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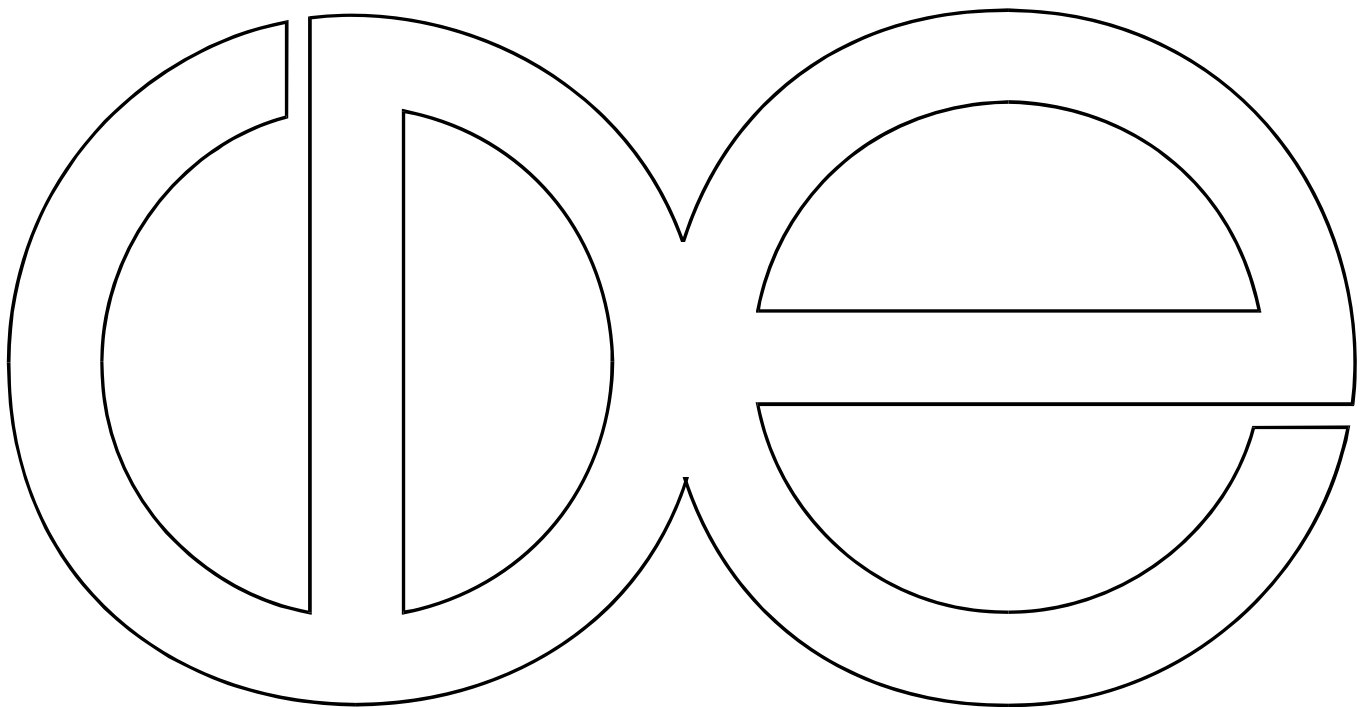
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Population Change and the Changing Educational Attainment of Ethnic Groups in the United States

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1

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Abstract. *This study assesses the effect of population change on decade changes in the educational attainment level of ethnic (ancestry) populations in the United States. Our data derive from decennial censuses, NLMS, World Bank and INS. We find that changes in the share of ethnic populations with one or more years of post secondary schooling are associated with selected components of population change during the 1980-1990 and 1990-2000 decades. The specific components include survivors during a decade, in-migration and emigration of the foreign-born. Likewise, intra-generational mobility is an important determinant of changes in educational attainment. The discussion addresses some limitations of the data and suggests directions for future research.*

Introduction

Most of the research on educational attainment and changes therein focuses on the roles that cognitive ability, socioeconomic and family background, place-specific opportunity structures -- such as those provided by neighborhood and school environments -- and public policies play in shaping the educational experiences of individuals as they move through the life course (see Mare, 1995; Gamoran, 2001; Entwisle, et al, 2005). In contrast, the analysis presented in this paper focuses more broadly on macro processes of change in educational attainment. Specifically, we describe and seek to account for relative changes in the educational attainment of ethnic (country of origin) populations in the United States during the period 1980-2000. We seek to advance previous work by giving greater attention to the contribution of population change on changes in the educational distribution. We focus specifically on the potential role of Intra- and intergenerational changes, and changes in the size of the foreign-born population on the changing educational attainment of the U.S. population.

The availability of large samples of individual ethnic (ancestry) populations with varying shares of immigrants and descendants provide a unique opportunity to estimate the sources of change in educational attainment. In pursuing this objective, we employ a synthetic age cohort approach to inter-censual estimates to decompose changes in educational attainment into components reflecting 1) intergenerational change, largely through mortality distinguished by nativity; 2) intra-generational change, via educational mobility; 3) international migration (immigration and emigration); and 4) emigration of the native-born. We calculate estimates of the impact of each of these components on decade changes in population for five-year age groups stratified by ethnicity and gender. We then estimate multivariate models to assess the impact of population change and origin country characteristics on changes in the educational attainment.

