a universally-supported priority of the federal government.

But in large sections of the United States - primarily the legacy industrial areas of the Midwest, Northeast, and Southeast – real estate markets are burdened with an oversupply of functionally obsolete housing. Much was built near factories that closed long ago. Most is approaching one-hundred years-old, or older, and is located in areas that have seen massive out-migration to other areas in nearby regions or across the country. And, most importantly, this housing is largely located in low-demand markets. Over the last generation much of this housing has been neglected and abandoned, and the foreclosure crisis made the problem more acute.

Meanwhile, federal housing policy in those areas, like in the rest of the country, appears focused on making more units, and not removal of the existing oversupply of blighted or obsolescent units. The Neighborhood Stabilization Programs (NSP), for example, only allowed 10% of a community's grant to be used for demolition. Getting above this cap required a waiver. Likewise, there is no equivalent to LIHTC to help communities improve low-income neighborhoods by eliminating the abandoned houses burdening those communities; the program focuses on creating new units. The CRA structure does not seem to allow banks to earn CRA credits for assisting communities with blight elimination requirements. And so on.

In light of this emphasis on building new units, U.S. Treasury's decision to allow some states to use Hardest Hit Fund allocations for blight demolition represents something of an innovation in federal policy. Under NIP and similar programs in other states, local governments are able to demolish vacant and blighted structures with federal funds. The recent decision of Congress to enhance the Hardest Hit Fund by $2 billion means blight demolition will occur at a large scale, in Ohio and in other states.[3]

These large-scale demolition programs can be observed and analyzed to evaluate their effectiveness. To questions like, "Does demolition of blight make neighborhoods safer and more stable?" and "What is the benefit-cost ratio (BCR)[4] of publicly-financed blight demolition for property tax revenue collections?", there has been no way to provide a scientifically rigorous answer. Due to advances in economic modeling

[3] See U.S. Treasury Press Release dated April 20, 2016 for details: https://www.treasury.gov/press-center/press-releases/Pages/jl0434.aspx.

[4] In previous Griswold and Dynamo Metrics reports (see Griswold (2006), Griswold & Norris (2007), Griswold et al. (2014), and Dynamo Metrics (2015)), the benefit-cost ratio (BCR), which measures total home value preservation amount divided by total demolition cost, has been referred to as "return on investment" or "ROI," and "cost-benefit ratio" or "CBR." Moving forward, this ratio will consistently be termed benefits-cost ratio (BCR) as standardly defined: http://web.stanford.edu/group/FRI/indonesia/newregional/lectures/lecture7/lecture7BW.pdf

and the introduction of "big data" capabilities to real estate information over the past decade, policymakers can start to objectively explore the potential benefits of making blight removal a central tenet of federal housing policy in industrial legacy communities.

Distressed Property Literature

The impacts of distressed properties and demolition on nearby housing can be measured using a *hedonic price function*[5], which estimates the marginal implicit value of structural and neighborhood characteristics associated with residential housing (Taylor, 2003). In other words, this approach provides a dollar value or percent impact on home value from a marginal increase (i.e. change by one unit) in housing attributes. For example, an additional bedroom or bathroom becomes explicitly known with this method, as well as unobserved "spillover" effects from the environment, such as the marginal impact on home value from an additional nearby distressed property or other disamenity.

The hedonic price function is the econometric modeling tool of choice to measure spillover effects from distress in the housing market, and has been leveraged regularly in the literature to better understand the financial and market impacts of distressed property dynamics. The use of the hedonic price function for measuring the impacts of distressed property and demolition is contemporary in the literature. The research methods the Dynamo team has employed in this study are the artifacts of a scholarly process that has unfolded over the past 40 years. While academia and associated scholarly rigor has worked to solve the myriad econometric modeling and microeconomic theory issues associated with spatially dependent urban real-estate markets, extensive real-world observational research has applied these theoretical models into a dynamic policy space.[6]

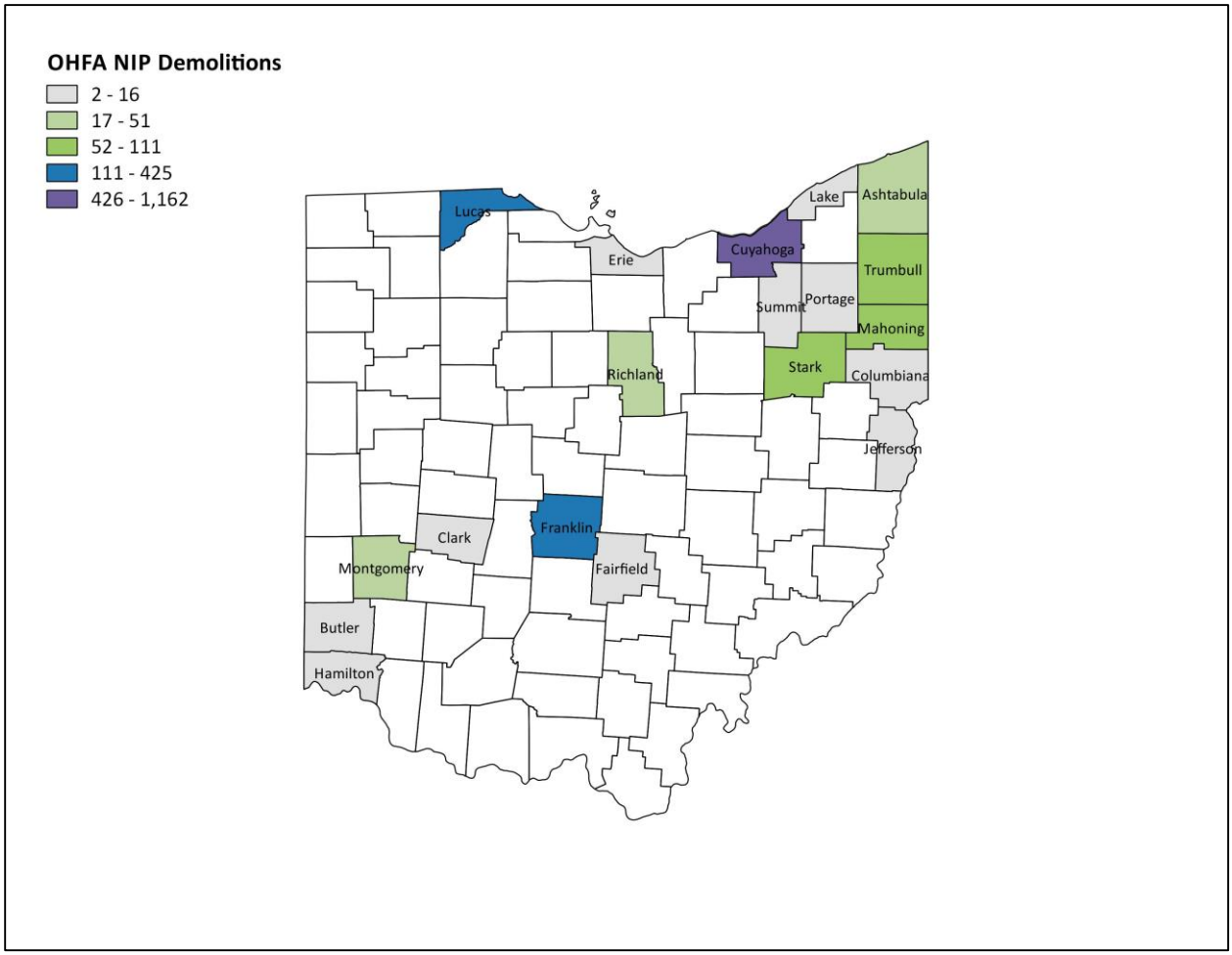
While specific econometric methods vary, the negative spillover effects on real estate markets from nearby distressed properties has been well established in the literature for over 15 years.[7] While the impacts caused by distressed properties are well documented, little scholarly work simulates the dynamic financial effect of demolition in distressed housing markets. Griswold (2006), Griswold and Norris (2007), Griswold et al. (2014) and Dynamo Metrics (2015) focus on these dynamics, using the predictive capabilities of the hedonic price function to estimate home value impact benefits captured by homes near demolition activity.

[5] See Rosen (1974).
[6] See Griswold et al. (2014), pgs. 11-15 for a history of the scholarly process.
[7] See Simons, Quercia and Maric, 1998; Immergluck and Smith, 2006; Griswold, 2006; Griswold and Norris, 2007; Schuetz, et al., 2008; Mikelbank, 2008; Leonard and Murdoch, 2009; Harding, et al., 2009; Rogers and Winter, 2009; Lin, Rosenblatt and Yao, 2009; Kobie 2009; Rogers, 2010; Hartley, 2010; Campbell et al., 2011; Groves and Rogers, 2011; Whitaker and Fitzpatrick, 2013; Griswold et al., 2014; Dynamo Metrics, 2015; Immergluck, 2015.

Framing the Research

This mid-program statewide analysis of the 19 participating OHFA NIP counties,[8] shown in Figure 1 below, is framed such that each research question is reflected by corresponding research objectives and hypotheses. Similarly, each research question, objective and hypothesis is echoed by corresponding research design, methods, and results to address and test the validity of each hypothesis, reach each objective and ultimately answer the research questions.

Figure 1: OHFA NIP Demolition Counts in Ohio Counties, Q1 2014 – Q1 2016



[8] The following is a list of Ohio counties that used OHFA NIP funds to perform demolition between Q1 2014 – April 8, 2016 (# demolitions performed in each county is in parentheses): Portage (2), Hamilton (5), Erie (7), Butler (8), Lake (8), Jefferson (8), Clark (10), Fairfield (13), Columbiana (13), Summit (16), Richland (27), Ashtabula (29), Montgomery (51), Stark (87), Mahoning (95), Trumbull (111), Franklin (171), Lucas (425), and Cuyahoga (1,164).

Research Questions

This research is driven by an overarching policy question: Is the early Hardest Hit Fund blight demolition administered across 19 counties in Ohio by OHFA NIP furthering the intent of Congress in EESA? Testing this policy question with objective scientific methods is driven by two primary research questions:

1. Is blight demolition administered by OHFA NIP in Ohio associated with a stabilization in residential property values?
2. Is blight demolition administered by OHFA NIP in Ohio associated with a reduction in mortgage foreclosure rates?

Research Objectives

The two primary research questions above are echoed by the primary research objectives of the study:

1. To estimate the impact of OHFA NIP administered HHF demolition programs across Ohio on home value stabilization;
2. To analyze the strength of the relationship between OHFA NIP administered HHF demolition programs across Ohio with reductions in localized mortgage foreclosure rates.

