Identifying Early Stages of Gentrification in Amsterdam

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Executive Summary

This paper seeks to establish which areas of Amsterdam are currently likely to be in the early stages of gentrification. Based on available venue data derived from FourSquare, districts are clustered using the k-Means clustering algorithm. Based on this a list of 10 districts is identified, that is currently gentrifying.

The analysis provided in this paper is meant to provide a preliminary analysis that can provide guidance as to which districts of Amsterdam to focus on for a more in-depth analysis, based on which investors, politicians and social society groups then can make further decisions.

1. Introduction

Since the rise of urbanisation much theory has been developed in order to understand and explain mechanisms, causes and consequences of urbanisation and related phenomenons. Gentrification is a term that has been coined by Ruth Glass during the second half of the last century (Wikipedia, NL, Gentrificatie, 07 Jan 2020). The phenomenon of less affluent neighbourhoods being transformed and uplifted in (property) value has since had such an immense impact on urban communities anywhere in the world that the academic term 'gentrification' describing this phenomenon has long become common vocabulary among the masses.

Gentrification can be found in various forms and when looking at it, different causes, mechanisms or gentrifiers can be identified depending on the area and time that is being considered.

In Amsterdam both, the causes and consequences of gentrification, have been subject to considerable debate in recent years. While gentrification is often framed as something positive, uplifting cities and neighbourhoods to a higher and better standard, this often only holds true when looking at the property values in the area in question.

Meanwhile, depending on the dynamics at play in the particular case of gentrification, higher property prices, increased costs of living and the change of amenities and availability of commodities and their prices often drives out people who originally lived in the area and now can no longer afford to live there.

Irrespective of whether gentrification is good or bad news for you, it can be beneficial to gain early insights into the early stages of gentrification, even before the price hike in property prices manifests itself. It is crucial for property developers to make their investments during the early stages in order to reap the highest profit towards the final stages of gentrification. Equally, political parties, activists and other social society groups representing those negatively affected by gentrification need to voice their concerns and organize themselves as early as possible, if they want to still be able to intervene and slow down the process or at least partially address the adverse outcomes of the gentrification process. So they, too, will benefit greatly from data identifying early stages of gentrification.

The city of Amsterdam is said to be gentrified and gentrifying in various areas at the moment. While the neighbourhoods and districts in the city centre have long become the most expensive areas to live, there are other areas of the city that are expected to experience major transformations in the coming years. During the past years the borough of Amsterdam Noord was often mentioned as being expected to gentrify rapidly. Since 2019 the borough, which is situated north of the water way 'Het IJ' has been connected to the rest of the city by an underground metro line that has significantly shortened the commute to anywhere in Amsterdam city centre and other commercial districts of Amsterdam. Other boroughs at the outskirts of the city such as Amsterdam Nieuw-West and Amsterdam Zuidoost are still considered to be cheaper to live than the boroughs in the city centre but have not undergone dramatic structural changes such as the introduction of new transport links in recent years.

This paper seeks to establish which areas of Amsterdam are currently likely to be in the early stages of gentrification. The analysis provided in this paper is meant to provide a preliminary analysis that can provide guidance as to which districts of Amsterdam to focus on for a more in-depth analysis, based on which investors, politicians and social society groups then can make further decisions.

2. Data and Data Sources

The data used for this analysis will come from several sources.

Amsterdam is currently divided into 8 boroughs, which are subdivided into a total of 23 districts (see Appendix for further details on the subdivision). The location and shape of these boroughs and districts of Amsterdam can be found on a map made available by the data service of the city of Amsterdam (Amsterdam boroughs, accessed 07 Jan 2020). Coordinates of the districts are not readily available but can be reconstructed with the help of aforementioned map (Amsterdam boroughs, accessed 07 Jan 2020) and google maps. District coordinates data has been collected by visually identifying the approximate centre of any given district and using the search nearby function on google maps. With the data collected from the various websites, I manually created a csv file that can be used for further analysis in a Jupyter Notebook. The coordinates provided in the csv file can be used to extract data of venues available in any given borough from FourSquare.

FourSquare has proven to be a well-documented up-to-date source for venue data in most major cities of the world. While the data is usually collected by untrained FourSquare users, the website has been set up in such a way that it is very clear and easy to use and data entry errors are unlikely and hence expected to be rare. This way of collecting data also has the great advantage that the data provided is continuously updated. In order to get a meaningful answer to our research question, it is crucial to have access to the most recent data on venues in any given area of Amsterdam. Therefore, FourSquare is an excellent choice for this analysis.

FourSquare is mainly used to get the venue category (such as café, gym, hotel) of each venue found in a borough. The kinds of venues available in a borough are expected to be a good indicator of the progress of gentrification in that borough. The data will be extracted from FourSquare using the FourSquare API. It will then be further processed in a JupyterNotebook in order to be used for the analysis.

Finally, a csv file with data on property values in each district of Amsterdam is available via the website of the data service of the city of Amsterdam (Amsterdam property value, 7.6b, 11 Oct 2019). The data is available in average price per square metre and in average total property value. It is

important to have both values as the size of property within the different districts can vary greatly. Rising property prices in a particular district are usually a good indicator of gentrification. This analysis will be looking to identify cases where the first signs of gentrification arise, for example, the (increased) availability of certain venues, but property prices are not, yet, picking up to a point where they would have risen to a level that comes close to the prices in the city centre.

3. Methodology

The process of gentrification usually comes with a significant change of the amenities in the given area. Van Weezel (2015) finds that the current gentrification in Amsterdam typically leads to a significant increase in cafés, facilities that offer yoga classes and sustainable supermarkets among others.

More generally, this paper seeks to follow this reasoning that the kind venues or amenities available in a certain area are likely to be in some way correlated to the degree of gentrification of that area.

Starting this analysis based only on a search for cafés, yoga studios and sustainable supermarkets, only, would be too narrow for an exploratory analysis and would potentially exclude important categories from the analysis. Therefore, an unsupervised clustering algorithm will be used to cluster the different districts based on *all* venues available in the districts of Amsterdam. K-Means, the clustering algorithm chosen for this analysis, works excellent to identify items with similar features.

After the venue data for each district of Amsterdam is extracted from FourSquare, the data is further wrangled and prepared for k-Means clustering. In order to do so, one hot encoding is used to indicate the availability or absence of each venue category per entry. The resulting dataframe is used as input for the k-Means clustering algorithm.

To find the best k for clustering, the elbow method is used. After this k-Means clustering is used to cluster the districts of Amsterdam. Once the districts have been grouped into clusters, correlation between Cluster Label and property price will be tested. If the hypothesis that venues in an urban area are an indicator for the degree of gentrification of that area is true, and when considering that the degree of gentrification is positively correlated with property prices, the analysis should find a correlation between cluster label and property prices. Furthermore, if the hypothesis, that during the early stages of gentrification, there will be moments when the venues in the area are starting to resemble those of gentrified areas, while the property prices may not, yet, have caught up with those of gentrified areas, is true, the correlation is expected to be imperfect.

The main purpose of testing correlation is, to ensure that the unsupervised clustering algorithm has actually grouped the districts based on features that are correlated to gentrification.

Finally, if correlation can be found, the average property price for each cluster will help interpret the clusters and discuss the results.