Background

The educational distribution of the U.S. population is dynamic, constantly changing in response to demographic, socioeconomic, and cultural and political forces which alter the educational aspirations and attainment of individuals moving through the life course. Specific factors one can identify which affect the educational distribution of the population includes intra- and intergenerational mobility, mortality, international migration to and from different origins, and period-specific societal changes with varying impacts on age cohorts. From 1940 to 1990, the average educational attainment of the U.S. population changed dramatically. The median educational attainment of the population twenty-five years of age and over increased from 8.7 years to 12.8 years; and the percentage completing high school or more increased from 24.5 to 77.6 (U.S. Bureau of the Census, 2008).

An important component of these changes has been intergenerational in character, with the educational attainment of offspring exceeding that of their parents (Featherman and Hauser 1978; Mare 1995). Mortality plays a direct role in facilitating intergenerational change. Thus, as older generations, with less educational attainment levels exits the population via mortality, the average educational attainment level of the population mirrors that of younger generations. In addition, the selectivity of mortality with respect to education (Sorlie, Backlund and Keller 1995) also raises average education levels. In general, mortality is lower at higher educational attainment levels, which incrementally could raise average educational attainment independent of age.

Average educational attainment can also change as a result of intra-generational change. The average schooling of the members of an age cohort observed at two or more points in time can reveal marked differences as a consequence of intra-generational mobility. The magnitude of the differences is strongly dependent on the age at observation: the younger the age, the greater the observed differences. Schooling, though continuous through completion of secondary school, can be disrupted for one or more years. Disruptions in schooling can occur for a number of reasons, including household responsibilities (child-bearing and child-rearing, caring for older relative, etc.), financial circumstances, military service, and institutionalization. In addition, even if no disruption occurs, the pursuit of post-college schooling can increase the age of school completion. While most individuals complete post-college education by the age of thirty, a few may not do so until later years (Mare 1995).

There are a number of ways in which period specific changes can affect the educational distribution of a nation. One of the most obvious ways is through shifts in the demand for labor with specific skills and education. For example, the shift in demand favoring human

3

capital/cognitive skills starting in the late 1970's dramatically altered the educational

requirements for securing good paying jobs in an economy that was more service oriented

functioning in an increasingly global market place. Differentials in returns to schooling widened

favoring workers with college degrees. Younger age cohorts were in a better position to respond

to these changes either because their schooling was not yet completed and/or because their

occupational careers had not reached the mature stage, locking them into a particular trajectory.

Second, since education is to a certain extent a public good, government policies altering

opportunities for schooling – such as the G.I Bill, government sponsored grants, fellowships, and

loans, changes in education-based criteria for admission to the U.S., alterations to the curricula

and requirements for school completion (i.e., No Child Left Behind) and tax polices—can

expand the enrollment of non-traditional students and alter the criteria and conditions for degree

completion.

Another form of period specific change which affects observed levels of educational

attainment both within and between ethnic populations is associated with the reporting of ethnic

identification. Ethnicity is not a fixed attribute as it can change as a result of individuals having

multiple ethnic identities, in which the salience of each changes over time. Whatever identity

individuals may select may reflect personal/family circumstances and/or societal forces which

may favor one ethnicity or ancestry over another during a particular period in time (see Alba

1990; Lieberson and Waters 1988).

International migration can affect the average educational attainment of a country in two

ways. The first is by way of size, duration, and the educational composition of migration flows.

A migration flow which is large in size and persists for a decade or more could increase the

origin share of the host population, which, through the educational composition of the flow

4

would in turn alter the educational distribution of the host population. The impact could be to increase or decrease average educational attainment depending on whether the educational composition of the flow is higher or lower than that of the host population. One would expect that higher or lower educational attainment at origin would be reflected in the composition of the migration flow, unless the stream is selective with respect to education in response to differential opportunities at destination. Currently, migration flows to the U.S. are bi-modal, attracting both individuals with limited and/or high educational attainment (Chiswick and Sullivan 1995; Chiswick, and DebBurman 2004; Massey 1999; Feliciano 2005).

Finally, a sustained flow linking an origin and destination rarely is one directional. Invariably, a counter-flow will develop as a consequence of some individuals experiencing adjustment problems at destinations; while others return to origin after having accomplished a goal which initially motivated them to migrate to a destination; or because of family considerations.

The second way in which international migration affects the educational distribution of the host population is through continued identification with and attachment to the culture and institutions of country of origin. Many foreign-born arrive in country with no expectation of remaining, and hence do not feel the need to assimilate to the host environment (see Massey, 1999). Indeed, residential concentration, and the institutionalization of services and opportunities, such as the development of origin-specific specialty markets (Fischer 1975; Massey 1985) reduces the need to "become American." Once settlement is established, the desire to reproduce elements of the origin environment considered necessary for the immigrant's well-being leads to the emergence of these adaptations. In addition, the salience and persistence of these patterns are in part determined by the reaction of the host population to the new arrivals.

5

In the end, the reflective nature of adaptive patterns leads to the formation of ethnic groups. Thus, origin-based adaptations and/or host society reactions can slow the rate of absorption of immigrants and their descendents into the institutional and organizational structure of the host society, including advancement in the educational system (Portes and Manning, 1986; Portes and MacLeod. 1996).

