Quantitative Assessment of Massachusetts Historic Rehabilitation Tax Credits

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Abstract

This study measures the degree of success of the Massachusetts Historic Rehabilitation Tax Credit Program. We consider five parameters when measuring: if there are more affordable housing units, are the funds allocated properly, are the projects being built in areas that need it the most, is the program worth the money, and what are the project outcomes? We found that HTC creates more affordable housing units with similar costs to other programs in areas where needed the most. However, it is inconclusive when determining if the funds are distributed properly. Based on these parameters we conclude that though the program has its flaws, it is considered successful. Not only does it preserve historical buildings, but it also creates more affordable housing units helping to close the gap in supply and demand. Moving forward, we recommend utilizing two machine learning models (Decision Tree & K-Nearest Neighbors) to provide additional information to the officials making these decisions. We firmly believe that a slow integrative implementation of these strategies will increase overall efficiency and equity of distributions across the board: ensuring success while minimizing costs.

Scope

The core objective of our project began as an exploration of the uses of the Massachusetts Historic Rehabilitation Tax Credit Program, specifically on affordable housing. Our original client, MassInc, wanted us to focus on three areas: equity, social awareness, and the uses/applications. In terms of equity, we consider the demographics and socio-economic profiles of the project location, sorting by city and zip code. For the programs' uses/applications, we look into the number of new affordable housing units built using MHRTC, how much the program cost, and how much each unit may cost. We did not include social awareness, as a parameter, in the midterm presentation as we did not have the dataset provided.

The majority of our findings are limited to Massachusetts as we mainly used the "Affordable Residential Housing HRC Project" dataset. Though, we also considered the LIHTC, a federal program. There is a need for more affordable housing, as the United States is facing a massive shortage. The two programs, LIHTC and MHRTC, are two programs that can be used as a catalyst to promote further development of those units.

Our original presentation covered more on the social impact of the two programs. Our goals involved answering questions like how many more units were built, how many jobs the programs provided, how much the programs gave away and to which companies, the average cost of each affordable housing unit, income and racial demographics of the programs' projects, and how much can people expect to save.

After the midterm, we re-presented our presentation to our new client, Bruce from Commonwealth Magazine. One thing that piqued his interest was the mention of the "inconsistencies of the distribution of funds". One of our slides touched on the fact that

"Some companies have been getting MUCH more money in distribution, even though they are not building as many developments."

We mentioned two projects: L.H. Hamel Leather Company and Baker Square Water Mill, both of which received $9.3 million and $7.8 million in total awards respectively. Then there are also projects like the Old Friend's Meetinghouse which got $4,600. This leads us to our new core objective for the final presentation: is the project actually work? In other words, is the MHRTC program "successful"?

One major difference between the final and the midterm is that we focus exclusively on Massachusetts. The extreme cases were both in Massachusetts so we decided to focus specifically on this state. In addition, without set KPIs, predetermined by the client, we defined our measures of success. Firstly, are there more affordable housing units? That would let us see if that number is significant enough of a difference to help close the gap between supply and demand. Next, are the funds distributed properly? We take a look at the distribution of the total awards. We also look to see if there is a correlation between application success rate and the number of affordable housing units and total awards to the number of affordable housing units. We also look at the connection between political contributions and tax credits. Thirdly, are MHRTC projects built in the regions that need it the most? Where we define need as areas that have high poverty and rent burden rates. Our fourth parameter is, is the program worth the money being spent on these projects? What is the average spending of the units and how does it compare to other programs? Is it more expensive? Finally, what are the project outcomes like? To do this, we went into the field to take a look at some of these projects. However, we are restricted to projects that are within the Boston University area so we were only able to go to twelve properties.

To determine who the residents are that benefit from the MRHTC affordable Housing units we assume that they have the same demographic information as all the other people in the same zip code area. To determine if the gap between the supply of affordable housing units and the demand for them is decreasing we had to use the poverty population instead of extremely low-income (ELI) people. We don't have ELI so we assume that both the poverty population and extremely low-income (ELI) people have the same trend with a steady difference.

Though the client wanted us to interview the head of the Massachusetts Historic Commission, to gain insights into the process of distributing the awards, we were unable to do so due to time restrictions. To get information about the distribution of funds we used the same dataset from the midterm, "Affordable Residential Housing HRC Project". The client was also interested in the different platforms which applicants use to see the affordable housing listings, which would have enabled us to see if their advertisements are effective.