4. Results

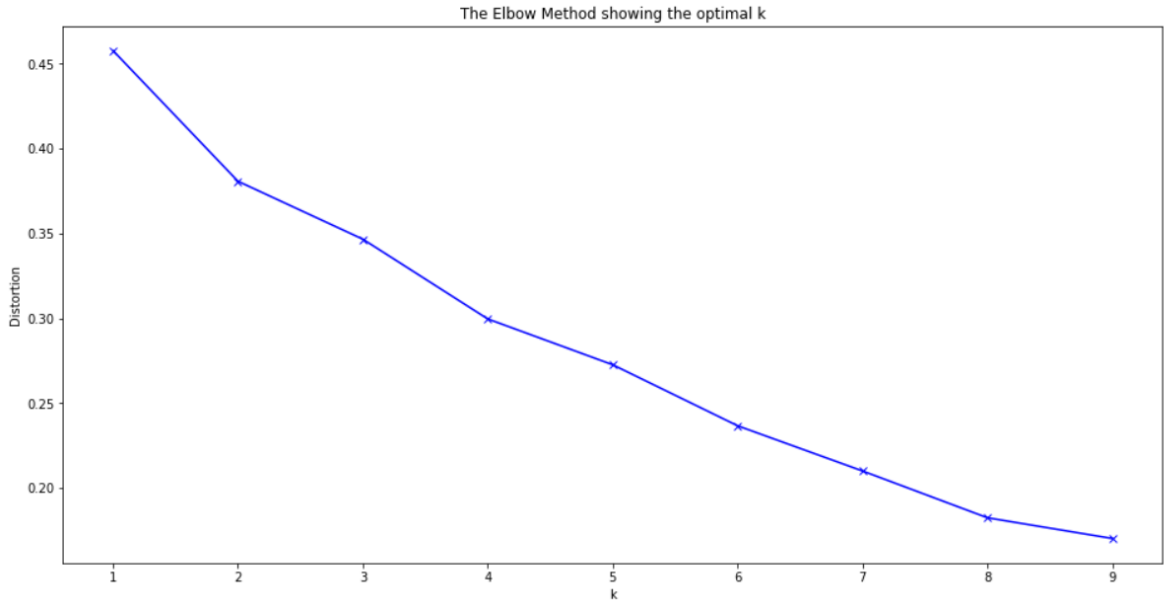
The data service of the city of Amsterdam divides Amsterdam into 23 districts. Of these 23 districts, 22 are residential areas, while one district, Amsterdam Westpoort, is industrial harbour area. This paper seeks to analyse gentrification in residential areas of Amsterdam. Westpoort is a mainly industrial area with only 4 venues registered on FourSquare. Therefore, the district of Westpoort will

be excluded from the analysis. K-Means clustering will thus be run on the data of the remaining 22 districts of Amsterdam.

4.1. K-Means Clustering

Before running the k-Means clustering algorithm, the elbow method should provide guidance in regards to the number of clusters that should ideally be created. Unfortunately, the resulting graph (visulaization 1) is somewhat inconclusive. A first bent can be found between 2 and 3, indicating that 3 might be the ideal k. However, an almost equally strong bent can be observed between 4 and 5. After 5 the graph flattens significantly. Looking at the research question, it seems preferable to have 5 clusters, in order to be able to distinguish between gentrified districts, not gentrified districts and districts that are currently gentrifying and that may be found to be in different stages of the gentrification process.

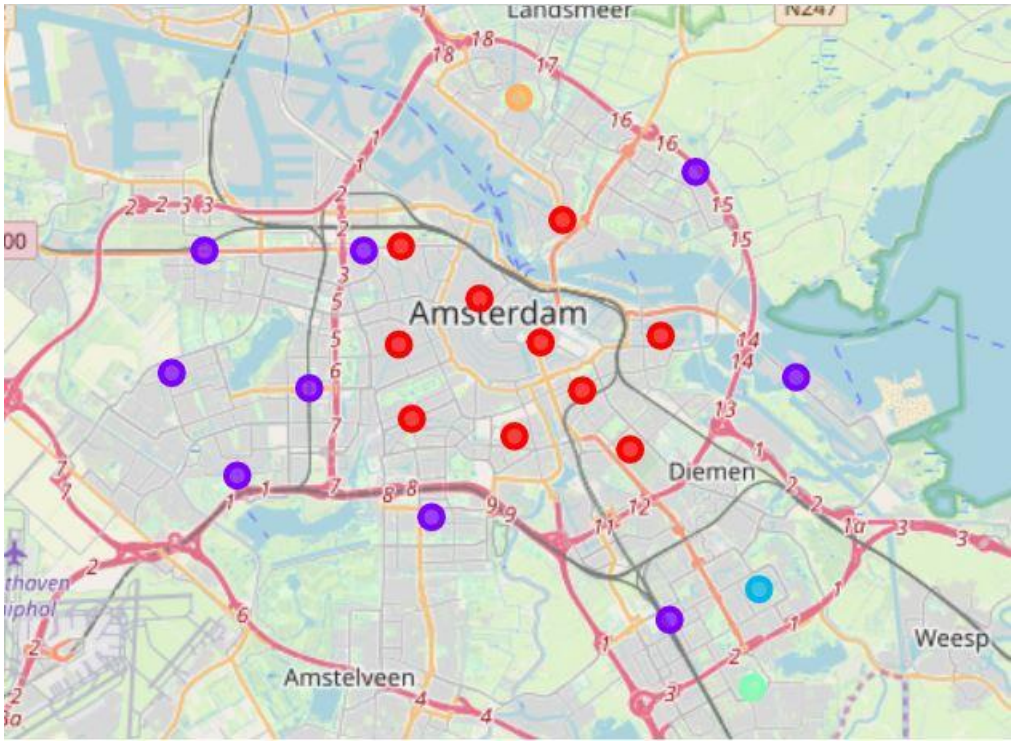
Visualization 1 – The elbow method as guidance to determine the optimal k-value for k-Means clustering



Running k-Means with k=5 leads to the following 5 clusters as shown on the map below (visualization 2). There is a clear differentiation between the urban centre and the districts closer to the outskirts of Amsterdam. Notably, Oud-Noord, the most southern district of the borough of Amsterdam Noord (north of the water way 'Het IJ' that splits Amsterdam in two parts), which is the area where the new metro line runs, has been included in the centre cluster.

Furthermore, the most northern district of Amsterdam Noord-West, as well as the two most southern districts of Bijlmer-Oost and 'Gaasperdam, Driemond' each form a separate cluster.

Visualization 2 – The 21 residential districts of Amsterdam clustered by venue data



4.2. Analysing the Clusters Based on Most Common Venues

To get a better idea of the typical venues of each cluster and what distinguishes each cluster from the others, the districts of each cluster, together with the 10 most common venues in those districts can be found in the tables below.

Cluster 0 is the cluster marked in red on the map which can mainly be found in the city centre and surrounding districts. Remarkably, the 10 most common venues of this cluster are almost exclusively cafés, restaurants, coffee shops, bars and hotels. In addition to that, one can find the odd Yoga Studio, Gym, Gastropub and vegetarian/vegan restaurant. Venues that are similar to those described by van Weezel as indicators for gentrification. It seems like these districts mainly cater for two groups of people, tourists and gentrifiers.

Table 0 - Cluster 0, red

	District	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	DX01 Centrum-West	Bar	Hotel	Café	Marijuana Dispensary	Gift Shop	Coffee Shop	French Restaurant	Dessert Shop	Boutique	Bistro
1	DX02 Centrum-Oost	Bar	Hotel	Restaurant	French Restaurant	Coffee Shop	Zoo Exhibit	Pizza Place	Breakfast Spot	Bagel Shop	Theater
2	DX03 Westerpark	Coffee Shop	Restaurant	Bar	Nightclub	Café	Italian Restaurant	Bakery	Hotel	Indonesian Restaurant	Brewery
4	DX05 Oud-West, De Baarsjes	Coffee Shop	Restaurant	Yoga Studio	Bar	Italian Restaurant	Grocery Store	Middle Eastern Restaurant	Indonesian Restaurant	Café	Pizza Place
9	DX10 Oud-Zuid	Restaurant	Hotel	Bakery	Italian Restaurant	Coffee Shop	Bistro	Ethiopian Restaurant	Pizza Place	Café	Bar
11	DX12 De Pijp, Rivierenbuurt	Japanese Restaurant	Italian Restaurant	Coffee Shop	Breakfast Spot	Pizza Place	Café	Ice Cream Shop	Indonesian Restaurant	Deli / Bodega	Restaurant
12	DX13 Oud-Oost	Restaurant	Bar	Hotel	Italian Restaurant	Café	Coffee Shop	Bakery	Gym / Fitness Center	Vegetarian / Vegan Restaurant	Turkish Restaurant
13	DX14 Indische Buurt, Oostelijk Havengebied	Coffee Shop	Café	Plaza	Bakery	Italian Restaurant	Restaurant	Fish Market	Supermarket	Grocery Store	Park
14	DX15 Watergraafsmeer	Hotel	French Restaurant	Soccer Field	Café	Restaurant	Park	Italian Restaurant	Coffee Shop	Bakery	Cafeteria
17	DX18 Oud-Noord	Restaurant	Café	Coffee Shop	Bar	Hotel	Park	Scenic Lookout	Gastropub	Lounge	Theme Park Ride / Attraction

Cluster 1 is the cluster marked on the map with purple, mainly containing districts further towards the periphery of Amsterdam. These districts seem to harbour relatively more hotels than restaurants. Supermarkets, parks, and hotels are the most frequent venues, followed by restaurants and gyms. While still catering for tourists as indicated by the high number of hotels in those districts, the high prevalence of supermarkets and gyms shows that these are residential areas that cater for those who live there.

Table 1 - Cluster 1, purple

	District	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
3	DX04 Bos en Lommer	Hotel	Restaurant	Supermarket	Bakery	Sandwich Place	Indonesian Restaurant	Mediterranean Restaurant	Coffee Shop	Fast Food Restaurant	Bar
5	DX06 Geuzenveld, Slotermeer, Sloterdijken	Hotel	Turkish Restaurant	Supermarket	Park	Furniture / Home Store	Drugstore	Train Station	Soccer Field	Coffee Shop	Dessert Shop
6	DX07 Osdorp	Supermarket	Turkish Restaurant	Grocery Store	Restaurant	Hotel	Gym / Fitness Center	Park	Dessert Shop	Indonesian Restaurant	Drugstore
7	DX08 De Aker, Sloten, Nieuw-Sloten	Park	Bus Stop	Hotel	Soccer Field	Café	Flower Shop	Playground	Chinese Restaurant	Restaurant	Resort
8	DX09 Slotervaart	Supermarket	Coffee Shop	Sandwich Place	Hotel	Asian Restaurant	Gym	Pharmacy	Tram Station	Chinese Restaurant	Plaza
10	DX11 Buitenveldert, Zuidas	Hotel	Restaurant	Gym	Breakfast Spot	Supermarket	Gym / Fitness Center	Bookstore	Bakery	Park	South American Restaurant
15	DX16 Ijburg, Zeeburgereiland	Harbor / Marina	Park	Restaurant	Coffee Shop	Bakery	Pizza Place	Farmers Market	Shopping Mall	Supermarket	Italian Restaurant
18	DX19 Noord-Oost	Supermarket	Clothing Store	Park	Plaza	Soccer Field	Gym / Fitness Center	Discount Store	Drugstore	Sports Club	Bus Stop
19	DX20 Bijlmer-Centrum, Amstel III	Hotel	Soccer Field	Platform	Office	Café	Music Venue	Concert Hall	Coffee Shop	Soccer Stadium	Auto Dealership

Cluster 2, shown on the map as aquamarine, only contains the district of Bijlmer-Oost. While catering for the basic grocery needs of residents with bakeries and supermarkets as most common venues, gyms and burger joints provide a minimum of leisure activities. Infrastructure, such as bus stops and metro stations are among the most common venues, ensuring that residents can commute elsewhere, for anything not available in the district.

It should be noted here that the 10 most common venues are relative categories. Having public transport venues in the most common venues category does not indicate that the district is better connected than other districts. It may instead indicate that other venues are even less common. Indeed Bijlmer-Oost only returned 19 venues in total from FourSquare.