Research Hypotheses

Research objectives associated with OHFA NIP administered HHF demolition programs are testable with specific analytic hypotheses:

1. If OHFA NIP residential demolition activity occurs in a neighborhood, then home values in the immediate environment will increase relative to areas without demolition;
    a. If an additional county land bank owned residential structure[9] is within 500 feet of a home, then the home will sell for less, all else equal.
    b. If an additional vacant residential lot is within 500 feet of a home, then the home will sell for more than if the vacant residential lot was actually a county land bank-owned residential structure, all else equal.
    c. Null hypothesis: The number of county land bank structures and residential vacant lots do not have a measurable impact on home values.
2. If OHFA NIP residential demolition activity occurs in a neighborhood, then mortgage foreclosure rates in the immediate environment will decrease over time.
    a. If a neighborhood experiences demolition, then it will experience lower rates of mortgage foreclosure over time, all else equal.
    b. Null hypothesis: There is no association between mortgage foreclosure rates and demolition activity.

Benefits Transfer Application for Statewide Analysis

This study introduces the framing of a methodological challenge that has not been included in previous distressed property impact studies conducted by researchers at Dynamo or within the distressed

[9] Under Treasury and NIP rules, properties eligible for demolition must be quasi-publicly owned (county land banks in Ohio). This means that every NIP demolished structure was a county land bank-owned house immediately before it was demolished. The study's comparison is "before" and "after", which therefore means "county land bank-owned house" and "vacant lot," respectively. The study assumes non-redevelopment of the subsequent vacant lots during the time-period of the study.

property academic field. With 19 counties[10] where NIP demolition activity has occurred since the beginning of the program and a charge of performing a mid-program review that estimates comprehensive statewide impacts, a benefits transfer[11] method was designed so application of findings from a single sample area could be extrapolated to similar areas throughout Ohio. The clear best practice would be to perform an original study in each of the 19 counties, but only Cuyahoga County had the necessary data to perform this research, due to the prior study conducted there and the volume of demolition activity there (over 50% of OHFA NIP funds had been spent in Cuyahoga County as of April 8, 2016).

The conceptual framework of the benefits transfer approach is well documented in the literature, and speaks to the application of econometric findings in one set of communities to similar areas elsewhere when analysts are faced with time or monetary constraints (see Rosenberger and Loomis, 2003). Use of the benefits transfer requires a strong assumption, however: that Cuyahoga County's housing market dynamics reasonably approximates the housing dynamics in the other 18 counties. Because that assumption remains untested, we acknowledge this study's inherent weakness in that regard.

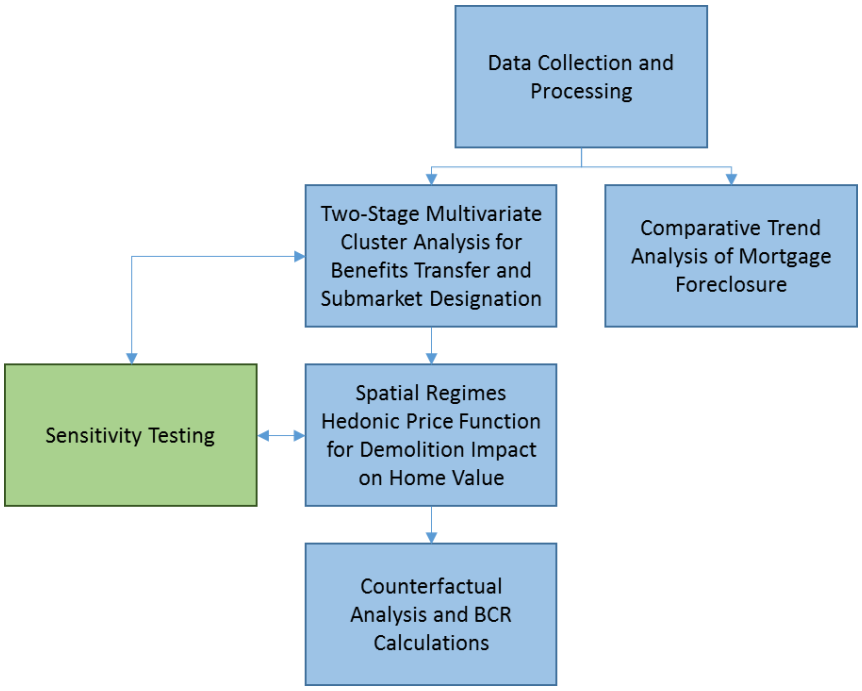
[10] 19 Ohio counties that used OHFA NIP funds to perform demolition between Q1 2014 – April 8, 2016: Ashtabula, Butler, Clark, Columbiana, Cuyahoga, Erie, Fairfield, Franklin, Hamilton, Jefferson, Lake, Lucas, Mahoning, Montgomery, Portage, Richland, Summit, Stark, and Trumbull.

[11] See Chapter 12 (pg. 445) for full explanation of the benefits transfer method: Rosenberger, R.S., and J.B. Loomis. 2003. "Benefits Transfer." Chapter 12 in (Champ et al. eds.) *A Primer for Non-Market Valuation.* Kluwer Academic Publishers: Netherlands. pp. 331-393.

Research Design

The statewide impact element of the research design is the transfer of demolition impact findings from the estimated hedonic price function in the Cuyahoga County study area ("Observational Study Area"),[12] to alike[13] Census Tracts in the other 18 counties that received HHF demolition in Ohio ("Benefits Transfer Study Area").[14] Under a set of restrictive assumptions, this design allows the transfer of findings from the Observational Study Area to the Benefits Transfer Study Area. While limited, this design attempts to reach the goal of estimating statewide OHFA NIP demolition impact by transferability of results from one sample area to other participating areas without an actual empirical study in the 18 remaining areas. Upon identification of the Observational Study Area and its relative "alikeness" to the Census Tracts in the 18 Benefits Transfer Study Area counties, detailed research in the Observational Study Area could begin. Figure 2 below provides a basic flowchart of the research process:

Figure 2: Research Design Flowchart



[12] All property level refined distressed property analysis was performed in the "Observational Study Area." The Observational Study Area is a subset of Census Tracts within Cuyahoga County identified by a two-stage multivariate cluster analysis (Stage One identifies the Observational Study Area) where OHFA NIP demolition occurred or is similar in socio-economic, demographic and housing market characteristics as the places that did receive demolition.

[13] Given that the "Observational Study Area" is within Cuyahoga County - a possible housing market outlier in Ohio - identifying precisely alike Census Tracts in the other 18 participating is not likely. The variance between housing market types and submarkets across Ohio counties requires in depth research which has not been performed due to study constraints. This study addresses this issue by pooling all Census Tracts outside the Cuyahoga study area where OHFA NIP demolition occurred into a two-stage multivariate cluster analysis (Stage Two is the pooling stage) under the assumption that demolition tends to occur in similarly marginal and weak housing markets, albeit relative to the overall housing market at hand in a given county.

[14] Application of findings identified in the "Observational Study Area" occur in the "Benefits Transfer Study Area." The Benefits Transfer Study Area is all Census Tracts in all 18 statewide OHFA NIP participating counties where OHFA NIP demolition occurred during the study time period.

The key research design components are presented in chronological order of their execution in the research process:

1. Analyze and identify Census Tract level submarkets to allow benefits transfer extrapolation of results from the Observational Study Area into the Benefits Transfer Study Area.[15, 16]
    a. This step is reliant on consistent U.S. Census Bureau socio-economic, demographic and housing data at the same geographic scale (Census Tract) across both the Observational and Benefits Transfer Study Areas.
    b. This step requires a two-stage multivariate cluster analysis to identify Census Tract level submarkets that are comparable such that results from the Observational Study Area hedonic price function are transferable.

2. Analyze property level data in the Observational Study Area to estimate home value impact from demolition with a spatial regimes hedonic price function (addresses Hypothesis 1)[17];
    a. This design component is reliant upon a statistically significant impact of blighted homes and vacant lots identified from the hedonic price function in each submarket to provide estimates of the "home value impact rate"[18] available to nearby properties from demolition in each submarket.
    b. This design component requires the specification of a spatial econometric model and associated analysis of results to test Hypothesis 1.

3. Analyze findings associated with home value impact from demolition in the spatial econometric analysis from the Observational Study Area to quantify the financial impacts from statewide OHFA NIP demolition (addresses Hypothesis 1)[19]:
    a. This design component is reliant upon the significance of distressed property coefficients (specifically land bank structures[20]) and vacant lot coefficients in each submarket for application of the home value impact rate available in each submarket from demolition.
    b. This design component requires an application of the home value impact rate through a counterfactual analysis that estimates the aggregate home value protected from each demolition compared to the cost of each demolition.[21]

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[15] The actual transfer of benefits from one area to another requires two assumptions to be true: the areas of interest are actually alike in relevant attributes and the coefficients derived from the study area actually reflect the marginal impact in the benefits transfer areas. Neither of these assumptions could be tested because of study resource constraints.
[16] See Appendix 1 through 4 for research results associated with design component 1.
[17] See Appendix 8 for research results associated with design component 2.
[18] See page 1 of Griswold, et al (2014) "Home value impact rate" available from demolition has been referred often as the "equity hedge" available from demolition in previous Griswold and Dynamo Metrics studies. Both refer to the nearby home value protected when a distressed structure is reduced to a vacant lot via demolition. See page 1 of Griswold, et al (2014) for more detail.
[19] See Appendix 10 for research results associated with design component 3
[20] See discussion point 1 in the Discussion Section of this document for further explanation.
[21] Findings from design component 3 are most reliable in the Observational Study Area given that comparable Census Tract-level submarkets outside Cuyahoga County (Benefits Transfer Study Area) are likely to exist in relatively different housing markets. Research methods attempt to address this issue, but without additional data from a more "normal" Ohio county, it is not possible to know the variation between housing markets in Cuyahoga County and those across the state.

4. Analyze property-level and Census Block data in the Observational Study Area to test the strength of association between homeownership preservation and demolition (addresses Hypothesis 2)[22]:
    a. This design component is reliant upon the ability to estimate the demolition and mortgage foreclosure rates at small geographic scales over time in the Observational Study Area.
    b. This design component requires a comparative trend analysis of mortgage foreclosure rates in alike submarkets in the Observational Study Area with varying levels of demolition intervention.
        i. Given that property level mortgage foreclosure data is not available at a similar scale in the Benefits Transfer Study Area, the study design provides inference in the benefits transfer areas associated with homeownership preservation by comparing the types of submarkets where demolition was performed with the strength of the relationship between mortgage foreclosure rates and demolition rates over time in the Observational Study Area.[23]

[22] See the Comparative Trends Analysis part of the Results section (page 34) for results associated with design component 4.
[23] Maps of the submarkets in the observational and Benefits Transfer Study Area counties can be found in Appendix 1.1 through Appendix 1.19. Table providing the number of demolitions in each submarket in each Benefits Transfer Study Area county can be found in Appendix 10.

Research Methods: Instruments and Measures

Four research methods (Rosenberger, R.S. and Loomis, J.B, 2003; Griswold, 2006; Griswold et al., 2014; Dynamo Metrics, 2015) have been employed by the Dynamo Metrics research team to satisfy the OHFA request for estimates of statewide neighborhood stabilization impacts attributable to OHFA NIP demolitions. Each research design component explained above is matched with an associated research method, method explanation and data requirement, as shown below. A detailed explanation of the outcomes from the application of these methods in concert with their associated objective, hypothesis and data requirements can be found in the results section that follows.

Generally, the four methods that mirror the four research design components are:

1. Performing a ***two-stage multivariate cluster analysis*** in which Census Tract data in the Observational and Benefits Transfer Study Areas are pooled together to define the most similar housing submarkets.[24] The two-stage multivariate cluster analysis is the method used to allow findings associated with home value impacts from demolition from the hedonic price function in the Observational Study Area to be transferable to matching submarkets in the Benefits Transfer Study Area;[25]

2. Estimating a ***spatial regimes hedonic price function*** with spatially defined property distress variables that quantify the impact and impact variability of OHFA NIP demolition across housing submarkets. The spatial regimes hedonic price function is the method used to identify the home value impact rate available from turning blighted structures into vacant lots in each submarket identified in Method 1.;[26]

3. Performing a ***counterfactual analysis*** that leverages the predictive capabilities of the spatial regimes hedonic price function to estimate benefit-cost ratios derived from applied home value impact rates associated with demolition expenditures in the Observational and Benefits Transfer Study Areas. The counterfactual analysis is the method that uses the home value impact rates identified in Method 2 to quantify the dollar value impact and BCR associated with OHFA NIP demolition in each housing submarket in each county, and statewide;[27]

4. Performing a ***comparative trend analysis*** of mortgage foreclosure rate changes through time in alike submarkets with and without demolition intervention activity in the Observational Study Area to estimate the strength of association between homeownership preservation and prevalence of demolition activity. The comparative trends analysis is designed to provide decision support and insight related to how OHFA NIP demolition impacts homeownership preservation.[28]

[24] "Housing submarkets" are akin to neighborhood typology clusters given that they are created by using Census Tract-level housing, socio-economic and demographic data together to define the key attributes of a given Census Tract.
[25] While the two-stage multivariate clustering method to define alike submarkets across counties is thorough, it does not ameliorate the issue that a single and possibly outlier type housing market was used as the Observational Study Area to define what "alike" submarkets are across OHFA NIP counties.
[26] See Griswold (2006), Griswold and Norris (2007), Griswold et al. (2014) or Dynamo Metrics (2015) for theoretical and application details related to the spatial regimes hedonic price function and spatial-count property distress variables.
[27] Specific application of counterfactual analysis from a spatial regimes hedonic price function can be found within Griswold (2006) and Griswold et al. (2014).
[28] See Griswold et al. (2014) for specific application of this type of comparative trend analysis.

Two-Stage Multivariate Cluster Analysis

Given study constraints, it was not possible to implement a full-fledged hedonic analysis for the 19 Ohio counties with NIP activity. In order to impute results for the 18 remaining counties from the analysis carried out for the Cuyahoga County Observational Study Area, it is imperative that the Census Tracts under study are "as similar" as possible.[29] To accomplish this, a two-stage multivariate cluster analysis was carried out. Stage One consisted of an analysis of all the Census Tracts in Cuyahoga County. A principal components analysis (PCA)[30] was carried out using the 23 census variables that were available for all Census Tracts in the study (both Cuyahoga County and the 18 others).[31] Subsequently, the computed values for the two main components (which explained 50.85% of the total variance) were used as the basis for a k-means clustering[32] exercise. The value of k was varied from 3 to 6 to identify the most appropriate cluster size.[33] [34] Close examination of the cluster fit statistics suggested k=4 as the cluster size. An analysis of the characteristics of the four clusters revealed that all the Census Tracts with NIP activity were concentrated primarily in two clusters. The Census Tracts in those two clusters[35] were then selected for subsequent analysis in a pooled setting with Census Tracts from the remaining 18 counties (the other Census Tracts in Cuyahoga county were not included in the subsequent hedonic analysis).

In Stage Two, this exercise was repeated, but now for the selected Observational Study Area Census Tracts from Cuyahoga County (those tracts in the two identified clusters from the first phase analysis)

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[29] An observation from outside this study supports use of this study's benefits transfer analysis, despite the methodological weakness set forth above and elsewhere in this study. The impact of vacant lots and distressed structures, when statistically significant within an identified submarket, have been shown to be relatively consistent throughout previous studies as well as the current one (See Immergluck (2015), Griswold et al. (2014) and Appendix 10). Specifically, the negative impact of an additional nearby vacant lot tends to decrease home value by 0.5%-1.5% (Griswold et al. (2014) and Appendix 10) and the negative impact of an additional nearby distressed structure tends to fall between 1.8%-5.2% (Immergluck, 2015), depending on submarket and distress type (it does tend to be higher in highest value submarkets where demolition does not occur in high frequency). Given this relative consistency in negative property impacts across studies, transferring benefits estimates of home value impact rates to other counties where the real Census Tract-level median household incomes are used to quantify home value impacts provides a reasonable estimation of the impact of demolition in those locations. The benefits transfer analysis further rests upon a herein untested but common-sense observation that most OHFA NIP demolition activity is occurring in weak-market urban areas that have, broadly speaking, market dynamics more similar to each other's than to strong-market areas in each's own county (i.e., a real estate market in a depressed inner-city neighborhood in Columbus behaves more like a depressed inner-city neighborhood housing market in Cleveland than it does to the real estate market in Dublin or Bexley). The summary statistics from this study do support this assumption given that 75% of sales observations sold for under $65,000 and 50% of sales observations sold for less than $30,000.

[30] Principal components analysis allows a researcher to summarize large correlated sets of variables with smaller numbers of representative variables that collectively explain the majority of variation in the original dataset (G. James, et al., 2013).

[31] Identified principal components used for Stage One can be found in Appendix 2.

[32] K-means (MacQueen, 1967) is a highly used spatial clustering method, used in our case for similarity grouping of the predicted values of the highest impact PCA outputs for Census Tract submarkets. The method imposes "k" breaks on an "N" dimensional dataset in which mean variance is maximized across "k" breaks and minimized within the "k" breaks.

[33] Results from the Stage One k-means analysis can be found in the map in Appendix 3. The two clusters chosen from Stage One where demolition occurred or are like the Census Tracts where demolition occurred are green and grey in Appendix 3.

[34] A Stage One multivariate cluster analysis where k=3 was run for sensitivity testing of the final model in Cuyahoga County alone. The sensitivity test was run such that the final model could be run ONLY on the submarket regime in Cuyahoga, as opposed to the pooled Stage Two version, such that a sense of what was "given up" by pooling the 18 county Census Tracts into the final model submarkets is given. Results from the sensitivity analysis can be found in Appendix 11.1 through 11.5.

[35] A small number of Census Tract that had demolition occur within them did fall outside of the two primary clusters. These Census Tracts were captured directly and included in the second stage of the cluster analysis.

together with all the Census Tracts in the remaining 18 counties that had NIP activity (Benefits Transfer Study Area).[36] Again, the same 23 census variables were used to construct the PCA,[37] and this time the first three main component scores were employed in a k-means clustering exercise.[38] A sensitivity analysis suggested that k=3 should be used. The resulting classification of Census Tracts into 3 clusters was used as the definition of the submarkets. In the Cuyahoga subset of Census Tracts, this formed the basis for the spatial regime (i.e., submarket) hedonic analysis. The counterfactual results were imputed to the Census Tracts in the 18 remaining areas using the submarket definition matching their cluster assignment.

Characteristics and findings from the regression analysis and resulting summary statistics associated with each of the three final submarket regimes were used to define the "lowest", "middle", and "highest" value submarkets in the study area. The regression analysis provided a clear and statistically significant look at the relative value differences between each market while the summary statistics supported those findings. See Appendix 7, 8 and 9 for details related to the three housing submarket regimes.

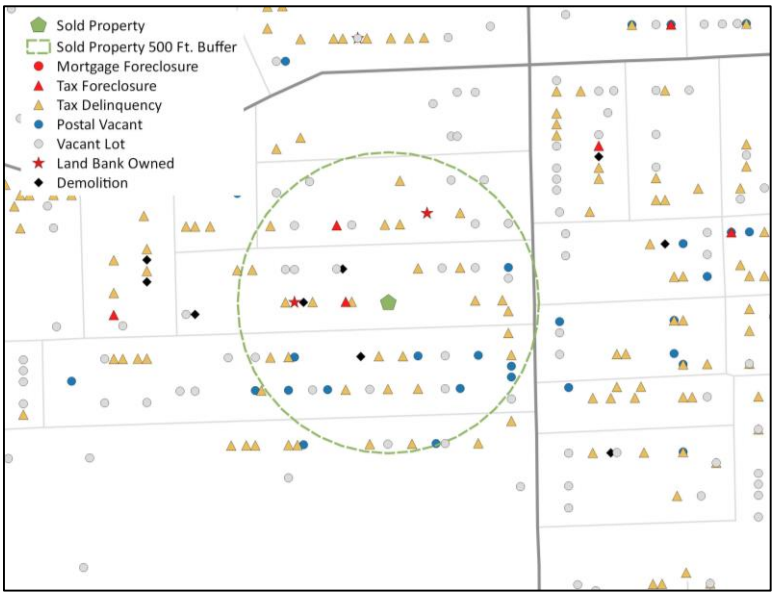
[36] Ideally, the analysis should also have contained Census Tracts from the remaining 18 counties that could act as "controls" (i.e., were similar but did not have NIP activity), but due to resource constraints this was not possible.
[37] Identified principal components used for Stage Two can be found in Appendix 4.
[38] Results from the Stage Two k-means analysis which identify all final county level submarkets can be found in the maps of Appendix 1.1 through 1.19.

Hedonic Price Function

The hedonic price function was utilized to estimate the impact of OHFA NIP demolition on home values in this study. Estimating a hedonic price function is an econometric method based on the economic theory that goods are ultimately valued by way of their utility-bearing attributes (Lancaster, 1966; Rosen, 1974). Given a competitive market, buyers are assumed to sort themselves by deciding on a "bundle" of attributes (i.e. a house) that they are willing to purchase, given their income constraints and preferences. The implicit prices of housing attributes will be decided by the supply of and demand for those particular housing attributes within the specified area (Deaton, 2002). The intuitive idea is that a house is made of its physical and structural attributes, as well as all the attributes of its particular environment and location. According to economic theory, the positive and negative value effects of these attributes are what make the price of a home higher or lower, respectively.[39]

If levels of non-market attributes such as disamenities associated with distressed structures and vacant lots can be measured correctly, a hedonic pricing model can be specified to examine the extent that variation in the non-market attribute is incorporated in the price of the final product (Deaton 2002). Multiple studies over the past decade have consistently shown that property distress can be measured well by using spatially defined variables that aggregate counts of distressed structures and vacant lots in the immediate environment surrounding a home in the time period it sold.[40] A conceptual layout of this approach is shown in Figure 3, below. Other key hedonic methodological elements critical to this study that were gleaned from previous similar research include space-time lag variables and submarket regimes to address spatial error, and standard corrections for heteroscedasticity, among others.[41]

Figure 3: Conceptual Layout of 500 Foot Buffer to Count Distress Near Home Sales Observations



[39] Even in the absence of an efficient market, a hedonic specification is useful as an empirical measure of the relationship between house attributes and the sales price.
[40] See Immergluck (2015)
[41] See theoretical and methodological sections of Griswold (2006), Griswold et al. (2014) and Dynamo Metrics (2015) for specific detail related to hedonic price function specification.

The hedonic price function was specified such that the price of a single-family residential housing unit is assumed to be a function of the bundle of attributes that characterize the house. The empirical specification used for the hedonic price function in this study is:

$$ln(P_i) = \beta_0 + \beta_1(ST_i) + \beta_2(D_i^S) + \beta_2(D_i^{VL}) + \Theta W_i + \Phi X_i + \Psi Y_i + \Omega Z_i + \varepsilon_i$$

Where natural log of housing price, P_i, is determined by: (1) a vector of space-time lag variables that measure the average sales price of the six nearest neighbors to the sold home in the previous quarter, ST_i;[42] (2) a vector of variables measuring aggregate counts of multiple types of distressed residential structures within 0-500 feet of a residential sale[43], D_i^S; (3) a vector of variables measuring density of vacant residential lots within 0-500 feet of a residential sale, D_i^{VL}; (4) a vector of variables describing the physical attributes of the house, W_i; (5) a vector of dummy variables describing the distress status or deed type when the house sold, X_i;) a vector of dummy variables describing the year and quarter in which the house sold, Y_i; (5) and, a vector of dummy variables describing the Census Tract submarket type identified from the multivariate cluster analysis in which the home sold[44], Z_i. The error term, ε_i, is assumed to have a conditional mean of zero and a constant variance.

The functional form assumes a semi-log relationship between price of a house and the attributes that make up the value of the house.[45] In general, non-linear relationships between price and the physical and neighborhood attributes are expected. For this reason, a preponderance of studies use the semi-log functional form (Taylor 2003). Taylor (2003) states, "The semi-log allows for incremental changes in characteristics to have a constant effect on the percentage change in price and a non-linear relationship on the price-level" (Taylor 2003; 355). This output from the empirical modeling process is ideal as it offers the opportunity to compare percentage impact on property values from incremental changes in unique distress variables across and within submarkets. A full list of variables with definitions used to estimate the hedonic price function are provided in Appendix 5. The model time series is set up with 27 quarterly time periods between second quarter (Q2) 2009 through Q4 2015.[46]

[42] Note that the relationship between the dependent variable and space-time lag is defined as log-linear, impacting the framing of its interpretation, and is potentially a scale mismatch. That said, under this specification results provide a useful and defensible interpretation that is highly significant.

[43] Both space-time and spatial count variables encounter boundary issues – meaning that homes are valued and counts are made outside the actual study area, respectively. The study area contains all the actual sales observations of the hedonic price function, but those homes can be influenced by homes that sold and distressed homes outside the study area in our approach. This was possible given access to the full Cuyahoga County analytics ready dataset.

[44] Census Tract dummy variables for submarkets only apply in the global model. In the spatial regimes function, all observations in each individual submarket are run as their own individual model.

[45] Taylor, Laura O. 2003. "The Hedonic Method." Chapter 10 in (Champ et al. eds.) A Primer for Non-Market Valuation. Kluwer Academic Publishers: Netherlands. pp. 331-393.

[46] Given that the model is designed to measure the proxy dynamics of demolition – i.e. estimate the coefficients of home value impact from the property distress before a demolition (blighted structure) and after (vacant lot), it is permissible to use many more time periods than during the actual OHFA NIP implementation period to capture the most robust coefficient estimates possible.

Spatial Regimes Hedonic Price Function

A so-called "spatial regimes model,"[47] is an insightful approach for a multiple submarket study such as this because all variable coefficients of the base model - including the impacts of nearby distressed properties- are allowed to vary between "regimes," i.e. submarkets. This yields estimates (and associated standard errors) for each of the model coefficients across each submarket. A test for spatial heterogeneity, or Chow test (Chow 1960, Anselin 1990) is a formal test of the null hypothesis of coefficient stability across the submarket regimes. The test can be carried out for each individual coefficient separately, as well as for all the coefficients jointly to determine if the submarkets arte truly different. The spatial regimes model was the chosen hedonic price function methodology and necessary testing was applied.

[47] An identical spatial regimes model that did not pool Census Tract attributes from the 18 OHFA NIP counties outside Cuyahoga County was run for sensitivity test purposes. The sensitivity test is a method designed to address how much the model outcome changes from the outside pooled data being introduced into the submarket regime. Outcomes from the sensitivity test can be found in Appendix 11.1 through 11.5.

Counterfactual Analysis

The base of the counterfactual methodological instrument is in using the estimated home value impact rate identified from the removal of an existing county land bank structure[48] (and its associated negative impact) and turning it into a vacant lot. The term "counterfactual" is used because the analysis estimates how much home value would have been lost if demolition never occurred, or how much home value was protected because demolition did occur. The argument for this use of the marginal implicit prices, or coefficients, identified in the final spatial regimes hedonic price function is well documented in the literature and can be found in detail in the theoretical section focused on using marginal implicit prices derived from the hedonic price function as welfare estimates in Griswold (2006).

The spatial regimes hedonic price function specified above allows quantification of the magnitude of these impacts in each submarket. The counterfactual analysis is then designed to put those coefficients to work in estimating the aggregate nearby home value protected each time an OHFA NIP demolition turns a county land bank structure into a residential vacant lot.[49]

The step-by-step methodological process of estimating the value of each OHFA NIP demolition using the spatial regimes hedonic price function is as follows:

1. Identify the submarket, Census Tract, and Census block each HHF demolition occurred within;
2. Identify the number of housing units within each Census block in which a demolition occurred;
3. Identify the area of each Census block in which a demolition occurred;
4. Aggregate the total number demolitions, housing units and area of Census blocks in which demolitions occurred to the Census Tract in which they are located;
5. Calculate the average lot area of a housing unit near a demolition within each Census Tract (total area of blocks with demolition divided by total housing units in blocks with demolition);
6. Calculate the number of housing units that would fall into a 500-foot circle around a demolition (area of a 500-foot circle divided by average lot area of housing units near demolition);
7. Establish the median home value by Census Tract (2010-2014) U.S. Census ACS Median Home Value);
8. Calculate the impact of OHFA NIP demolitions (count of housing units impacted by demolitions multiplied by median home value of each Census Tract multiplied by percent impact of demolition within submarket).

[48] The negative impact of a county land bank structure was used for the counterfactual analysis because these are the property types that are being demolished with OHFA NIP funds.

[49] Results of the counterfactual analysis are estimates with standard errors which can be made available upon request.

Comparative Trends Analysis

The comparative trend analysis is the method used to assess the strength of the relationship between demolition activity at the neighborhood level and homeownership preservation across varying types of housing submarkets.[50] Specifically, the mortgage foreclosure rate was calculated within the Observational Study Area at neighborhood scales within each housing submarket where demolition intervention both occurred and did not occur. The mortgage foreclosure rate trends in similar areas were then compared over 24 time periods (Q1 2010 – Q4 2015)[51] with the key control variable being the existence or non-existence of demolition activity. The product of this analysis is four comparative trend charts: an aggregate chart in which mortgage foreclosure rates in all areas with demolition intervention are compared to the rates in all those that did receive demolition intervention and a similar chart for each of the three final housing submarkets identified in the Observational Study Area. Upon identification of the average mortgage foreclosure rates in areas with and without demolition in each submarket, a paired difference in means t-test[52] was performed to test whether the mortgage foreclosure rates were indeed statistically significantly different from one another. Visual analysis of the trends is also used to gain inference of the strength of the relationship between demolition and homeownership preservation.

The step-by-step methodological process of executing the comparative trends analysis is as follows:

1. Identify whether or not each Census Block within the Observational Study Area experienced any residential demolition between Q1 of 2010 and Q4 of 2015.
2. Identify quarterly counts of mortgage foreclosure and residential properties with structures in all Census Blocks within the Observational Study Area.
3. Aggregate counts of Census Block level mortgage foreclosure and residential properties in each submarket into two categories: 1) counts in Census Blocks that experienced residential demolition (intervention); and, 2) counts in Census Blocks that did not experience residential demolition (non-intervention).
4. Calculate quarterly mortgage foreclosure rates within each submarket, and overall, using aggregate counts (mortgage foreclosure aggregate count divided by residential structure aggregate count) in intervention and non-intervention categories.
5. Graph quarterly trends of intervention and non-intervention mortgage foreclosure rates, with linear trend lines, within each submarket and overall.
6. Visually compare the slopes of the trend lines and perform paired difference-in-means t-tests on the time-series mortgage foreclosure rates to ascertain the strength of the relationship between demolition and homeownership preservation in each housing submarket.

[50] See Griswold et al. (2014) for an additional application and outcome from this method.
[51] Only 24 time periods were used in the comparative trends analysis as opposed to 27 in the hedonic price function because mortgage foreclosure data was not available in the same format between the two analyses.
[52] See page 2 of the linked PDF for explanation of difference in means t-test performed: http://www.stata.com/manuals13/rttest.pdf

Data

Key data required for the full study includes property-level geo-location and time-stamped data on physical and distress attributes, arms-length sales, and all OHFA NIP and other programmatic demolitions in the Observational Study Area. Key data required for the Benefits Transfer Study Area include all 23 Census Tract-level housing, socio-economic and demographic variables from the U.S. Census Bureau as well as all property-level and time-stamped OHFA NIP demolition data. Significant data processing was undertaken in partnership with the Center on Urban Poverty and Community Development at Case Western Reserve University in order to run the hedonic price function to estimate the distress levels and sales environments around homes sales. Building analysis ready data sets for the two-stage multivariate cluster analysis, counterfactual analysis and comparative trend analysis required significant data processing as well.[53]

Specific data requirements to build the functional methodological instruments to execute each study application that address the research framework, design and methods are outlined below.

- *Two-stage multivariate cluster analysis*
  - OHFA NIP demolition data (to identify Census Tracts of interest);
  - Cuyahoga County sales data (to test distribution of sales across Census Tracts and submarkets within the Observational Study Area);
  - Census Bureau housing, socio-economic and demographic data at Census Tract level (to differentiate Census Tracts into unique submarkets);
  - Parcel (in Observational Study Area) and Census Tract shapefiles (to assign each Census Tract into its respective submarket defined through the cluster analysis);

- *Spatial regimes hedonic price function*
  - Cuyahoga County arms-length sales (to provide home values for hedonic price function observations);
  - Time-stamped, geo-located distressed properties (to get counts and attributes of each distress count variable surrounding each observation when it sold);
  - Northeast Ohio Community and Neighborhood Data for Organizing (NEO-CANDO) (to provide all other relevant housing characteristics for hedonic price function observations).

- *Counterfactual Analysis*
  - OHFA NIP demolition location (to identify property home values impacted nearby);
  - Census Block level housing units and geographic area (to identify the count of homes impacted by each demolition);
  - Submarket identification of each Census Block (to match the estimated home value impact and neighborhood submarket of homes impacted by demolition);
  - Census Tract Median Home Value (to use as the value estimator for homes near demolitions).

