A DISTRIBUTIONAL ANALYSIS OF EARNINGS ASSIMILATION

OF IMMIGRANTS IN UNITED STATES: 1994-2008

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by
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ABSTRACT

In this study the author applied an entropy-based index to measuring earnings assimilation at the distributional level, for Hispanic and Asian immigrants in United States, by gender and nativity status. Besides, the author investigated the mechanism of earnings assimilation for these immigrant groups by examining the contributions to overall assimilation through assimilation in productivity-related characteristics and assimilation in returns to characteristics, using quantile regression and counterfactual analysis methods.

Analyzing earnings data from the Current Population Survey March Supplements from 1994 to 2008, the author tested competing assimilation models and perspectives. It is found that, overall, the Asian immigrants, the second and the third generation Hispanic immigrants are well assimilated. The majority of the first generation Hispanic men and women are yet to be fully assimilated both in productivity-related characteristics and in returns to characteristics. The foreign-born Asian men, being the exception among the Asian immigrants, deserve special attention, as their productivity-related characteristics are under-evaluated in the labor market.

Keyword: earnings, distribution, assimilation, immigration, entropy, counterfactual
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Chapter 1

Introduction

Immigration has become the determinant force that reshapes the demographic profile of United States. During the 1950s, “approximately 250 thousand legal immigrants were admitted to the United States every year” (Borjas 2007). By the 1990s, immigration speeded up with about one million new arrivals every year, in addition to a huge number of undocumented immigrants. In 2000, foreign-born immigrants contribute more than half of the population growth (Bean and Stevens 2003), and meanwhile they consist of 12% of the labor force in United States. The influx of immigrants has sparked a great body of literature which examines the labor market integration of immigrants, and debates perpetuate on issues such as how well immigrants are assimilated in the US labor market.

Using wages as the primary measure for labor market attainment, economists repetitively documented an empirical regularity, which was first noted by Chiswick (1978). That is, foreign-born immigrants, starting at a disadvantaged position, tend to enjoy a higher wage growth after arrival (Schultz 1998). In his seminal study, Chiswick analyzed data from the 1970 census and found that it takes about 15 years for white male immigrants to achieve similar earnings profiles to comparable native-born, and outperform the natives afterwards (Chiswick 1978). Although this does not occur uniformly to all immigrants with various ethnicity and country of origin, and cohorts are shown to experience different rates of assimilation (Schultz 1998; Borjas 1995), earnings
growth in general is associated with increasing length of residence in the destination, which resonates the assimilation theories developed along the side of sociological research.

Sociological investigation of immigrant assimilation in United States dates back to the 1930s when attentions of the Chicago school were devoted to studying the immigrant settlements in large metropolitan areas. Observations of the earlier European immigrants laid the ground for the classical assimilation model, under which assimilation is viewed as “a process of interpretation and fusion in which persons and groups acquire the memories, sentiments, and attitudes of other persons or groups, and, by sharing their experience and history, are incorporated with them in a common culture life” (Gordon, 1964: 62). Obviously, a temporal component is built in the overall assimilation process, including economic assimilation.

However, the classical assimilation model was contested with the reality that the “new immigrants” featured people from Asia, Latin America and other less developed countries. Their different cultures, beliefs, customs, and skin color, or “race,” add to the complexity of the assimilation process and raise the concern that the “new immigrants” might not be successfully assimilated just as the white European immigrants did. Previous studies have shown that the level of earnings assimilation among immigrants varies by country and global region of origin. The second generation of immigrants from Asia has attained earnings comparable to the native-born whites, while the labor market performance of the descendants of the immigrants from Latin America are less favorable. Especially Mexican immigrants, who make up the majority of the Hispanic immigrants, are characterized with below-average education, lower English language proficiency,
above-average fertility, and the relatively low economic return to education. Segmented assimilation theory, and the racial disadvantage model are thus intended to account for the diverging paths of labor market assimilation that different ethnic groups have taken.

It should be noted, that regardless of the various perspectives that different schools proposed to account for assimilation process, the influential empirical studies listed above all share a common analytic framework - the Mincer model (Mincer, 1974). With almost no exception, earnings are conceptualized as a linear function of a set of demographic characteristics such as age, experience, and the square of experience, education, nativity, ethnicity, as well as other traits perceived to be relevant. The regression coefficients indicate the relationship between the conditional mean of wages and the covariates. In particular, the coefficient of the nativity variable is interpreted as the differential in wages between the immigrants and the native-born (the reference group) and serves as the base to evaluate the assimilation progress of certain immigrant group. Moreover, interactions between nativity and certain covariates are sometimes added if there is a good reason to believe that the earnings return of these covariates varies by nativity. Therefore, the measure of assimilation is represented as an average difference in wages between some typical immigrants and natives, assuming they share similar economic returns to other characteristics.

A few problems arise in this analytic framework. First of all, by pooling the immigrants and natives together and running linear regressions, researchers conceptualize that the relationship between the covariates and labor market attainment for the immigrants and for the natives can be characterized in a similar linear function except the item of nativity. Secondly, the relationship detected on the conditional mean and the
covariates is inappropriately interpreted as holding for the whole sample and not restricted to the mean. For this reason, although one can let the effect of covariates vary across certain groups by adding interactions to address the first problem, the coefficients of interaction items can only inform us about what happens to the conditional mean, leaving the rest of the distribution untouched.

A more serious flaw of this analytical framework comes from the substantive challenges revealed in recent studies of immigrant assimilation. It has become more and more evident that immigrants to the US from different countries at different time are featured with different characteristics, which have a lot to do with their labor market performance after arrival. The changing composition of immigrants thus requires an analytic framework that goes beyond the previous efforts which impose strong assumptions of the homogenous labor market mechanisms among immigrants and natives. Moreover, with the heterogeneity among immigrants in both their characteristics and the earnings returns to these characteristics, conventional linear regression modeling of assimilation fails to separate assimilation in terms of characteristics from assimilation with respect to the returns. Thus, an analytic framework capable of measuring the overall level of assimilation and identifying the level of assimilation in traits and in premiums to traits is highly desired.

This dissertation is presented as an attempt to overcome the challenges to the analytic framework outlined above and thus to advance theoretical approaches in immigrant assimilation studies. A new analytic framework is developed with particular efforts to measuring and analyzing assimilation at a distributional level, in addition to
identifying the contributions to overall assimilation through assimilation in composition and in coefficients.

The first analytical chapter (Chapter 4) portrays the overall trends of immigrant assimilation in United States from 1994 to 2008, a period with rising earnings inequality and the arrival of a great number of new immigrants. In this chapter we compare the entire earnings distributions between the immigrants and the native whites (here defined as non-Hispanic whites born by American-born parents). Such comparisons are drawn for men and women separately, in which immigrant groups are classified according to race/ethnicity and nativity.

In the second analytical chapter (Chapter 5 we examine to what extent immigrant groups differ from native whites with respect to their productivity-related characteristics including years of education, years of experience, regions of residence, metropolitan residence, and marital status. Moreover, we run counterfactual analysis to obtain the hypothetical earnings distributions of immigrants under two scenarios: i) the immigrants are fully assimilated in terms of productivity-related characteristics; ii) the immigrants are fully assimilated in terms of labor market returns to their characteristics. The counterfactual analysis allows us to test the applicability of classical assimilation theory, segmented assimilation theory, and racial disadvantage model for understanding assimilation process at a distributional level, and also enables us to decompose the overall assimilation into contributions made through assimilation in characteristics and through assimilation in returns to characteristics. The analyses are guided by the research questions below.
Chapter 4:

1. What are the magnitude and trend of earnings assimilation measured at the distributional level for Hispanic immigrants in United States during the 1994 to 2008 period?

2. To what extent do the observed trends of assimilation for Hispanic immigrants vary by generation status and gender?

3. What are the trends in earnings assimilation for the Asian immigrants in United States during the same period?

Chapter 5:

1. For foreign-born Hispanic immigrants and the second and third generations, what are the contributions to the overall assimilation through assimilation in characteristics and assimilation in returns to characteristics, respectively?

2. Do the patterns of contribution through assimilation in characteristics and assimilation in returns of the Hispanic immigrants and decedents hold for Asian immigrants?

3. To what extent do the results support the classical assimilation theory, segmented assimilation theory, and radical disadvantage model for understanding the assimilation process at a distributional level?

These questions are addressed through analyses using the March Supplementary data from the Current Population Survey from 1994 to 2008. The main measure of
earnings assimilation is an entropy-based divergence index calculated on the basis of the earnings distribution of the natives and the immigrants. The analyses are conducted for men and women separately, for it is well known that labor market rewarding mechanism for women differs substantially from that for men.

The overall earnings assimilation is measured for the cross-sectional population at each time point. Quantile regression methods are utilized to capture the relationship between the outcome variable and the covariates across the earnings distribution. More details about the data and the methods are discussed in Chapter 3. In the next chapter I shall provide a theoretical framework for the analysis by reviewing previous studies on earnings assimilation and presenting research hypotheses. It is worth adding that although earnings are the focus of this study, the analytical framework can be applied to assimilation studies on other aspects with continuous outcomes.
Chapter 2

Background

What is assimilation?

The word assimilation is controversial to students of immigration. To some researchers assimilation bears a normative component that new immigrants are obliged to abandon traits and characteristics formed in their origin countries and adapt to the host society mainstream, voluntarily or involuntarily (White and Glick 2009). Thus assimilation sometimes is associated “with the narrowest understanding of Anglo conformity or the worst excesses of Americanization campaigns” (Brubaker 2001: 533). Regardless of the disagreement in the connotation of assimilation, there seems little doubt that movement of immigrants toward socioeconomic parity with the host society is desirable. In this study I use assimilation simply as an equivalent to the convergence in outcome variables among the groups under comparison. Moreover, following White and Glick (2009), I recognize that the assimilation process involves movement of both the host and new arrivals along multiple dimensions. That is, assimilation happens when the interested outcome of immigrants converges to that of the natives, or vice versa and I do not presuppose the direction of the movement. Along the multiple dimensions of assimilation outcomes, I shall focus on earnings, for economic attainments determine to a large extent one’s well-beings in other aspects.
**Earnings as a function of characteristics & returns to characteristics**

While wages have been for long time conceptualized as a product of traits and return to traits in the labor market by economists (e.g. Mincer 1974), to analyze earnings assimilation by “assimilation in traits” and “assimilation in returns” (defined below) has yet to become a standard approach in sociological inquiries. Let me first clarify a few terms being used in the following text. As a standard approach, wage (or other economic outcomes) is usually conceptualized as a product of traits and returns to traits, as expressed in the following equation:

\[ W = X \beta \]

where \( W = (X_1, X_2, X_3, \ldots, X_m) \) and \( \beta = (\beta_1, \beta_2, \beta_3, \ldots, \beta_m)' \)

Here \( W \) stands for wage, and \( X \) is a vector of characteristics of the respondents, such as age, education attainment, experience. The vector \( \beta \) represents the labor market returns to these characteristics, respectively. Each elements of \( \beta \) is sometimes called as the “premium” or “price” of the corresponding characteristics in the labor market.

Thus, to speak of the wage assimilation, we are talking about the convergence of the immigrants’ wage (denoted as \( W_I \)) to that of the natives (\( W_N \)). Conceptually, we could talk about the assimilation in traits and assimilation in returns to traits, which refers to the convergence in \( X \) (\( X_I \) VS \( X_N \)) and in \( \beta \) between the immigrants and the natives (\( \beta_I \) VS \( \beta_N \)). In what follows I shall argue that an analytic framework as such can be helpful for us to better understand earnings assimilation process.
The classical study of earnings assimilation utilizes cross-sectional data and associates the greater earnings of earlier immigrants with the longer length of residence and thus claimed to identify the effect of assimilation (Chiswick 1978). However, from the “declining cohort quality” argument we learn that characteristics of immigrants arriving at various time points can differ so that documented earnings differentials across immigrant cohorts may not necessarily reflect a result of assimilation. Instead it could only reflect a changing quality of immigrant cohorts. In particular, Borjas (1985) showed that immigrant cohort arriving during 1970-1980 experienced slower growth in wage than the earlier immigrant cohorts, which he explained as a result of declining quality of immigrant cohorts. Clearly, this study raises the issue of separating starting point from trajectory (White and Glick 2009). Viewing immigrant assimilation as a process with multiple cohorts of newcomers joining the “melting pot”, where the immigrants start or what characteristics they carry upon arrival no doubt condition the assimilation trajectories they are going to get through.

A question arises naturally following the recognition of the necessity of separating starting point and trajectory: what happened to the traits that immigrants are characterized with upon arrival during the followed-up trajectory? (I believe this question is the core of assimilation study.) If we classify these traits into the ascribed and the attained characteristics, it is possible that the attained characteristics would change over time during the assimilation process (even ascribed characteristics can change in rare case). For example, new immigrants may take advantage of the education resources in

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1 While ethnicity is usually viewed as a stable characteristics over time, studies show that economically successful minorities tend to identify themselves more with “native whites” (e.g. Duncan and Trejo 2005).
the receiving country and earn education credentials after arrival, which makes this person’s human capital profile more alike that of the natives and thus helps him/her to achieve higher earnings (Akresh 2007). Also, an immigrants landing in a metropolitan city with few opportunity for well-paid jobs may migrate to a high-tech triangle to benefit from the opportunities offered by the booming economy. That is, changing characteristics towards that of those who consist of the “mainstream” can be part of assimilation process, and I shall denote it as “assimilation in characteristics”.

Another component of assimilation deserves as much attention as assimilation in characteristics. That is, assimilation in returns to characteristics. By this term I refer to a convergence in returns to characteristics between immigrants and the natives. Take human capital as such a characteristic for illustration. An immigrant with comparable education to the natives may not enjoy same economic return in the labor market of destination for many reasons. But over time, it is possible that his/her education credential will get better recognized in the labor market so that an increase in returns to education will be observed. Once immigrants enjoy a comparable education return to that for natives, we would conclude that the labor market does not discriminate against the human capital of immigrants and that immigrants are well assimilated in terms of the returns to human capital. By the same token, if we observe that the education returns of the immigrants converge towards that for natives across generation, we would conclude a pattern of generational assimilation is observed.

Thinking of assimilation along the two dimensions – characteristics and returns to characteristics has implications for policies with respect to immigration and labor market
integration. While the large number of undocumented immigrants characterized with low skill has raised concerns in the public that these people and their descendants would have little chance to be assimilated into the “mainstream” (Bean & Stevens 2003), it remains unclear how fast they are assimilated into the “mainstream” with characteristics comparable to the natives and how well their characteristics are evaluated in the US labor market. By distinguishing assimilation in traits and assimilation in returns to traits, we are able to find out whether problems in assimilation (if any) are due to the inability of labor markets in fairly rewarding the characteristics of immigrants or a result of other barriers that prevent the immigrants to achieve characteristics comparable to the natives.

Also, economists have argued that “productivity gains from immigration are maximized when the immigrant population differs most from the native population and immigrants have skills that the native workforce lacks” (Borjas 2006: 56), which raises the issue that whether assimilation is desirable. However, this rhetoric can be confusing if not distinguishing assimilation in traits from assimilation in returns to traits. The productivity gains from immigration get maximized when the skills (characteristics) of immigrants supplement those of the native workers, which does not necessarily preclude immigrants from achieving a comparable earnings if their skills are rewarded appropriately. For earning is a product of skills and returns to skills. Simple as it may appear, failing to separate the two components when examining assimilation would get us trapped into meaningless debates. While the sociological literature in assimilation has not spoken to this issue explicitly, it is still worthwhile for us to review what the prevailing assimilation theories say implicitly before we endeavor further theory-building.
What does the literature say about earnings assimilation?

Represented in the early work of Robert Park (1926), Irving Child (1943), Oscar Handlin (1951) and Milton Gordon (1964), the straight-line assimilation model suggests that immigrants experience steady improvement in socioeconomic outcomes over time, within and across generations. It envisions “a process unfolding in a sequence of generational steps: each new generation represents on average a new stage of adjustment to the host society, that is, a further step away from ethnic ‘ground zero’, the community and ethnoculture established by the immigrants, and a step closer in a variety of ways to more complete assimilation” (Alba & Nee: 27). According to Gordon (1964), assimilation occurs through several stages along multiple dimensions. In his view, cultural assimilation (i.e. language acquisition) precedes structural assimilation and identification assimilation. Here structural assimilation refers to the entrance of an immigrant group into primary group relationships with the majority group through organizations, cliques, and institutions (including marriage, education institutions and labor market). Therefore we may derive that over time immigrants and the native converge both in terms of traits and with respect to returns to traits, within and across generation.

The straight-line assimilation theory was developed to account for the “melting pot” phenomena for the earlier European immigrants and has been criticized for being too optimistic about the integration of more recent immigrants. As Latin America and Asia replace Europe and become the primary sending areas for the current immigration, revisions to this classical model are attempted to incorporate the new reality. Segmented
assimilation theory is one of the new models developed to account for the socioeconomic assimilation process of the second and third generation of the post-1965 immigrants.

Segmented assimilation theory was developed in the 1990s when economic restructuring led to decreasing employment in manufacturing. Looking at the history of earlier European immigrants when low-skilled immigrants found jobs in manufacturing and moved upward along with the booming economy, scholars were concerned that the descendants of the post 1965 immigrants would have totally different life opportunities: they will either go to college, moving upward in the “hourglass” economy, or end up with low-skilled jobs that their parents hold. Moreover, as they grow up in US and get used to the entitlement of being American, they maybe look down upon the career of their parents so refuse to take their parents’ jobs. This would lead them to join the “underclass” (López and Stanton-Salazar 2001; Portes and Rumbaut 2001; Zhou 1997). Children of immigrants from Asia who came to US with extremely high human capital or social capital are predicted to join the mainstream within one generation, while kids of labor migrants especially the Mexicans would have experience “downward” assimilation. Segmented assimilation theory thus implies diverging paths of assimilation: depending on their own characteristics, and available support from their ethnic community, and the context of reception upon arrival, different immigrant groups can have different trajectories of assimilation. It can be inferred that according to this perspective, downward assimilation is resulted from the failure of immigrants to be assimilated with traits comparable to the natives. This framework, imprinted with a pessimistic tongue on
the fate of new immigrants, does not answer directly to the issue whether immigrants
become assimilated in the returns to characteristics over time.

The racial/ethnic disadvantage model argues that increasing knowledge of the
English language and longer length of residence in the receiving country does not
necessarily lead to economic assimilation, due to barriers set to obstacle the upper
mobility of the ethnic minority groups (Glazer and Moynihan 1963). This perspective
holds that the host society is highly stratified according to race and ethnicity and thus the
earnings differentials associated with nativity is just a reflection of the ethnic inequality
in earnings. Moreover, racial discrimination and the disadvantages it bears will be passed
onto the second and third generation; this together with the growing awareness of
discrimination will undermine their motivation to move upward (Bean & Stevens: 99)

Under this framework we can hypothesize that although immigrant minorities may
experience assimilation in traits, they can only claim smaller returns to traits than the
natives.

Ideal types

Overall, assimilation theories outlined above can be summarized into three ideal types:

a. Straight-line assimilation suggests assimilation in traits along with
   assimilation in returns to traits, which is shared by the upward assimilation
   trajectory of the segmented assimilation theory
b. The downward assimilation version of segmented assimilation model
   implies dissimilation in traits with assimilation/under-assimilation in
   returns
c. Racial disadvantage model predicts assimilation in traits with dissimilation in returns to traits

<table>
<thead>
<tr>
<th>Assimilation in characteristics</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assimilation in returns to characteristics</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Downward assimilation</td>
<td>?</td>
<td>Straight-line assimilation; upward assimilation</td>
</tr>
</tbody>
</table>

**Table 2.1 Assimilation models I**

All of the models are built with an assumption that assimilation process implies that immigrants will become more like natives – however this may not necessarily be true. Assimilation, or convergence in the interested outcome between immigrants and natives, can occur when the natives move towards the immigrants as well. This is not impossible, especially during a time of economic restructuring.

It is well documented that income inequality in the US (as well as in other OECD countries) has been rising since the 1970s. An appealing explanation for the rising inequality is the skill-biased technological change argument (SBTC). Under the SBTC framework, computerization has substituted for routine tasks and managed to complement the non-routine tasks, which increases the demand and price for non-routine labor and depresses the wage for routine labor (Autor, Levy and Murnane 2003: 2-3). As a result, traditionally routine-task-intensive industries should undergo rapid
computerization to replace the routine labor, which is supported with empirical evidence. Because the non-routine labor includes both analytic and interactive tasks such as medical diagnosis and legal writing (high-skilled) and manual tasks such as janitorial services and truck driving (low-skilled), both the higher and the lower ends of the labor market are expect to expand.

Following the SBTC model we would expect to see the booming of the higher end and lower end of skill distributions of labor. Accordingly, some of the former middle class will move into the upper part of the labor market with a significant share of their peers moving downward. Along with the labor market polarization, today’s immigrants are exactly characterized with a bimodal distribution of skills. Newcomers from Asia tend to be dominated with high-skilled workers, while relatively few of the immigrants from Mexico and Latin America have a college degree. While natives who experience downward mobility may feel reluctant to take low-skilled jobs because of the stigma attached, low-skilled immigrants would perceive them as great opportunities to make ends meet. Moreover, newcomers are usually hired to supplement the native workers. It is shown that high-skilled immigrants are not necessarily subject to lower return to education when they are hired as flexible workers rather than cheap labor in the higher end of the labor market (Reichl 2009). