Building Permits as a Metric of Gentrification in Washington, D.C.
Stephanie Blenko
GOVT 696 – American University
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Defining Gentrification

It is incredibly easy to identify gentrification when it happens in a city. New construction, an influx of wealthy people, often white, and the opening of hip boutique shops on every street corner are all hallmarks of the geospatial phenomenon. The Merriam Webster definition says gentrification is "the process of renewal and rebuilding accompanying the influx of middle-class or affluent people into deteriorating areas that often displaces poorer residents." Studies have shown time and time again that gentrification displaces residents of low economic status, and recent studies suggest that this results in a decrease in the quality of living conditions for the displaced (Sheppard, 3). In order to mitigate the negative effects of gentrification, it is important to establish a common metric to identify and measure gentrification's progress such that policy can be used to allow the phenomenon to occur in a manner that does not negatively impact established residents.

Because the study of gentrification is relatively new in the social research field, there is some debate regarding how to best measure it. It is impossible to measure the process itself, so most researchers concede to measuring the side effects. Common methods include measuring change in income, change in property values, change in population demographics, and change in education levels. The best studies use combinations of these measurements to determine where gentrification is occurring.

Gentrification in Washington, D.C.

Washington, D.C. has struggled with neighborhood gentrification for decades. According to Asch and Musgrove, the famously expensive Georgetown area was one of the first communities to experience a fast and dramatic population change in the 20th century when post-World-War-I revitalization efforts pushed blue-collar working-class citizens out of the neighborhood. The areas of Foggy Bottom and Capitol Hill followed suit in the 1940's and 50's. Adams Morgan, Shaw, and DuPont experienced similar change in the 1960's and 70's. In the 21st century, the city has seen gentrification occur in the H Street district, Columbia Heights, Petworth, and the intersection of U and 14th streets, just to name a few areas.

Gentrification puts at risk the city's rich history for minorities and African-Americans in particular. Washington became a safe haven for freed slaves during and after the Civil War. As a result, many neighborhoods became prominent centers for black cultural and artistic movements. Shaw is still home to Howard University, arguably the most famous historically black college in the nation.

The gentrification process not only displaces residents who have lived in these neighborhoods for decades, but it also poses the risk of erasing the culture of these areas. Sam Gringlas of NPR chronicles the stories of several older residents of Shaw. He notes their sense of alienation in a place that has always been their home. These residents are proud of the history they've lived through: the 1968 riots that captured national attention after the assassination of Martin Luther King Jr., the crack epidemic of the 1980's, and the turmoil of local politics.

It is crucial that cities are able to institute policy in gentrifying areas to protect the historic residents and the history of the neighborhood.

When starting my research, I decided to explore another side effect of gentrification: construction. Specifically, I hypothesized that a high number of building permit applications in a particular area of D.C. could signal gentrification. I expected to find a significant overlap between areas with many permit applications and areas where outside research has determined gentrification is taking place. I also hypothesized that I could use application fees to measure the scope of construction being done and subsequently use that information to find more significant construction in gentrifying areas.

Data
I combined six data sets from Open Data D.C., each containing all building permit applications received by the D.C. government each year from 2012 to 2017. Each data set contained 39 variables, including the address where the work was to be done, the ward number, the associated fees, the permit type and subtype, and a neighborhood cluster variable.

