

Living apart together: The economic value of ethnic diversity in cities

EPB: Urban Analytics and City Science
2022, Vol. 0(0) 1–16

© The Author(s) 2022

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/23998083221082112

journals.sagepub.com/home/epb



Jessie Bakens

Research Centre for Education and the Labour Market, Maastricht University, Maastricht, The Netherlands

Raymond JGM Florax

Department of Agricultural Economics, Purdue University, West Lafayette, IN, USA

Department of Spatial Economics, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

Tinbergen Institute, Amsterdam, The Netherlands

Henri LF de Groot

Department of Spatial Economics, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands

Tinbergen Institute, Amsterdam, The Netherlands

Peter Mulder

TNO, Amsterdam, The Netherlands

Abstract

In consumer cities, the presence and location of immigrants impacts house prices through two channels, which both can be valued positively as well as negatively: (i) their presence and contribution to population diversity and (ii) the creation of immigrant-induced consumer amenities like those associated with ethnic restaurants in terms of both their quantity as well as diversity. We hypothesize that these two mechanisms create a trade-off in which city dwellers want to live apart yet consume together. We use unique microdata of house prices and ethnic restaurants in the city of Amsterdam over the 1996–2011 period and a generalized propensity score (GPS) matching technique for multiple continuous treatments to estimate the trade-off between consumers' love for ethnic goods and their variety on the one hand, and ethnic residential composition on the other hand. We find evidence for the existence of such a trade-off: proximity to ethnically diverse restaurants indeed compensates for a negative correlation between the presence of immigrants and house prices. This trade-off mostly holds for neighborhoods featuring both a diverse population and a high level of amenities in terms of restaurants.

Corresponding author:

Jessie Bakens, Research Centre for Education and the Labour Market, Maastricht University, Tongersestraat 53, Maastricht 6211 LM, The Netherlands.

Email: j.bakens@maastrichtuniversity.nl

Keywords

amenities, diversity, immigrants, hedonic pricing, propensity score matching

JEL-classification: D12, D62, J15, R10

Introduction

For many people, cosmopolitan cities like New York, London, and Amsterdam are attractive residential locations because they are rich in amenities (Glaeser et al., 2001). Large (cosmopolitan) cities offer a relatively high product variety (Berry and Waldfogel, 2010) and they often are home to the largest concentrations of ethnic groups within a country (Borjas, 1995). Schiff (2015) shows that city size and the concentration of heterogeneous consumers in cities influence product variety. Immigrants increase the heterogeneity of consumer products and services—like ethnic restaurants, specialty food shops, hair stylists or entertainment—because immigrants have a comparative advantage in producing these goods (cf. Mazzolari and Neumark, 2012; Ottaviano and Peri, 2005), may be more entrepreneurial (Mickiewicz et al., 2019), and preferences for restaurants differ by ethnicity (Waldfogel, 2008). Immigrant-induced amenities may thus have a positive effect on the consumer value of cities, especially if urban consumers exhibit a love for product variety (Ottaviano and Peri, 2006). But, ethnic segregation patterns observed in many large cosmopolitan cities suggest that the presence of immigrants in cities does not lead to a straightforward positive impact on local residential utility (Bakens et al., 2013, Bakens and de Graaff, 2020). Residential segregation patterns are of course due to a combination of factors, including embedded social networks that cause biases with respect to the areas in which people search for houses (see Krysan and Crowder 2017). But, the evidence of ethnic sorting patterns often can only be partly explained by socio-economic and demographic differences between ethnicities, and may thus signal a negative utility effect of ethnic diversity in the local population composition on individual (native) people (Bayer et al., 2004; Card et al., 2008; Cutler et al., 1999; De La Roca et al., 2014; Hårsman and Quigley, 1995; Ioannides and Zabel, 2008). Ioannides and Zabel (2008) show that individuals prefer to live in neighborhoods with people who have similar (ethnic) characteristics, which could partly account for the persistence of observed ethnic segregation patterns in many cities (see, for example, Card et al., 2008; De La Roca et al., 2014).

Together, this suggests the existence of a trade-off in which people in cosmopolitan cities may want to live apart yet consume together. Research by Bakens et al. (2013) and Bakens and de Graaff (2020) for the Netherlands suggests the existence of a preference to live in areas with relatively low concentrations of immigrants, while at the same time areas with easy access to immigrant-induced amenities, such as ethnic restaurants, are found to be relatively attractive. In this paper, we further investigate this phenomenon, focusing on the potential trade-off between population composition and the supply of immigrant-induced consumption goods at the neighborhood level. In doing so, we account for the diversity of consumption goods and immigrants in this trade-off, because, especially at higher levels of immigrant and restaurant density, immigrant and restaurant diversity might play a role in shaping preferences. If we hypothesize that consumers in a typical consumer city exhibit a “love of variety” for consumption goods (following Dixit and Stiglitz, 1975; Ottaviano and Peri, 2006), areas featuring immigrant-induced amenities are even more attractive if these amenities are heterogeneous in nature. Similarly, areas that have a diverse immigrant population might be more attractive than areas with a cluster of homogeneous immigrants.

The trade-off between ethnic population and amenity diversity is likely to be nonlinear in nature. One can imagine that the marginal effect of an increase in immigrant density on neighborhood

attractiveness depends on the existing level of immigrant density. The same holds for the density of amenities; an additional restaurant in a neighborhood with many restaurants may have a different effect on the neighborhood's attractiveness than a new restaurant in a neighborhood with only a limited number of restaurants. In addition to these effects potentially being nonlinear, the spatial scale at which these effects materialize may matter. We hypothesize that the effect of a neighborhood's population composition on residential utility matters most in the direct local environment of a house, while consumer amenities can more easily be enjoyed outside of the direct environment of the house (one can travel to go out for dinner). To our knowledge, we are the first to investigate the potential trade-off between the "love of variety" for ethnic goods and the residential population composition. In our empirical analysis, we measure the attractiveness of residential locations in Amsterdam by house prices. We use local immigrant density and diversity to test the general idea that the presence of immigrants has a negative effect on house prices, which might also depend on the composition of the immigrants in terms of their diversity. We use the density of ethnic restaurants to test the general idea that cities are attractive because of the number and variety of amenities available. The case of Amsterdam fits the goal of our analysis well, in that Amsterdam is a consumer city in addition to a productive city. [De Groot et al. \(2010\)](#) and [Vermeulen et al. \(2016\)](#) show that land prices in Amsterdam are (much) higher than in the rest of the Netherlands, partly because of all the amenities that make it an attractive residential area. Amsterdam also represents an ethnically diverse consumer city with sufficient spatial variation across residential areas in terms of the density of immigrants as well as immigrant-induced amenities.

Our focus on restaurants as a measure of consumer amenities serves two purposes. First, restaurants sell goods that need to be consumed locally. The kind of products supplied therefore reflect the taste of the local consumer ([George and Waldfogel, 2006](#); [Mazzolari and Neumark, 2012](#); [Waldfogel, 2008](#)). House prices in this local market, then, reflect the utility derived from these consumer goods. Second, restaurants can easily be differentiated by ethnicity. Very few products or services so clearly reflect ethnicity or country of origin as sushi restaurants or trattorias selling home-made pasta.¹ The ethnic feature of the cuisine of the restaurant is a measure of horizontal product differentiation that focuses on differences in consumer tastes.² To our knowledge, we are the first to explicitly measure immigrant-induced consumer amenities and link these to the attractiveness of residential areas.

Obviously, immigrants do not locate randomly across neighborhoods and the effect of immigrant and restaurant density on house prices might (thus) very well be endogenous. We turn to a quasi-experimental estimation method by implementing the generalized propensity score (GPS) matching technique for continuous treatment variables following [Hirano and Imbens \(2004\)](#).³ In our analysis, density and diversity are continuous treatment variables that affect house prices depending on the treatment's intensity. Both [Hirano and Imbens \(2004\)](#) and [Egger and Von Ehrlich \(2013\)](#) show that the procedure of using GPS with multiple continuous endogenous treatments results in an unbiased estimate of the effect of the treatment variables (density and diversity of population and restaurants) on the outcome variable (house prices).

In this paper, we show that implementing the GPS matching does not fully solve, but decreases the bias stemming from non-randomness of treatments in the data. We find evidence that supports the hypothesis that in neighborhoods in Amsterdam which have both relatively many restaurants and many immigrants, city dwellers prefer to live apart and consume together. Our results confirm that immigrant-induced (heterogeneous) consumer products create positive externalities that ameliorate the negative effect of the presence of immigrants on house prices in these neighborhoods.

The structure of the paper is as follows. In the next section, we describe the data and estimation method. The Results section presents the estimation results and robustness checks, and the Conclusion section concludes.

Data and method

Data

We construct a unique dataset with microdata on house prices in Amsterdam for sales transactions during the period 2006–2011. The dataset can be divided into three parts. The first part contains the data on individual house transactions, and includes georeferenced information that can be used to obtain spatial coordinates. The housing data are provided by the Dutch Association of Real Estate Agents (NVM). The second part of the dataset contains sociodemographic characteristics at the 6-digit ZIP code level. Amsterdam consists of about 17,000 6-digit ZIP code areas, each comprising approximately 25 residential dwellings on average. The third part of the dataset contains information on restaurants, with georeferenced information available for each outlet. The 6-digit ZIP code level data and the data on restaurants are provided by the Department of Research, Information, and Statistics (OIS) of the Municipality of Amsterdam.

From the dataset, we construct our dependent variable as the house price per square meter living space in constant 2008 euros.⁴ Our main variables of interest are the density and diversity of immigrants and restaurants. The country of birth of one's parents is used to determine ethnicity (with the maternal side being the leading determinant). An immigrant is defined as anybody for whom at least one parent was born outside of the Netherlands.⁵ To calculate the diversity among immigrants, a distinction is made between Western and non-Western immigrants. Immigrants from Europe, North America, Australia, New Zealand, Japan, and Indonesia⁶ are Western immigrants. We further categorize the non-Western immigrants into five groups: Turks, Moroccans, Surinamese, Antillean/Aruban, and other non-Western.

For restaurant density and diversity, we use the country of origin of the type of cuisine served by the restaurants. For each restaurant, the name and location are available in the dataset. With this information, each restaurant was checked to determine the ethnicity of the cuisine based on: (i) the name of the establishment, (ii) the characteristics found in Chamber of Commerce data on the Internet, or (iii) the establishment's appearance on Google Streetview. Paradoxically, although a very typical Dutch cuisine exists, it is difficult to find in restaurants. It is rather blended with Belgian, French, and Italian dishes. Additionally, many Belgian, French, or Italian restaurants are Dutch-owned. Therefore, it is difficult to distinguish between Dutch, Belgian, French, and Italian cuisine, and all of these are considered Dutch or native. The different ethnic groups of restaurants used in the analysis are European, Middle-Eastern/Arabic, African, Asian, and American.⁷

For our analysis we identify four key aspects of the local environment of a sold house.⁸ The local environment is defined as a circular area with a radius of 250 m for the population around the location of the house and a radius of 1 km for restaurants around the house. We thus assume that the spatial scale at which immigrant density impacts consumer utility differs from the spatial scale at which restaurant density impacts utility. The larger the radius used to calculate the local environment the smaller the variation in the observed density and the more closely each observation reflects the overall density of Amsterdam. Although 250 and 1000 m are arbitrarily chosen, a larger radius decreases the standard deviation of the distribution for each variable. In addition, given the "urban fabric" of Amsterdam 250 m is a relevant unit for residential diversity, while 1000 m is a relevant unit in terms of a city district. To maintain identification based on variation in the data, we therefore choose 250 and 1000 m as the spatial scales.

The first two aspects of the local environment are immigrant and restaurant density. Density is measured as the total immigrant population or number of restaurants in the local environment relative to the density in Amsterdam as a whole.