[53] Please contact Dynamo Metrics at dynamometrics.com for more information regarding data sets and data processing associated with this study.

- *Comparative Trends Analysis*
    - Location of 1-4 units residential properties quarterly (to identify a control for the total houses in a given area where some homes are mortgage foreclosed);
    - Location and quarterly counts of mortgage foreclosure in the Observational Study Area (to quantify quarterly mortgage foreclosure rates);
    - Location of all demolitions (to identify areas that either did or did not receive demolitions Census Block level);
    - Submarket identifier (to control for which type of neighborhood submarket type).

All raw data files captured were merged and processed at the parcel level within the Observational Study Area, and at the Census Tract level in the Benefits Transfer Study Area. [54]

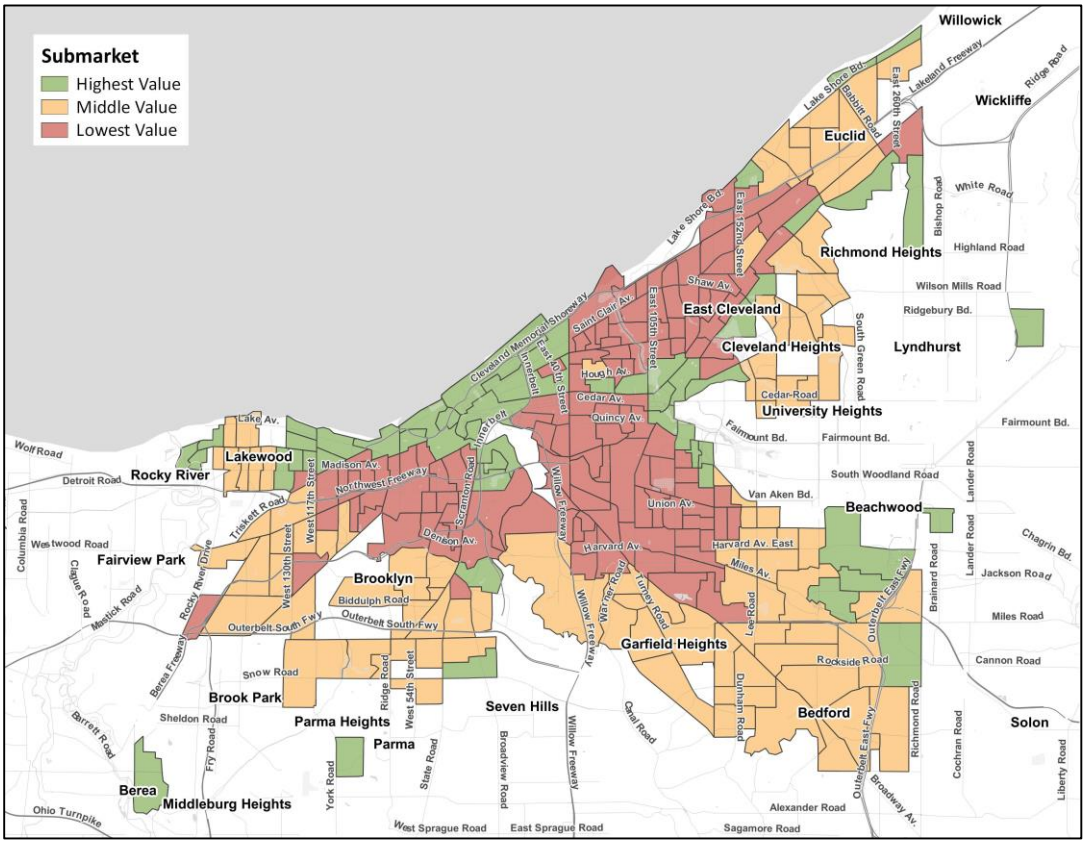
[54] See Appendix 6 for full metadata and explanation of each individual raw and processed data set included in the study.

Results

Two-Stage Multivariate Cluster Analysis

Three submarkets were identified as a result of the two-stage multivariate cluster analysis in the Observational Study Area and the Benefits Transfer Study Area: 1) lowest value submarket; 2) middle value submarket; 3) highest value submarket. As shown in the regression results in Appendix 9, the three submarket regimes are statistically significantly different than one another. The regression results in Appendix 8 show that homes in the highest value submarket sell for an estimated 10% more than the middle value submarket, while homes in the lowest value submarkets sell for an estimated 34.5% less than the middle value submarket. Specific variation in the explanatory variables across submarkets in each OHFA NIP participating county can be found in Appendix 7. The Observational Study Area in Cuyahoga County is highlighted in Figure 4 below.

Figure 4: Census Tract Submarkets in the Cuyahoga County Observational Study Area



Central to the two-stage multivariate cluster analysis is that building a benefits transfer approach with a single study area is not advisable for deriving precise results in other, potentially dissimilar areas. Stage One of the cluster analysis is robust in Cuyahoga County given that an original study is performed there, and validity of submarkets is testable. Stage Two, which includes all NIP demolition activity statewide, further retains validity of the spatial regimes hedonic price function in Cuyahoga County during sensitivity

testing in terms of its predictive power and statistical significance.[55] This means that the cluster analysis, resultant submarkets and spatial regimes hedonic price function in Cuyahoga County is robust in its definition of housing submarkets.

The Stage Two pooling in the cluster analysis provides some mixed results in the consistency of Census Tract summary statistics at the individual county levels, as shown in Appendix 7. There is consistency in the second stage method identifying the lowest market areas, but identifying a distinct difference between the middle and highest value submarket varies in some cases. In short, the weakness of the benefits transfer approach is exposed through the summary statistics at the county level. Using the defined second stage submarket definitions in the Benefits Transfer Study Area is permissible despite identified methodological weakness because of the following two assumptions: 1) OHFA NIP demolition occurs in marginal and weak market neighborhoods; and, 2) the strength of previous studies in identifying consistent confidence intervals related to blight impact on home value and vacant lot impact on home value (i.e. home value impact rate available from demolition).[56]

Stage One Multivariate Cluster Analysis Results

Based on 23 Census Tract level socio-economic and demographic variables[57], Stage One of the two-stage multivariate cluster analysis was run for the entirety of Cuyahoga County so the Observational Study Area could be selected. Stage One selection of the Census Tract boundaries of the Observational Study Area was based on identifying the best grouping of clusters that had at least one demolition occur within them, and alike Census Tracts that did not have any demolition occur within them. A careful analysis revealed that the optimal fit in Stage One included the k-means result with four housing submarkets. Census Tracts where demolition occurred or were in the same clusters as those where demolition occurred fell into two of the four clusters, which appear as green and grey within Appendix 3. These housing clusters were then pooled with the rest of the Census Tracts across Ohio where OHFA NIP demolition occurred during the study time period to prepare Stage Two of the cluster analysis. See Appendix 2 and 3 for detailed results from the Stage One multivariate cluster analysis.

Stage Two Multivariate Cluster Analysis

Based on the same 23 Census Tract level socio-economic and demographic variables from Stage One, Stage Two of the analysis was run in the Observational Study Area identified in Stage One pooled with all Census Tracts that received OHFA NIP demolition in the other 18 Ohio counties (the Benefits Transfer Study Area). The result of the Stage Two analysis is the three submarkets assigned to each Census Tract in the Observational Study Area for the hedonic modeling and benefits transfer analysis. Given that a selection bias is imposed because only areas that had demolition or were like areas that had demolition were included in the study, a “relative” naming convention for the housing submarket regimes is required. This is because some of the areas where no demolition has occurred are the healthiest and highest value housing markets, and these areas are effectively taken out of the study area in our approach. The submarket naming convention is therefore “lowest,” “middle,” and “highest” value

[55] See sensitivity testing results in Appendix 11.1 through 11.5.
[56] See Immergluck (2015)
[57] See Appendix 2 and 4 for a full listing of the 23 Census Tract variables used for the multivariate cluster analysis.

submarkets[58], since they are relative to one another and not reflective of relative strength across the entire Cuyahoga County housing market. Details of the Stage Two cluster analysis can be found in Appendix 1.1-1.19 and Appendix 4. Summary statistics for all 23 variables used to perform the two-stage cluster analysis associated with each submarket at the county level can be found in Appendix 7.

[58] Given that housing and housing lot density is typically higher in the middle value market, the resulting BCR is highest there. While true, if the same density of the middle value market is available in a specific neighborhood the highest value market, then BCR would be much higher there because the housing value impact rate from demolition is over 18% in the highest value submarket and is 5.5% in the middle value market.

Spatial Regimes Hedonic Price Function

Global and spatial regimes hedonic price functions were specified in the Observational Study Area using the three submarket types identified in the two-stage multivariate cluster analysis. The Chow Test (see Chow (1960) and Anselin (1990)) was used to test for spatial heterogeneity amongst submarkets in the spatial regime hedonic model, and performed very well, strongly suggesting proper specification of submarkets.[59] Other relevant diagnostic tests were performed to identify a best fit model specification.[60] The outcomes of the full model specification can be found in Appendix 8. Coefficients and the significance of their impact on home values of key property distress variables are provided in Table 1 below. Specific interpretation of the magnitude, meaning and statistical significance of each distress variable's coefficient and its impact on home value are provided below.

Reading Table 1

- P-Value
  - If the p-value is 0.05 or less, then the coefficient is considered to have a statistically significant impact on home property value.
- Coefficient
  - If coefficient is statistically significant (i.e. the p-value is 0.05 or less), then it has an impact on property value.
  - Coefficients read as a percent impact on property value from a marginal change. For example, a coefficient of -0.025 that is statistically significant suggests an additional distressed property within 500 feet of the given home will have a -2.5% impact on its property value, all else equal.

Table 1: Key Variable Results from Global and Three-Submarket Regime Hedonic Models[61]

	Global Model		Lowest Value Submarket		Middle Value Submarket		Highest Value Submarket	
Observations	30707		10986		17028		2693	
R-Squared	0.517		0.2453		0.4861		0.5266	
	Coefficient	**P-Value**	**Coefficient**	**P-Value**	**Coefficient**	**P-Value**	**Coefficient**	**P-Value**
Vacant Structure within 500 ft.	-0.0036	0.0260	0.0029	0.2750	-0.0077	0.0000	0.0044	0.4810
Land Bank Structure within 500 ft.	-0.0523	0.0000	-0.0356	0.0000	-0.0634	0.0000	-0.1880	0.0000
Delinquent Structure within 500 ft.	-0.0121	0.0000	-0.0115	0.0000	-0.0237	0.0000	-0.0342	0.0000
Mortgage Foreclosed Structure within 500 ft.	-0.0067	0.0000	0.0095	0.0020	-0.0053	0.0100	-0.0219	0.0030
Tax Foreclosed Structure within 500 ft.	-0.0253	0.0000	-0.0231	0.0020	-0.0512	0.0000	-0.0744	0.0260
Residential Vacant Lot within 500 ft.	-0.0053	0.0000	-0.0041	0.0010	-0.0085	0.0000	-0.0028	0.2640

Positive and statistically significant home value impact rates were identified within each respective submarket regime as a result of the final global and spatial regimes hedonic price function specification. Some detail of how the home value impact rates were quantified for the global model and each submarket regime from the spatial regimes hedonic price function is provided here.