The D.C. government has divided the District into 39 distinct areas and neighborhoods numbered 1 through 39 as an internal organizational mechanism to qualify locations on a level that is more specific than ward number, but less specific than census tract. Figure 1 shows the boundaries of the neighborhood clusters.
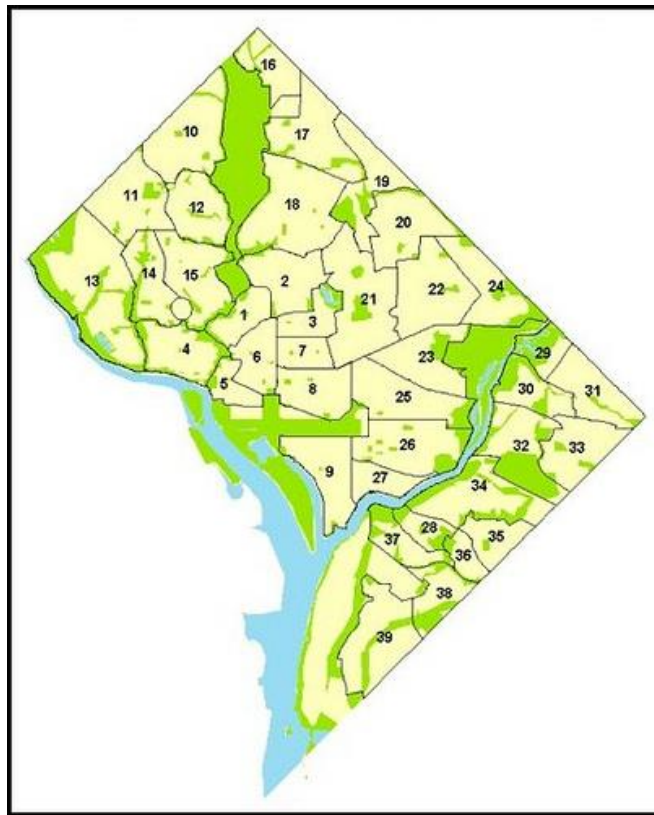

Figure 1

<u>Methods – Permit Quantity</u>

Governing published a report identifying gentrifying census tracts in D.C. based upon changes in statistics between the 2000 Census and the 2010 Census. Specifically, their algorithm looked at areas that fell below the 40th percentile in mean income in 2000 and then saw dramatic increases in property values, income levels, and education levels by 2010. *Investopedia* took this information and compiled it into a report, condensing the census tracts into seven specific neighborhoods that were gentrifying: Columbia Heights, Eckington, Navy Yard, Near Northeast (H Street Corridor), Petworth, Southwest, and Truxton Circle.

I paired these neighborhoods with their corresponding neighborhood clusters and created a variable called "gentrified". This variable is binary and denotes whether each permit application's work is to be done in a gentrifying area or a non-gentrifying area. Any permits with a location in neighborhood clusters 2 (Columbia Heights), 9 (Southwest), 18 (Petworth), 21 (Truxton Circle), 25 (Near Northeast), or 27 (Navy Yard), received a one, indicating gentrifying, while the remaining permits were given zeros indicating non-gentrifying. The gentrified variable serves as a "key" and for the purposes of my research will be considered to contain correct qualifications.

In order to create a new metric for determining which neighborhoods were gentrifying or not, I graphed the number of permit applications submitted per neighborhood cluster between 2012 and 2017. Figure 2 shows the resulting graph. Visually, there is a dramatic increase in the number of permits that divides clusters into those with less than 10,000 permits and those with greater than 10,000 permits.
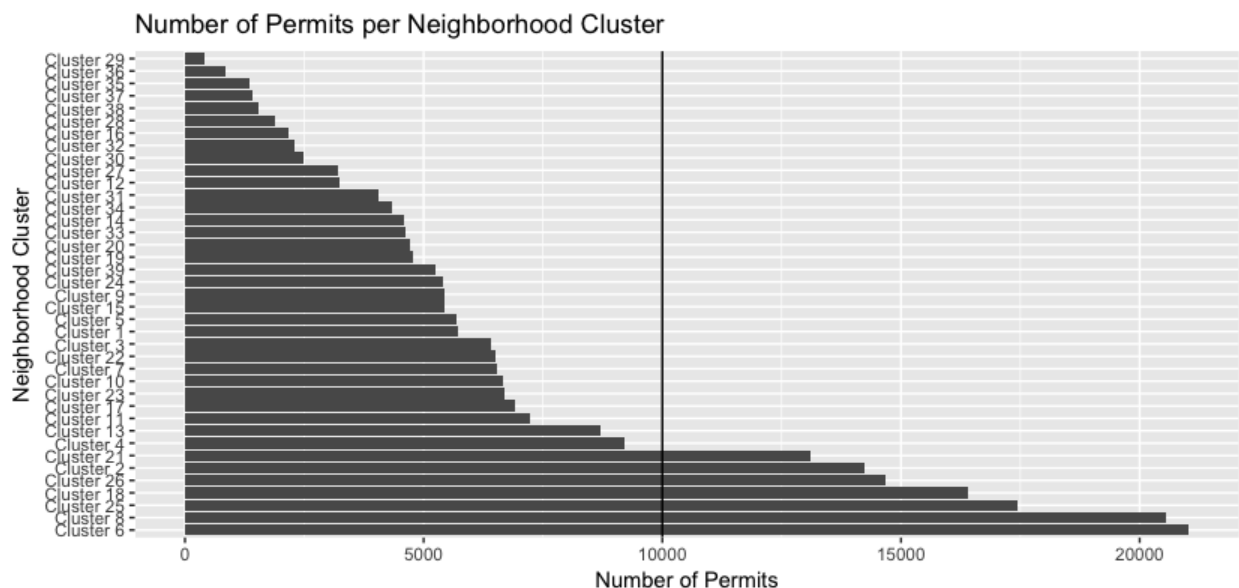