Research and Methodology

Our research began with defining "affordable housing" in clarity. According to Chapter 40B Sales Prices and Rents, the "affordable" refers to spending no more than 30% of low and moderate-income households' budget (Housing and Community Development[1]). Also, we found out that housing affordability had been a growing national crisis, which made it clear of the logic behind the program on affordable housing: constructing more affordable homes for extremely low-income renters to close the "gap" (gap refers to the difference between supply and demand of affordable housing). So, before we dive deeply into the impacts of the state HTC program, we started to familiarize ourselves with "the gap - A Shortage of Affordable Homes" as described in a recent report by The National Low Income Housing Coalition. We researched the housing crisis on the national level, its measurements, drivers, and trends; and then we focused more specifically on Massachusetts. We found out that Massachusetts had a shortage of 108,157 homes (Up For Growth[2]). With relatively low vacancy rates, a large population of extremely low-income households, a high rate of the housing cost burden, and practical obstacles faced by affordable housing developers including high construction costs and higher rent levels compared to other states, Massachusetts was also experiencing a shortage of affordable housing in the entire state.

After getting a deep understanding of the problematic situations in the housing market, we conducted research on the solutions to it: LIHTC (Low Income Historical Tax Credit) program on the federal level and MHC (Massachusetts Historic Rehabilitation Tax Credit) program on the state level. Both subsidy programs addressed housing affordability by directly financing the construction of housing on the developers' side through tax cuts. LIHTC had a primary focus on building more affordable housing for low-income households by dedicating a minimum percentage of their units to affordable housing units: "(A) at least 20 percent of the units had to be both rent-restricted and occupied by households with incomes at or below 50 percent of area median income (AMI), or; (B) at least 40 percent of the units had to be both rent-restricted and occupied by households with incomes at or below 60 percent of AMI" (Shelburne, Stagg, 2018). While MHC had a primary focus on rehabilitating historical places which had an added-on of generating 9,118 new affordable units.

To explore the social impacts and assess the performance of HTC program, we used the HTC awarded list combined with American Community Survey (ACS) data to see if HTC projects were built in areas where it's needed the most and to see if these new affordable housing units close the gap between supply and demand of affordable housing. To define which area truly needed new affordable housing, we primarily used two factors: poverty rate (percentage of individuals/families with annual income < $33,148) and rent burden rate (percentage of individuals/families spending more than 30% of annual income in housing). The poverty rate revealed the income level of the region, and the rent burden rate took into account the rental

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[1] https://www.mass.gov/orgs/housing-and-community-development

[2] https://www.bostonherald.com/2022/07/14/massachusetts-nation-have-crippling-housing-deficit-study-reports/

price level of the region. Ideally, HTC projects should be built in regions with relatively high poverty rates or with high rent burden rates, as such areas tended to have more people who needed affordable housing. One potential flaw was that such methodology and the result could only be valid under the assumption that people living in affordable housing must share the same or similar demographic information as others living in the same area. Otherwise, our result could be biased.

When it came to the gap between supply and demand, affordable and available (AA) housing units per 100 Extreme Low Income (ELI) households became a key measurement in defining the gap. ELI household was defined as a household with an annual income below 30% of the area median income. AA rate was defined as: AA per 100 ELI households = affordable and available units / number of ELI low income. Given the fact that ACS did not provide statistics for the number of ELI households, we had to use the number of households in poverty as substitution, which was defined as households with less than 40% of the area median income. Thus, we had to make an assumption that ELI households and poverty households shared the same trend with a steady difference. Under the assumption, since the number of households in poverty fluctuated around 670,000 between years, an increment in the AA rate had to be a result of an increment in AA housing. Even though HTC was not the only program that provided support in building affordable housing, there was no doubt that HTC contributed to part of the increase in affordable housing, as HTC generated more than 9,118 new affordable housing units in Massachusetts.

Another measurement in determining the overall success of HTC was if the funds were appropriately allocated between each project and between different rounds of application within the same project. Our client was specifically interested to see if the following situations exist: 1. A project applied multiple times and only succeeded once, but the project got a huge amount of money in the one-time success; 2. The amount for a project in different rounds was significantly different. To locate such a project, using an estimator like application successful rate would not be able to capture such behavior. A better estimator here was the variance of funding. As the variance of funding measures the spread between each round of awarded, a project with mostly failed results in multiple rounds of application and got significantly large amounts in a few successes would turn out to have a huge variance. Therefore, we introduce variance of the funding as a helper to spot any potential project that might fall in the above characteristics.

Our analysis on variance of funding drew our attention to Winn company, which developed the Baker Square Water Mill, Baker Square II project, and other 17 HTC-supported projects. Through the Massachusetts Office of Campaign and Political Finance (OCPF) database, we find the Winn company CEO, Lawrence Curtis, along with other Winn-related people have donated over $18,000 since 2002 to the secretary of state, Galvin. The amount of donation seemed to be related to the amount of HTC credits Winn company received, as both the amount of donation and the amount of credits reached their peak around 2005. Another thing we noticed was that when we visited 9 HTC-funded properties in Chelsea, MA, we found out that all of

them were managed by the Winn Company. However, even though everything seems to be related, we still need more evidence to analyze and prove the causality between them.

In addition to assessing the program performance, our research also served as complementation and extension of our data analysis to investigate things that could not be explained simply by plain data points and to validate the result. In our first stage of analysis, the HTC data suggested that there were 9 HTC projects actually taking away housing units throughout the project. One good example was the Warren House. Located at 1600 Washington St, Newton, Warren House claimed, in the HTC dataset, to be a residential property with 59 units of housing prior to HTC funding and 21 units of housing after the HTC funding, which suggested a decrement of 38 housing units. We were surprised to see projects taking away housing as the project was supposed to bring more housing units to the community. Therefore, we decided to conduct a field trip to Newton. The properties were fairly large: one soccer field and two basketball courts were right next to the building, which gave us easy measurements of the building size. Besides, there were more than 50 mailboxes at the building entrance. Therefore, it was reasonable to say that this building had much more than 21 units of housing, and the HTC dataset might have errors.

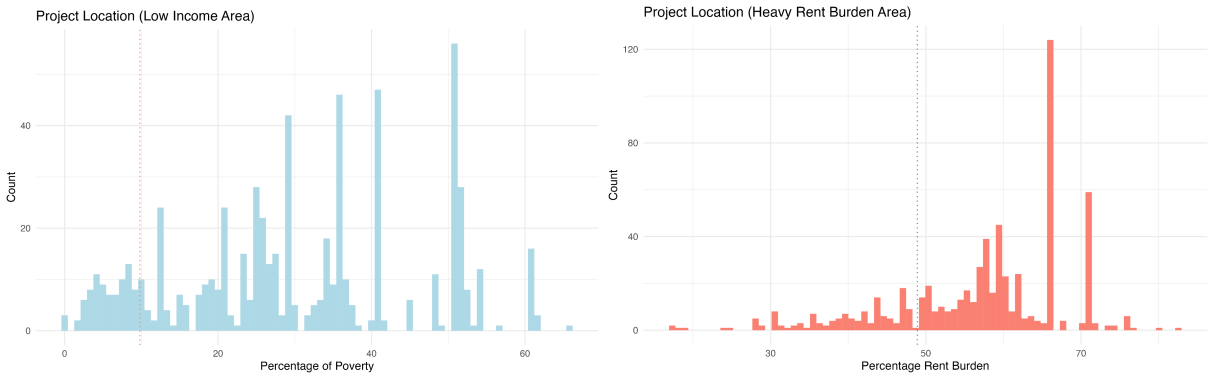
In addition to the Warren House, throughout our field trip, we also visited another 12 properties that also received funds from HTC, and these properties were primarily located in East Boston and Chelsea. During the trip, we found out that there were some projects listed as residential in the HTC application; however, the building was clearly not residential in reality. For example, Theodore Lyman School located at 10 Gove Street, East Boston claimed to be a residential project with 47 housing units. However, it turned out that the building was used as the East Boston Neighborhood Healthcare Center. Another finding was that there seemed to be a big divergence between the outcome of different projects. Some projects perfectly met the main purpose of HTC, which intended to preserve historically significant buildings and provide more housing units to the community; while some others did not seem to have any difference compared to the building right next to it that did not receive any funding from HTC. One positive example was the Walden Street Fire Station. Located at 15 Walden Street, Revere, the building was originally built as a fire station. After the rehabilitation program, the building became home to 7 units of senior housing. Most importantly, what made this building historically significant, the former fire truck bays, original staircases, and wood wainscoting, had been retained throughout the rehabilitation process.

Statistical Analysis and Data Visualization

Our quantitative analysis aims to answer the following questions to explore the Massachusetts HTC program's social impacts, determine its overall success, and evaluate its achievements.

1. Are Historical Tax Credit projects developed in the area where it needs the most?
2. Are HTC funds being distributed appropriately?
3. Is HTC worth the money it gets?
4. Does the HTC program close the gap between the demand and supply of affordable housing units?

For the first question, we define the area where it needs the most as: (1) the regions with a poverty rate higher than the state average poverty rate of 9.8%; (2) the regions with a housing cost burden rate higher than the state average housing cost burden rate of 48.9%. All the data we used are from the 2021 American Community Survey. The two histograms we created in R are: (1) Distribution of project locations in low-income areas, and (2) Distribution of project locations in rent-burden areas.[3]