[59] Chow Test results from final spatial regimes hedonic price function can be found in Appendix 9.
[60] Corrections for spatial autocorrelation and heteroscedasticity were applied. Contact authors for specific specification test results.
[61] Observation counts are the aggregate number of arms-length sales occurring within each respective model over the study time period (Q2 2009 – Q4 2015).

- *Global model (all submarkets treated as one housing market)*
    - An additional Cuyahoga Land Bank Structure within 500 feet of a residential home sale decreased its value by 5.23%, all else equal.
    - An additional residential vacant lot within 500 feet of a residential home sale decreases its value by 0.53%, all else equal.
    - The home value impact rate available to each home within 500 feet of an OHFA NIP demolition is estimated at 4.70% (5.23% - 0.53%) per demolition performed.

- *Lowest Value Submarket Regime*
    - An additional Cuyahoga Land Bank Structure within 500 feet of a residential home sale decreased its value by 3.56%, all else equal.
    - An additional residential vacant lot within 500 feet of a residential home sale decreases its value by 0.41%, all else equal.
    - The home value impact rate available to each home within 500 feet of an OHFA NIP demolition is estimated at 3.15% (3.56% - 0.41%) per demolition performed.

- *Middle Value Submarket Regime*
    - An additional Cuyahoga Land Bank Structure within 500 feet of a residential home sale decreased its value by 6.34%, all else equal.
    - An additional residential vacant lot within 500 feet of a residential home sale decreases its value by 0.85%, all else equal.
    - The home value impact rate available to each home within 500 feet of an OHFA NIP demolition is estimated at 5.49% (6.34% - 0.85%) per demolition performed.

- *Highest Value Submarket Regime*
    - An additional Cuyahoga Land Bank Structure within 500 feet of a residential home sale decreased its value by 18.80%, all else equal.
    - An additional residential vacant lot within 500 feet of a residential home sale does not significantly impact the home's value, all else equal
    - The home value impact rate available to each home within 500 feet of an OHFA NIP demolition is estimated at 18.80% (18.80% - 0%) per demolition performed.

It is important to note that a full sensitivity analysis of the spatial regimes hedonic price function was run. The sensitivity test investigated the difference in overall model performance when the pooled data from the second stage of the multivariate cluster analysis that defines submarkets was removed and Cuyahoga County submarkets were defined on their own. The model difference was minimal, suggesting that not much was lost by integrating the Census Data of the areas where demolition was occurring across the state to allow a version of benefits transfer. With that said, it also speaks to the weight of the data in Cuyahoga County in the submarket cluster analysis, and further suggests that a second sample study area may be critical to properly calibrate a true benefits transfer of the impacts of demolition from the statewide OHFA NIP demolition program.

Counterfactual Analysis

The counterfactual analysis is based on the magnitudes of negative impact from distressed structures[62] and vacant lots on housing value estimated in the spatial regimes hedonic model. The removal of residential blighted structures creates residential vacant lots. The coefficients from the hedonic analysis show the negative impact that land bank properties and vacant lots have on property values. Land bank owned structures, in all hedonic models, have a much larger negative effect on home values than vacant lots. The difference between having a land bank structure near a home and a vacant lot created by demolition, is the "home value impact rate" as previously defined, and is the protected home value from demolition activity. The estimated home value impact rate, shown in Table 2 from each hedonic model, provide the estimated protected value that each demolition creates on all properties within 500 feet of each OHFA NIP demolition in each submarket.

Table 2: Home Value Impact Rate in Global and Three-Submarket Hedonic Models from Demolition

Global	Lowest value	Middle Value	Highest Value
-4.70%	-3.15%	-5.50%	-18.80%

The total benefit-cost ratio within each submarket statewide, shown in Table 3, was quantified by estimating the number of homes within 500 feet of each OHFA NIP demolition in each submarket and then by multiplying the relevant percent value protected by the relevant median home value. The number of homes impacted varied based on the Census Block data and the amount of home value varied by the median home value applied to each home within each Census Block. Specific county level financial impacts from OHFA NIP demolitions within each submarket can be found in Appendix 10.

Table 3: Statewide Home Value Impact Estimates from OHFA NIP Demolition by Submarket

Submarket	Demolitions	Estimated Homes Impacted	Demolition Cost	Demolition Impact	Net Impact ($)	BCR
Lowest Value	1,704	6,121	$21,349,134	$81,556,090	$60,206,956	3.82
Middle Value	486	2,828	$6,120,700	$37,092,663	$30,971,963	6.06
Highest Value	58	758	$741,095	$2,741,500	$2,000,405	3.70
Total	2,248	9,707	28,210,929	121,390,253	93,179,324	4.30

Table 4: Cuyahoga County Home Value Impact Estimates from OHFA NIP Demolition

County	Submarket	OHFA NIP Demolitions	Estimated Housing Units Within 500 Feet	Total Demolition Cost	OHFA NIP Demolition Impact by Submarket	Submarket BCR
Cuyahoga	Lowest Value	990	3,870	$12,492,387	$54,812,066	4.39
	Middle Value	138	1,068	$1,671,274	$14,403,076	8.62
	Highest Value	34	440	$409,267	$1,802,059	4.40
	Totals	**1,162**	**5,378**	**$14,572,927**	**$71,017,201**	**4.87**

[62] The estimated coefficients of negative impacts of Cuyahoga County Land Bank owned structures were used to quantify the counterfactual analysis because these were the actual structures that were being demolished by OHFA NIP funds.

Table 4 above provides a look at specific submarket breakouts of demolition expenditure and benefit-cost ratios from home values impacted near OHFA NIP demolition in the Cuyahoga County Observational Study Area during the study time period. Results strongly suggest positive returns in the form of home value impact and BCR from OHFA NIP demolition investments in all Cuyahoga County housing submarkets.

Table 5: Cuyahoga County & Statewide Home Value Impact Estimates from OHFA NIP Demolition

Geography	OHFA NIP Demolitions	Estimated Housing Units Within 500 Feet	Total Demolition Cost	OHFA NIP Demolition Impact	BCR
Cuyahoga County	1,162	5,378	$14,572,927	$71,017,201	4.87
All other OHFA NIP Counties	1,086	4,329	$13,638,002	$50,373,052	3.69
Statewide Total	**2,248**	**9,707**	**$28,210,929**	**$121,390,253**	**4.30**

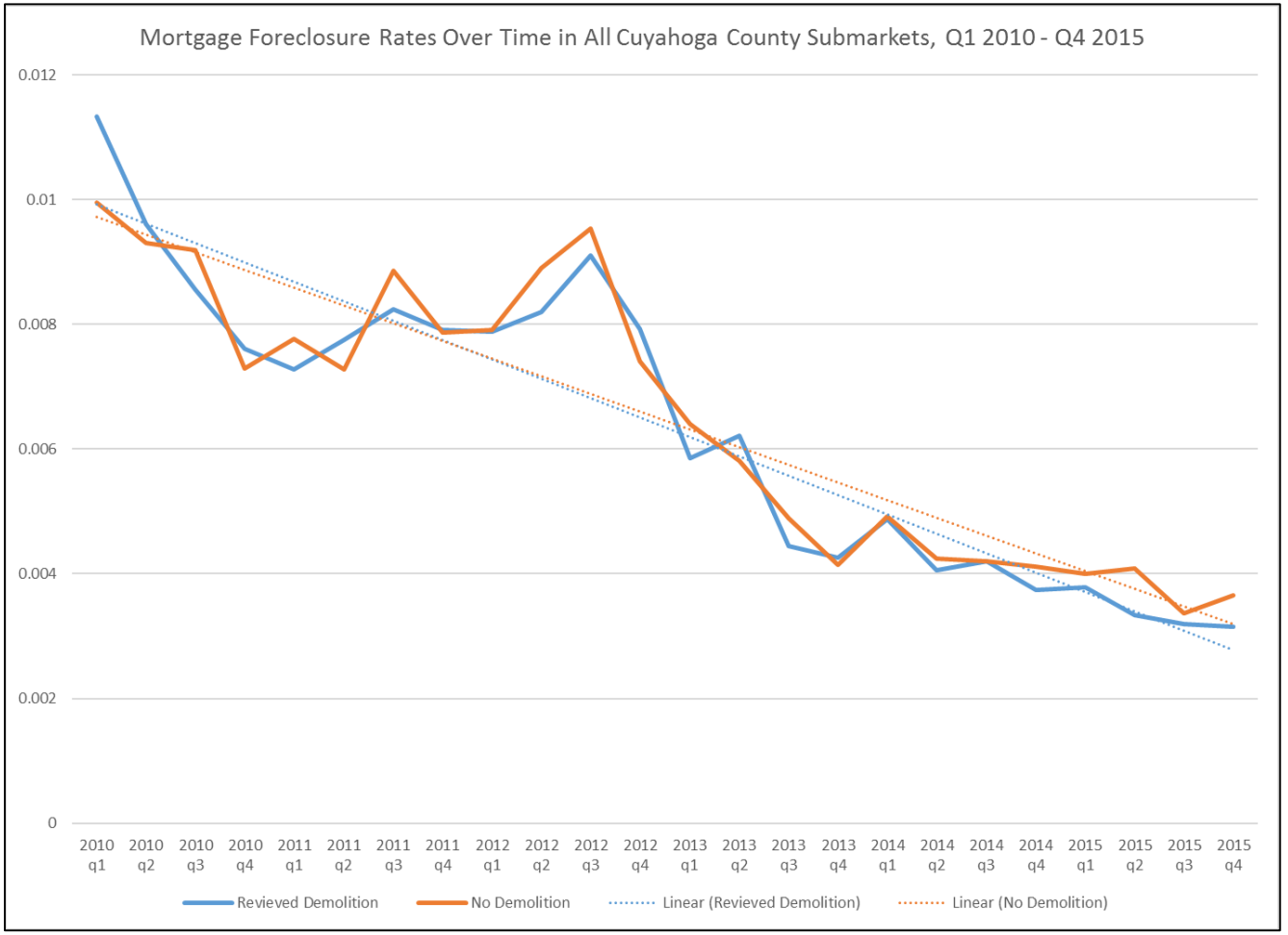
Table 5 above shows the aggregate home value impact from OHFA NIP demolition in Cuyahoga County as compared with the overall OHFA NIP program outside Cuyahoga County (18-county Benefits Transfer Study Area) over the study time period. It is important to break out findings between the Observational Study Area and the Benefits Transfer Study Area as shown in Table 5 because one is robust and self-referential and the other imputes findings from the Observational Study Area in a statistically smoothed (but notably non-referential) way. That said, the majority of the OHFA NIP program expenditures at the time of this study is in Cuyahoga County (greater than 50% of expenditures and demolition activity), therefore suggesting a robust understanding of OHFA NIP impact to date.

