National Origin Differences in Residential Segregation of Asian Americans: Trends from 1970 to 2010

Weiwei Zhang

Brown University

September, 2013

INTRODUCTION

The Asian population in the United States has rapidly grown from less than 1 million in 1970 to approximately 18 million in 2010, which accounts for 5.6 percent of the total population (Census 2010). Most of this growth is attributable to the immigration from Asian-origin countries. The Immigration and Nationality Act of 1965 abolished immigration quotas based on national origins and permitted entry primarily on the basis of occupational skills or family reunification. As a result, the foreign-born Asian population has grown from about 0.5 million in 1960 to 11.6 million in 2011 (American Community Survey 2011). Today, for most Asian groups about half of the group population is foreign-born. Overall, Asians have passed Hispanics as the largest group of new immigrants to the United States (PEW 2013). "Asian American" is an umbrella category that includes not only Chinese, Japanese, and Filipinos, but also Indians, Koreans, Vietnamese, Cambodians, Laotians, Thai, and so on. In the presence of this constant replenishment, Asian Americans may tend to display increased levels of residential segregation.

Previous studies on residential patterns often treat Asian Americans as one racial group. This umbrella category includes not only Chinese, Japanese, and Filipinos, but also Indians, Koreans, Vietnamese, Cambodians, Laotians, Thai, and so forth. A few studies have shown that disparities in segregation from non-Hispanic whites are nontrivial across Asian ethnicities. Vietnamese are found to be the most segregated among major Asian groups; while Japanese display high levels of residential integration with whites (Massey and Denton 1992). Metropolitan areas with a disproportionate share of new Asian immigrants, such as Vietnamese, experienced more increases in the Asian-white segregation from 1980 to 1990 than did other areas; while a reversed pattern was found in areas where Filipinos had a significant presence

(Frey and Farley 1996). Another way to examine the dissimilarities among Asian groups is to measure segregation between Asian groups. In Zhou and Logan's study of Chinese in New York metropolis, they report that the segregation between Chinese and other major Asian groups is as high as its segregation from non-Hispanic whites and Hispanics. Hence, they conclude that the treating Asian Americans as one group "notably understate[s] the residential separation of these subgroups" (Zhou and Logan 1991: 404). A recent study by Kim and White (2010) confirms that Asian groups are moderately segregated from each another.

A number of researchers proposed Theil's (1972) entropy index (*H*) for handling multigroup segregation (Fischer 2003; Iceland 2004; Reardon and Firebaugh 2002; Reardon et al. 2000; White 1986). Like the dissimilarity index, the entropy index measures the evenness of racial and ethnic geographic distribution by comparing groups' distribution in a broader area to the distribution in a neighborhood nested within that area. Unlike the dissimilarity index, the entropy index can handle comparisons of multiple groups simultaneously and generate one single value for multiple comparisons. Furthermore, the index can be partitioned into components by categorical groups, such as ethnic groups or occupational categories, and geographic units, such as census tracts, school district, or metropolitan areas.

Taking advantage of the decomposition of entropy index, the analyses in the current study focus on the six major Asian groups (Chinese, Indians, Filipinos, Japanese, Koreans, and Vietnamese) and examine national origin differences in segregation from whites and segregation between Asian groups over the period of 1970 – 2010. The steps are (1) compute multigroup segregation, measured by the entropy index, for the six Asian groups and whites; (2) calculate the between-Asian-group component as the share of the multigroup segregation; (3) decompose segregation from whites by geographic scales for each Asian group. Geographic components are

segregation within census tracts, between city and suburb, between metropolitan areas, and between census divisions.[1]

SOURCE OF DATA

Data for the analyses are taken from the decennial census Summary File 1, 1970, 1980, 1990, 2000, and 2010 from the United States Bureau of the Census. These files provide full population counts of whites and the six Asian groups at the level of census tract across the whole country. [2] In order to have a standard geographic boundary over time, I use the method developed by a group of scholars to adjust population counts in earlier years to reflect the 2010 census tract boundary.[3] Following the Census Bureau, suburban locations are defined as tracts lying within the metropolitan boundaries but outside of the central-city core.