Table 2 - Cluster 2, aquamarine

	District	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
20	DX21 Bijlmer-Oost	Bakery	Supermarket	Gym / Fitness Center	Burger Joint	Bus Stop	Metro Station	Shopping Mall	Drugstore	Park	Grocery Store

Cluster 3, shown on the map as mint green, only contains the district of Gaasperdam, Driemond. With metro stations as most common venue and supermarkets, grocery stores and pharmacies still within the 10 most common venues, this district, similar to Bijlmer-Oost, resembles a commuters town. However, with the notable exception that coffee shops are the second most common venue in the district. Again, it should be noted that the district of Gaasperdam, Driemond only returned 38 venues. So the high relative position of metro stations can partially be explained by the low number of venues available within the district.

Table 3 - Cluster 3, mint green

	District	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
21	DX22 Gaasperdam, Driemond	Metro Station	Coffee Shop	Soccer Field	Supermarket	Park	Chinese Restaurant	Gym	Grocery Store	Shopping Mall	Pharmacy

Cluster 4, marked on the map in orange, again, only consists of one district, the district of Amsterdam Noord-West. However, the most common venues available in this district are very different from cluster 2 and 3. Steakhouses, restaurants, cafés and Gastropubs, make this district somewhat similar to clusters 0 and 1. However, the further presence of soccer fields, department and grocery stores and a motorcycle shop make it again somewhat different. Furthermore, it should be noted that the district of Noord-West only returned 22 venues from FourSquare. Only Bijlmer-Oost with its 19 venues returned less venues than Amsterdam Noord-West. The low number of venues available in Noord-West, can be explained by the fact that this district is still under construction.

Table 4 - Cluster 4, orange

	District	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
16	DX17 Noord-West	Steakhouse	Restaurant	Soccer Field	Department Store	Grocery Store	Motorcycle Shop	Café	Sandwich Place	Bistro	Gastropub

4.3. Correlation Cluster Labels and Property Prices

Having identified these clusters, the analysis now turns to the question, what the property prices are in those clusters and if the cluster label is, at all, correlated to the property prices in the cluster.

As tables 5 and 6 show, the cluster labels and property prices are somewhat correlated with significance levels of $p<0.01$. As expected the correlation is not perfect. However, it is sufficient to be confident that the clusters found during the analysis can actually provide some insights on the status of gentrification in a given district.

Table 5a – Pearson's correlation between Cluster Label and average property price of a cluster

	Cluster Labels	avg property price 2019
Cluster Labels	1.000000	0.543346
avg property price 2019	0.543346	1.000000

Table 5b – p-value of Pearson's correlation between Cluster Label and average property price of a cluster

	Cluster Labels	avg property price 2019
Cluster Labels	1.000000	0.008523
avg property price 2019	0.008523	1.000000

Table 6a – Pearson's correlation between Cluster Label and average property prices per square metre of a cluster

	Cluster Labels	avg property price per sqm 2019
Cluster Labels	1.000000	0.543346
avg property price per sqm 2019	0.543346	1.000000

Table 6b – p-value of Pearson's correlation between Cluster Label and average property prices per sqm of a cluster

	Cluster Labels	avg property price per sqm 2019
Cluster Labels	1.000000	0.000311
avg property price per sqm 2019	0.000311	1.000000

5. Discussion

When looking at the average property prices and average property price per square metre for each cluster (table 7 and table 8), the trends are somewhat similar to each other, though not identical. Cluster 0, the cluster in and around the city centre, proves to be the most expensive cluster in both tables. The centre cluster is followed by cluster 1, the periphery cluster. Again, in both tables this cluster holds second place.

Cluster 4, only containing Amsterdam Noord-West, follows on third place. Finally, cluster 2 (Bijlmer-Oost) and 3 (Gaasperdam, Driemond) are significantly cheaper than all the other clusters. While average property price of cluster 2 is slightly higher than that of cluster 3, the property price per square metre is lower in cluster 2 than in cluster 3. Both clusters, judged by their venues, showed

signs of commuter towns, rather than gentrification. Therefore, neither of them, is worth considering when looking for districts in early stages of gentrification.

Table 7 – Average property price in euros in 2019 for each cluster

Cluster Labels	avg property price 2019
0	435974
1	303757
4	280830
2	215199
3	211503

Table 8 – Average property price per square metre in euros in 2019 for each cluster

Cluster Labels	avg property price per sqm 2019
0	5703
1	3665
4	3416
3	2613
2	2444

In addition to ruling out cluster 2 and cluster 3, cluster 0 clearly is already gentrified, and therefore, is not relevant for this analysis, either. The clusters that, then, remain to be further investigated are cluster 1 and cluster 4. While cluster 1 has been clearly identified as gentrifying cluster, based on its venues, cluster 4 remains an odd one. In terms of price it is right in the middle of the clusters and still quite close to the average of cluster 1. However in terms of venues it remains different.

This difference, however, can be easily explained by the unique situation this district finds itself in. Vast areas of Amsterdam Noord-West are currently under construction. A significant amount of newly built houses are coming on the market and more are still expected to come on the market in the near future. As more people move towards the area, new amenities are expected to become available. These expectations together with the district's close proximity to the increasingly gentrified district of Oud-Noord with its new metro connection, have catapulted property prices already close to those of cluster 1.

Both, cluster 1 and cluster 4 can be considered to be gentrifying. The difference is, however, that cluster 1 is following the classic gentrification route of existing urban areas being uplifted and thus gentrified, whereas Oud-Noord (cluster 4) experiences, what Brian Doucet identifies as 'new-build gentrification' (Wikipedia, NL, Gentrificatie, 07 Jan 2020).

Looking more closely at clusters 1 and 4 then, tables 9 and 10 clearly confirm that Noord-West (cluster 4) lies somewhere in the middle of districts when sorted on property prices.

Having identified clusters 1 and 4 as gentrifying clusters, tables 9 and 10 thus provide a list of the 10 gentrifying districts of Amsterdam that this paper would recommend for further investigation.

Table 9 – Average property price by district of clusters 1 and 4

District	Cluster Labels	avg property price 2019
DX11 Buitenveldert, Zuidas	1	434370
DX16 Ijburg, Zeeburgereiland	1	417221
DX08 De Aker, Sloten, Nieuw-Sloten	1	363093
DX04 Bos en Lommer	1	303575
DX19 Noord-Oost	1	281950
DX17 Noord-West	4	280830
DX09 Slotervaart	1	277565
DX07 Osdorp	1	244801
DX06 Geuzenveld, Slotermeer, Sloterdijken	1	232065
DX20 Bijlmer-Centrum, Amstel III	1	179169

Table 10 - Average property price per square metre by district of clusters 1 and 4

District	Cluster Labels	avg property price per sqm 2019
DX04 Bos en Lommer	1	4929
DX11 Buitenveldert, Zuidas	1	4709
DX16 Ijburg, Zeeburgereiland	1	4072
DX09 Slotervaart	1	3757
DX17 Noord-West	4	3416
DX08 De Aker, Sloten, Nieuw-Sloten	1	3379
DX19 Noord-Oost	1	3312
DX06 Geuzenveld, Slotermeer, Sloterdijken	1	3284
DX07 Osdorp	1	2978
DX20 Bijlmer-Centrum, Amstel III	1	2562

Even without more in-depth research the below lists can already be of great value to investors. Property prices in the districts of Cluster 1 and 4 differ somewhat from each other with the most expensive districts almost reaching the average of the gentrified centre-cluster. The cheaper districts within Cluster 1 and 4 can be expected to be in early stages of gentrification. The property prices of the upper part of the list is already (almost) aligned with the gentrified centre cluster and therefore less interesting for answering the research question of this paper.

Depending on preferences regarding relative value of space and desired time period for return on investment, investors can choose to invest in either districts on the lower part or the middle part of districts lists provided in tables 9 and 10. Investment in the cheaper districts would likely yield a higher return on investment after gentrification, but would probably mean a longer waiting time for the return. Investment in the middle segment of this list might yield a quick return, as gentrification has already progressed further, but as a consequence of this a lower marge can be expected.

Political parties and pressure groups, interested in alleviating the negative consequences of gentrification, will likely be most effective when focusing on the lower half of the list, as intervention likely needs to be done as early as possible in order to be successful. The districts at the top of the list are likely districts where those adversely affected by gentrification, are already starting to feel the negative effects of gentrification. In those districts, prevention might be too late. Instead immediate action to address the problems, of those suffering from the negative effects of gentrification, is likely to be necessary.

Conclusion

This paper set out to identify which areas of Amsterdam are currently likely to be in the early stages of gentrification. This exploratory analysis found that the districts of 'Bos en Lommer', 'Buitenveldert, Zuidas', 'IJburg, Zeeburgereiland', 'Slotervaart', 'Noord-West', 'De Aker, Sloten, Nieuw-Sloten', 'Noord-Oost', 'Geuzenveld, Slotermeer, Sloterdijken', 'Osdorp' and 'Bijlmer-Centrum, Amstel III' can be categorized as districts that are currently gentrifying. Within this group, a rather wide range of property values can still be found. This list of 10 districts does narrow down the area to focus on for investors or political parties and social society groups. Together with the property prices and table of most common venues provided in this paper, they can further narrow down the area of their interest, depending on their specific goal. Furthermore, the group of 10 districts, identified in this paper, can be used as pre-selection for further research into the nature, mechanisms and current progress of the gentrification currently taking place, as well as research on the social effects and consequences of the ongoing gentrification.

Sources/References

Wikipedia, NL, Gentrificatie, 07 Jan 2020 : https://nl.wikipedia.org/wiki/Gentrificatie

Amsterdam boroughs, accessed 07 Jan 2020 : https://maps.amsterdam.nl/gebiedsindeling/

Amsterdam property value, 7.6b, 11 Oct 2019, accessed 07 Jan 2020, https://data.amsterdam.nl/datasets/U3sNCWlwTlnm0Q/stedelijke-ontwikkeling-22-gebieden/

Google Maps, https://www.google.nl/maps, accessed, 07 Jan 2020

van Weezel , Tjerk Gualtherie, *Volkskrant* (22 Aug 2015): *Dure huizen, rijke mensen, koffie en veel yoga*, https://www.volkskrant.nl/kijkverder/2015/VK22082015/index.html , accessed 07 Jan 2020

Appendix

Subdivision of Amsterdam boroughs (with blue background) into districts (white background, index starting with DX)

The only exception is the borough of Westpoort which is not divided into further districts. Westpoort has been excluded from the analysis due to the lack of residential areas in the borough/district.

A Centrum
DX01 Centrum-West
DX02 Centrum-Oost
E West
DX03 Westerpark
DX04 Bos en Lommer
DX05 Oud-West, De Baarsjes
F Nieuw-West
DX06 Geuzenveld, Slotermeer, Sloterdijken
DX07 Osdorp
DX08 De Aker, Sloten, Nieuw-Sloten
DX09 Slotervaart
K Zuid
DX10 Oud-Zuid
DX11 Buitenveldert, Zuidas
DX12 De Pijp, Rivierenbuurt
M Oost
DX13 Oud-Oost
DX14 Indische Buurt, Oostelijk Havengebied
DX15 Watergraafsmeer
DX16 Ijburg, Zeeburgereiland
N Noord
DX17 Noord-West
DX18 Oud-Noord
DX19 Noord-Oost
T Zuidoost
DX20 Bijlmer-Centrum, Amstel III
DX21 Bijlmer-Oost
DX22 Gaasperdam, Driemond
ZX99 Westpoort

Source: Amsterdam property value, 7.6b, 11 Oct 2019, accessed 07 Jan 2020, https://data.amsterdam.nl/datasets/U3sNCWlwTlnm0Q/stedelijke-ontwikkeling-22-gebieden/