Comparative Trends Analysis

The comparative trends analysis provides a view into the strength of the relationship between demolition activity in Cuyahoga County and homeownership preservation as expressed through localized mortgage foreclosure rates over time. Primarily designed for decision support,[63]a visual analysis of the trends shows favorable relationships of the impact of demolition on mortgage foreclosure rates over time in all comparative zones – meaning that trend lines of areas receiving demolition are either lower or decreasing at a faster rate than areas without demolition, or both. Paired difference in means t-tests were performed on the differing mortgage foreclosure rates in the aggregate and three submarkets within the Observational Study Area. The only t-test that showed a statistically significant difference between mortgage foreclosure rates where demolition has and has not occurred is the middle value housing submarket.[64] The results of this analysis within each submarket are graphed below.

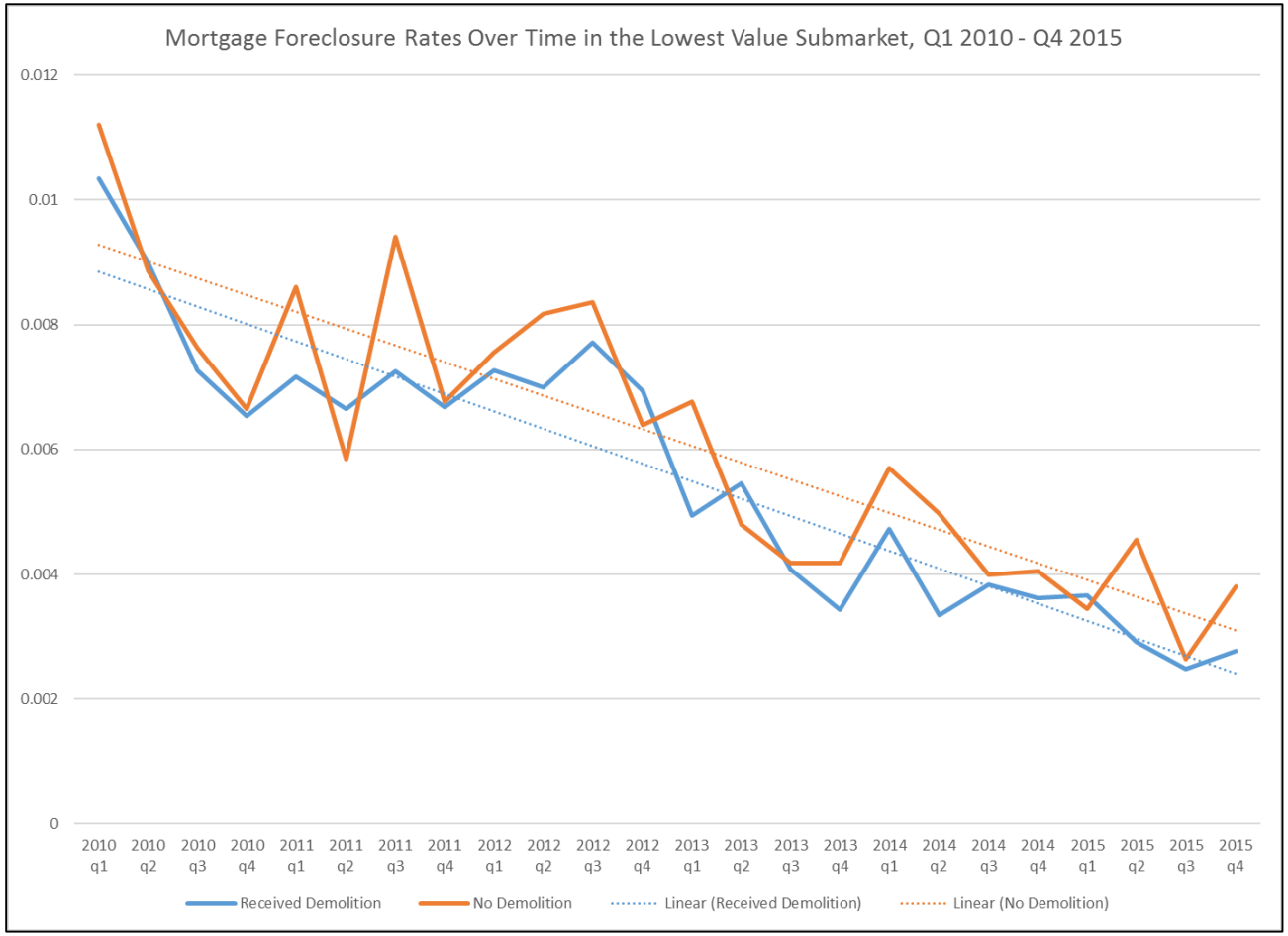
[63] Parallel analysis used for decision support by U.S. Treasury can be found in Griswold et al., 2014.
[64] Middle value submarket paired t-test score was statistically significant at the 0.000 level.

Aggregated Housing Markets in Cuyahoga County Study Area



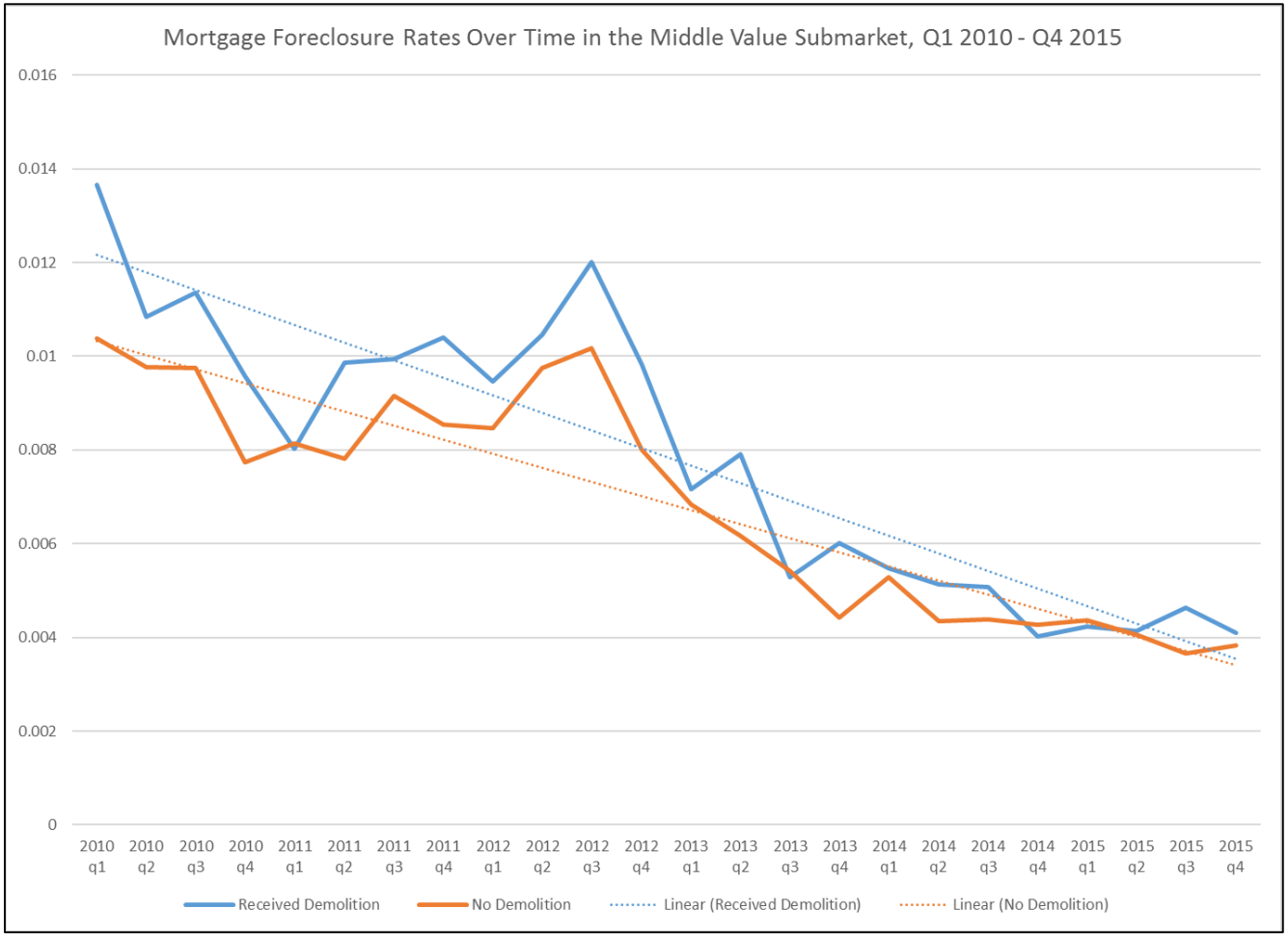
The overall trends of mortgage foreclosure rates in places that received demolition across the Observational Study Area decreased more quickly than those that did not. While trends show a relationship of faster decreasing trends in areas with demolition, the paired difference in means t-test of mortgage foreclosure rates in the with and without areas over time was not statistically significantly different.