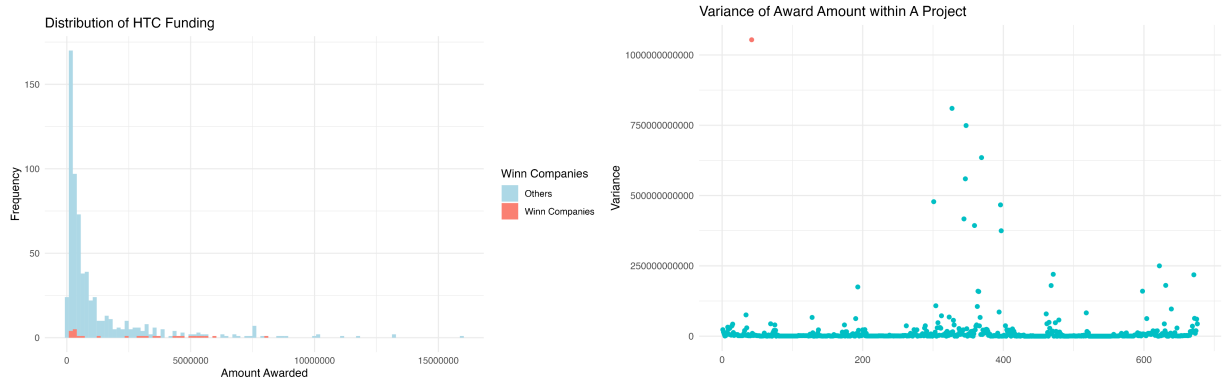


As we can see from the histogram on the left, the red dashed line represents the state's average poverty rate of 9.8%. From our calculation, 87% of the Massachusetts HTC projects are built in regions with a poverty rate higher than the state average rate, proving that the projects are built in the areas where people need affordable housing the most. As the second histogram shown on the right, the blue dashed line represents the state average rent burden rate of 48.9%. From our calculation, 79% of the Massachusetts HTC projects are built in regions with a housing cost burden rate higher than the state average rate, further consolidating that the projects are built in areas where people are in need.

For the second question, we define "appropriately" as distributing the HTC funds relatively even between each project without many outliers. We first created a histogram displaying the distribution of HTC funds including the amount awarded on the horizontal axis and the number of projects on the vertical axis. Then, we created another scatter plot displaying the variance of the award amount. The variance here is measured by calculating the variance of each project's award amount for each application. The two histograms are (1) the Distribution of HTC Funding, and (2) the Variance of Award Amount within a Project. The overall HTC

[3] United States Census Bureau - American Community Survey URL: https://data.census.gov

funding distribution shows that a few projects are getting significantly higher awarded amounts than others.



[4]As we can see from the first graph on the left, most projects received funding of around 500,000 as the median of the amount awarded is $ 484968.3 from our calculation. We highlighted the Winn Company as an outlier here because it is associated with 17 credit projects and received a total funding of $28,203,000. In the second histogram, we further analyzed the distribution of funding by calculating the variance of funding within one project. The red dot on the top left represents the Winn Company which has the highest variance. The two graphs prove an outlier existing in the projects and raise our question "is there a connection between political contributions and award amount?" This leads us to further research on the relationship between the amount of donation and award received. In conclusion, HTC funding is not distributed appropriately.

For the third question, we compared the average funding per unit of the Massachusetts HTC program with other programs including LIHTC and the Baker-Polito Program. The benchmark we set is the average funding per affordable housing unit on the national level where we got the estimate from Urban Institute.

(1) The table for comparing the funding per unit and the national level construction cost per unit:

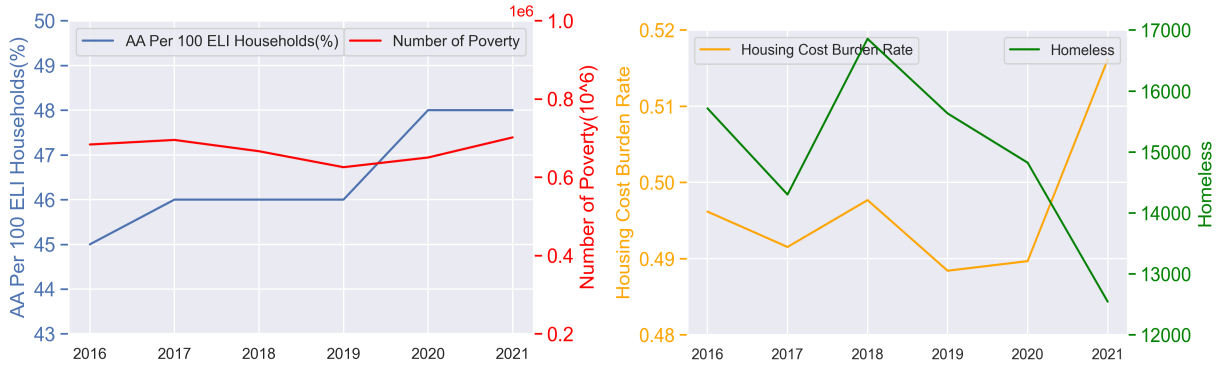
	Total Funding	Total Units	Total Affordable Housing Units	Average Funding per Unit	Average Funding per Affordable Housing Unit
HTC	$876,224,853	18,038	13,662	$48,576	**$64,135**
LIHTC	$329,634,301	66,336	55,503	$4,969	**$5,939**
Baker-Polito Administration Affordable Housing Program	$139,000,000 ($50 million direct funding + $89 million housing tax credits	NA	1,474	NA	**$94,301**
100 Units Affordable Housing Project Cost	$20,024,638	100	100	$40,049	**$40,049**

From the table we created above, monetarily speaking only, we can conclude that the funding per unit of the Massachusetts HTC program is appropriate because the average $64,135 per unit is relatively larger than the average cost per unit on the national level. But the difference is not

[4] Urban Institute URL: https://apps.urban.org/features/cost-of-affordable-housing/

huge, and not as huge as the Baker-Polito program. It is reasonable that the program might have higher funding than the national level per unit due to two reasons: (1) higher construction costs for renovating historic places; (2) construction costs in Massachusetts are higher than the national average construction costs.

For the last question, we measured the gap between the demand and supply of affordable housing by conducting a time-series analysis of Affordable and Available units per 100 ELI households (2016 to 2021) (National Low Income Housing Coalition).. We also created another graph of time-series analysis on housing cost burden rate and homeless population (2016 to 2021) to account for the homeless people which are not measured in ELI households in ACS. The data of the sheltered homeless population was downloaded from the National Alliance to End Homelessness. The two graphs are (1) a Time-series analysis of AA per 100 ELI households and Poverty; (2) a Time-series analysis of Housing Burden Rate and sheltered Homeless Population. [5]



The upward slope of AA per 100 ELI households (blue line) represents the gap between the demand and supply of affordable housing is closing. The relatively stable line of poverty population (red line) further proves that the provision of affordable housing largely contributes to closing the gap. The second graph shows that, before the pandemic started (2020), there was a strong positive correlation between the housing cost burden rate and the sheltered homeless population at a rate of 0.88. During the pandemic, the homeless population decreased and the housing cost burden rate increased. It is reasonable as we found out that the government provided services for homeless people with isolated living places, aiming to decrease the number of shelters and decrease the spread rate of COVID-19 among the homeless. The high spread rate and mortality rate among the homeless also contributed to a decrease in the homeless population.

[5] National Alliance to End Homelessness URL: https://endhomelessness.org/homelessness-in-america/homelessness-statistics/state-of-homelessness/

Key takeaways

After a series of research and studies, there are 3 key takeaways from this project.

First, who is benefitting from HTC projects? On the one hand, HTC projects are benefitting the low-income people and the whole community. One huge economic impact of affordable housing created by HTC is the number of jobs it can create, both during the construction phases and ultimately through long-term societal growth. Let's consider the economic impact of simply renewing a historical building can provide: the developer companies will need to hire manufacturing and construction companies in order to rehabilitate. Then, the housing centers will need staffing for maintenance, operations, and leasing jobs to keep grounds well-managed and clean for the residents it needs to attract and retain. Of course, there are also many long-term opportunities that come with HTC projects in local economies. Another one of the benefits is that HTC projects improve mobility that ultimately creates more money for our cities. Though some of these jobs are more immediate than others, the long-term benefits of affordable housing are profound and can lead to meaningful change in society.

On the other hand, HTC also benefits the developer and the building owner. The developer and the owner of the building both benefit from HTC. The HTC is a financial incentive that encourages historic building investment. It encourages private property owners to renovate historic properties into rental housing, office, retail, manufacturing, and entertainment spaces, among other income-generating uses. HTC is also a source that rewards owners for making an investment that helps to revitalize communities and extends the economic life of older buildings. A project can claim 20% of qualified expenses as HTC. The owed income taxes are directly reduced by the tax credit. One dollar of owed taxes is offset by the tax credit. $200,000 in HTC will be generated by a project with $1 million in qualified expenses, which will offset $200,000 in federal income taxes.

Secondly, the key question we could answer is: is there more affordable housing due to HTC projects? Due to the research, the answer is positive. Until 2016, data shows that HTC projects created 153,255 low-income housing units and 9,287 units of affordable housing in Massachusetts. Moreover, HTC-related historic rehabilitation investment benefits state economies as well as the national economy. The HTC is designed not only to preserve and rehabilitate historic buildings, but also to promote the economic revitalization of older communities in the nation's cities and towns, along Main Streets, and in rural areas. For example, in Massachusetts 2021, HTC-related rehabilitation activity totaled about $250.2 million. The national impacts of that investment included 3,251 jobs, an additional $465.9 million in output, $175.6 million in income, $235.6 million in GDP, $40.4 million in Federal taxes, and $55.1 million in total taxes.[6]

However, we still need more. According to the National Low Income Housing Coalition, "Only 37 affordable and available rental homes exist for every 100 extremely low-income renter households." (March 2021)[7] Due to our research, these 9,287 new affordable housing units only

[6] https://www.novoco.com/resource-centers/historic-tax-credits/htc-reports-and-research

[7] National Low Income Housing Coalition; link: https://nlihc.org

fill in around 5.5% of shortage in excess demand. In addition to that, there are also some projects that took away some affordable housing units. Also, we found out that, as the Massachusetts Historical Commission (MHC) statute's wording states, "projects that contain affordable housing" are qualify for HTC, but they do not need to provide solely affordable housing. This wording makes way for projects that may have originally not been considering affordable units but may choose to incorporate them to strengthen their tax credit application and give it a competitive edge, especially in a state with high demand for credits like Massachusetts. Furthermore, we found out that some data might be wrong. Our team went on a field trip to the HTC project at Warren House (1600 Washington St., Newton), and we found that the actual affordable housing unit did not match the data.

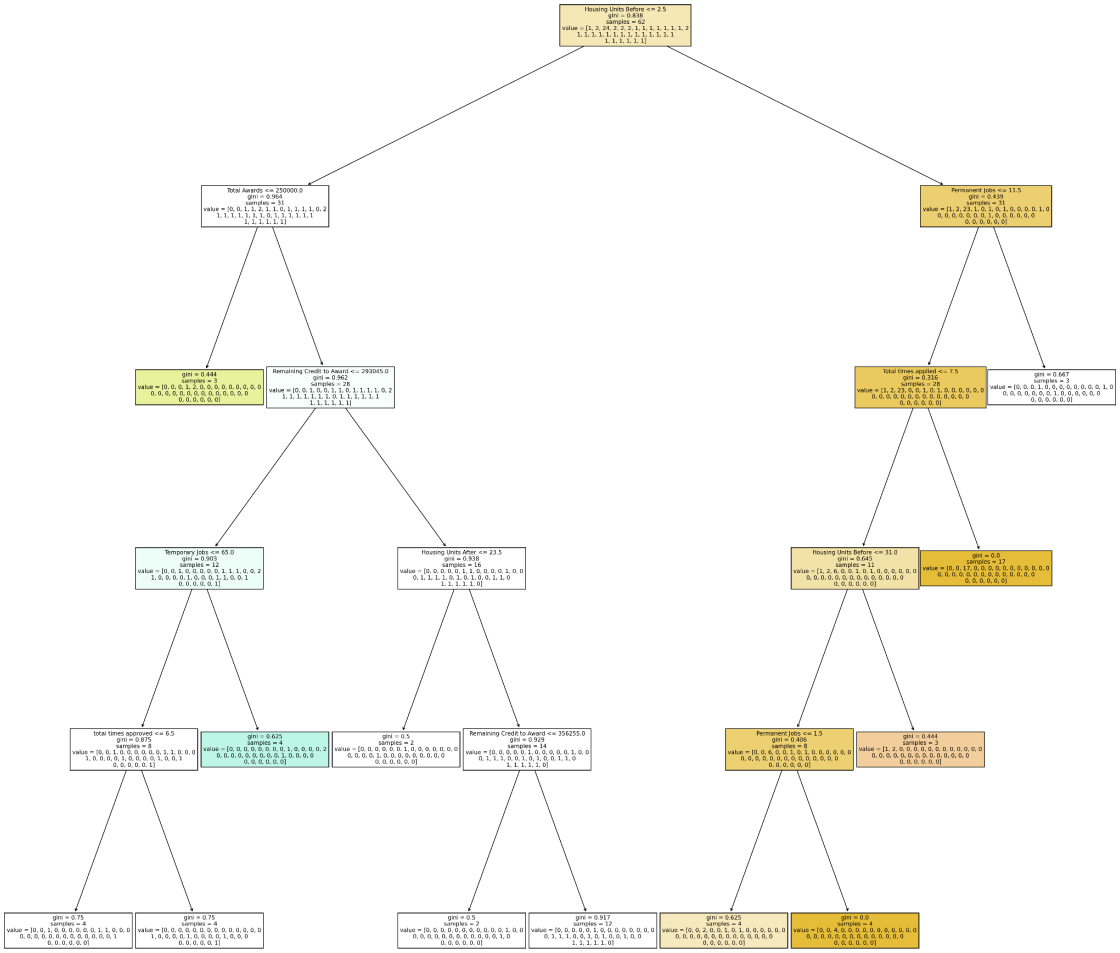
For our next steps, there are several things needed for further investigation. Firstly, we need more precise and more comprehensive data. We have very limited data at this stage, some of the data is vague. Secondly, we need a more transparent publicity of the HTC project's application. From WinnCompanies case, we assume that there are projects with the possibility of improper profit. Thirdly, in order to make more affordable housing units using HTC, we recommend that the government could set criteria such as 70 percent of the HTC are set to support development of new affordable housing units.

Recommendations based on Machine Learning Techniques

Now that we understand the background of the HTC and the patterns of its distribution, lets find a way to fix it.

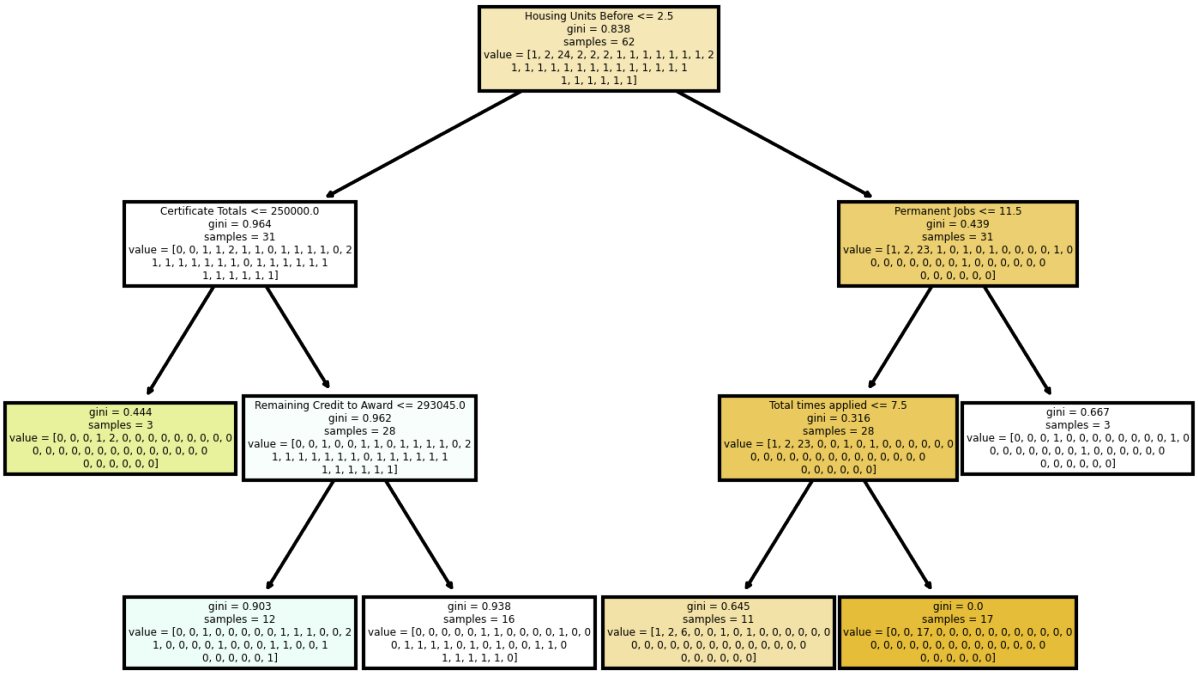
As mentioned in our Midterm Presentation, we believe that rather than having one person(Secretary of State) approve funds, that a Machine Learning(ML) model performs the initial scan and predict the economic impact of the proposed development based on location, cost, past performance and a plethora of other variables. And while this is the end goal, it is important to understand that such a stark switch from one person to machine will not be taken lightly.

Therefore we decided to first build a model that would figure out which variables were the most influential to an application that successfully created a number of affordable housing units. The model we chose to do this was a Decision Tree. A decision tree works by crawling through the data and models decisions and their possible consequences. This model is often used in decision analysis, to help identify the best strategy that optimizes the end goal.
We ran a decision tree on our full dataset and got the tree below.



As you can see, the tree is quite complex and has lots of branches. When we zoom in, we learn that the most influential variable is ‘Housing Units Before’, followed by ‘Total Award”, “Permanent Jobs Created”, and “Total Times Applied”. This gives us a lot of insight into which variables are the most important throughout our dataset. We can use this data and relay it to the pertinent individuals within government agencies and explain to them that these are the variables that they should be looking at with precise eyes. If legislators can understand that these few variables play the largest role in determining success for affordable housing units, we can begin making steps towards utilizing machine learning in our decision making process. In order to make it even more palatable to legislators, I have pruned the decision tree and made it more

understandable.