Data Sources and Sample Selection

This study makes use of data from decennial censuses, National Longitudinal Mortality Study (NLMS), the World Bank, and Immigration and Naturalization Service to analyze decade changes in population and educational attainment during the 1980-1990 and 1990-2000 periods. Specifically, we use PUMS files drawn from the 1980 (1 and 5 percent), 1990 (1 and 5 percent), and 2000 (1 percent) decennial censuses. From these data, we generate population counts for five-year age cohorts, stratified by ethnicity, ancestry, sex, nativity, immigration, and educational attainment. We restrict the data to individuals who do not reside in group quarters. The sample sizes for 1980 and 1990 are much larger than for 2000 for two reasons. First, information on ancestry (or country of origin) is not available on the 2000 five percent sample. Second, taking into account that many of the immigrant/ethnic groups are of recent origin, the larger sample sizes for 1980 and 1990 assure an adequate sample size for these groups. In addition, the one percent sample for 2000 is about 25 percent larger than that of the two previous censuses.

Data from NLMS are used to estimate mortality rates for five-year age groups during the period between 1979-89 stratified by ethnicity, sex, nativity, and educational attainment. The NLMS is a CPS based data file with supplemental data from the National Death Registry

identifying respondents on the CPS samples that died during the 1979-89 period. These data were subsequently merged with the census based tabulations using ethnicity, sex, age, nativity, and education as linking variables. After the merge, educational attainment was collapsed to two categories: individuals with less than one year of post-secondary education and those with one or more years of post-secondary education. Since over three-quarters of the adult population of the U.S. population twenty-five years of age and over have at least completed high school, we believe one or more years of post-secondary education should provide considerable variation in educational attainment between country of origin groups in our sample for analysis purposes.

Although ancestry (country of origin) is not reported in the NLMS file, we were able to assign mortality indicators for ethnic groups, which were then assigned to ancestry groups based on their ethnic group status. The most important implication of this re-classification scheme is that ethnic groups who are classified as belonging to the same racial category (such as non-Hispanic white, black, Asian, or American Indian) are assigned the same mortality estimates. Finally, since the NLSM only provides estimates of deaths occurring between 1979 and 1989, the survival probabilities applied to the 1980 and 1990 populations are the same. We acknowledge that applying the mortality schedule for 1980-90 to 1990-2000 introduces an additional source of error, the magnitude of which is not known. Thus, decade-changes in the probability of survival are not a factor responsible for observed differences.

The set of steps that we follow to assign ancestry membership is as follows. First, we classify individuals by detailed Hispanic origin. If a specific origin was not identified, we use place of birth, followed (if necessary) by first ancestry mentioned. Next, we use the detailed information available for Asians and American Indians, followed by place of birth and ancestry if necessary. For blacks, followed by whites, we rely on information for place of birth and first

reported ancestry. Before this procedure could be applied to the 2000 census, a single racial classification had to be created following a particular ordering of ethnic groups. A single racial classification was assigned to individuals who identified themselves as being part black; followed by a single racial classification for Asians, then American Indians (if they indicated a tribal affiliation), and finally whites. While these steps capture most people in our samples, it does not capture everyone. In particular, in households in which individuals do not report a specific ancestry group, if available, we assign them the ancestry reported by someone else in the household under the assumption that families and people that live together are likely to be of similar ancestry background.

In the cases where individuals report multiple ancestries, we choose to make use only of the one reported first. In 1980 PUMS, there are several multi-ancestry group classifications that we decided to breakup for the purposes of standardizing these categories across the remaining PUMS data files. Finally, individuals for whom no ethnic classification was possible were subsequently assigned to the "Other American" category.

We use data from the Immigration and Naturalization Service public use data files for 1980-1989 and 1990-1999 to obtain information by country of origin on visa declaration of the foreign-born population arriving in the U.S. during a decade. The visa declarations that are of particular interest include those related to family, employment, non-immigrant, refugees, and asylees. Finally, educational attainment data for the countries of origin included in our sample were obtained from the World Bank (http://devdata.worldbank.org/edstats/td10.asp). These data were developed by Barro and Lee (2000).

Results

Observed and Expected Educational Attainment

Table 1 provides summary statistics on the average percentage of seventy-three ethnic group populations with one or more years of post-secondary education for 1980, 1990, and 2000. The percentages were calculated by grouping the seventy-three individual ethnic/country of origin groups into twelve major world regions, including three major native-born American groups. These percentages are standardized by age and sex for each decade using the total population as a standard. The descriptive statistics report in this table, as well as Tables 2-4, are presented as a convenient way to summarize the variation in educational attainment for the seventy-three country of origin groups. In any event, in Table 1, one can observe considerable variation between ethnic groups in educational attainment. The groups with the highest percentage with one or more years of post-secondary education across decades include (in order of rank) Middle Eastern, Asian, European, and Canadian; and the lowest rank includes Mexican, American Indian, Hispanic, and African American. These rankings are consistent with those reported by others (see Hirschman 2001; Mare 1995).

In general, we find substantial increases in the percentage of ethnic group populations with one or more years of post-secondary education, particularly during the 1980-90 decade. The native-born American groups (African American, American Indian, and Other American) followed by Mexican experienced the largest increases over the two decades. However, note that these changes, while they narrowed the differences between these groups and the others, they did not appreciably alter the ranking of the groups. Individuals from Oceania began the 1980 decade with the highest percentage with post-secondary education, but experienced the smallest amount of change in educational attainment during the twenty year period.

The period specific changes in educational attainment observed for all groups over the 1980-2000 decades are the result of the influence of a number of factors. First, the entrance of new cohorts at the bottom with higher than average educational attainment, and the exit, through death, of less educated cohorts at older ages increased the educational attainment of ethnic groups overall across decades. Second, intra-generational mobility can be a factor. Recall that the youngest age cohort ages 15-24 could have increased their educational attainment levels in the ten (1980-1990, 1990-2000) and/or twenty (1980-2000) years from first being observed in the census, respectively. Third, the entrance and exit of individuals via international migration can alter average educational attainment. A final source of change reflects inter-censual errors of various types, including enumeration and reporting errors (discussed below).

Tables 2 and 3 provide a different perspective on changes in the educational attainment of ethnic groups. These results do not reflect the influence of the entrance of new cohorts, educational upgrading, and inter-censual errors. Column (1) of both tables is identical to the percentages reported in Table 1 for 1980 and 1990, respectively. Columns (2) and (3) provide expected post-secondary education percentages, which were derived by applying a mortality schedule to the 1980 and 1990 populations and adding the foreign-born population that arrived during the 1980-1990 or 1990-2000 decades, respectively. Column (2) contains both survivors during the decade and the recently arrived foreign-born; column (3) only contains the survivors. Although the changes reported in these tables are smaller than those reported in Table 1, they clearly indicate that both mortality and the in-migration of the foreign-born contributed to decade changes in educational attainment. Comparing columns (4) and (5), one can determine the relative impact of survivors versus migration on changes in educational attainment. Table 2 indicates that for Europeans, Mexicans and Hispanics, survivors account for most if not all of the

10

changes. However, note that for Mexicans, migration actually reduced educational attainment, implying that recent arrivals had lower educational attainment than those already present. In the case of the other ethnic groups with foreign-born components, there are three instances in which the impact of survivors and migration are identical (Caribbean, Middle Eastern, and Oceanian), while the impact of migration is larger for three others ethnic groups (Sub-Sahara African, Asian, and Canadian), implying that in-migration raised the average educational attainment of these groups.

For the 1990 cohorts (Table 3), the amount of change is smaller, and survivor/migration differences are smaller as well. In six of nine groups, survivors have a greater impact on educational attainment (European, Mexican, Hispanic, Caribbean, Middle Eastern, and Sub-Saharan African). In the case of Mexican and Caribbean, migration actually lowered educational attainment. It is highly likely that the inflow of migrants consisted of a disproportionate share of individuals with lower educational attainment levels. These groups have the longest histories of migration to the U.S., and thus it is likely that the educational selectivity of migration has diminished to a greater extent. The diminishing of educational selection is also apparent for the other groups but not as great. This pattern is consistent with what one would expect; that is, education selectivity should diminish over time as the flow from origin to destination continues. In the analyses presented below, we seek to account for decade changes in educational attainment observed in Tables 2 and 3, by applying a multi-level model of decade changes in educational attainment.

Multivariate Models

We begin with a discussion of a model of the components of change in population for the 1980-1990 and 1990-2000 decades. The model is presented as:

$$\sum_{i=15-24\to25-34}^{j=65-75\to75-84}(P_{t+n} - P_t) = [(P_t * S_{t,t+n}) + (P_t(1 - S_{t,t+n})) + IM_{t,t+n}^{fb} \quad \textbf{(a)}$$

$$+ \quad RESID_{t,t+n}^{nb} + EM_{t,t+n}^{fb} + RESID_{t,t+n}^{fb}]$$

where P_t *and* P_{t+n} are respectively, the population at the beginning and end of a decade; $S_{t,t+n}$ is the probability of survival during a decade; $IM_{t,t+n}^{fb}$ is foreign-born population arriving in the U.S. during a decade; $RESID_{t,t+n}^{nb}$ is the residual for the native-born population; $EM_{t,t+n}^{fb}$ is the foreign-born population emigrating from the U.S. during a decade; and $RESID_{t,t+n}^{fb}$ is the population remaining after other components for the foreign-born are derived. This formula does not provide a detailed specification of the components of change, rather only those components that extant data will allow. This formula for decade change is applied to individual ethnic groups (n=73) by sex (2), age (12), and educational attainment (2) for each decade. Estimates for native- and foreign-born were derived separately, then subsequently combined. The twelve five-year age groups begin with ages 15-19 and end with ages 70-74, at the beginning of a decade. The NLSM provides no education data for persons less than 15 years of age, and mortality for persons 75 years of age and over is too great for our purposes.

Several of the terms in the formula require further explanation. The foreign-born population who arrived during a decade (IM) actually consists of several sub-groups, including

12

1) legal immigrants – persons who are or have applied for permanent U.S. resident status; 2) legal non-immigrants – persons admitted with employment or school related visas, and their dependents; and diplomats and their dependents; 3) the unauthorized – persons who entered the U.S. illegally or who failed to leave once their visa expired; 4) return migrants, who emigrated, but returned during the decade (may also include an unknown share of (1-3) who arrived in a previous period, emigrated, then subsequently returned); and 5) individuals who were incorrectly identified as having arrived in a decade.