In addition to the density of immigrants and restaurants, we look at their diversity. Diversity is measured with the broadly used Hirschman-Herfindahl index, which allows to measure both richness (the number of groups) and diversity (the distribution across groups).

Analogously to the density measure, we use the relative diversity index, that is, the diversity relative to the overall diversity of the immigrant population and restaurant diversity in Amsterdam. A summary of all variables included in the analysis and descriptive statistics can be found in [Tables 1 and 2](#).

The majority of the observations in our data lie between a treatment intensity of 1 and 5 for immigrant density, between a treatment intensity of 0.9 and 1 for immigrant diversity, and below a treatment intensity of 1 for restaurants. As [Table 3](#) shows, the correlation between immigrant and restaurant density is negative and low, but statistically significant (the coefficient is -0.14), which indicates that within areas there is no strong correlation between the size of the immigrant population and the number of restaurants. Correlations between the treatments do show that restaurants are more diverse in areas with more immigrants. The positive correlation between restaurant diversity and immigrant density is not investigated in this paper, but used as an assumption. The statistically significant correlation points towards the fact that immigrant-induced diverse amenities arise with the presence of immigrants because of a supply as well as demand effect of immigrants of ethnic goods and services. The data also reveal a positive correlation between restaurant density and diversity indicating that areas with a higher restaurant density on average have a higher diversity of restaurants. The same holds for immigrant diversity. [Figures 1 and 2](#) show the spatial distribution of the treatments, specifically the treatment intensities. From these maps, it can be seen that the areas that have both a large immigrant population share and many restaurants (in addition to high immigrant and restaurant diversity)) are limited to the neighborhoods just outside the city center—where, compared to the city center, immigrant density starts to increase, restaurant density starts to decrease, and restaurant diversity is highest. Insofar as we would find a trade-off between immigrant density and restaurant density it is most likely to happen in these neighborhoods because the joint

Table 1. Descriptive statistics.

	mean	st. dev.	min.	max.
Price per square meter in e	3435	1000	770	12,190
Relative immigrant density ^a	4.05	2.16	0.05	13.05
Relative restaurant density ^a	1.28	1.47	0.08	9.11
Relative immigrant diversity ^a	0.85	0.15	0.14	1.02
Relative restaurant diversity ^a	0.91	0.16	0.18	1.20
Share social rent pc6	0.24	0.32	0	1
Share owner occupied pc6	0.43	0.29	0	1
Population density km ²	10,930	4346	322	20,510
Distance to Amsterdam CS station (meter)	3617	2,01	250	1162
Distance to top10 (meter) ^b	32,500	18,167	11,000	108,000
Distance to nearest metro station (meter)	1660	925	21	4889

Data source: OIS and NVM.

^aWe use the diversity and density relative to the overall diversity and density of the immigrant population and restaurants in Amsterdam. Because of this scaling, the distribution of the measures is not normally distributed around 1, which would have been the case if we had used the measures relative to the density or diversity in the sample. The immigrant density and diversity are measured in a 250 m radius around the dwelling. The restaurant density and diversity is measured in a 1000 m radius around the dwelling.

^bThe ten main tourist attractions are based on visitor numbers. We use total distance from the dwelling to the ten attractions. The ten tourist attractions used are the Rijksmuseum, Van Gogh Museum, Anne Frank Huis, Artis Zoo, Stedelijk Museum, Madame Tussauds, Heineken Experience, Nemo Science Center, Hermitage, and Venustempel Museum.

Table 2. Dummy variables.

	Category	Observations
Inside A10 highway ring	Yes	32, 621
	No	7, 519
Garden	Yes	2, 852
	No	37, 288
Transaction year	2006	7, 785
	2007	7, 640
	2008	6, 385
	2009	6, 179
	2010	6, 279
	2011	5, 872
Number of rooms	3 or less	27, 981
	4	7, 505
	5 or more	4, 654
Type of dwelling	Simple house	153
	Canal house	209
	Bungalow	29
	Villa	94
	Ground floor apartment	5, 640
	Upper floor apartment	24, 732
	Gallery apartment	1, 457
	Maisonette	1, 464
	Portico flat	3, 035
	Ground and upper floor apartment	285
	Single-family house	2, 266
	Town house	734
	Rest category	42
Observations		40, 140

Data source: OIS and NVM.

Table 3. Correlations between relative treatments.^a

	Immigrant density	Restaurant density	Immigrant diversity
Restaurant density	−0.14***		
Immigrant diversity	0.45***	−0.55***	
Restaurant diversity	0.36***	0.29***	0.04***

Data source: OIS and NVM.

^aThe statistical significance of the correlation coefficients is indicated by ***, **, * for the 0.01, 0.05, and 0.1 significance levels, respectively.

occurrence of both restaurants and immigrants is necessary for a trade-off. A more detailed discussion of the distribution of the treatments and the joint spatial occurrence of multiple treatment intensities can be found in the Supplemental Material.

Method and diagnostic tests

Following the approach of [Hirano and Imbens \(2004\)](#) for GPS and the modification of the estimation for multiple continuous treatments ([Egger and Von Ehrlich, 2013](#)) we estimate the dose-response