Following this decision tree(with True going left, and False going right), we can gain up to 93.8% of a favorable outcome if

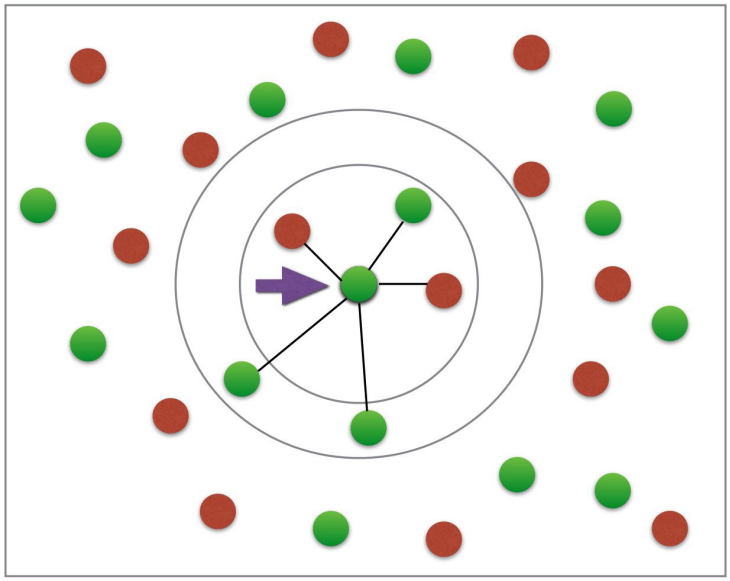
1. Housing Units Before is < 2.5
    a. Essentially, a plot of land that is undeveloped, meaning that demolition of the site is not necessary.
2. The company has been given greater than 250,000 dollars in the past
    a. Proving that they have performed successful projects in the past and hope to continue doing so
3. Remaining Credit to Award is greater than ~290,000
    a. Showing that they have more money to be awarded, which is an inventive for the firm to successfully build the affordable housing they promised in order to gain the tax credit

This successful variable analysis was able to give us valuable insight into which factors lead to positive developments. This will allow the future legislative committee to best understand what factors to prioritize when going through HTC applications.

However, what if we want to understand not only what attributes lead affordable housing being created, but also, the economic impact of the construction. This may not have been possible a few years ago, but with some data science we can make it happen.

To estimate the economic impact of a project, we decided to measure the difference in affordable housing units before and after a projet was completed. This allows us to learn *exactly* how many units will be created, upon which an economic value can be calculated alongside an economic expert.

In order to accurately predict how many affordable units were being created, we decided to build a K-Nearest Neighbors Model (KNN). This is a supervised learning classifier, that uses proximity between variables to make predictions about the grouping of an individual data point. Essentially, it plots all of the variables on a multi-dimensional matrix, and finds the points that are closest in regards to all variables. Then, based on the closest figures, it predicts the center of that point as the true value.



The figure attached is a visual representation of the algorithm. And as you can see, this method utilizes past data effectively, and allows us to "triangulate" the true value given the inputs.

Our KNN model was very successful. With just the limited data, we were able to accurately predict the correct number of affordable housing units created around 60% of the time. The algorithm performed best when we looked at the 3 nearest neighbors, and triangulated the center (K=3). If we had access to more data, or even the national data, we would be able to build a model with *much* higher accuracy, estimated to be in the low 90 percent!

So how can we combine both models to successfully create change?

Utilizing both the KNN model and the Decision Tree, we can create massive change surrounding the HTC. Using the Decision Tree, we can ensure that the applications that we are choosing display the correct variables that have historically produced very positive results. Then, from that subset of applications, we can apply our KNN model and predict the true number of affordable units created. Once complete, we can select the applications that create the highest number of units for the lowest cost! This way, we optimize utility for society while ensuring that minimal funds are at risk for being wasted.

The main risk of implementing these models is the "black box" nature of some of these algorithms. For example, there are many ways to build a decision tree, and some may result in slightly different structures. Our decision tree was pruned based on the "Gini Index" which

allows us to solve for the highest accuracy rate possible. However, one may want to solve for an alternative purpose, which can lead to issues down the line.

The KNN model however, deals with a different risk. Due to the fact that it can be fully visualized and broken down, it is not a “black box” like the other method. The KNN model is fully reliant on past data, and due to our application of the model, we are only able to predict the number of units created based on other successful projects in the past. And while this may make the most sense economically, it does not take into account any new developments in construction or housing design. If there were a new company to enter the market and have the technology to build many more houses for a cheaper price, then the model would not be able to reward this company’s ingenuity. This, however can be taken care of throug human intervention. As long as there are humans running the model and reading the applications, they will be able to spot outliers such as this in order to avoid this issue.

Overall, implementing ML models can be scary; regardless of the situation. However, slowly introducing them to those who are unfamiliar while emphasizing their power can open their eyes. The strongest solution to addressing inequality is to learn from the past and ensure that we do not make the same mistakes again. Implementing these machine learning models allow us to learn from the past, while using solutions from the present, in order to save our future.