The foreign-born population who arrived during a decade (IM) is particularly difficult to track. While the composition of the recently arrived foreign-born is known, the actual size of this population and its constituent components are not known. The difficulty is compounded by inaccurate reporting partly resulting from reliance on proxy reports provided by individuals in the household who do not actually know when someone arrived in country. A second problem is that there could very well be a large discrepancy between when an individual arrived and when she applied for legal resident status. Apparently, many individuals report the date when a change in status occurred, not the date they actually arrived in country (as for example, a change from student visa to permanent resident visa) (see Redstone and Massey, 2004). Some foreign-born individuals delay reporting their presence in the U.S. until citizenship is obtained. Apparently, many individuals do not consider themselves residents before citizenship. In the end, the unavailability of an accurate count of the recently arrived foreign-born and the proportionate composition of that population would seriously bias efforts to subdivide the recently arrived foreign-born into the components listed above.

The residual component for the native-born ($RESID_{t,t+n}^{nb}$) includes (or excludes) an

unknown number of persons because of classification, reporting, and enumeration errors; and an

unknown number of the native-born who emigrated from the U.S. during the decade. Similarly,

biases plague the residual component for the foreign-born ($RESID_{t,t+n}^{fb}$) since both residuals

were derived by applying a forward survival estimation procedure, subtracting survivors (and

emigrants for the foreign-born) during a decade from the observed population at the end of the

decade. These biases are not present in the estimate for foreign-born emigration, because the

estimates (subdivided by sex, age and Mexican origin) were derived from a different data system

(see Van Hook et al. 2006).

Table 4 reports estimates of components of decade change in population expressed as

average ratios of the population with one or more years of post secondary education to the total

population of a region of origin category. The ratios are averages of those calculated for each

ethnic group by sex and age within each region of origin category. The ratios attempt to capture

the educational composition of the population represented by a component, and can be

interpreted as the average share of a sub-group's population with one or more years of post-

secondary education. [Appendix Table 1 provides estimates of the components of changes for

the total population of a region of origin category, expressed as a percentage of the mid-decade

population of region of origin.] For most of the region of origin groups across the components

of population change categories, educational composition favors those with high school

education or less. Most of the exceptions are associated with the recent migrant and foreign-

born emigrant categories, particularly for the 1990-2000 decade. The ratios for the two residual

categories require further explanation. In both instances, the ratios reflect a range of values from

14

positive to negative, resulting in ratios that could exceed one (1.00). For example, the Mexican native-born residual has a value of (2.038), which is likely a result of a deficit of Mexicans with high school education or less being observed in the end of period census versus a surplus of post high school educated being similarly observed.

We estimate a multi-level model predicting decade changes in educational attainment incorporating the measures, as previously defined, in addition to other explanatory variables. The multi-level can be specified as follows:

$$Log\,(PED_{t,t+n}\,/\,PED_t) = A_j + \sum_{j=1}^{k} \beta_j DEM + \sum_{j=1}^{k} \beta_j COC + \varepsilon_j$$

$$\boxed{1}$$

$$A_j = \gamma_k + \sum_{k}^{l} \gamma_k COUNTRY + \mu_k$$

$$\boxed{2}$$

where *PED* is the proportion of an ethnic group with one or more years of post-secondary education at the beginning and end of a decade, respectively; *DEM* represents demographic variables, including sex, age, a dummy variable for the 25-34 year old age group, share of an ethnic group's population that is foreign-born; *COC* consists of the six components of population change measures. Recall that the components are expressed as the share of the population with one or more years of post secondary education specific to a country, sex, and age category. By including these components in the model we seek to determine whether the educational composition of a component is related to decade changes in educational attainment.

The dummy variable for the beginning of decade 15-24 year old age group is included to capture the effect of intra-generational mobility. We assume that the vast majority of the members of a cohort will have completed schooling between ages 25-34, and, in any event, in

including this variable we are attempting to separate the impact of educational mobility from changes in population associated with survival during the decade and migration of the foreign-born. Level-two (equation 2) consists eleven dummy variables representing region of origin. It is assumed that individuals from the same region of origin share similar characteristics and experiences in the U.S., including educational outcomes. The variable (A_j) represents the intercept values from equation (1), one for each of the 73 ethnic groups, and thus represent systematic variation in changes in educational attainment not accounted for by the variables represented in equation (1).

Table 5 reports the results from the multi-level model estimation for the 1980-1990 and 1990-2000 decades. The primary question we seek to address with these results is that of whether changes in educational attainment are associated with the educational composition of a component. A positive coefficient would indicate that educational composition favorable to those with post secondary education is associated with increased educational attainment for an ethnic group during a decade; a negative coefficient would indicate the reverse.

Reported results suggest an affirmative answer to this question, at least with respect to several of the components. First, note that educational composition of survivors, recent migrants, and foreign-born emigrants have strong effects on changes in educational attainment. In both decades, the greater the share of recently arrived foreign-born and foreign-born emigrants with one or more years of post secondary education, the greater the increase in the average educational attainment for an ethnic group as a whole. These findings suggest that new arrivals are more advantaged educationally, while emigrants are less advantaged raising the educational attainment of those remaining. The inverse association for survivors would appear counter-intuitive, but one need only recall that survivors are more likely to be favorably

16

endowed educationally. Thus, if a greater share of survivors is already highly educated, the rate

of increase for this group would be less than for those who were less educated at the beginning

of the decade.