Figure 2

Based on this determination, I made a new variable, "many_permits", which assigned a one to permits in clusters 21, 2, 26, 18, 25, 8, 6, all of which had more than 10,000 permits. Permits in all other clusters were assigned zeros.

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A new binary "success" variable was created; assigning permits a one if "gentrified" and "many_permits" matched, denoting a correct classification by "many_permits", and a zero if they did not match, denoting an incorrect classification by "many_permits". Figure 3 demonstrates that 34 out of 39 of the neighborhood clusters were successfully classified according to the *Governing* research. This translates to a success rate of 0.872.
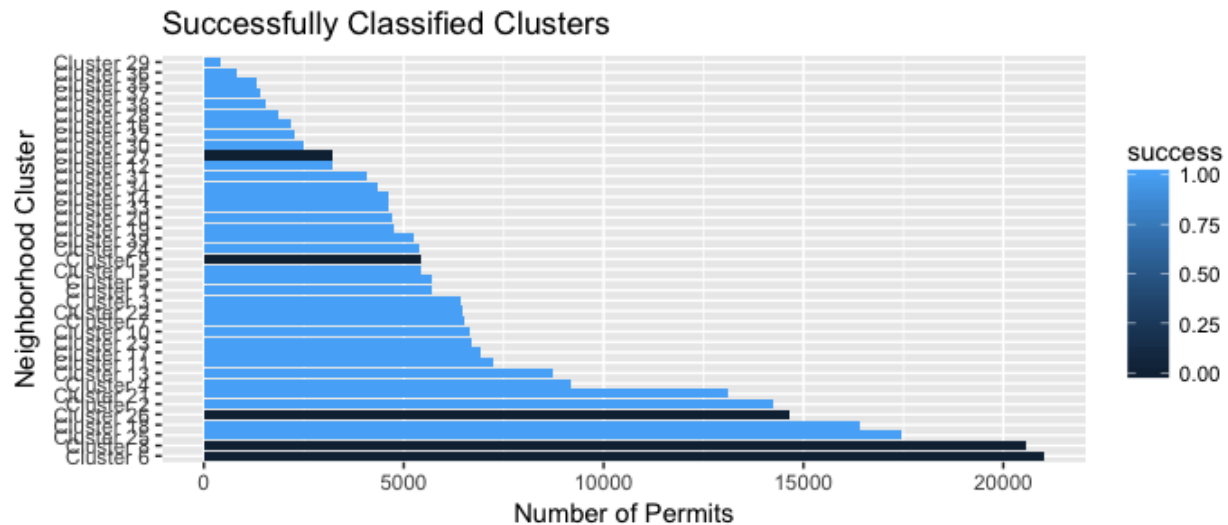