ENTROPY INDEX

The calculation of the entropy index begins with the computation of the diversity index. The diversity (E) of a tract is defined mathematically in the way that the value reaches its minimum of 0 when there is only one single group and the value reaches its maximum when each group is equally present in the total population in that tract. In the entropy method, measure of diversity is defined as

[1] There are nine census divisions: New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, and Pacific.

[2] In the1970 census, questions in the short form for the entire population did not include inquiries of Spanish origin or descent (only available in the long form distributed to the 5 percent sample population). Therefore, group counts in 1970 were taken only from the general race question. Chinese, Indian, Filipino, Japanese, and Korean were categories included in the race question at that time. The category of Vietnamese, however, was not. Vietnamese ethnicity could only be identified using the birthplace information, which was collected from the sample. Thus, for 1970, the Vietnamese is excluded from the analyses.

[3] The key behind the standardization of the census tracts is to use the areal interpolation to estimate population characteristics from prior years using 2010 tract boundaries. By overlaying the tract maps in two different times and assigning the weights to the component parts for each focal tract, population counts or other aggregate data are imputed with weights assuming that all population characteristics have the same distribution as the total population across blocks within a tract, and across fragments within a block. See Logan et al. (2012) for the detailed methodology.

$$E = \sum_{r=1}^{n} p_r \ln(\frac{1}{p_r})$$

where p_r is the proportion of the population made up of group *r* (multiple groups can be introduced into the calculation). As the diversity values of each tract and of the metropolitan where the tract belongs to are calculated, the entropy index of segregation (*H*) for the metropolitan can be calculated as:

$$H = \sum_{t=1}^{n} \frac{w_t}{W}(\frac{E_m - E_t}{E_m})$$

where E_m is the diversity of the metropolitan and E_t is the diversity of a tract *t* that belongs to the metropolitan; w_t and *W* are respectively the population of the tract *t* and of the metropolitan as a whole. Hence, the entropy value can be regarded as the proportional reduction in error (PRE) for measuring diversities at the metropolitan level by using data on distribution patterns at the tract level. In other words, it is "the weighted average deviation of each category's diversity from the total diversity, standardized by the total diversity." White (1986) explicitly describes the properties of the Entropy Index as followings: The Entropy Index varies between 0, when each parcel has the same composition as the city, so knowledge of parcel sheds no light on population composition, and 1, when each tract contains one group only.

Entropy Decomposition

The general form of the entropy decomposition is given by the following equation, where *p* is the elements of being decomposition P. Reardon et al. (2000) provide a proof of this decomposition in the appendix of their article.

$$H = \sum_{p \in P} (\frac{w_p}{W})(\frac{E_p}{E})H_p$$

The expression for group decomposition is revised as the following:

$$H_{7g} = \left(\frac{E_{w\backslash 6g}}{E_{7g}}\right)\left(H_{w\backslash 6g}\right) + Q_{6g}\left(\frac{E_{6g}}{E_{7g}}\right)\left(H_{6g}\right)$$

where $H_{w\backslash 6g}$ and $E_{w\backslash 6g}$ are the pairwise entropy and diversity of whites and six groups as combined; H_{6g} and E_{6g} are the multigroup entropy and diversity of the six Asian groups; H_{7g} and E_{7g} are the multigroup entropy and diversity of the six Asian groups plus whites; Q_{6g} is the proportion of the six Asian groups combined in the total population.

The first product on the right-hand side of the equation is the between-Asian-white segregation component and the second product is the component of segregation between Asian groups. Each component divided by the total multigroup segregation, which is the item on the left-hand side of the equation, is the share of that component in the total segregation. The share of the total multigroup segregation that is attributable to the between-Asian-white component could be reduced by changing only the relative white/Asian racial balance in tracts. The portion of the total multiracial segregation that is attributable to segregation between Asian groups could be reduced by transferring ethnic members of the six Asian groups among tracts while leaving their collective relationship to whites unchanged.

The entropy index can be decomposed by geographic units. Take one entropy value for a single metropolitan area as an example. The geographic units within the metropolitan area are city and suburb. The lowest geographic unit for the calculation of the Entropy Index is the census tract. The entropy index for the metropolitan area can be decomposed into three parts: within-city, within-suburb, and between-city-and-suburb components. The equation is expressed as following:

$$H = H_{C\times S} + \left(\frac{T_C E_C}{TE}\right) H_C + \left(\frac{T_S E_S}{TE}\right) H_S$$

where H_C , E_C , T_C , H_S , E_S , T_S , are respectively the segregation, entropy, and total population of the city and the suburbs; $H_{C\times S}$ is the segregation between city and suburban.