The educational composition of those that died during the 1980-1990 decade had no

effect on changes in educational attainment, but there is a statistically significant negative effect

for the 1990-2000 decade. This finding simply indicates that the relative odds of dying are

greater for the less educated as one would expect. The native- and foreign-born residuals had no

effect on changes in educational attainment. The absence of effects could reflect the fact that

these components are derivative and their composition likely heterogeneous.

The effects of other variables on changes in educational attainment can also be observed

in Table 5. First, as expected, changes in educational attainment are greater for men, and

inversely related to age. Share of an ethnic population foreign-born is associated with lower

change in education, but only in the first decade. Finally, with respect to the level-one variables,

educational upgrade is strongly positively related to changes in educational attainment.

Although this variable was included to capture intra-cohort changes in educational attainment,

we should also caution that some portion of the effect of education upgrading may actually

include the educational selectivity of migration. This is because the 25-34 year old age group is

also at greater risk of migration.

One can observe very few statistically significant effects of the region of origin variables.

In fact the average intercept value associated with the level-one equation (see Table 5) remained

virtually unchanged with the addition of the level-two variables. Nevertheless, in light of their

high share of all immigrants we should not undermine the negative effect of being Mexican on

educational attainment. This is further salient if the desired mainstream trajectory remained that

of old European immigrants and their descendants. The gap between these two groups has widened and turned significant especially over the last decade. In a previous analysis (not shown), specific characteristics of individual countries were used, including median education at the beginning of the decade for country of origin, and changes in median educational attainment at origin during the decade; and four measures of visa status at entry during a decade. These measures include the proportion of all foreign-born individuals who entered during a decade based on family, employment, legal non-immigrant status, or as refugees/asylees. None of the visa-related variables were statistically related to changes in education, and median education at origin was significant only for 1990-2000.

Discussion

Results clearly indicate that selected components of population change were statistically associated with decade changes in educational attainment. Specifically, the educational composition of survivors, foreign-born in-migrants and emigrants, and death (1990-2000 only) were related to decade changes in educational attainment. In addition, other variables, including sex, age, share foreign-born (1980-1990 only), and intra-generational mobility were also statistically associated with changes in education. The strong positive effect of intra-generational mobility attests to the importance of intra-generational change. However, as previously noted, we cannot be sure that all of the change captured by the upgrade variable actually reflects intra-generational change because of the particular manner in which this variable was operationalized.

We were surprised to discover that the level-two variables had little or no effect on changes in educational attainment. In fact, the lack of changes in the intercept when the level-

18

two variables are added indicates that a multi-level is not required to explain changes in educational attainment. Future research will have to determine whether another set of variables would be more appropriate pertaining, among other factors, to specific period effects such as educational opportunities for ethnic/immigrant minorities, structural changes in the labor market, and development of social and economic ethnic niches. It will also be interesting to explore spatial variations in the effect of region of origin variables.

The approach applied here to decompose ethnic group-level changes in education attainment by focusing on the role of population is distinctly different from previous efforts. While it is generally known that generational change, mortality, and international migration affect the educational distribution of a society, we believe that this is the first attempt to study these sources of change systematically. This approach should not be confused with those that seek to account for changes in the educational status of individuals linked to various social, economic, ethnic, and demographic strata. While this type of change has direct implications for aggregate change it is not a substitute.

A number of limitations of this study must be noted. Most important of all is the inability to do a complete decomposition of the components of population change. This includes the limited availability of information on the size and composition of the foreign-born population; and the inability to provide an accurate account of various sources of errors, including enumeration, recording, and classification errors. The limited information availability in the census makes it impossible to separate these factors. A second limitation relates to the lack of a mortality schedule for the 1990-2000 period. In applying the schedule for the previous decade, we eliminate any possibility of determining whether decade differences in mortality were a contributing factor to observed changes in several of the components, and between ethnic group

19

variations.

        A population decomposition approach to changes in educational attainment is ideally suite to an analysis encompassing two to three generations of cohorts passing through the life-course, where it would be possible to observe all vital events, migrations, and period-specific changes that affect cohorts differently.

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Table 1. Percentage Ethnic Group Population with One or More Years of Post-Secondary Education [ab]

Ethnic group	1980 (1)	1990 (2)	2000 (3)	Decade Change		
				(2)/(1) (4)	(3)/(2) (5)	(3)/(1) (6)
European	32.91	48.87	58.12	1.49	1.19	1.77
Mexican	12.35	20.07	22.23	1.63	1.11	1.80
Hispanic	22.61	30.73	35.31	1.36	1.15	1.56
Caribbean	27.04	37.19	41.49	1.37	1.12	1.53
Middle Eastern	42.44	55.37	59.68	1.30	1.08	1.41
Sub-Saharan African	36.14	49.48	46.48	1.37	0.94	1.34
Asian	42.21	52.44	58.69	1.24	1.11	1.39
Oceanian	44.29	44.90	49.07	1.01	1.09	1.11
Canadian	32.79	45.69	55.76	1.39	1.22	1.70
African American	19.48	31.14	38.24	1.59	1.22	1.96
American Indian	17.65	28.31	37.27	1.60	1.35	2.22
Other American	20.83	29.61	39.35	1.42	1.32	1.89

Source: 1980, 1990, 2000 PUMS.
a. Population 15 Years of age and over.
b. Percentages standardized by age and sex. Total population used as standard.

Table 2. Percentage Ethnic Group Population with One or More Years of Post-Secondary Education [ab]

	1980 Cohorts				
	1980 Observed Age 15+	1990 Expected (Age 25+)		Ratios	
		Total	Survivors Only	(2)/(1)	(3)/(1)
Ethnic group	(1)	(2)	(3)	(4)	(5)
European	32.91	34.04	33.94	1.03	1.03
Mexican	12.35	12.94	13.07	1.04	1.06
Hispanic	22.61	24.52	23.79	1.09	1.05
Caribbean	27.04	29.61	28.40	1.10	1.05
Middle Eastern	42.44	46.68	44.54	1.10	1.05
Sub-Saharan African	36.14	45.86	38.49	1.27	1.07
Asian	42.21	47.02	43.90	1.11	1.04
Oceanian	44.29	47.77	45.66	1.08	1.03
Canadian	32.79	36.92	34.24	1.13	1.04
African American	19.48	20.89	20.89	1.07	1.07
American Indian	17.65	18.62	18.62	1.06	1.06
Other American	20.83	21.60	21.60	1.04	1.04

Source: 1980 PUMS.
a. Column (3), Total includes survivors and foreign-born arrived during decade.
b. Percentages standardized by age and sex. Total population used as standard.

Table 3. Percentage Ethnic Group Population with One or More Years of Post-Secondary Education [ab]

	1990 Cohorts				
	1990 Observed Age 15+	2000 Expected (Age 25+)		Ratios	
		Total	Survivors Only	(2)/(1)	(3)/(1)
Ethnic group	(1)	(2)	(3)	(4)	(5)
European	48.87	50.75	50.72	1.04	1.04
Mexican	20.07	20.32	21.45	1.01	1.07
Hispanic	30.73	32.40	32.14	1.05	1.05
Caribbean	37.19	37.97	38.87	1.02	1.05
Middle Eastern	55.37	57.66	57.70	1.04	1.04
Sub-Saharan African	49.48	53.77	52.44	1.09	1.06
Asian	52.44	56.26	54.19	1.07	1.03
Oceanian	44.90	48.01	46.05	1.07	1.03
Canadian	45.69	50.27	47.67	1.10	1.04
African American	31.14	33.21	33.21	1.04	1.04
American Indian	28.31	29.93	29.93	1.06	1.06
Other American	29.61	30.86	30.86	1.04	1.04

Source: 1990 and 2000 PUMS.
a. Column (3), Total includes survivors and foreign-born arrived during decade.
b. Percentages standardized by age and sex. Total population used as standard.

Table 4. Average Ratios of Components of Change by Region of origin[1]

1980-1990 Decade

Ethnicity	Survived	Died	Recent[2] Migrant	N_Born Residual	F_Born Emigrant	F_Born Residual
European	0.37973	0.33618	0.51176	0.02632	0.50974	0.35658
Mexican	0.14451	0.10102	0.13122	2.03848	0.15269	-4.03205
Hispanic	0.26892	0.23799	0.30322	1.18711	0.31570	0.37150
Caribbean	0.32023	0.27790	0.38002	0.34200	0.37871	1.03450
Mid.East	0.42826	0.38554	0.45005	0.58226	0.42990	0.75121
African	0.36015	0.29132	0.54954	0.65907	0.57600	0.09238
Asian	0.38238	0.35864	0.49707	0.95882	0.46862	0.43771
Oceania	0.46303	0.41882	0.40256	3.09474	0.45735	0.43232
Canadian	0.33580	0.29028	0.52356	0.44729	0.50921	1.24190
Afro.Amer.	0.21681	0.15954	1.00000	0.92473	1.00000	1.00000
Amer.Ind.	0.19778	0.15591	1.00000	0.76068	1.00000	1.00000
Oth Amer.	0.22832	0.19211	1.00000	4.25441	1.00000	1.00000

1990-2000 Decade

Ethnicity	Survived	Died	Recent[2] Migrant	N_Born Residual	F_Born Emigrant	F_Born Residual
European	0.51828	0.47808	0.59186	0.8187	0.57626	0.30343
Mexican	0.21153	0.16679	0.15305	0.9244	0.09825	0.11428
Hispanic	0.33207	0.27750	0.38529	0.5412	0.32690	0.29763
Caribbean	0.40358	0.34811	0.48161	0.0267	0.40459	-0.09179
Mid.East	0.53744	0.50098	0.55873	18.1242	0.50204	0.57152
African	0.47872	0.40723	0.70164	0.3853	0.53948	0.51471
Asian	0.47462	0.45882	0.57165	1.1239	0.52341	0.84247
Oceania	0.44446	0.41806	0.43434	0.7477	0.45624	0.52474
Canadian	0.44901	0.40312	0.65674	0.8259	0.60483	0.66530
Afro.Amer	0.32209	0.25593	1.00000	0.5830	1.00000	1.00000
Amer.Ind.	0.28775	0.24705	1.00000	1.6761	1.00000	1.00000
Oth Amer.	0.31750	0.26688	1.00000	0.3689	1.00000	1.00000

1. The ratios refer to the number of individuals with one or more years of post-secondary education to the total population, calculated over country of origin, sex and age.
2. Recent migrant refers to the foreign-born who arrived during the decade.

Table 5. Multi-level Analysis of Change in Educational Attainment

Variables	1980-1990		1990-2000	
	Coefficient	Standard Error	Coefficient	Standard Error
Level-one				
Intercept	0.4313***	0.0254	0.2223***	0.0201
Sex	0.0837**	0/0327	0.0356*	0.0179
Age	-0.0210**	0.0071	-0.0501***	0.0042
Share FB, 1980(1990)	-0.1942*	0.0939	0.1157	0.0655
Com.Pop Chgl				
Survived	-3.2623***	0.4017	-1.3012***	0.1926
Died	0.3419	0.3869	-0.4730**	0.1869
Recent Migrant	1.1545***	0.0868	0.1689***	0.0429
N_Born Residual	0.0005	0.0008	0.0000	0.0001
F_Born Emigrant	0.3278***	0.0511	0.0964*	0.0463
F_Born Residual	0.0012	0.0031	0.0001	0.0004
Educat Upgrade	0.4394***	0.0640	0.1868***	0.0382
Level-one intercept	0.4312***	0.0342	0.2223***	0.0257
Level-Two				
Region of Origin				
European	0.1910	0.1429	0.2373*	0.1053
Mexican	0.0420	0.2461	-0.4704**	0.1802
Hispanic	0 1249	0.1551	-0.1906	0.1141
Caribbean	0.2889	0.1752	0.1419	0.1291
Mid. East	0.4214**	0.1598	0.1236	0.1181
African	0.0576	0.2688	0.0221	0.1986
Asian	0.2281	0.1619	0.0813	0.1210
Oceania	0.3421	0.2708	0.0076	0.2009
Canadian	0.0725	0.2694	0.1539	0.1982
Afro.Amer.	-0.9659***	0.2729	-0.1224	0.2004
Amer.Ind.	-1.0349***	0.2729	0.0980	0.2005
Oth Amer. (Omitted)				

*p<.05. **p<.01, ***p<.001
Level-one observations=1752; Level-two observations=73

Appendix Table 1. Estimates of Components of Decade Change in Population[1]

1980-1990 Change

Ethnicity	1980 Population	Survived	Died	Recent[2] Migrant	N_Born Residual	F_Born Emigrant	F_Born Residual	1990 Population
European	112678012.08	86.9699	-20.1158	0.4973	5.1082	-1.2115	1.5401	97763508.29
Mexican	5758166.96	81.8017	-13.3498	17.6576	2.4447	-55.3144	58.2617	6344884.09
Hispanic	2923683.07	76.2361	-13.1215	19.6396	-0.3148	-34.2978	49.4712	3618498.84
Caribbean	4557956.75	68.5420	-12.0534	35.0266	3.8667	-46.7981	58.7778	825858.27
Mid.East	734672.34	76.7795	-14.5723	24.1355	6.9831	-31.9707	32.8268	872864.88
African	231345.48	72.3618	-14.0536	19.5990	2.6809	-38.5704	57.5717	303961.08
Asian	2682852.98	67.2509	-11.0117	31.4744	1.6621	-45.3733	66.7662	4172124.23
Oceania	68867.56	60.0014	-11.9531	29.3308	6.8679	-44.1360	76.1445	122407.65
Canadian	1297837.22	66.8750	-17.9718	4.2439	44.8281	-11.9566	11.1731	1761289.95
Afro.Amer.	16240183.36	86.9690	-20.5755	0.0423	5.4865	-0.1219	0.3274	13961513.47
Amer.Ind.	2964292.98	88.5640	-16.0882	0.0197	6.7838	-0.1633	0.4719	2700645.62
Oth Amer.	18266685.52	87.2009	-21.4254	0.9007	4.1616	-2.3547	6.6384	15365286.12

1990-2000 Change

Ethnicity	1990 Population	Survived	Died	Recent[2] Migrant	N_Born Residual	F_Born Emigrant	F_Born Residual	2000 Population
European	116746622.89	92.4174	-22.3113	0.7068	-8.7544	-1.2809	2.1686	86768252
Mexican	9008899.42	71.2609	-11.2733	14.4374	2.8644	-66.1326	95.0372	12821690
Hispanic	4638325.18	70.3997	-11.9710	14.8189	9.2350	-30.9234	54.5512	6621984
Caribean	1026991.45	64.4818	-10.8931	23.5896	2.5038	-38.3758	73.5014	1697205
Mid.East	1055934.10	73.4831	-13.7217	20.6520	4.3819	-27.6238	43.0481	1364844
African	374998.69	41.6725	-7.0485	10.8038	57.0971	-32.7304	74.4563	1164161
Asia	5264688.19	67.8925	-11.0457	23.2111	3.6085	-36.0089	62.5625	8073010
Oceania	159417.55	65.0603	-10.7674	17.7158	17.1408	-32.4291	56.7586	260918
Canadian	2022998.32	79.4898	-20.2930	4.1894	10.3915	-8.3483	14.5024	2031699
Afro.Amer.	18106908.39	86.4979	-20.4382	0.1264	6.5660	-0.2820	0.4214	15757909
Amer.Ind.	3464521.22	90.3403	-17.4997	0.0484	1.8197	-0.1284	-0.0215	2960684
Oth Amer.	18983350.23	58.5639	-14.5883	0.9248	68.2812	-1.6532	2.3713	32917338

1. All estimates are expressed as a percentage of the mid-decade population.
2. Recent Immigrant refers to foreign-born who arrived during the decade.