Figure 3

Methods – Large Project Permit Quantity
While there is little research on the topic, it is widely acknowledged that one of the side effects of gentrification is an increase in large scale construction projects. Within the building permits data sets, the only variable that indicates the scale of the permit is the associated permit fees. The DC Planning and Zoning Department has a comprehensive fee schedule for building permits with a variety of charges corresponding with project specifications ("Schedule of Fees"). On the whole, the larger the building permit fee, the larger the project. The range of building permit fees in this data set is large, with data spanning from $36 to $234,742,885. However, looking exclusively at observations within fees greater than $1000 narrows the data set down to just 25,958 observations with the highest fees and therefore the largest scale.

When looking at the large-scale projects by cluster in Figure 4, the gentrified neighborhoods, marked in light blue, do not consistently have the highest numbers of large scale projects. However, the majority of them do fall above the average.
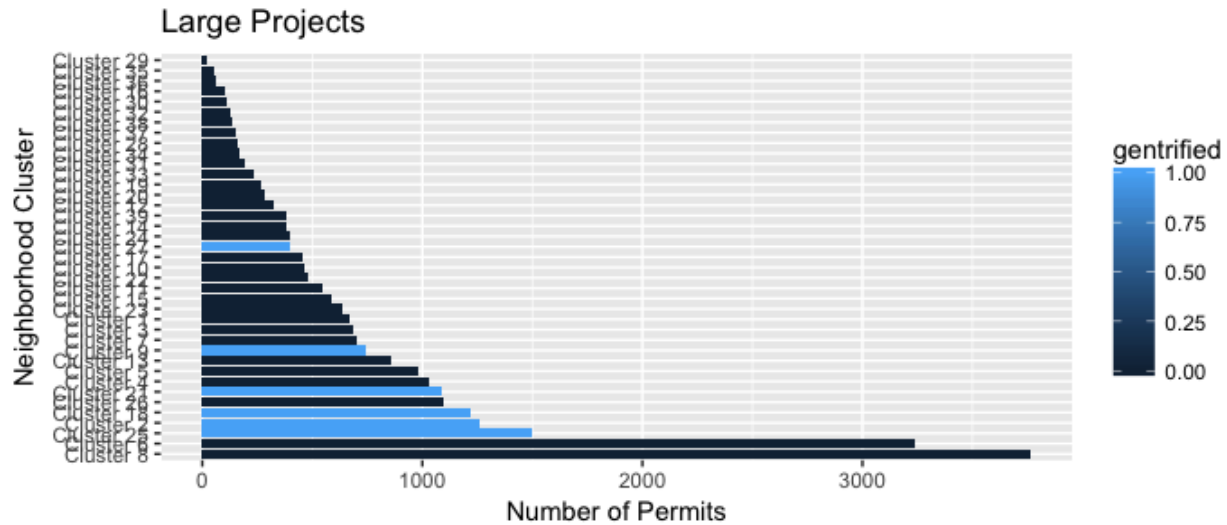
Figure 4

If this metric were to be used in a consequential context, it would be important to follow up with the DC Planning and Zoning office to clarify what kind of auditing process permit applications go through to ensure that fees are appropriate and accurate.

Conclusion
Based on the data tested, the quantity of permit applications in an area is a reasonable indicator of gentrification. However, it should not be used alone; rather it could be useful in conjunction with other established gentrification metrics already used in academic research. The use of large project permits as a metric is less useful but does provide supporting evidence that there are a higher than average number of large construction projects happening in gentrifying areas.

Discussion
There are several limitations to this research. First, the data used is highly specialized to a specific set of years in only the District of Columbia, and therefore the conclusions cannot be extrapolated to other cities or time frames. However, further research might prove that the methodology itself can be extrapolated.

Additionally, there are limitations to the *Governing* conclusions that this research relies on. Their conclusions were based on demographic changes between the 2000 and 2010 censuses. With census data only being collected every ten years, and the 2020 census fast approaching, this research could be considered out of date. While there is no standardized timeframe for how long the gentrification process takes, start to finish, it is quite possible that some areas identified by the "gentrified" variable, could be past the stages of active gentrification, and new areas could have started to gentrify since 2010. Therefore, it is possible that neighborhood clusters are incorrectly categorized in this research.

A confounding variable in this research is any inconsistencies in the population and number of buildings in each neighborhood cluster. Preliminary research did not reveal whether there is an attempt to standardize clusters beyond just estimating the boundaries of neighborhoods. A clear

example of how inconsistencies could interfere occurs at a ward level. Ward 2 encompasses the central business district and much of the National Mall, and predictably, no matter how the applications in this data set are split up, when grouped by ward, ward 2 consistently has the most permit applications. A similar phenomenon might be occurring at a neighborhood cluster level.

Further Research
There are dozens of ways to group permit types, and each grouping can be examined for correlations with gentrification. For example, each permit is classified by a type and subtype. Figures 5 and 6 show the number of levels that these variables add to the data and the extent to which they can be analyzed. It is possible that one particular type or subtype of permit has a high positive correlation with gentrification.
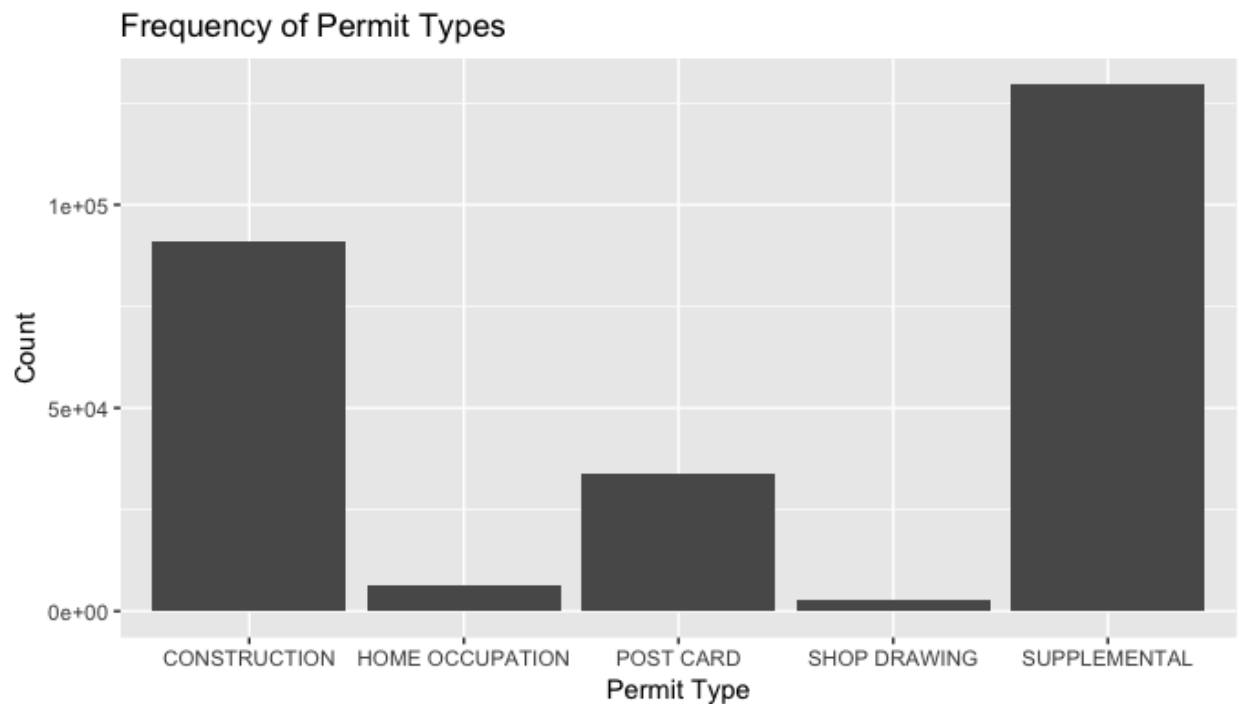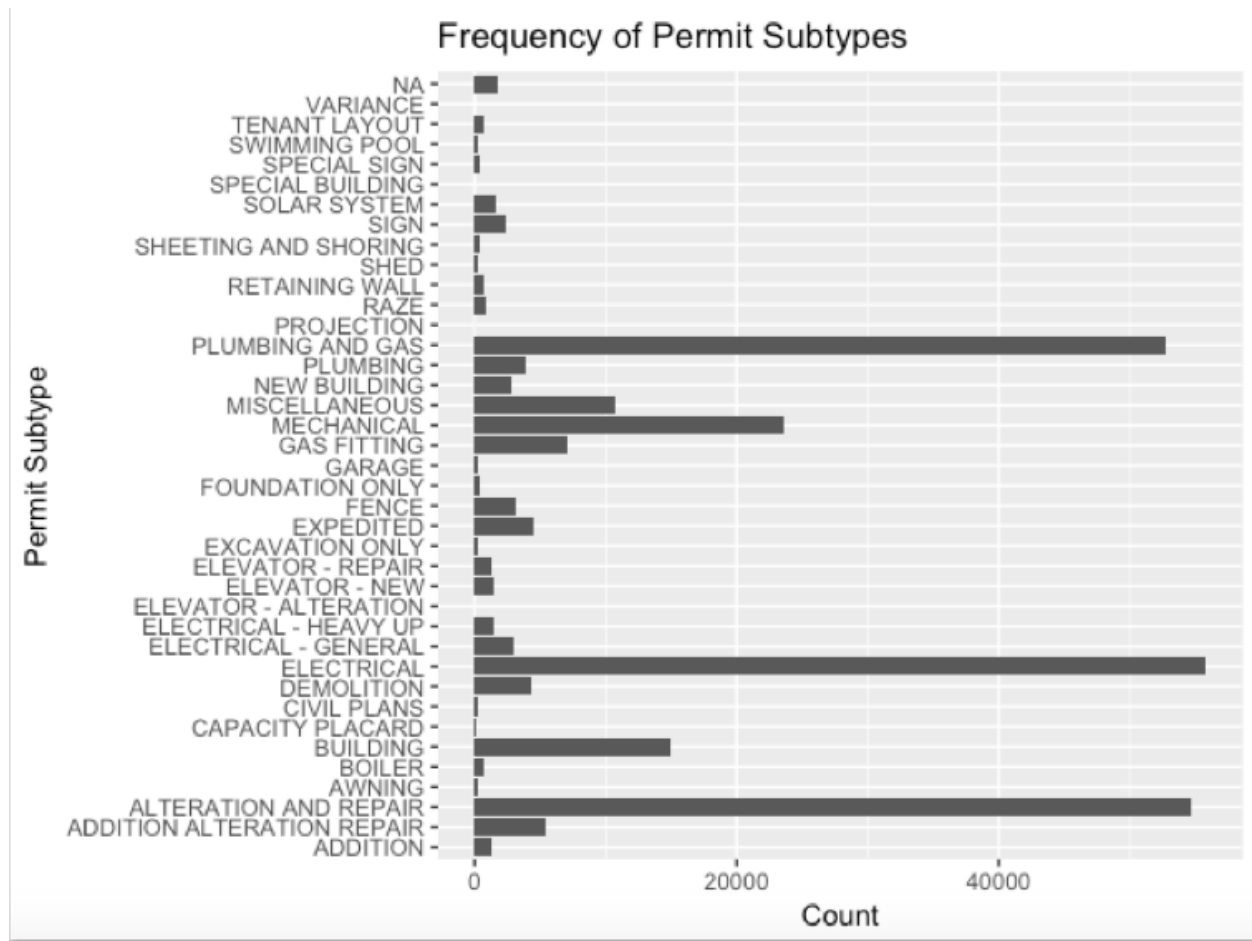

Figure 5

Figure 6

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