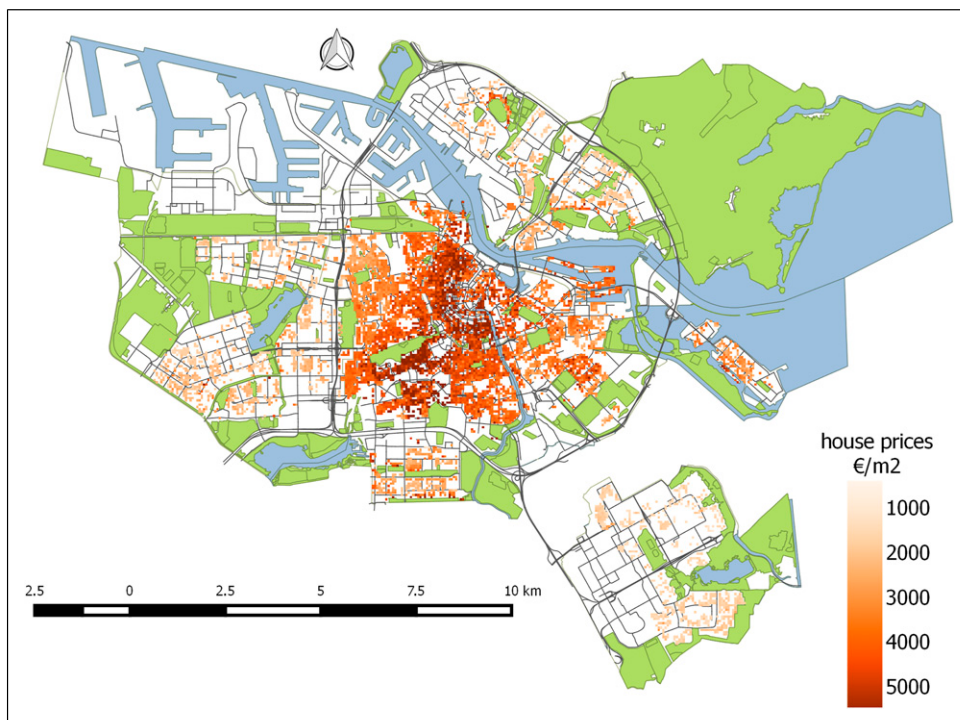


Figure 1. Average per square meter house prices between 2006–2011 in constant 2088 prices.

function in three steps. A detailed description is given in the [Supplemental Material](#). In the first step, the conditional distribution of the treatments given the covariates is modeled. In the second stage, we estimate the conditional expected house prices given the multivariate treatment intensities and the estimated GPS. In the final stage, the average potential outcome at different treatment level combinations is estimated.

The covariates in the selection equation explain about 53 percent of the variation in immigrant density and 81 percent of the variation in restaurant density.⁹ The R^2 -values of the immigrant and restaurant diversity estimations are relatively low, 25 percent and 37 percent, respectively. Although the spatial distribution of the treatment intensity of restaurant and immigrant diversity does not indicate the nature of the omitted variables, there is likely an underlying pattern explaining restaurant and immigrant diversity that we cannot perfectly capture with our data. Restaurant diversity might also be related to market factors such as competition and quality, while immigrant diversity might relate to other spatial aspects, that we do not observe. For the GPS to obtain unbiased estimates of the dose-response function, the covariates in the first step need to be normally distributed. A Henze-Zirkler multivariate normality test of a random 10 percent sample of the errors of the GPS estimation shows that the conditional treatments are not multivariate normally distributed. The univariate Q-Q plots of the residuals in the Supplemental Material show that the non-normality in the data is present for all treatments. The Q-Q plots show high kurtosis for all treatments, especially in the left tails, but the effect is most apparent for restaurant diversity.

In the second stage, we estimate the conditional expected house prices given the multivariate treatment intensities and the estimated GPS. The likelihood ratio test shows that including the GPS leads to a better model specification for estimating the dose-response function, with a χ^2 of 1941. We reject the null hypothesis that the GPS does not improve the specification, with a p -value less than 0.1 percent.

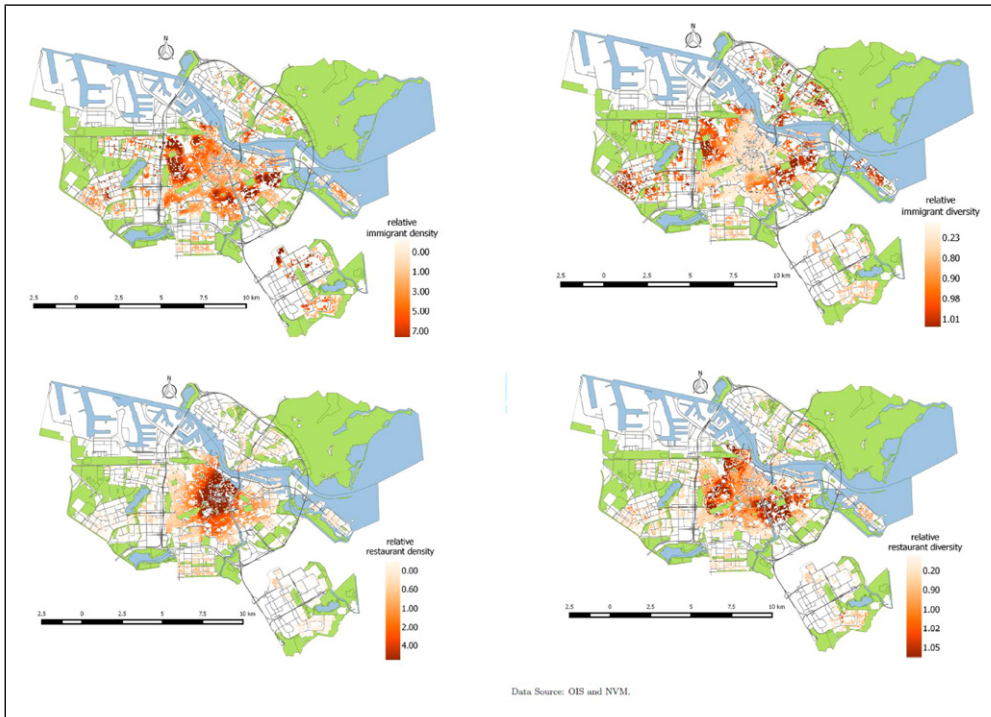


Figure 2. Average density of immigrants (above left), density of restaurants (below left), diversity of immigrants (above right) and diversity of restaurants (below right).

In addition to the requirement of a normal distribution of residuals, we need to test the balancing of the matching procedure. An adequate balancing score is obtained if the mean value of the covariates at a particular value in some treatment interval is not significantly different from the mean value of the covariates outside of that treatment interval. Calculating the balancing of the GPS in the case of multiple treatments is rather cumbersome, and we use the single-treatments for the evaluation of the balancing in which it is assumed that treatments are independent. In the Supplemental Material, we describe in detail how the balancing is calculated.

For the treatment of restaurant density, 29 percent of the covariates is balanced in the unadjusted case, and the balancing increases to 33 percent when adjusted for the GPS. Although the balancing could ideally be improved, adjusting for the GPS does increase the balancing substantially for population density. Given the number of observations within each treatment interval, small deviations are more likely to be statistically significant resulting in overall lower balancing. Although the latter argument also holds for the balancing of restaurant density, the adjusted balancing is inadequate to conclude that the treatment intensity of restaurants is more or less randomly distributed across locations in Amsterdam. From Figure 2, we see that the clustering pattern of restaurants is substantially strong, making it nearly impossible to control for this pattern with the GPS from the selection equation. The dose-response function for restaurant density is therefore likely to be overestimated as we cannot fully control for other variables that impact house prices simultaneously with restaurant density. As GPS matching is also described to make imbalances worse in dataset that have a high potential of making causal inference (low levels of imbalance) and is best used in data with high levels of imbalance, we feel that we do not make the matter worse by using the GPS matching (King and Nielsen 2019).

The matching for estimations of each of the four treatments as single treatments, independent of the other treatment intensities, shows that adjusting for the GPS improves the randomness of treatment intensities given the covariates. Implementing the propensity score thus improves the results compared to the results obtained from more conventional estimations such as OLS. We do not obtain a fully balanced sample for any treatment variable, however, which indicates that the conditional treatment intensities of the four treatments are not fully randomly distributed across locations in Amsterdam and we need to be cautious about causal interpretation of our results.

Results

We first discuss the conditional treatment effect for each treatment separately. We subsequently investigate whether there is a trade-off between people consuming together yet living apart. To this end, we estimate the trade-off between the treatment intensities of immigrant density and restaurant density, conditional on the diversity of immigrants and restaurants from the multivariate estimation, and the trade-off between immigrant density and restaurant diversity, conditional on the density of restaurants and the diversity of immigrants from the multivariate estimation.

Multivariate results

Figure 3 shows the dose-response function of the four different treatments. House prices are higher in areas with both higher levels of restaurant density and higher levels of restaurant diversity, supporting the idea that there might exist a “love of variety” effect as far as diverse restaurants are concerned. The correlation between restaurant density and house prices is the most pronounced: the difference in house price between the low restaurant density and high restaurant density is over €1500 per square meter. The role of immigrant density is moderate as house prices are somewhat lower at higher immigrant density. This supports the hypothesis that areas with a relatively high number of immigrants exhibit lower house prices, signaling less attractive residential areas. This result might indicate that average levels of immigrant density do not substantially impact house prices in a city like Amsterdam, where about half of the population is of immigrant descent. Finally, the dose-response functions show that house prices are higher in areas with lower immigrant diversity, between the 20th and 40th quantiles of the value of immigrant diversity, but house prices are lower at higher immigrant diversity treatment intensities. This result supports the hypothesis that

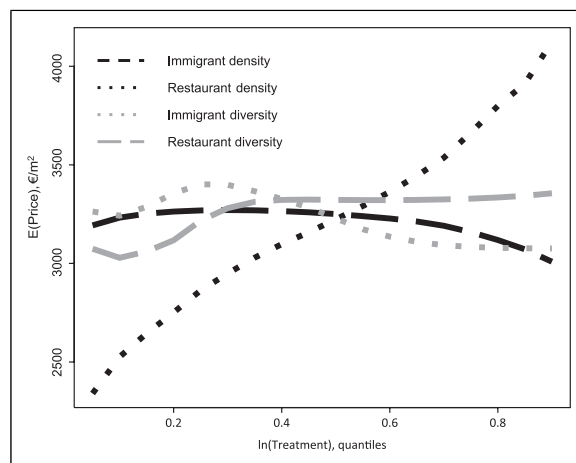


Figure 3. Conditional multivariate dose-response functions of relative treatments.

residents prefer relatively homogeneous neighborhoods. Theoretically, this can also mean homogeneity in terms of the clustering of one immigrant group. These effects are about €200 per square meter between the houses in neighborhoods with a low and high immigrant diversity.

A trade-off between a preference for an ethnic homogenous population composition and an ethnic diverse supply of consumption goods can, in the context of our study, only occur in areas with a negative correlation between house prices and immigrant density on the one hand, and a positive correlation between restaurant density and house prices on the other hand. In Figure 3, this occurs to the right of the intersection between the house price and restaurant density lines, which implies that the trade-off only occurs in areas with both relatively high restaurant density and high immigrant density. The maps in Figure 2 indeed show that as described before, this is the case in those areas in which restaurant density is still high but not as high as in the city center and immigrant density is high but not too high. These areas (including “De Pijp”, “Oosterpark” and “De Baarsjes”) are located just outside the city center and feature the highest restaurant diversity in Amsterdam; they are known for both their consumption and residential value. The dose-response functions thus point toward some subtle mechanisms at work in a consumer city. We need to further look into the trade-off between the treatment of immigrants and restaurants to confirm these conclusions.

Trade-off

Figure 4 depicts the dose-response function of the joint estimation of the density of restaurants and immigrants.¹⁰ Just like in Figure 3, a positive correlation between immigrant density and restaurant

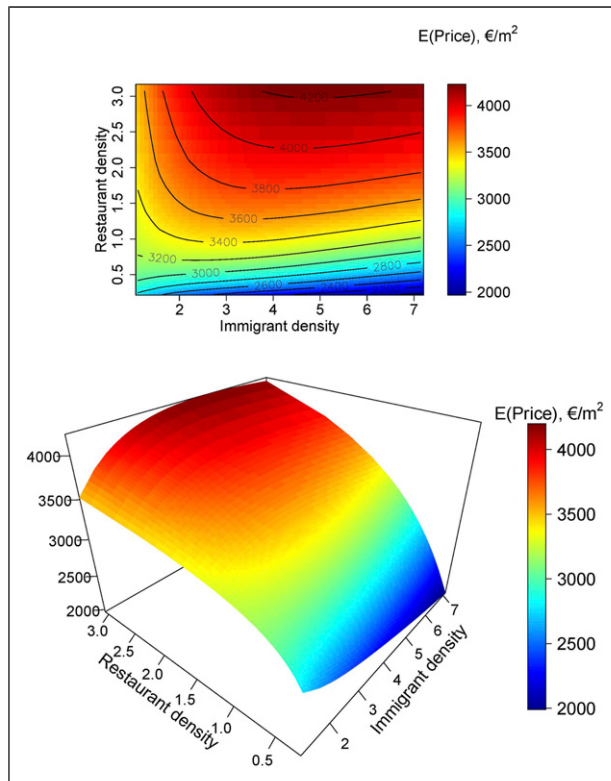


Figure 4. Multivariate contour plot and dose-response function for relative restaurant and relative immigrant density trade-off.