The first element on the right-hand side of the equation is the portion of total metropolitan segregation attributed to segregation between the city and suburbs. The remaining two elements represent the within-city and within-suburb portions of metropolitan segregation, respectively. Each component shows the proportion of segregation that can only be reduced through redistributing elements in that component.

RESULTS

I first calculate the multigroup segregation for all metropolitans.[4] Table 1 presents the mean of the metropolitan values from 1970 to 2010, weighted by the total metropolitan population of whites and the six Asian groups combined. The table is organized with each row containing results for each time point. The first panel reports the actual multigroup segregation values (*H*) with metropolitan variations measured by the minimum, the maximum, and the standard deviation. In the second panel, the within-group component is measured by its share of the total segregation. Variations across metropolitans are also included. The shares of the between-Asian-white component and the between-Asian-group component add up to 100 (the between-Asian-white segregation component is not shown in the table).

[4] Non-Hispanic whites and the six Asian groups are included for the analysis. Asian alone with one Asian ethnic category is used to define Asian groups. I also excluded the metropolitans with less than 10 tracts because the decomposition by geography requires a sufficient number of units at the lowest geographic scale.

Table 1 Multigroup Segregation across Non-Hispanic Whites and Asian Groups (the Index of Entropy) and the Share of Segregation that is between Asian Groups, 1970-2010

	Multigroup Segregation				Between Asian Group Component (%Share)			
	Mean	Minimum	Maximum	STDEV	Mean	Minimum	Maximum	STDEV
1970	0.1496	0.0000	0.5570	0.0563	42.6	0.0	87.7	13.58
1980	0.1383	0.0000	0.3056	0.0489	44.9	0.0	81.2	11.95
1990	0.1391	0.0258	0.3289	0.0506	40.1	9.1	78.4	10.23
2000	0.1476	0.0287	0.2808	0.0568	37.3	8.3	78.1	9.17
2010	0.1494	0.0282	0.2935	0.0605	36.0	6.7	78.5	9.11
Tracts in MSAs are included. Weighted by Metropolitan Populations of White and Six Asian-Origin Groups								

Over time, the multigroup segregation remains similar with little changes. A value of 0.15 means that the levels of diversity in tracts are, on average, 15% lower than the level of diversity of the metropolitan area, which means that there is an uneven distribution of groups across tracts The variations across metropolitans are quite substantial, but have decreased greatly over time. In 1970, the maximum *H* (0.557) is above 7 standard deviations from the mean; while in 2010, the maximum *H* (0.2935) is within 2.5 standard deviations above the mean.

The between-Asian-group component represents the share of segregation within Asian groups. It has steadily decreased since 1980. Referring to the decomposition equation below, if the product on the left-hand side of the equation remains unchanged (the total multigroup segregation has little change from 1970 to 2010), the cause to the declining share of the between-Asian-group component (the second product on the right-hand side of the equation) is a combined product of changes in the proportion of the six Asian groups as a whole, the ratio of between-Asian-group diversity to the multigroup diversity (whites plus six Asian groups), and the between-Asian-group segregation. Since the proportion of the six Asian groups has increased over time, the other terms must have declined to generate an observed declining share of the between-Asian-group component. It is worth noting that despite the declining trend, the

between-Asian-group component still counts more than one third of the total multigroup segregation.

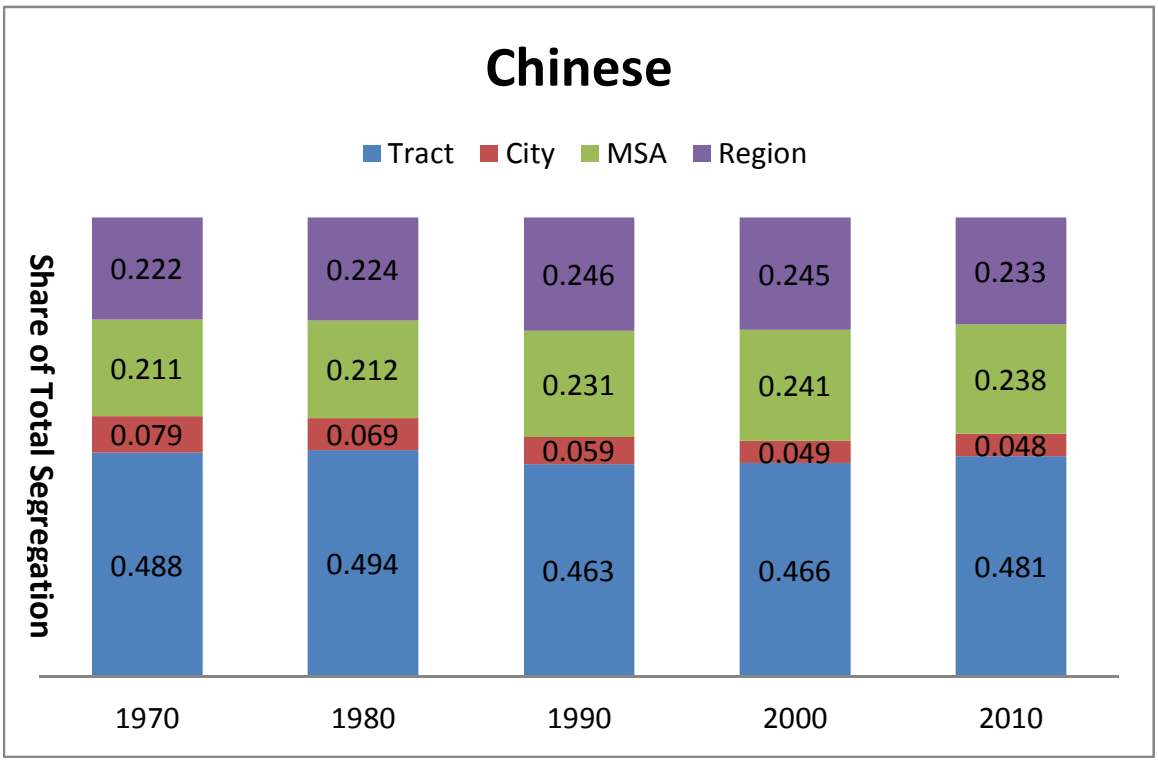
Next, four compositional segregations are disaggregated from the total segregation between the group and whites: tract segregation within city/suburb, between-city-suburb segregation within metropolitan areas, between-metropolitan segregation within regions, and between-region segregation.[5]

Figure 2 presents for each Asian group the segregation from whites decomposed by chosen geographic scales. One graph is for one group separately. The bars on the graph represent the total segregation expressed as a 100 percent for five decades.[6] Each bar is then divided into four parts, representing the share of segregation correspondingly. The top part is the share of between-region segregation followed by the other three components: between-metropolitan, between-city-and-suburb, and within-tract.

[5] The logic is that each lower level of geography is the constitutional part of the geography of a higher level. Metropolitans nest in regions; the city and suburb are the two component geographies within each metropolitan area; and tract is the smallest geography nested within the city and suburb. One issue is that because metropolitans nested in a region do not add up to a complete whole region, with some non-metropolitan parts as residual a geography. This component is not filtered out for the calculation of its independent share. Instead, its share of the total segregation is lumped together with the component of the finest geography, the tracts. Therefore, the tract component actually includes the calculation of tracts within the city and suburb plus tracts in the residual geography in the region after the metropolitan component is filtered.

[6] Data for Vietnamese do not include 1970.

Figure 2 Decomposition of Segregation from non-Hispanic Whites by Geographic Scale, 1970-2010: Region, MSA, City-Suburb, and Tract



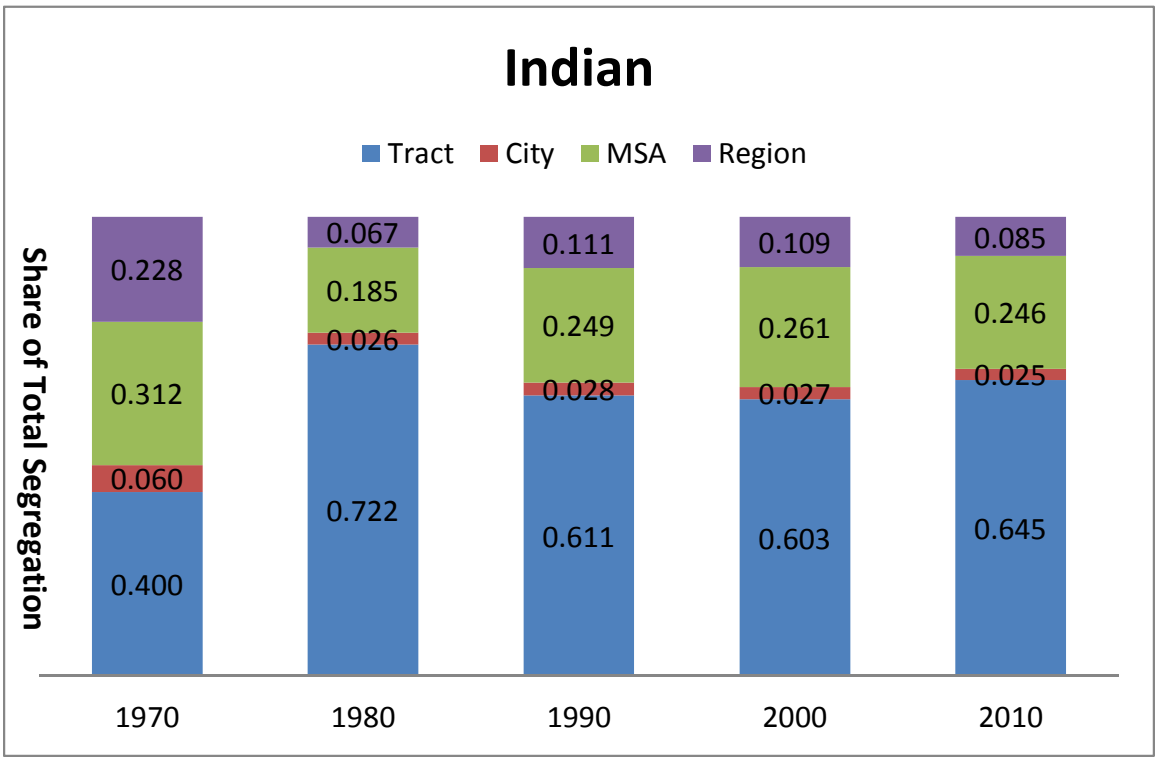
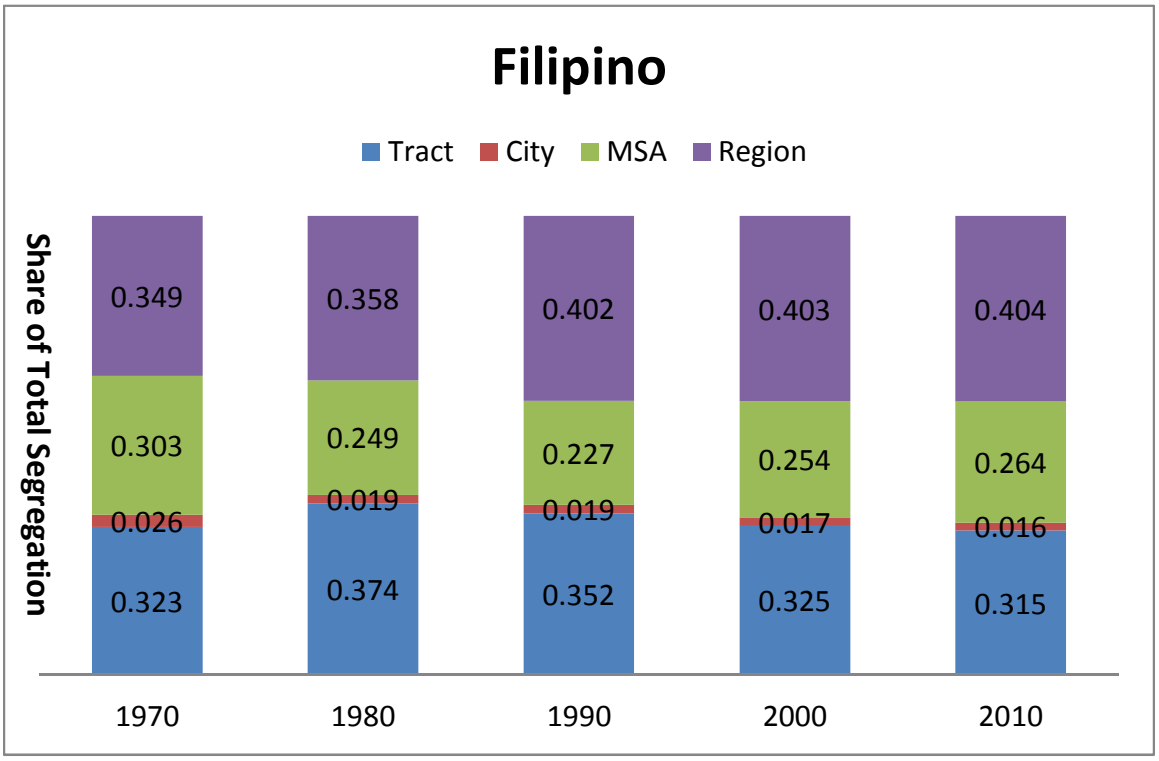


Figure 2, continued



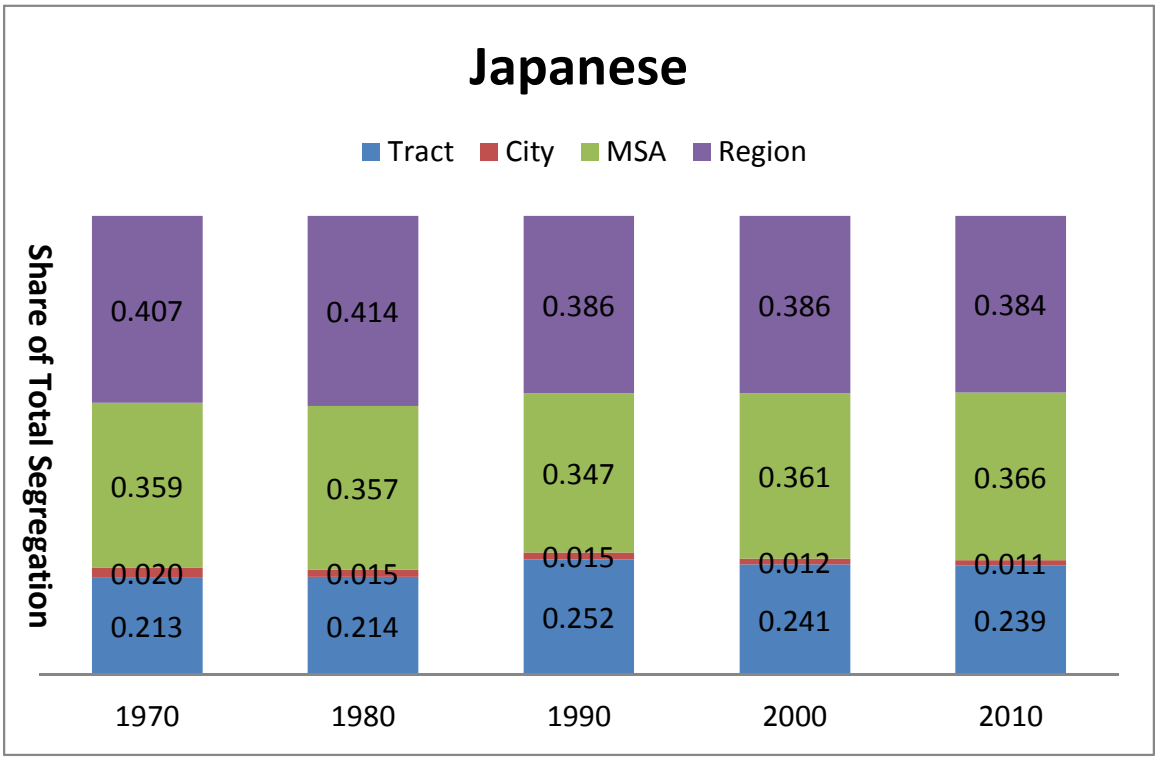
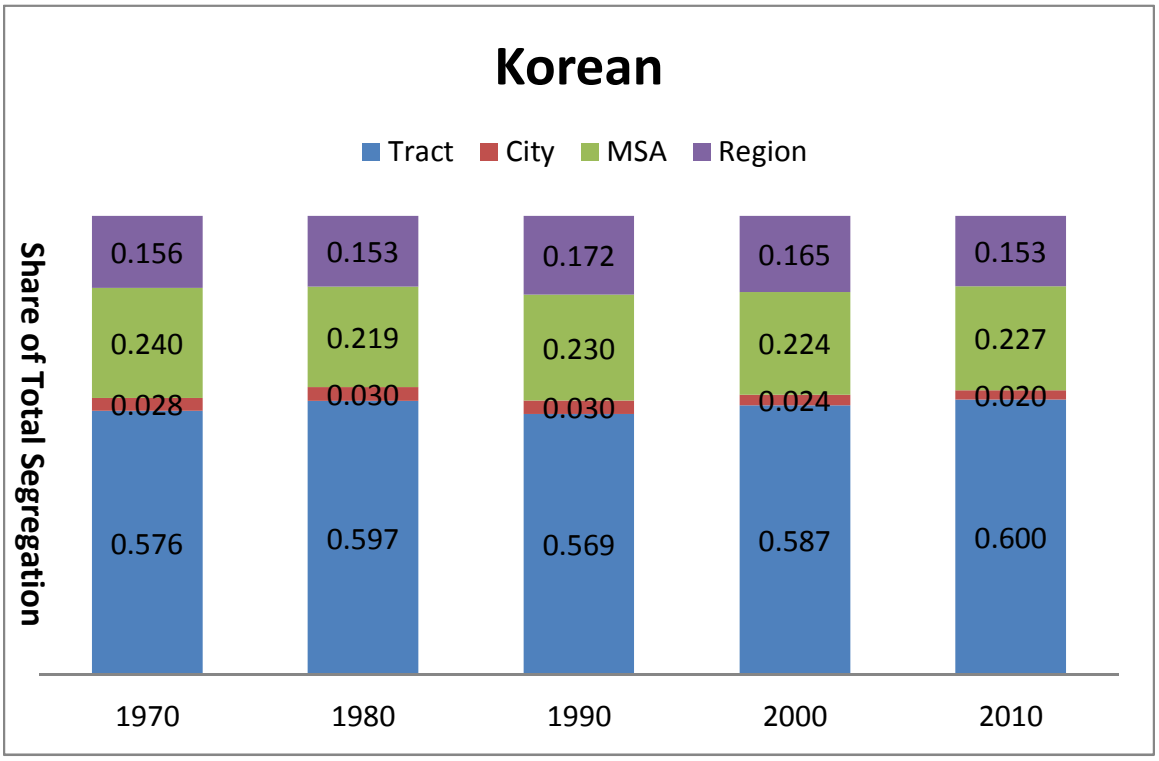
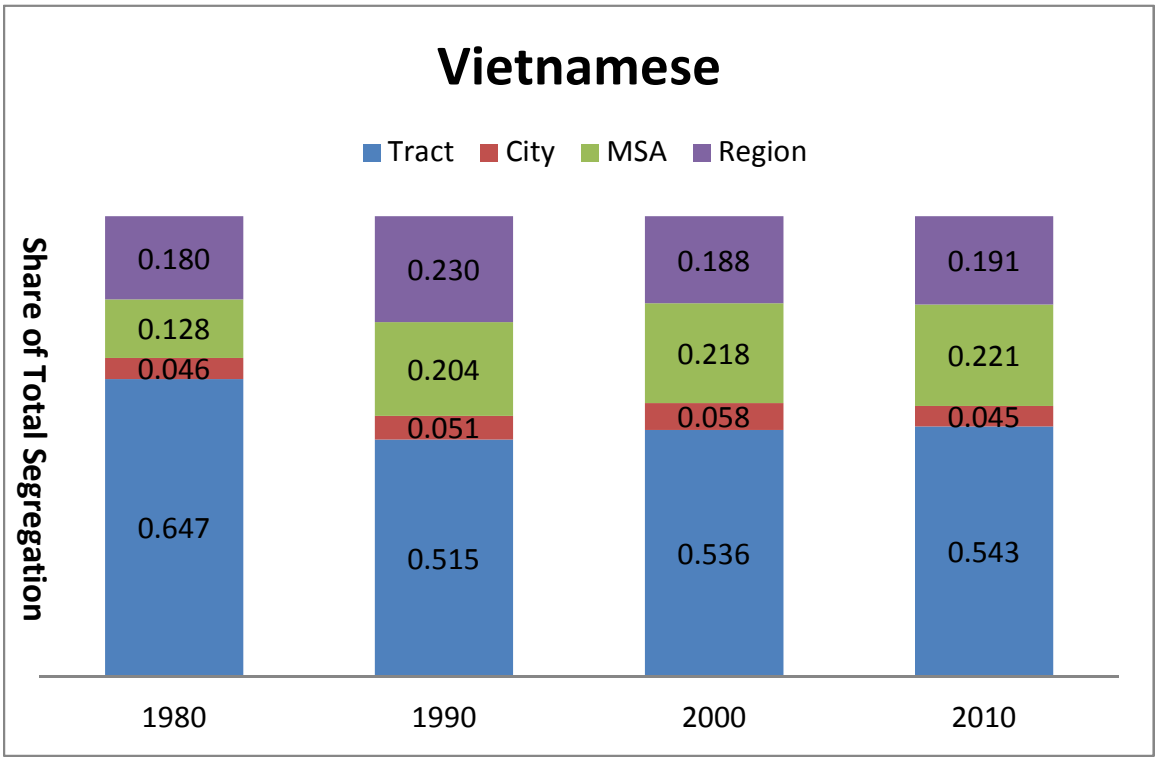


Figure 2, continued





Over time, shares of compositional geographic parts for each group have not changed greatly (except Indians in 1970 and 1980). Comparing across groups, Filipinos and Japanese display the largest percentage of share contributed by the between-region and between-metropolitan components. About two-thirds of these two groups segregation is attributed to the disproportionate distribution across large areas. A relocation of group members from one metropolitan to another where they previously were not found will substantially reduce their measured segregation from whites. In contrast, Indian and Koreans exhibit a large share of tract component (around 60%). The interpretation follows that moving from tracts with a high concentration of ethnic members to tracts with a low concentration while keeping their relative share in the total population unchanged, a significant reduction in segregation from whites can be achieved. For Chinese and Vietnamese, segregation at larger geographic scales constitutes approximately an equal share of the total segregation from whites as segregation within tracts.

REFERENCES

Fischer, Mary J. 2003. "The Relative Importance of Income and Race in Determining Residential Outcomes in US Urban Areas, 1970-2000." *Urban Affairs Review* 38:669–96.

Frey, William H., and Reynolds Farley. 1996. "Latino, Asian, and Black Segregation in US Metropolitan Areas: Are Multiethnic Metros Different?" *Demography* 33:35–50.

Iceland, John. 2004. "Beyond Black and White : Metropolitan Residential Segregation in Multi-ethnic America." *Social Science Research* 33:248–71.

Kim, Ann H., and Michael J. White. 2010. "Panethnicity, Ethnic Diversity, and Residential Segregation." *American Journal of Sociology* 115:1558–96.

Massey, Douglas S., and Nancy A. Denton. 1992. "Residential Segregation of Asian-origin Groups in United States Metropolitan Areas." *Sociology and Social Research* 76:170–77.

PEW Research Center. 2013. *The Rise of Asian Americans* (updated edition, April 4, 2013). Report downloaded from http://www.pewsocialtrends.org/asianamericans.

Reardon, Sean F., and Glenn Firebaugh. 2002. "Measures of Multigroup Segregation." *Sociological Methodology* 32:33–67.

Reardon, Sean F., John T. Yun, and Tamela McNulty Eitle. 2000. "The Changing Structure of School Segregation: Measurement and Evidence of Multiracial Metropolitan-area School Segregation, 1989-1995." *Demography* 37:351–64.

Theil, Henri. 1972. *Statistical Decomposition Analysis: With Application in the Social and Administrative Sciences*. Amsterdam, Netherlands: North Holland.

White, Michael J. 1986. "Segregation and Diversity Measures in Population Distribution." *Population Index* 52:198–221.

Zhou, Min, and John R. Logan. 1991. “In and Out of Chinatown - Residential Mobility and Segregation of New York City Chinese.” *Social Forces* 70:387–407.