RE: Application for Howard T. Fisher Prize in Geographic Information Science
Paper Title: "Creative Class and Diversity: Spatial and Temporal Dynamics in Chicago Neighborhoods"

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Dear Committee,

Please consider the paper I'm presenting here for the Howard T. Fisher Prize in Geographic Information Science for the year 2006-2007. I am a graduate student in the Sociology Department at Harvard University and the author of the paper titled "Creative Class and Diversity: Spatial and Temporal Dynamics in Chicago Neighborhoods", which I submitted as my Art Master's Thesis, and for which I received an evaluation of "Above PhD" from professors: Robert J. Sampson, Peter V. Marsden and Mary C Waters of the Sociology Department. In the following I start by acknowledging the important people and groups that have helped in the course of my work on this project, I specify the reasons why I believe the paper deserves your consideration for the GIS prize in general and in more detail, and then I present the significance of the question I address, some findings from the analyses, and some of the contributions that I believe the paper makes to the literature on diversity, population flows, and urban community growth.

I thank professor Robert Sampson for funding a special Census tabulation critical for this study, and for advice along this project. I am also grateful to participants to the GIS and Population Science Workshop, UCSB July 2005 for their comments and suggestions on a first draft. I bring thanks also to Deborah Schildkraut for her significant comments and to the participants to Harvard University's Conference on "Embracing Diversity: Latino Immigration and the Transformation of the American Society", October 2006. I also thank the participants in the Migration and Immigrant Incorporation workshop at Harvard for their feedback.

Brief Summary of Main Questions
In this paper I examine the role that diversity in general, and Latino and immigrant diversity in particular, play in the social and economic growth of Chicago neighborhoods by attracting creative and talented residents to these neighborhoods. First, I integrate two central theories (Fischer 1975 and Florida 2002) that tap into the role of diversity for neighborhood social processes. Second, I examine the appropriateness of existing diversity measures and propose a new way to operationalize diversity which accounts, among others, for within-group heterogeneity of immigrants and Latinos. Finally, I examine empirical support for the theory by estimating time change models that control for spatial spillovers, a problem which haunts most neighborhood level analyses.

GIS Contributions
I believe this work is appropriate to be considered for the H. T. Fisher prize because it illustrates important GIS applications in the social sciences. First it emphasizes the value of visually representing the geographic distribution of organizations and community characteristics to support important theoretical points in addition to, and maybe more compelling than, statistical tests. It also makes use of GIS techniques to examine methodological and measurement assumptions.

Furthermore, the paper emphasizes the importance of using spatial-temporal GIS analysis in testing macro level social theory with cross-disciplinary resonance. Finally, the paper illustrates the merits of a multidimensional scaling technique for creating a visual representation of residential segregation and argues for adding the technique to the set of tools already available in software such as ArcView or Geoda.

More specifically, in this paper:
1. I make use of ARC GIS's geocoding technology to determine the geographic coordinates of all the Starbucks stores in Chicago city based on address information retrieved from the internet. The Starbucks index in this paper constitutes a proxy for relevant amenities that are often associated with professionals and residents in other creative occupations.

2. I aggregate the organizational information to the community level and merge the data to a data file with indices of creative class, language diversity and other census based indices relevant for the theoretical argument in the paper. The resulting file was joined using ArcView to a polygon shape file containing census tract boundary information for Chicago.

3. In order to understand the cross neighborhood patterns of diversity and creative class I mapped a set of indices of diversity of the population and their change scores in time, and examined their patterns of geographic distribution with the distribution of socioeconomic disadvantage, Starbucks index and of the creative class scores. The results show two important patterns:
a) first, the distribution of diversity, creative class, disadvantage and Starbucks follow important overlapping patterns, and
b) second, the neighborhoods showed a remarkable pattern of spatial clustering along vectors of diversity, creative class and disadvantage, suggesting that a model estimating the effect of diversity on creative class dynamics would be seriously affected by the spatially correlated errors, violating assumptions of independence of the regular OLS models.

4. As a result, in testing the theory through multivariate models I conducted further diagnostics of spatial dependence (in GEODA). After constructing a spatial weights matrix based on a Rook distance criterion the spatial dependence diagnoses and the maximum likelihood regression models indicated the spatial lags as more appropriate than the spatial error. The findings suggested that

5. Suggesting important complexities in the measurement of diversity the geographic representation of the neighborhoods scores in their various diversity index showed somewhat overlapping but more importantly, distinct distribution patterns of the scores of racial diversity, regional diversity or language diversity.

6. In order to graphically represent the geographic distribution of various racial and ethnic groups relative to each other across Chicago neighborhoods, I conducted a multidimensional analysis of the residential distance between each pair of ethnic/racial groups according to their distribution within the neighborhood relative to their distribution across the city, making use of the dissimilarity index, most commonly used in segregation analysis. The MDS produced in an *abstract* geometric space a graphical representations of all groups relative to each other, illustrating the tendency of some groups to reside *geographically* closer to some groups more than others. This is one of the first studies that I am aware of to make use of MDS method in order to visually represent residential segregation of groups relative to each other simultaneously based on dyadic as well as global information of actual residential locations. I am not aware of such a technique to be available yet in Arc View or

related software and would respectfully suggest that it would be a great addition for the future.

Theoretical Argument

In this paper I argue that the diversity of neighborhood residents can be beneficial to the economic growth of that neighborhood by nurturing a culturally creative environment and attracting new residents with artistic inclinations, which further attract creative professionals and other highly skilled individuals. I thus extend to the neighborhood level Florida's (2002) creative class approach on diversity, which links diversity of the cities to their growth in income level. I also build on Fischer's (1975) classic subcultural theory of urbanism, which argues that increases in population diversity should positively associate with increases in creativity and unconventionality.

Significance

Social science research has long acknowledged the tendency of individuals to segregate from dissimilar others (e.g. Simkus 1978; Marsden 1988; Charles 2003) and the heightened risk of culture clashes that accompanies population heterogeneity in urban settings (e.g. Fischer 1975; Min 1996; Smelser and Alexander 1999). The prevalent mass media accounts together with a large number of studies on various types of population diversity emphasize the perceived negative side of diversity, a side which arguably begets mistrust, intercultural tensions, crime, or violence (e.g. Borjas 1990; Knack and Keefer 1997; MacDonald 1997; Butcher and Piehl 1998; Smelser and Alexander 1999; Huntington 2004; Alesina and La Ferrara 2002; Putnam, 2004)[1].

In contrast, very little theoretical and empirical scholarship[2] has investigated so far the more benign side of diversity, namely, how urban diversity fosters important forms of avant-garde culture, and significant innovations in art, music and science (Fischer 1995) and positive forms of inter-group contact, such as inter-racial marriage (Blau 1977). Considering the rapid changes in the demographic composition of American cities (Bean and Stevens 2003; Fong and Shybuya 2005), the fact that the new immigrants and children of immigrants account for sixty percent of the annual population growth in the US (Bean, Swicegood, and Berg 2000), and taking into account that neighborhoods within major cities also tend to become increasingly multi-racial and multi-ethnic too (Denton and Massey 1991; Alba, Denton, Leung, and Logan 1995; Kasinitz, Mollenkopf, and Waters 2002), not understanding how communities can manage their diversity, and maybe benefit from it, can have long term consequences for both the community and its individual residents. It is surprising that so few studies have theoretically or empirically examined the conditions under which culturally diverse communities are able to *overcome* emergent inter-group tensions and succeed in achieving social balance, innovation and growth. In contributing to this recent line of research on the benefits of diversity this paper theoretically and empirically addresses significant questions pertinent to the areas of urban growth, neighborhood social processes, diversity, race, ethnicity, and immigration, and demography. Specifically, it examines how ethnic, multicultural diversity can bring *positive change* across urban neighborhoods by attracting certain types of new residents, such as artists and other creative individuals.