density in the contour plot of [Figure 2](#) implies a potential trade-off in which the negative correlation between immigrant density and house prices might be offset by access to more and ethnic diverse restaurants. In line with the single treatment estimate, we find that in general there is a negative correlation between house prices and the density of immigrants as is shown in the blue area with the lowest house prices. However, house prices tend to be higher once high levels of immigrant density go together with a relatively high level of restaurant density. The results also show that the density of restaurants needs to be substantially high for this latter effect to occur; at low levels of restaurant density house prices remain low in areas with high immigrant density. The joint estimation of the two treatments thus confirms the conclusion that a trade-off between ethnic population composition (“living apart”) and ethnic amenity diversity (“consuming together”) exists.

This trade-off can be observed for a relevant part of the observations in our data, given the distribution of the variables with a mean value of immigrant density of 4.05, and a mean value of restaurant density of 1.28 (this is also shown in the hexabin density plot in the Supplemental Material). As the values of the treatments are defined as above or below the average in Amsterdam (above or below 1), we find that the trade-off mostly exists in areas that have an above average immigrant and restaurant density. This suggests that the trade-off between living apart yet consuming together mostly holds for a specific type of neighborhood, namely those neighborhoods that feature both a diverse population as well as many amenities in terms of restaurants (see also the description in the Supplemental Material). For a city like Amsterdam, this holds typically for neighborhoods located just outside of the main city center, that form as such the intermediate areas between the amenity-rich city center and the residential areas further away from the city center. The results of the trade-off described in [Figure 4](#) are thus conditional on the treatment intensities of restaurant and immigrant diversity as observed in the data, that is, around the mean of the restaurant and immigrant diversity.

In order to investigate whether restaurant and immigrant diversity play a role as well, we also estimated the dose-response functions for immigrant and restaurant density, assuming low (around the value of the first quartile) and high (around the value of the third quartile) levels of immigrant and restaurant diversity.¹¹ The results confirm that the overall trade-off remains intact at low levels of immigrant diversity: there is a negative correlation between higher immigrant density and house prices at low levels of restaurant density but not at high levels of restaurant density. However, at high levels of immigrant diversity, the negative correlation between immigrant diversity and house prices remains at high levels of restaurant density. So both high levels of immigrant density and diversity are negatively correlated with house prices, irrespective of restaurant density and whether the observed trade-off holds. Furthermore, only for higher levels of restaurant diversity the trade-off seems to materialize. In other words, only if an area features many restaurants and these restaurants are diverse, the correlation between immigrant density and house prices turns out to be positive. It shows that ethnic diversity of restaurants does play a role in explaining spatial variation in house prices, but that the overall restaurant density is a crucial determinant of the observed house price patterns.¹² Finally, since the trade-off between “living apart” and “consuming together” predominantly takes place in neighborhoods that feature a relatively high number of restaurants, the trade-off is less likely to occur in typical residential areas (in our case: most areas outside of the Amsterdam ring road) as compared to areas with combined (residential and consumer) functions (inside the ring road).

Discussion

As is indicated earlier in this section, including the GPS leads to a better model specification for estimating the dose-response function. However, the balancing scores for the covariates in the model indicate that we still need to be cautious about our results being biased by unobserved

covariates, and be cautious in giving a causal interpretation to the results. Therefore, we have conducted various robustness checks.

For as far as omitted variable bias is concerned, failing to include crucial variables that may explain immigrant and restaurant density or house prices undermines the GPS. One concern is that especially the spatial pattern of the distribution of restaurants is so specific, that it is hard to include all covariates that explain this pattern (and get a balanced match). For the population distribution, the main concern is that we have not included income variables that better control for income sorting. For both cases, we do not have the data at hand to properly control for these omitted variables. Income data are only available at the equivalent of the so-called postcode4-level (which has about 100 observations), and the data are not available for all postcode4-levels. To better control for restaurant density, we include hotel data, more specifically: the total number of hotel rooms in the same postcode4-level as the dwelling. As the hotel data are only available as of 2012, we included the data as robustness check. There is no variation over time in these data, because most of our observations are within the years after the economic crisis; the variation in hotel rooms has not been that large as the hotel boom in Amsterdam only started after 2014. Consequently, including the number of hotel rooms does not substantially improve our balancing and therefore does not substantially improve the GPS.¹³

Also, our balancing and results are not driven by the year dummies included in the selection equation. As stated earlier, we have tested different distances for restaurants and population and we also believe that alternative ways of measuring distances, for example, in travel time instead of Euclidean distance, will not change the results, as Amsterdam is a flat city with very well developed public transport system and high quality bike lanes. This means that for every location within the city, the distance one can travel within a given time is more or less equal for all locations. Finally, as we do not distinguish restaurant quality, we cannot disentangle whether it is all kinds of restaurants that have a positive impact on house prices, or just, for example, restaurants of a certain quality. In our dataset of restaurants, we can actually observe that (compared to the US and other large cities), Amsterdam did not have many fastfood restaurants from the well-established chains in 2011. Therefore, these chain restaurants will not have impacted the results as such.

A final robustness check concerns the likely endogeneity in the analysis, as migrants locate in areas with low house prices and expensive neighborhoods may be more attractive areas for starting restaurants. As is shown above, the GPS does improve the model compared to, for example, OLS. However, we cannot be fully sure there are no endogeneity issues left. But, in order to test the direction of the relationship between immigrant and restaurants density, and house prices, we reconstructed the dataset to estimate a fixed effect model. To this end, we averaged house prices and all other variables over postcode5-levels per year to induce a panel structure to the data. The estimation includes an interaction term of the restaurant and immigrant density, and all the time-invariant control variables.¹⁴ The results also show that areas that have experienced an increase in immigrant density have experienced a decrease in house prices, and areas with an increase in restaurant diversity have experienced an increase in house prices. The effect of immigrant density seems to be stronger than that of restaurant density. These results are in line with what we find using the GPS estimation.

Conclusion

It is often hypothesized that immigrants affect the utility of living in large cities because they foster the access to consumer products that are available (Bakens et al., 2013; Bakens and de Graaff (2020); Glaeser et al., 2001; Ottaviano and Peri 2005, 2006). These effects can be either positive or negative, implying the existence of a potential trade-off in the appreciation of ethnic consumer goods on the one hand and the presence of the ethnic population on the other hand. Our empirical

analysis for the city of Amsterdam indeed confirms the existence of such a trade-off in specific neighborhoods, thus suggesting a preference to live apart but consume together.

More specifically, our results show that there are compensating effects of density and ethnic diversity of restaurants on immigrant density at the neighborhood level. We also find that amenity-rich areas in terms of restaurants have higher house prices if these amenities are diverse. The correlation between restaurant density and house prices is especially substantial; in Amsterdam the positive correlation between restaurant density and house prices is stronger than the correlation between house prices and population composition. However, the compensating effect of proximity to ethnic restaurants cease to exist substantially if the immigrant population becomes very diverse or large. We found that the trade-off between living apart yet consuming together mostly holds for a specific type of neighborhood, namely those neighborhoods that feature both a diverse population as well as many amenities in terms of restaurants. In Amsterdam, this holds typically for neighborhoods located just outside of the main city center, that form as such the intermediate areas between the amenity-rich city center and the residential areas further away from the city center.

A couple of questions raised in this paper warrant further research. Since, our analysis focused on the city of Amsterdam, we do not know whether the observed spatial relationships between house prices, population composition and restaurant diversity at specific scales (smaller effects for population and larger effects for restaurants) hold for other cities; it may well be that they depend on city size and transportation costs. To answer this question, further research into the internal structure of cities and the connectedness between neighborhoods and between areas with different user functions, such as residential and shopping areas, is needed. Also, further research is needed to see how well our results fit to cities that, as compared to Amsterdam, are much less ethnically diverse and that might have different segregation patterns.

In addition, the results in this paper not only raise the question of how the internal structures of cities foster the utility derived from ethnic density or diversity, but also how these structures can affect the utility derived from immigrants. Our research is a cross-sectional model of trade-offs in neighborhoods. Further research with a dynamic model may provide insights into the changes of trade-offs and the underlying causes for these trade-offs.

Acknowledgement

We are grateful to colleagues who have contributed through discussion and comments on previous versions of this paper at various seminars and conferences. This paper was written when the first author was affiliated with the department of Spatial Economics VU University Amsterdam and she received funding for this research from the New Opportunities for research Funding Co-operation Agency in Europe (NORFACE). Jessie, Peter, and Henri would like to dedicate this paper to Raymond who sadly and unexpectedly passed away in the finalization stage of this paper.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Supplemental Material

Supplemental material for this article is available online.

Notes

1. Ethnic shops also arise in areas with many immigrants, but products sold in shops do not need to be consumed locally, and shops are much more difficult than restaurants to differentiate following an ethnic criterion. Obviously, the relationship between immigrants from a specific background establishing restaurants from a specific background is not perfect, that is, Italian restaurants can be run by non-Italians. However, for our reasoning to be true in this paper, the relationship need to be loosely present, but more importantly, products need to reflect the taste of the local consumer which then needs to be the ethnic migrant and other consumers with a “love of variety”.
2. We are not able to distinguish between horizontal and vertical product differentiation. In the latter, the quality of restaurants based on, for example, price is used ([Berry and Waldfogel, 2010](#)).
3. Examples of the empirical implementation of GPS matching for continuous treatment variables can be found in [Fryges and Wagner \(2008\)](#); [Becker et al. \(2012\)](#); [Mitze \(2014\)](#).
4. In order to exclude extremely small or large houses, we restrict the sample to houses priced between €30,000 and €4,500,000 and a floor area between 30 m² and 475 m². Because we do not have data on income, the share of social rent is included. It turns out that the share of the 6-digit ZIP code population that is dependent on social welfare are highly correlated with the number of houses with social rent at the 6-digit ZIP code level. Because the data on social rent are available for all observations, this variable is included.
5. This is the commonly used definition in the Netherlands.
6. We follow Statistics Netherlands for the categorization of immigrants. Indonesia is a former Dutch colony, and many Indonesians have the Dutch nationality. For Indonesians, the cultural distance with the Dutch is small compared to other non-Western groups and is therefore considered Western. As a developed country Japan is also considered Western.
7. For restaurants, we thus not follow the exact same categorization as for the population. Japanese and Indonesian restaurants are considered Asian, while US restaurants are considered American etc.
8. For a detailed discussion on the exact measures, we refer to the [Supplemental Material](#).
9. See the [Supplemental Material](#) for the regression results and details.
10. The contour plot and dose-response function is plotted for the values of the immigrant density and restaurant density between the 5th and the 90th percentiles.
11. The results are not reported here but available upon request.
12. As we do not observe the quality of the restaurants, we assume that if restaurants are considered amenable, it is observed in higher house prices, if they are considered a negative amenity, it should be observed in lower house prices.
13. Results are available upon request.
14. Results are available upon request.