Lowest Value Housing Submarket Regime in Cuyahoga County Study Area



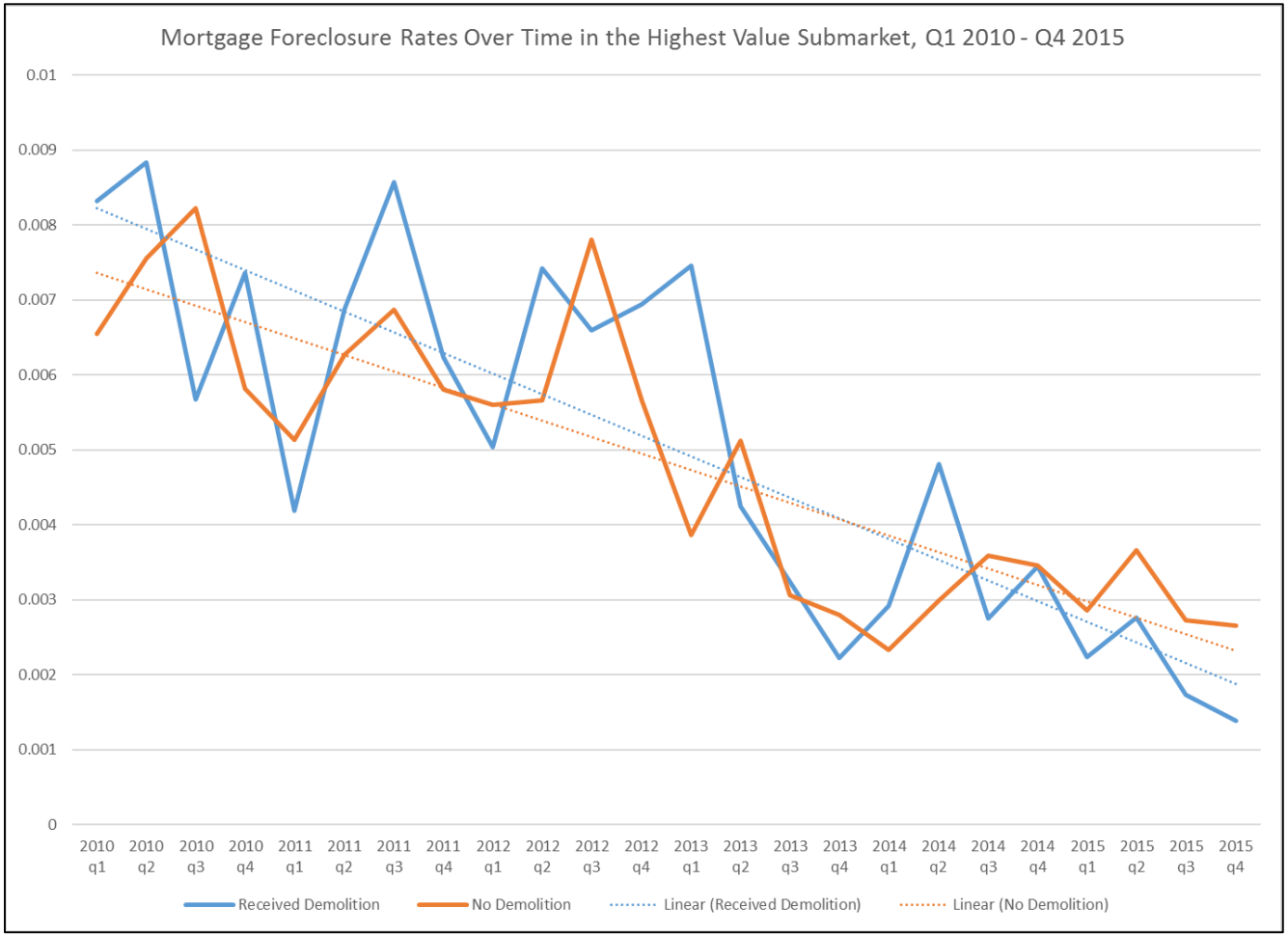
Mortgage foreclosure rates in the Lowest Value Submarket tended to be lower before the introduction of the demolition within the lowest value submarket. With that said, the rates of mortgage foreclosure within Census Blocks that received demolition as opposed to those that did not experienced slightly larger declines in mortgage foreclosure rates over time. The contrast in these trends is the least pronounced as relative to the other submarkets. While trends show a relationship of faster decreasing trends in areas with demolition, the paired difference in means t-test of mortgage foreclosure rates in the with and without areas over time was not statistically significantly different.

Middle Value Housing Submarket Regime in Cuyahoga County Study Area



Mortgage foreclosure rates in those areas that received demolition at the beginning of the study period were higher than those that did not in the middle value submarket, but experienced greater declines as demolitions occurred over time. This trend paired with a statistically significant paired difference in means t-test of mortgage foreclosure rates in the with and without demolition areas over time suggests that demolition is a likely driver of lowering mortgage foreclosure rates in the middle value submarkets.

Highest Value Housing Submarket Regime in Cuyahoga County Study Area



In the highest value submarket, those areas that received demolition began with greater amounts of mortgage foreclosure within the study period, but experienced greater declines resulting in a mortgage foreclosure rate that was lower than those areas that did not receive demolition by the end of the analysis time period. While trends show a relationship of faster decreasing trends in areas with demolition, the paired difference in means t-test of mortgage foreclosure rates in the with and without areas over time was not statistically significantly different.

Study Discussion

1. For the first time in spatial econometric distressed property research, the impact of county land bank owned structures was differentiated from other distressed structure typologies. The county land bank owned structures consistently had the highest negative impact on nearby housing in every submarket regime. We did not differentiate between structures headed for demolition, on the one hand, and structures headed for rehabilitation, resale, or mothballing on the other hand. Nor are we suggesting that county land banks are bad landlords; it is merely the properties that they hold naturally tend to have blight characteristics. Presuming that the county land banks acquire some better condition properties with an eye toward rehabilitation, it may be inferred that this study actually underestimates the negative impact of county land bank owned properties acquired for demolition. The home value impact rates might have been larger had the study differentiated between the two land bank property types as described above.

2. A selection bias was introduced in the spatial regimes hedonic price function that does not allow housing sales observations within the final model that are not in the Observation Study Area. This bias was purposely introduced in an attempt to isolate the demolition impact investigation into areas where demolition is actually occurring or are similar to areas where demolition is occurring. The naming convention attached to the housing submarkets is therefore relative – highest, middle and lowest value submarkets, because the markets where no demolition is occurring (likely more stable and higher value) are omitted. This speaks to the insight that demolition tends to occur in weak and marginal markets. Statistics of the hedonic model observations are such that 75% of sales were priced below $65,000 and 50% of sales observations were priced below $30,000. The healthiest housing markets in Cuyahoga County are therefore not readily observed in this study.

3. Some of the time periods used in the occurred prior to the OHFA NIP specific time periods. Previous periods were used because, in hedonic modeling, a deeper time series best specifies robust coefficient estimates in the key distress variables. These robust distress variable coefficient estimates were used as multipliers in the counterfactual analysis for all OHFA NIP demolitions, and are applicable beyond the Q4 2015-time period of the model specification – therefore allowing demolition in 2016 to be considered in the counterfactual analysis.

4. This study quantifies and assesses the beneficial impacts of OHFA NIP demolition during a specific slice of time (Q1 2014 – Q1 2016). Given planned blight removal programming through 2020, this research serves as the basis for identifying all Census Tract-level submarkets (only Census Tracts where demolition occurred to date we included in this study), and therefore the demolition benefit multipliers in all participating and potentially participating county Census Tracts. Such fully-developed targeting of impacts is consistent with EESA's goal of maximizing the taxpayers' return on HHF investment.

Discussion of Benefits Transfer Analysis

5. The benefits transfer approach used in this study is its primary limitation or weakness. Taking into account both time and resource constraints associated with this study, the benefits transfer method used in this context is a new contribution towards identifying effective methods of imputing demolition impact results from one regional economy's submarkets to another's. It also is an innovation towards providing near real-time decision support for future action. With that said, the transferability of the results of the benefits estimation from the spatial regimes hedonic price function from the Observational Study Area to the 18 other Ohio areas rests on two assumptions:

- The submarket structure identified through the cluster analysis on the principal components of the Census Tract variables for the Census Tracts identified in the sample is representative for each of the relevant areas in the 18 other counties over the time period covering the study;
- The regression results (the coefficient estimates) that were obtained from the in-depth analysis of the Cuyahoga County observational study area housing market apply to the benefits transfer study area housing markets of the relevant areas in the 18 other counties.

The first assumption is addressed by pooling census observations for all Census Tracts in Ohio where demolition activity occurred (Stage Two of the cluster analysis) with the Census Tracts in the Cuyahoga County sample. Initial examination of the results showed that a cluster analysis for Cuyahoga County by itself revealed similar groupings as those obtained from the full data set.[65] However, this does not necessarily imply that the reverse holds as well. This would require a separate clustering exercise for representative Census Tracts in each of the 18 counties (not just Census Tracts with demolition activity) and an assessment of the degree to which they conform to the patterns suggested by the pooled data. If the socio-economic makeup of the 18 counties is similar enough, the first assumption is reasonable. However, there are grounds to suspect that Cuyahoga County may not be fully representative of the others due to the broad range of housing variability there. The only objective way to assess this is by means of a separate analysis for each of the 18 areas. In addition, the submarket determination is based on Census data at one point in time. To the extent that the socio-economic makeup of some of the subareas may be changing over time, this would also need to be accounted for.[66]

The second assumption is more tenuous. It boils down to accepting that the structural characteristics of the housing submarkets in the Census Tracts within the 18 counties in question are identical to those of the Cuyahoga County housing submarkets under investigation. This is necessarily wrong to some extent. The extent to which it does not hold will affect the degree of precision that can be attributed to the overall benefit estimate that is extrapolated to the areas not included in the econometric analysis. The only solid way to turn this unproven assumption into more reliable findings would be to conduct separate and similar analyses for each of the 18 counties As an intermediate solution, a separate analysis in a second urban county could provide a formal basis for extrapolation of the degree to which the estimates in the second study county deviates from the estimates in a first (e.g., Cuyahoga County), and how such deviation could be related to measureable characteristics of the area (e.g., unemployment rate, number of housing starts).[67]

[65] Compare findings in Appendix 1.5 with 11.2 to examine these differences.
[66] See Mikelbank (2011) for discussion of neighborhood dynamics from 1970-2000 in Cleveland, OH.
[67] See Footnote 31 for discussion regarding how the assumptions in this section were addressed in this study.

Key Insights

1. As shown in Appendix 10 and elsewhere, OHFA NIP appears to be meeting the EESA objective of protecting home values in all housing submarkets.

2. In terms of homeownership preservation, evidence is strongest that mortgage foreclosure rates are decreasing faster in areas receiving demolition than in areas not receiving demolition in the middle value submarket. While the comparative trends are favorable toward a similar conclusion in the other submarket comparative trends analyses, the trend lines are not shown to be statistically significantly different than one another in those housing markets. This suggests that conducting as many demolitions as possible in the middle value ("yellow" in Appendix 1.5) submarket will do the most to reduce mortgage foreclosure rates over time.

3. A recurrent insight from previous demolition impact studies that continues to be drawn from this study is that evidence shows demolition activity having the largest impact when it occurs at the margin of neighborhood health. The greatest benefit-cost ratio in the Cuyahoga County Observational Study Area is found in the middle value submarket ($8.62 in home value protected for each $1 in demolition cost) – almost double the benefit-cost ratio of either the lowest value submarket ($4.39 value retained to $1 cost) or the highest value submarket ($4.40 value retained to $1 cost). This suggests that conducting as many demolitions as possible in the middle value ("yellow" in Appendix 1.5) submarket will preserve the most home value.[68]

   Further, and as noted in Paragraph 2, above, the middle value submarket comparative trend analysis is the only submarket that shows mortgage foreclosure rates over time in areas that received demolition are statistically significantly decreasing faster than areas that did not receive demolition. Both parts of this study suggest that identifying areas within cities where the housing market is poised for positive or negative change in neighborhood health (i.e. the "margin" of the housing market) is key intelligence for decision making related to publicly funded housing market intervention.[69]

4. A new finding from the study provides evidence that more than a decade of high volume demolition activity is likely stabilizing the lowest value housing submarkets of the Cuyahoga County Observational Study Area. Given sustained demolition in Cuyahoga County, a statistically significant home value impact rate of 3.15% is identified from demolition in these areas. This hedge was not present in a parallel study performed three years ago.[70]

[68] See footnote 58 on page 25 for further discussion related to relative housing density in the middle and highest value submarkets and how lot density impacts the BCR in those submarkets.
[69] For precision application, on-the-ground targeting would identify optimally impactful demolition sites at the property level by taking housing submarket, housing values in the immediate area, and the relative housing density surrounding each potential location into account given that optimal impact occurs where the highest submarket multiplier, highest home values and highest housing density exist simultaneously.
[70] See Griswold et al. (2014).

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