[1]Many of these studies however, do not necessarily examine diversity at the community level but rather examine differences in trust or crime for instance between immigrants or ethnic groups and native born or Whites.

[2] A recent review of more than 80 studies on diversity in formal organizations (Williams and O'Reiley 1998) finds that, while diversity can decrease group cohesion, make communication more difficult and conflicts more frequent and intense, under certain conditions diversity increases group creativity and performance.

One of the most prominent theoretical developments on the benefits of diversity for cities and regions, which has gained considerable political momentum and popularity and has generated heated debates both in the mass media and academia[3], is Richard Florida's creative class theory of urban growth (2002). Glaeser (2004) considers Florida's book, *The Rise of the Creative Class* as "the most popular book on regional economies over the past decade" (2002:1). Florida argues that the diversity of a city or region attracts artists, or 'bohemians', creative individuals, and other highly skilled individuals, which in turn attract new and well-paying, high-tech jobs, contributing both directly and indirectly to the social and economic growth of the area. His empirical studies, however, only compare large geographic areas like cities and regions (2002) and more recently (2005), nations but never neighborhoods. Examining if Florida's predictions hold at the neighborhood level constitutes an important test of the creative class thesis by showing if the 'preference' of the creative class residents for diversity remains as strong when that diversity becomes more tangible and its impacts closer to home by directly coloring their own neighborhoods. In this paper I take Florida's argument to the neighborhood level, and address the advantages and additional challenges to such an endeavor. This paper adds to the literatures on occupations, labor force mobility and social class a systematic examination of the creative class *subgroups,* such as bohemians, professionals and scientists and educators, to understand their potentially different association with diversity.

The creative class argument encompasses important social and cultural dimensions, yet Florida offers insufficient explanations of the social processes implied in it. In the following section of the paper I draw on Fischer's (1975) subcultural theory of urbanism and recent work on ethnicity and immigration (e.g. Varshney 2002; Martinez and Valenzuela 2006), to explain the social processes through which the diversity can generate new creative capacities and neighborhood growth. Similarly, Florida's narrow and controversial conceptualization of diversity (mainly gay concentration) does not reflect what I believe to be a more appropriate understanding of diversity which incorporates important other dimensions, such as ethnic or immigrant diversity, reflecting potentially very different social identities, beliefs, and values (Fischer 1975). In this paper I add to Florida's model a more rigorous definition that integrates ethnic diversity, linguistic diversity, immigrant[4] diversity, and regional diversity components.

Furthermore, in these analyses I emphasize the importance of accounting for the dynamic processes through which, by impacting neighborhood growth, diversity potentially undermines itself. To my knowledge, no study to date has examined the applicability of the creative class argument at the neighborhood level, made use of similar multidimensional measures of cultural and ethnic diversity, or investigated the temporally and spatially dynamic processes connecting diversity to neighborhood growth.

<u>What types of diversity?</u>

Quantitative analyses of population diversity often lump together Latinos into an all-encompassing pan-ethnic group. However, recent studies show that they can, in fact, exhibit a high degree of within-group heterogeneity suggesting that indices of diversity using all Hispanics under one

[3] A search in *Google Scholar* based on these keywords: "2002 'Richard Florida' and 'Rise of creative class'" yielded 582 scholarly works (journal articles, conference papers, books, reviews, preprints etc) associated with Florida's book, of which only less than a half are in the social science, arts and humanities area.

[4] Acknowledging the complexities of racial/ethnic and cultural identities, only a few other studies use multiple indicators of diversity such as by race, ancestry, and US state of birth, or country of birth for foreign born (e.g. Ottaviano and Perri 2005, Lian and Oneal 1997).

category might not capture the true level of diversity of an area. In this paper I use multiple Latino subgroups based on census data on Latino origin, such as Mexican, Puerto Rican, Ecuadorian, Guatemalan, Salvadorian, Cuban, Chilean, and Columbian. Linguistic diversity index refers to the language individuals speak at home and is based on 25 language groups according to their classification in the Census 1990. The 39 groups in Census 2000 were collapsed into 25 for comparison with the 1990 data. Some of the language groups composing this diversity index are: Spanish, French, Italian, Portuguese, German, Polish, Russian, Greek, Japanese, Koreans, Vietnamese, Arabic, and Hungarian.

In the maps below I compare the distribution of language diversity scores across Chicago neighborhoods with the distribution of regional and racial/ethnic diversity. The maps show how the geographical distribution of 'diversity' can be differently interpreted depending on the index used. They support the idea that there are true different types or dimensions of diversity which differentially structure the city neighborhoods.

How much within group heterogeneity?

One way this question using census data is through a residential segregation analysis. In the table below in the Appendix II I show the average number of individuals in the 42 ancestry and origin groups across Chicago neighborhoods. The last column is a summary measure of segregation or integration for these groups. Although a very useful piece of information, the segregation ranking looses a lot of information that might be potentially useful. It can tell how integrated these groups are all the others but cannot convey if the subgroups within the panethnic categories are similar in their residential patterns or if they tend to stay closer to some subgroups more than others.

To be able to answer these questions I combine analyses of residential segregation and multidimensional scaling to examine the overall patterns of residential proximity between different ethnic subgroups, and more specifically, Latino subgroups. This is a newly proposed powerful technique that indicates the tendency of different subgroups to reside in more diverse or more isolated areas, according to their general location in space in closer, or more distant, proximity to members of other (sub)groups.

The findings show a very loose residential clustering of the Latino subgroups next to each other and, more importantly, they show that some subgroups, such as Mexicans or Peruvians, display a relatively high degree of isolation away from members of other Latino subgroups. In fact, Mexicans appear to reside closer to residents of Arab ancestry than to Guatemalans or Salvadorians. By showing that at the same score of racial/ethnic diversity the within-group diversity can vary widely the paper brings a critical contribution to the literature on Latino diversity suggesting that a simple racial diversity index counting Latinos in single categories is not appropriate and that distinct within-Hispanic and diversity indices need to be included in analyses of diversity.

How to operationalize diversity?

So far all the measurement and analyses of diversity have been relatively static in time. How could we measure and examine the dynamism and diversity across time? *Table 2* shows how predominantly *mono-ethnic neighborhood*s (White in the first upper row) or multi-ethnic (e.g. including Whites, Blacks, Asians and Latinos residents (Bottom row) change into different racial-ethnic compositions across the 1990's. It illustrates a considerable movement from mono ethnic communities to multiethnic but also the reverse. It also speaks to how valuable this type of descriptive exercise can be for our

understanding of potential substantive changes in the groups making up a diverse neighborhood even if number wise it does not change status.

Multivariate Spatial Analyses

Multidimensional Scaling Analysis and Hierarchical cluster are multivariate techniques that transform the similarities among neighborhoods on some social indicators, in this case diversity scores, into spatial distances. The MDS graphical operation moves neighborhoods closer together if they are more similar on the input indices. Based solely on diversity and socio economic indices the analyses show that neighborhoods tend to become structured in the geometric social space significantly according to their concentrations of bohemians as well. Remarkably, when moved to their actual coordinates the resulting map shows an that the spatial clustering overlaps with the clustering of the neighborhoods based on social distance. This proves even more the need for accounting for spatial autocorrelations and spillovers when estimating any type of regression model as I show next.

Table 6 shows the effect of various indicators, including diversity on interdecade change in the percent of artists, professionals, and scientists and educators. The coefficients show that the 1990 diversity level has positive effect on change in bohemians and scientists but not for professionals. This disconfirms Florida's view of the creative class as a homogenous group and supports the idea that professionals tend to cluster in less diverse areas. Moreover, as the concentrations of creative class increase the diversity tends to decrease suggesting some negative indirect feedback from diversity to itself, very similar to what some might describe as gentrification. This finding also disconfirms Florida's thesis which does not explicitly account for these negative processes.

Discussion and Conclusions

Consistent with Florida and Fischer's predictions, I find that, controlling for spatial proximity, cultural diversity in general and Latino and immigrant diversity in particular do predict growth in the neighborhood concentration of bohemians, creative, and highly skilled individuals. However, overall, the findings support methodological and theoretical amendments to some of the theoretical predictions, which entail a rethinking of the specification of diversity and reconcile the positive and negative dynamics between population diversity and neighborhood growth.

In this paper I argue that the ethnic-cultural diversity of neighborhood residents can be beneficial to the economic growth of that neighborhood by nurturing a culturally creative environment and attracting new residents with artistic inclinations, which further attract other creative and highly skilled individuals. Consistent with Florida (2002) and Fischer's (1975) theories, in this paper I find that neighborhood diversity tends to significantly influence the spatial clustering of bohemians and other creative class among Chicago neighborhoods, even after controlling for spatial dependence. Diversity appears to also attract higher concentrations of 'talent' (i.e. highly educated individuals) directly predicting neighborhood development in addition to its positive indirect impact via bohemians or creative class. By finding support for the creative class this paper contributes to advancing our understanding of *how* diversity can contribute to social and economic growth communities, therefore compensating for, if not even overcoming, its potential negative effects that media accounts and pessimistic research have warned us about (Borjas 1990; Knack and Keefer 1997; MacDonald 1997; Butcher and Piehl 1998; Smelser and Alexander 1999; Huntington 2004; Alesina and La Ferrara 2002; Putnam, 2004). The analyses in this paper therefore add important findings to the recent scholarly work calling for a closer look at the mechanisms through which diversity may benefit to communities (Sampson 2006; Martinez and Valenzuela 2006; Ottaviano and

Perri's 2005; 2006; Varshney's 2002; Briggs 2004). Moreover, the fact that the thesis is supported at the neighborhood level brings us one step further in gauging how real the preference of the creative class for diversity may be, rather than mere abstractions. Individuals' choice to reside in diverse neighborhoods says more about their true preference for diversity than their choice for homogenous neighborhoods albeit in a diverse city. To better understand actual individual perceptions, interpretations of, and preferences for diversity beyond its potential discomforts further research using individual survey data will be invaluable.

The analytic strategies and the findings of this study also systematically address some important limitations of Florida's creative class theory, suggesting key implications for further theoretical conceptualizations and empirical investigations of the ecological and individual level processes underlying the association between diversity and neighborhood development. As the levels of multicultural diversity decrease in time, the clustering of bohemians, other creative class and talent increases, implying that the same diverse character of a neighborhood, which initially attracts new creative and talented residents, across time, may paradoxically contribute indirectly to its own decline. Similarly, while increasing concentrations of bohemians seem to attract increases in the concentration of professionals and other talented individuals, at the same time they also significantly associate with the displacement of residents in the working class and, albeit to a lower degree, of residents in the service class. These results provide important supporting evidence for processes of cyclical gentrification (Zuckin 1987), as described in recent field-based research in Chicago (Lloyd 2006).

One main contribution of this study to both the creative class and diversity arguments consists in the theoretical conceptualization and empirical analysis of cultural diversity as conveyed by a combination of indices, including ethnic and linguistic subcultures among others, as well as by complementary analytic strategies, such as the analysis of a racial diversity mobility matrix of Chicago neighborhoods. Extending from Fischer (1975; 1995), in this paper I argue that if the creative class argument is to carry any serious weight it needs to stand the test of a more challenging, yet more appropriate, specification of subcultural diversity that include racial or ethnic, ancestry, linguistic, immigrant or regional dimensions[5]. Adding to the research and theory on racial/ethnic and immigrant communities, which often use only broad panethnic groups to describe diversity, this paper underscores the importance of accounting for multiple types of diversity and for multiple subgroups *within* each larger, panethnic group. It would be valuable for future research to look even closer at each of the specific types of diversity and combination of subgroups to investigate their potentially different impact on urban communities.

The analysis of ethnic diversity transitions across time shows that the stably diverse and diversifying neighborhoods have significantly higher concentrations of bohemians and creative class than their homogenous of homogenizing counterparts. Consistent with findings by Alba et al (1995) and Denton and Massey (1991) for other US cities, between 1990 and 2000 Chicago too has had a larger number of racially/ethnically mixed neighborhoods than racially homogenous ones. However, the transition matrix in Chicago paints a more complex picture than the overall diversification trend suggests. For instance, the all-Hispanic or the all-Black neighborhoods not only failed to become more integrated, but instead gained in numbers across the decade. Considerable instances of

[5]A multidimensional scaling configuration of 42 ethnic origin/ancestry groups based on residential segregation scores (Graif 2006) indicates considerable variation in the average diversity across the neighborhoods hosting each subgroup within the broad panethnic White, Asian, and Hispanic categories.

neighborhood de-diversification and their unexpected association with growing bohemian clusters (as illustrated in the spatial multivariate models) indicate the need for more studies on the processes and consequences of ethnic *homogenization* (e.g. Wilson 1987 ; Logan, Alba and Zhang 2002 for two distinct approaches for understanding homogenization).

The negative coefficient of diversity in predicting temporal change in professionals' concentrations stands in stark contrast with the positive diversity coefficient on the other creative subgroups. This dividing line within the creative class finds further support in the positive association between the Starbucks index and the professionals, in contrast to the negative association with the rest of the creative class. With these findings the paper raises a critical theoretical question on how consistent the lifestyles and residential patterns are across all the creative class subgroups, and how well all the occupations included in the creative class index capture the 'true' creative class, suggesting the need for a more fine-tuned definition of the creative class and of the distinct processes shaping their residential patterns (Baris 2003).

Although, scholars (e.g. Clark 2004) propose it among other possible amenities measures, the Starbucks index only partially works as expected, namely only for professionals and service class. In contrast, it does not have any significant coefficient on the change in the concentration of the highly skilled, and it works in the negative direction for bohemians and scientists and educators. The negative prediction is not surprising for bohemians, however, in the light of Lloyd's (2006) field study accounts, which suggest that the poorly paid artist in search for authenticity might find Starbucks as a symbol of the conventional corporate world, a mere imitation of bohemian coffee shops[6]. The similar negative association of the Starbucks index with scientists and educators implies that, in some sense, the preferences of this creative subgroup might be closer to bohemians than to professionals. The Starbucks index, also positively associates with higher concentrations of professionals and service class across Chicago neighborhoods. These findings speak to the distinct role that unconventionality and local amenities may contribute to growth in a neighborhood independent of its affluence level (Fischer 1975, Suttles 1984; Molotch et al 2001; Sampson and Raudenbusch 1999; Clark 2004b; Jacobs 1961; Lloyd 2006). Future studies on the preferences and lifestyles of members of these particular groups would benefit the theory in helping to explain some of these subcultural variations within the creative class.

This study is responding to an important need in the neighborhood effects and urban development literature for more complex specifications of spatial and temporal dynamics in examining the evolution of neighborhood processes across time (Sampson et al 2002). Although too often ignored in neighborhood studies due to various methodological challenges, the specification of *spatial dependence* is an important prerequisite in translating Fischer and Florida to the neighborhood level, as suggested by studies of Chicago (Sampson and Morenoff 2006), which show that the socio-economic characteristics of neighborhoods are strongly associated with the characteristics of their contiguous neighbors. Controlling for spatial dependence partially controls for the inconsistency between the formal boundaries of the Census tracts and how people actually perceive their neighborhoods and partially captures the likelihood that individuals take into account attributes of contiguous areas when they move to a neighborhood or that individuals prefer to make small moves across contiguous neighborhoods. More research is needed to understand the individual residential mobility preferences and social constraints. Similarly, I invite that further

[6] Lloyd (2006) describes how the local coffee shops, but not Starbucks, allow the local artists to work on display or have 'open mic' performances.

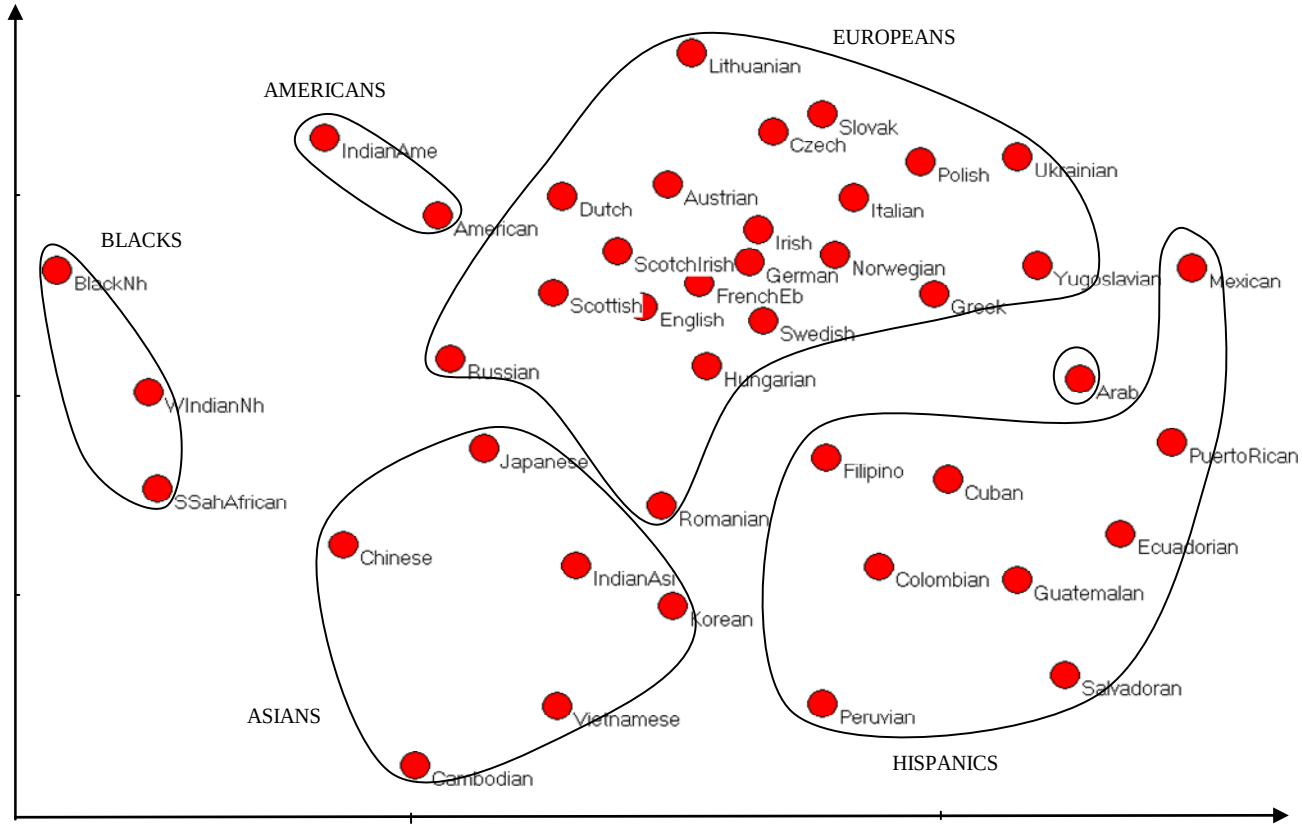
research explore more complex models that specify in more detail the processes of inward and outward diffusion of creative class and diversity from a neighborhood to another.

This paper systematically takes on the theoretical and empirical challenges inherent in extending the creative class thesis to the neighborhood level, and discusses the theoretical and empirical implications of such an extension. One of the main contributions of this paper to the diversity and creative class debate consists in theoretically specifying and empirically examining socio-ecological processes through which multi-cultural diversity can shape urban neighborhoods, namely, through its dynamic connection to the spatial clustering of the creative class.

In this paper I further the theory by integrating the creative class thesis with classical theoretical contributions set out by prominent scholars (e.g. Blau 1977; Florida 1975; Suttles 1984; Molotch et al 2001; Zuckin 1995; Glaeser 2003; Paulsen 2004). Of all these contributions, I mainly focus on Florida's subcultural theory of urbanism, which I believe enables a better understanding of some of the micro processes underlying Florida's macro model. This paper builds on Fischer's approach and shows that diversity can become the engine for social change even at the neighborhood level. Moreover, it expands the definition of diversity to include multiple dimensions such as linguistic diversity, racial and ethnic diversity, within-Hispanic diversity and regional diversity. Important new questions remain to be investigated to better understand the processes described here, such as what are the types of diversity that may be more attractive to the creative class or may lead to more intergroup exchanges, what is the role that residential segregation plays in mediating the diversity benefits, or what is the tipping point, if any, beyond which diversity starts to wither away. Despite its limitations, largely due to data constraints particular to this level of analysis, I believe this paper pushes the discussion on diversity one step farther by reflecting on the temporally and spatially dynamic social processes underlying the conflicting patterns of interconnection between diversity and urban growth.

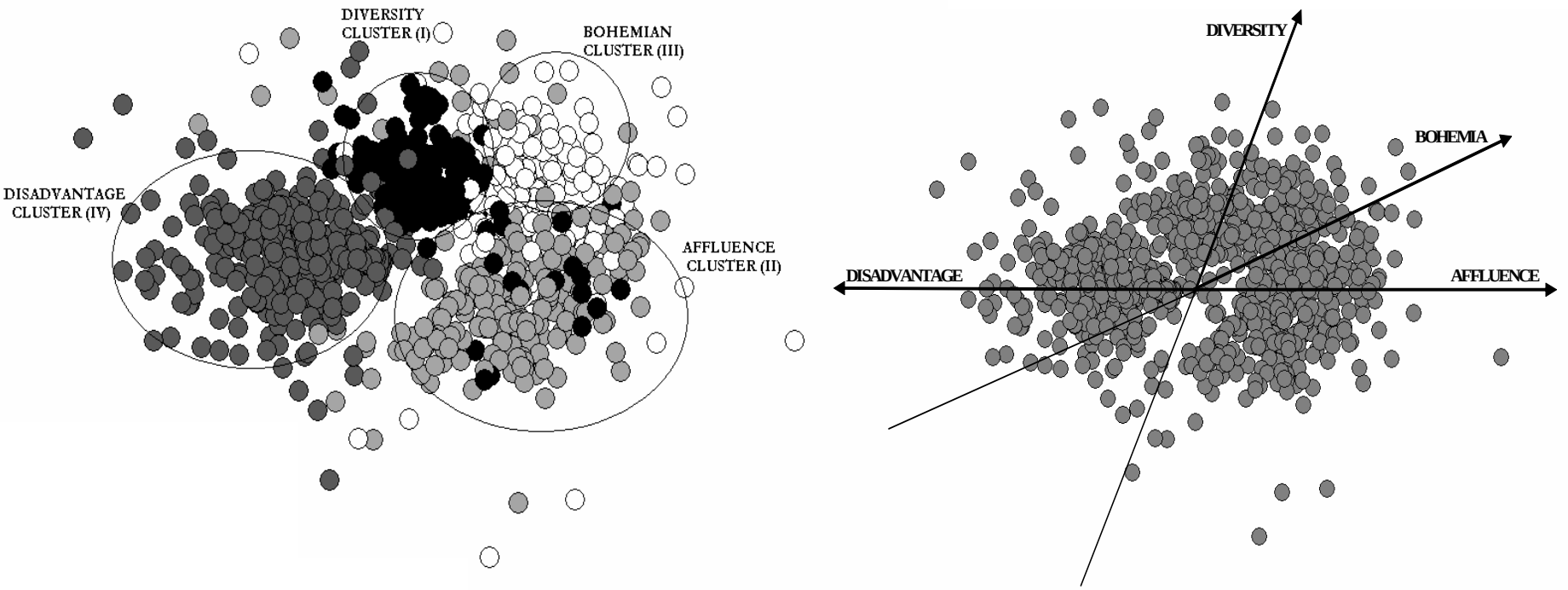
[Note: References available at request]

FIGURE 1. Multidimensional Scaling Configuration of Residential Segregation among Racial/Ethnic Origin and Ancestry Groups in 1990 Across Chicago Neighborhoods.



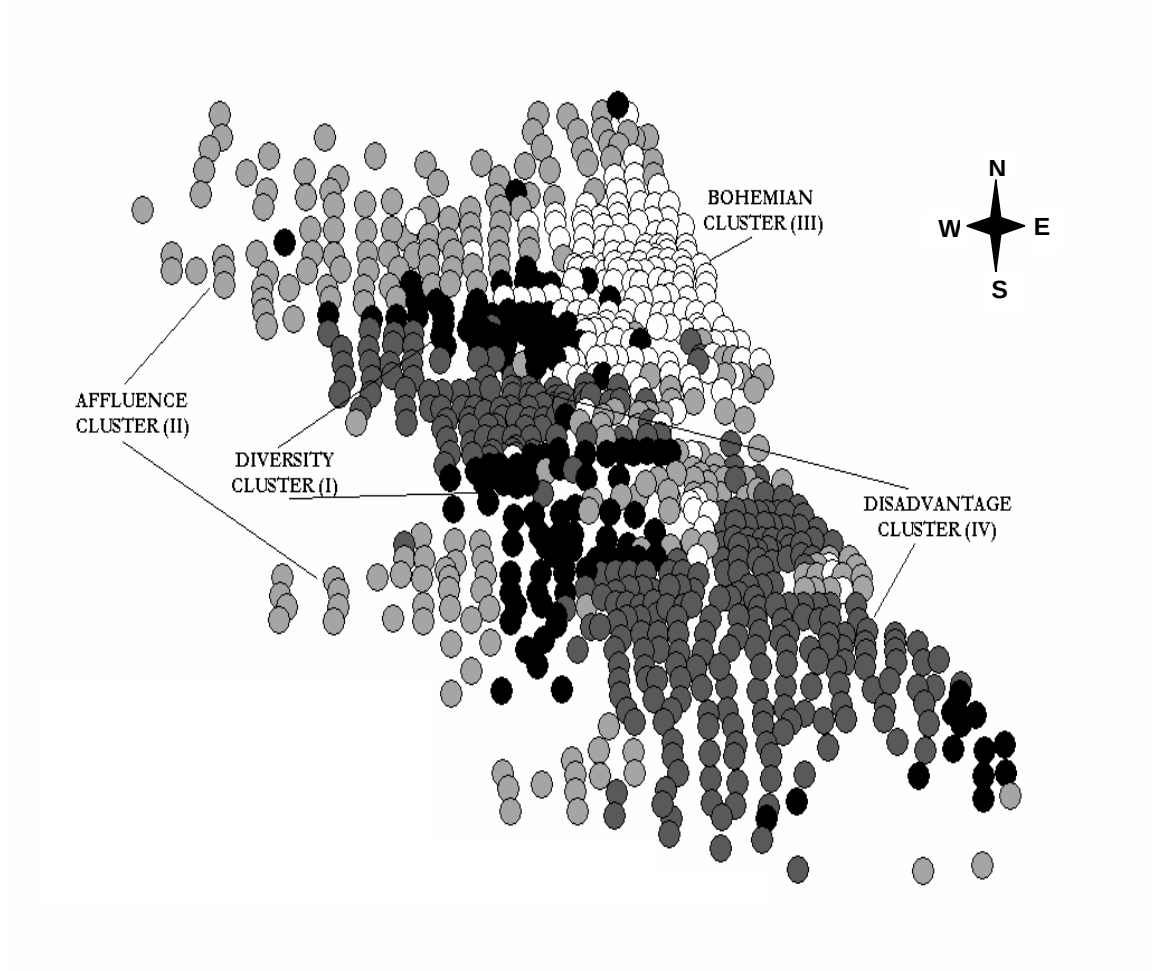
Notes: The small circles represent the ancestry/ethnic origin subgroups. The MDS spatial arrangement fits a 42-by-42 matrix of sub-group residential patterns across Chicago Census tracts based on the dissimilarity index of segregation.

FIGURE 3. Spatial Configuration based on Multidimensional Scaling Analysis and Hierarchical Cluster Assignment of Chicago Census Tracts 1990-2000. MDS arrangement and Structural Distance Cluster solution are based on dissimilarity scores between each pair of tracts on diversity and socioeconomic indices in 1990 and residual change 1990-2000 (LEFT: Cluster loops and grey shades added; RIGHT: estimated MDS coordinates added).



Notes: The small circles are Chicago neighborhoods;
The big loops and grey shades indicate cluster assignment of each neighborhood;
The arrows indicate axes or dimensions along which neighborhoods are distributed in the structural space, the direction of the arrow indicates larger values of a neighborhood on the characteristic indicated on the axis

FIGURE 4. Geographical distribution and hierarchical cluster assignment of Chicago Census tracts 1990-2000. Structural Distance Cluster solution is based on dissimilarity scores between each pair of tracts on diversity and socioeconomic indices in 1990 and residual change 1990-2000.



Notes: The figure reconstitutes the geographic map of Chicago with slightly distorted latitude and longitude coordinates.
The small circles represent neighborhoods. The different grey shades represent different structural cluster assignment of neighborhoods.

FIGURE 5. Spatial Distribution of Diversity of Languages Index, Regional Diversity, and Racial Diversity Scores across Chicago Neighborhoods in 1990.

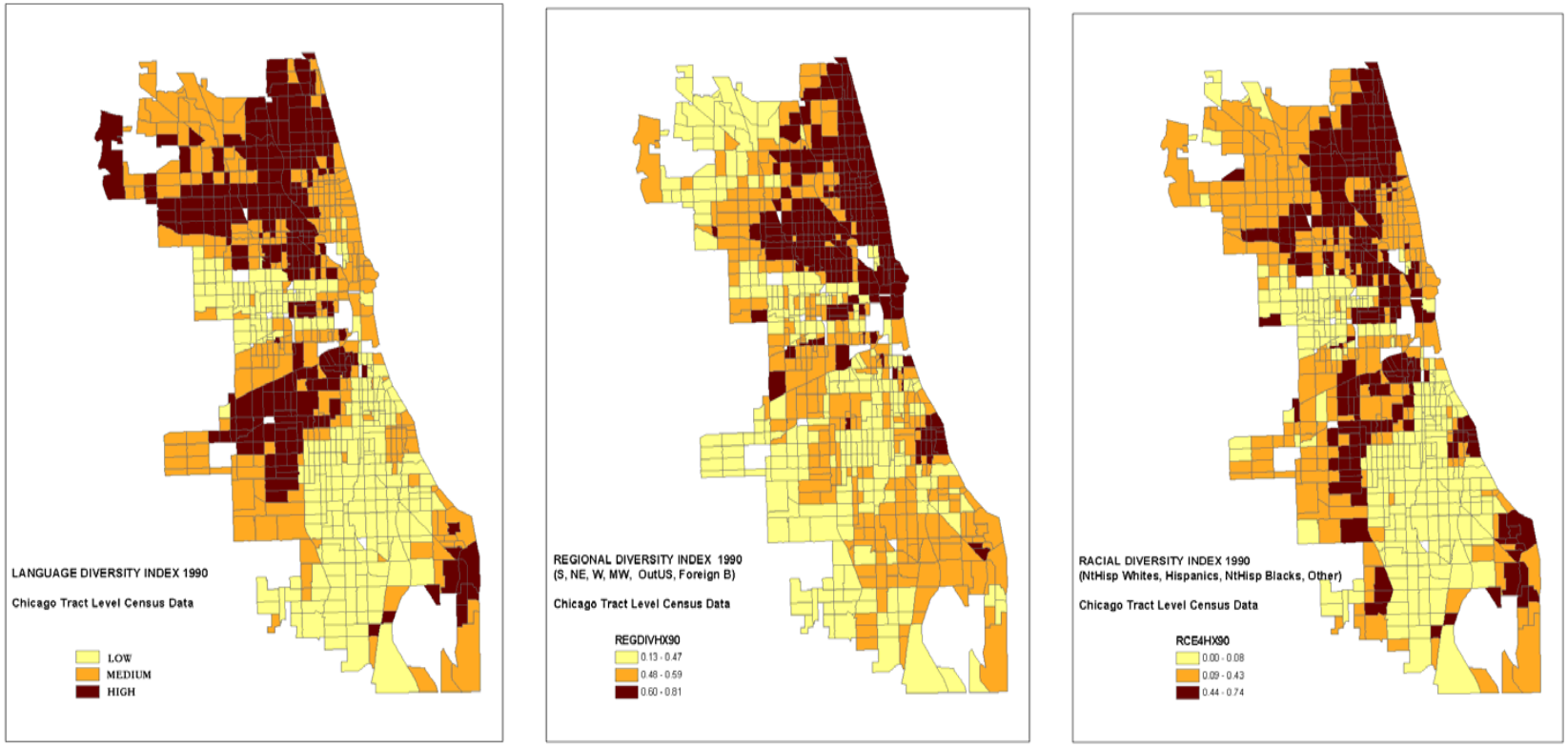


FIGURE 6. Spatial Distribution of the Starbucks Stores, Bohemian Index Scores, and Creative Class across Chicago Neighborhoods: 1990 Score (left) and 1990-2000 Residual Change (right).

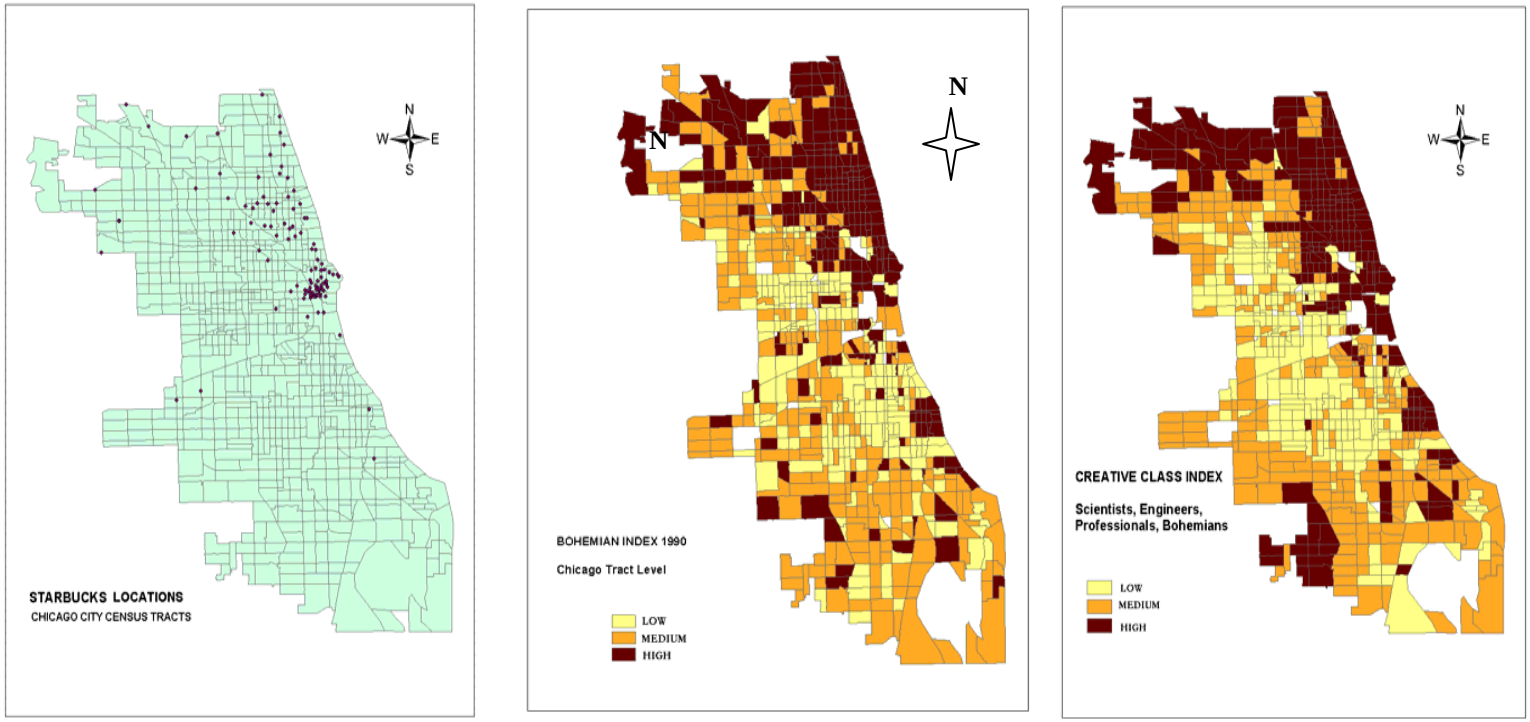


Table 2. Racial Transition Matrix: Cells show the number of Tracts with a specific racial composition in year 1990 (rows) which changed or not into a different racial composition by year 2000 (columns)

		RACIAL COMPOSITION 2000														
RACIAL COMPOSITION 1990		**W**	**B**	**A**	**H**	**W-B**	**W-A**	**W-H**	**B-A**	**B-H**	**W-B-A**	**W-B-H**	**W-A-H**	**W-B-A-H**	*Total*	*%*
Whites only ……	**W**	**7**				**1**	**1**	**15**				**2**	**3**		*29*	*3*
Blacks only ……	**B**	**1**	**253**			**1**				**3**				**1**	*259*	*31*
Asians only ……	**A**						**1**								*1*	*0*
Hispanics only ……	**H**				**13**										*13*	*2*
Whites - Blacks ……..	**W-B**		**16**			**16**				**3**	**1**	**14**	**1**	**5**	*56*	*7*
Whites -Asians ……..	**W-A**						**2**						**3**		*5*	*1*
Whites- Hispanics ……..	**W-H**	**7**			**6**			**99**		**1**		**22**	**15**	**2**	*152*	*18*
Blacks- Asians ……..	**B-A**								**1**						*1*	*0*
Blacks-Hispanics ……..	**B-H**		**6**							**8**		**2**			*16*	*2*
Whites- Blacks -Asians ……..	**W-B-A**	**1**				**1**					**6**			**5**	*13*	*2*
Whites- Blacks -Hispanics …….	**W-B-H**	**2**			**2**	**1**				**13**		**61**	**3**	**12**	*103*	*12*
Whites- Asians - Hispanics ……	**W-A-H**						**1**	**13**				**5**	**64**	**13**	*96*	*12*
Whites- Blacks -Asians-Hispanics	**W-B-A-H**									**1**		**9**	**6**	**64**	*80*	*10*
Total		*18*	*275*		*21*	*20*	*5*	*136*	*1*	*29*	*7*	*115*	*95*	*102*	*824*	*100*
%		*2*	*33*	*0*	*3*	*2*	*1*	*17*	*0*	*4*	*1*	*14*	*12*	*12*	*100*	

*Notes: *Racial composition assesment for this analysis is based on the existence of any of the four main racial groups in a tract.*
A group was considered present if it had a minimum of 100 members residents of the tract.

Table 3: Means and Standard Deviations* of Diversity, Socioeconomic and Creative Class Indices for Chicago Census Tracts by Durability or Change of Racial Homogeneity or Diversity**

	1990 Index Scores				1990-2000 Change Scores			
	HOMOGENOUS / HOMOGENIZING NEIGHBORHOODS		DIVERSE / DIVERSIFYING NEIGHBORHOODS		HOMOGENOUS / HOMOGENIZING NEIGHBORHOODS		DIVERSE / DIVERSIFYING NEIGHBORHOODS	
Multi-Cultural Diversity								
Language Diversity	.092	(.105)	.436	(.177)	.006	(.095)	.017	(.110)
Racial Diversity	.063	(.111)	.391	(.181)	.020	(.085)	.048	(.140)
Hispanic Diversity	.047	(.116)	.311	(.221)	.008	(.066)	.043	(.134)
Asian Diversity	.006	(.026)	.083	(.114)	.004	(.025)	.009	(.055)
Immigrant Diversity	.057	(.140)	.341	(.173)	.008	(.077)	.050	(.111)
Regional Diversity	.475	(.095)	.558	(.127)	-.047	(.083)	.021	(.066)
Diversity of Ancestry								
Percent Multiple Ances	.037	(.095)	.208	(.122)	-.006	(.047)	-.036	(.081)
Gay Index	.054	(.290)	.136	(.354)	.065	(.325)	.116	(.421)
Socioeconomic Disadvantage	.885	(1.076)	-.451	(.628)	-.150	(.596)	-.076	(.400)
Working Class Occupations	8.246	(4.967)	12.644	(5.603)	-1.628	(3.844)	-2.645	(3.565)
Service Occupations	16.806	(6.773)	21.334	(5.757)	-.146	(4.972)	-1.487	(4.822)
Creative Class Indices								
Percent Bohemians	.435	(1.289)	1.336	(1.633)	.018	(.817)	.221	(1.355)
Percent Professionals	3.763	(4.946)	7.782	(7.254)	1.122	(3.303)	2.444	(5.049)
Percent Scientists/Educ	2.447	(2.398)	3.596	(3.210)	.097	(2.009)	1.718	(3.048)
Talent Index	6.194	(9.139)	14.853	(15.198)	2.468	(6.923)	5.848	(9.156)
N	*314*		*510*		*314*		*510*	

*Notes: * Standard deviations in parantheses*

***Racial diversity assesment for this analysis is based on the number of racial groups present in a tract. A racial group was considered present if it had a minimum of 100 members residents of the tract.*

Table 4. Mean Scores for Multi-Cultural Diversity, Creative Class and Socioeconomic Indices - Chicago City-Tract Cluster Assignment Based on Hierarchical Cluster Analysis Using Ward Method on Squared Euclidean Distance

STRUCTURAL DISTANCE CLUSTERS	DIVERSITY CLUSTER (I)		AFFLUENCE CLUSTER (II)		BOHEMIAN CLUSTER (III)		DISADVANTAGE CLUSTER (IV)	
1990 Indices* (b)								
Multi-Cultural Diversity Index	**.954** **	(.503)	.002	(.976)	.497	(.880)	***-.763*** **	(.405)
Language Diversity	**.463**	(.136)	**.440**	(.195)	**.439**	(.162)	***.086*** **	(.098)
Racial Diversity	**.411**	(.155)	.332	(.202)	**.459**	(.147)	***.072*** **	(.128)
Hispanic Diversity	**.497** **	(.168)	.189	(.152)	.353	(.213)	***.036*** **	(.094)
Asian Diversity	***.022***	(.032)	**.120** **	(.143)	.094	(.094)	***.004***	(.011)
Immigrant Diversity	**.440** **	(.142)	.339	(.179)	.334	(.157)	***.029*** **	(.057)
Regional Diversity	.576	(.087)	.498	(.142)	**.647** **	(.085)	***.465*** **	(.078)
Diversity of Ancestry Index	-.558	(.860)	**.891**	(.795)	**.787**	(.924)	***-1.014*** **	(.209)
Gay Index	.028	(.105)	.030	(.082)	**.476** **	(.682)	***.018***	(.150)
Socioeconomic Disadvantage Index	-.163	(.515)	***-.741*** **	(.426)	-.544	(.495)	**.997** **	(.991)
Creative Class Indices (a)								
Percent Bohemians	*.401*	(.470)	.990	(1.058)	**3.133** **	(2.194)	***.190***	(.347)
Percent Professionals	***2.746***	(1.651)	8.155	(5.818)	**13.335** **	(9.359)	***2.983***	(2.925)
Percent Scientists/Educators	***1.352*** **	(.908)	3.954	(3.300)	**5.287** **	(3.568)	2.309	(2.034)
Working Class Occupations (a)	**17.286** **	(4.418)	12.099	(5.246)	10.495	(5.944)	***7.809*** **	(3.797)
Service Occupations (a)	***15.940***	(4.542)	23.088	(4.744)	***23.675*** **	(5.773)	***16.641***	(6.116)
Talent Index(a)	***3.500***	(2.616)	15.504	(12.765)	**26.881** **	(18.041)	***4.731***	(4.761)
Racial Composition (a)								
Percent Blacks (non-Hispanic)	***9.037***	(13.289)	***10.016***	(21.485)	***9.064***	(12.620)	**95.140** **	(11.407)
Percent Whites (non-Hispanic)	28.645	(23.399)	**68.141** **	(27.520)	59.521	(21.959)	***2.105*** **	(5.054)
Percent Hispanics	**60.917** **	(23.557)	13.943	(18.043)	25.984	(20.674)	***2.368*** **	(7.732)
Percent Asians	***1.143***	(1.655)	**7.764** **	(12.337)	5.084	(5.382)	***.187***	(.588)
N	***136***		***224***		***157***		***318***	

Notes:

**Index or change scores in bold are highest (if in borders) or lowest (in italics) across all four clusters*

** The index change score is significantly higher (if in borders) or lower (if in italics) than the scores of each of the other clusters (cf. Tuckey and Bonferonni tests)

(a) The measure is external to the hierarchical cluster analysis (i.e not included in the distance measure)

(b) Standard deviation in parantheses

TABLE 6. Maximum Likelihood Spatial Regression Models of Change in Creative Class Subgroups 1990-2000 : Residual and Raw Change Scores

1990-2000 Change Scores:	BOHEMIANS				PROFESSIONALS				SCIENTISTS / EDUCATORS			
	Raw Change		Residual Change		Raw Change		Residual Change		Raw Change		Residual Change	
Independent Variables	Coef.	*Std. Err.*	Coef.	*Std.Err.*	Coef.	*Std.Err.*	Coef.	*Std.Err.*	Coef.	Std.Err.	Coef.	*Std.Err.*
10-Year Lagged Variables												
Socioeconomic Disadvantage	-.199	*(.060)* **	-.014	*(.055)*	-1.416	*(.184)* **	.072	*(.185)*	-.385	(.146) **	.131	*(.131)*
Density of Population (a)	.078	*(.080)*	-.172	*(.078)* *	-.192	*(.240)*	-1.199	*(.272)* **	.239	(.190)	.140	*(.192)*
Multi-Cultural Diversity Index	.178	*(.043)* **	.202	*(.043)* **	-.472	*(.132)* **	.439	*(.145)* **	.484	(.106) **	.705	*(.106)* **
Diversity of Ancestry Index	.485	*(.059)* **	.028	*(.052)*	.682	*(.185)* **	-.580	*(.189)* **	1.247	(.152) **	.734	*(.137)* **
Gay Index	.885	*(.128)* **	.238	*(.100)* *	.769	*(.389)* *	-.324	*(.355)*	-.044	(.312)	-.413	*(.251)*
Bohemian Index	-.554	*(.034)* **			1.736	*(.121)* **	.902	*(.123)* **	.337	(.093) **	.057	*(.084)*
Professionals					-.388	*(.025)* **						
Scientists/Educators									-.276	(.034) **		
Interdecade Difference Scores (Raw / Residual)												
Change in Disadvantage	-.403	*(.082)* **	-.240	*(.085)* **	-2.502	*(.246)* **	-2.418	*(.291)* **	-.946	(.198) **	-1.110	*(.205)* **
Change in Population Density(a)	-.297	*(.211)*	-.652	*(.218)* **	-.128	*(.620)*	-1.033	*(.737)*	-.084	(.502)	.146	*(.520)*
Change in Multi-Cultural Diversity	-.205	*(.089)* *	.107	*(.088)*	-.861	*(.262)* **	-.569	*(.310)*	-.534	(.210) *	-.424	*(.218)* *
Change in Diversity of Ancestry	.625	*(.085)* **	.416	*(.088)* **	1.943	*(.264)* **	1.419	*(.310)* **	1.330	(.212) **	1.229	*(.219)* *
Change in Gay Index	.529	*(.100)* **	.337	*(.103)* **	.366	*(.297)*	-.028	*(.354)*	.414	(.241)	.456	*(.250)*
Change in Bohemian Index					.293	*(.100)* **	.329	*(.119)* **	.349	(.080) **	.320	*(.084)* *
Starbucks Index	-2.467	*(1.124)* *	-3.708	*(1.165)* **	9.178	*(3.344)* **	-2.757	*(3.929)*	-3.438	(2.691)	-7.033	*(2.763)* *
Spatial lag	.236	*(.040)* **	.304	*(.043)* **	.270	*(.035)* **	.280	*(.040)* **	.053	(.045)	.044	*(.046)*
Intercept	.401	*(.068)* **	.123	*(.064)*	1.598	*(.214)* **	-.055	*(.225)*	1.203	(.185) **	.010	*(.157)*
R-square	.398		.260		.650		.485		.405		.354	

Notes: p<.05, ** p<.01; (a) Coefficients and std.errors were multiplied by 10 000*

APPENDIX I.
Descriptive Statistics for Multi-Cultural Diversity, Creative Class and Socioeconomic Indices Chicago Census Tracts (N = 836)

	1990		2000		CHANGE	
	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Creative Class Indices						
Percent Bohemians	.991	(1.564)	1.164	(1.627)	.146	(1.187)
Percent Professionals	6.271	(6.754)	8.270	(8.675)	1.950	(4.525)
Percent Scientists/Educators	3.160	(2.974)	4.315	(4.079)	1.134	(2.817)
Working Class Occupations (% Residents)	11.003	(5.770)	8.808	(4.900)	-2.281	(3.687)
Service Occupations (% Residents)	19.613	(6.530)	18.749	(5.250)	-1.004	(4.896)
Multi-Cultural Diversity						
Linguistic Diversity	.309	(.229)	.320	(.230)	.012	(.105)
Racial Diversity	.269	(.226)	.307	(.225)	.038	(.123)
Hispanic Diversity	.211	(.227)	.241	(.234)	.030	(.114)
Asian Diversity	.055	(.100)	.062	(.103)	.007	(.046)
Immigrant Diversity	.236	(.213)	.270	(.237)	.033	(.103)
Regional Diversity	.526	(.123)	.523	(.137)	-.004	(.082)
Diversity of Ancestry						
Diversity of White Ancestry	.386	(.341)	.568	(.222)	.182	(.211)
Percent w/ Multiple Ancestry	14.314	(13.957)	11.873	(12.249)	-2.441	(7.230)
Gay Index						
Percent Gay Couples	.109	(.361)	.201	(.360)	.092	(.414)
Socioeconomic Disadvantage						
Percent Female-Headed Families	30.354	(17.488)	30.550	(18.442)	.232	(10.706)
Percent Residents in Poverty	25.499	(20.462)	22.472	(16.346)	-3.027	(20.837)
Percent Unemployed	14.767	(11.476)	13.207	(10.860)	-1.559	(8.608)
Percent w/ Public Assistance	18.819	(17.287)	17.416	(14.843)	-1.403	(9.802)
Racial Composition						
Percent Blacks (non-Hispanic)	42.046	(44.316)	42.840	(43.575)	.795	(7.725)
Percent Whites (non-Hispanic)	35.011	(34.948)	29.875	(31.807)	-5.136	(14.938)
Percent Hispanics	19.431	(26.208)	22.913	(28.578)	3.482	(13.553)
Percent Asians	3.292	(7.552)	3.752	(8.127)	.460	(3.064)
Talent Index						
Percent w/ BA or more	11.571	(13.815)	16.116	(17.696)	4.544	(8.503)

APPENDIX II.

Ancestry and Racial/Ethnic Origin Subgroups, 1990 Individual Counts, Across Chicago Neighborhoods

Subgroups (Total 42)		**Mean**	**Std. Dev.**	**Max.**	**Total Members in Chicago**	**Subgroup Residential Integration Rank**
Asian						
	Chinese	27.76	152.44	3657	23210	34
	Filipino	35.06	88.63	955	29309	11
	Japanese	8.21	23.06	259	6865	23
	Indian Asian	17.50	73.01	1139	14627	26
	Korean	16.58	81.55	1315	13857	28
	Vietnamese	5.02	34.93	579	4200	**39**
	Cambodian	1.88	19.16	360	1572	**42**
Hispanic						
	Mexican	416.13	893.59	11522	347885	33
	PuertoRican	144.99	377.66	3751	121209	35
	Cuban	12.53	31.00	297	10474	18
	Guatemalan	15.42	46.44	577	12895	31
	Salvadoran	4.64	21.81	341	3877	37
	Colombian	6.57	18.99	164	5491	27
	Ecuadorian	7.91	24.82	281	6612	32
	Peruvian	3.10	12.25	120	2592	36
"Western" European						
	Austrian	8.32	18.63	170	6955	12
	Dutch	8.22	16.40	121	6872	14
	English	47.97	83.30	639	40106	**3**
	French Eb*	16.58	27.63	231	13863	5
	German	235.94	338.53	1701	197245	**1**
	Irish	193.00	317.91	2717	161344	4
	Norwegian	10.81	20.65	155	9039	8
	ScotchIrish	10.51	19.25	140	8783	7
	Scottish	10.80	22.12	159	9032	9
	Swedish	23.69	44.93	553	19806	**2**
	Italian	112.28	201.71	2042	93862	10
	Greek	25.29	90.08	1872	21143	13
Central Eastern European						
	Hungarian	9.91	21.62	202	8285	6
	Ukrainian	11.14	43.21	978	9311	24
	Czech	13.64	26.66	207	11399	15
	Russian	36.47	123.36	1645	30491	20
	Lithuanian	22.24	67.81	931	18594	29
	Polish	261.33	486.13	4712	218475	17
	Romanian	8.62	28.02	388	7205	22
	Slovak	13.94	27.66	241	11656	19
	Yugoslavian	12.30	34.03	388	10285	21
Arab						
	Arab	14.64	53.40	894	12241	25
Black						
	Black NH**	1286.56	1923.26	16000	1075566	**41**
	West Indian NH**	10.30	35.81	637	8607	**38**
	Sub-Saharan African	12.35	47.48	963	10321	**40**
American						
	American	39.78	48.11	347	33259	16
	Indian American	7.80	16.70	163	6518	30
Total Residents		3328.68	2382.57	16279	2782775	
Total Neighborhoods* **					836	

*Notes: * Eb means Except Basque*

***NH refers to Non-Hispanic*

**** Only neighborhoods with more than 100 residents in 1990 and 2000*