References

- Bakens J, Mulder P and Nijkamp P (2013). Economic impacts of cultural diversity in the Netherlands: productivity, utility, and sorting. *Journal of Regional Science* 53(1), 8–36.
- Bakens J and de Graaff T (2020). Valuation of ethnic diversity: heterogeneous effects in an integrated labor and housing market, *Journal of Economic Geography*, 20(1), 197–223.
- Bayer P, McMillan P and Rueben KS (2004). What drives racial segregation? New evidence using census microdata. *Journal of Urban Economics* 56(3), 514–535.
- Becker S O, Egger P H and von Ehrlich M (2012). Too much of a good thing? On the growth effects of the EU’s regional policy. *European Economic Review* 56(4), 648–668.
- Berry S and Waldfogel J (2010). Product quality and market size. *Journal of Industrial Economics* 58(1), 1–31.

- Borjas GJ (1995). Ethnicity, neighborhoods, and human capital externalities. *American Economic Review* 85(3), 365–390.
- Card D, Mas A and Rothstein J (2008). Tipping and the dynamics of segregation. *Quarterly Journal of Economics* 123(1), 177–218.
- Cutler DM, Glaeser EL and Vigdor JL (1999). The rise and decline of the American Ghetto. *Journal of Political Economy* 107(3), 455–506.
- De Groot HLF, Marlet G, Teulings CN and Vermeulen W (2010) *Stad en Land*. The Hague: CPB Netherlands Bureau for Economic Policy Analysis.
- De La Roca J, Ellen IG and O'Regan KM (2014). Race and neighborhoods in the 21st century: what does segregation mean today? *Regional Science and Urban Economics* 47, 138–151.
- Dixit AK and Stiglitz JE (1975) Monopolistic Competition and Optimum Product Diversity. In: Brakman S. and Heijdra B.J. (eds). *The Monopolistic Competition Revolution in Retrospect*. Cambridge: Cambridge University Press.
- Egger PH and Von Ehrlich M (2013). Generalized propensity scores for multiple continuous treatment variables. *Economics Letters* 119(1), 32–34.
- Fryges H and Wagner J (2008). First evidence and productivity growth: exports treatment from a continuous approach. *Review of World Economics/Weltwirtschaftliches Archiv* 144(4), 695–722.
- George LM and Waldfogel J (2006). The "New York Times" and the market for local news- papers. *American Economic Review* 96(1), 435–447.
- Glaeser EL, Kolko J and Saiz A (2001). Consumer city. *Journal of Economic Geography* 1(1), 27–50.
- Hårsman B and Quigley JM (1995) The spatial segregation of ethnic and demographic groups: comparative evidence from Stockholm and San Francisco. *Journal of Urban Economics* 37(1): 1–16.
- Hirano K and Imbens G W (2004). The Propensity Score with Continuous Treatments. In Gel- man A. and Meng X.-L. (Eds), *Applied Bayesian Modeling and Causal Inference from Incomplete Data Perspectives*. West Sussex: Wiley InterScience, 73–84.
- Ioannides YM and Zabel JE (2008). Interactions, neighborhood selection and housing demand. *Journal of Urban Economics* 63(1), 229–252.
- King G and Nielsen R (2019). Why propensity scores should not be used for matching, *Political Analysis*, 27(4), 435–454.
- Krysan M and Crowder K (2017). *Cycle of Segregation: Social Processes and Residential Stratification*, New York: Russell Sage Foundation.
- Mazzolari F and Neumark D (2012). Immigration and product diversity. *Journal of Population Economics* 25(3), 1107–1137.
- Mickiewicz T, Hart M, Nyakudya F, et al. (2019). Ethnic pluralism, immi- gration and entrepreneurship. *Regional Studies* 53(1), 80–94.
- Mitze T (2014). Does regional science need an experimentalist buzz? *Regional Studies, Regional Science* 1(1), 51–59.
- Ottaviano GIP and Peri G (2005). Cities and cultures. *Journal of Urban Economics* 58(2), 304–337.
- Ottaviano GIP and Peri G (2006). The economic value of cultural diversity: evidence from US cities. *Journal of Economic Geography* 6(1), 9–44.
- Schiff N (2015). Cities and product variety: evidence from restaurants. *Journal of Economic Geography* 15(6), 1085–1123.
- Vermeulen W, Teulings CN, Marlet G and De Groot HLF (2016) *Groei&Krimp*. Nijmegen: VOC Uitgevers.
- Waldfogel J (2008). The median voter and the median consumer: local private goods and population composition. *Journal of Urban Economics* 63(2), 567–582.

Author Biographies

Jessie Bakens is project leader and senior researcher at the Research Centre for Education and the Labour Market (ROA) at Maastricht University. She obtained Master's degrees in Economics and in Social Sciences from the Vrije Universiteit Amsterdam. Jessie conducted her PhD research at the Department of Spatial Economics at the Vrije Universiteit Amsterdam. Her research focusses on regional labour markets and education, labour market forecasts and skills requirements in the labour market.

Henri de Groot is professor in Regional Economic Dynamics at the Department of Spatial Economics at the Vrije Universiteit Amsterdam and also affiliated to Ecorys (Rotterdam). Since 2002, he is a fellow of the Tinbergen Institute, he is academic partner of the CPB Netherlands Bureau for Economic Policy Analysis, and since December 2015, he is crown-appointed member of the Social and Economic Council of the Netherlands (SER). He studied Economics at Tilburg University and graduated in 1994 (cum laude). In 1998, he obtained his Ph.D. from Tilburg University with a dissertation on economic growth, unemployment and the sectoral composition of economies.

Raymond Florax was professor at the Department of Agricultural Economics at Purdue University, LaFayette (IN) and at the Department of Spatial Economics at Vrije Universiteit Amsterdam. Raymond had a long and distinguished career in regional science with his primary scientific interests are in econometrics, spatial econometrics and economic geography.

Peter Mulder is Senior Scientist at TNO Energy Transition Studies and studies the economics of energy transitions, cities and the spatial structure of economic development, energy use and urbanization, spatial inequality, (spatial) diffusion of technology, and the role of institutions and governance in economic development. He obtained his Ph.D. in Economics from Vrije Universiteit Amsterdam with a thesis on the economics of technology diffusion and energy efficiency. From 2007 until early 2020 he worked at the Spatial Economics Department of the Vrije Universiteit Amsterdam as assistant professor.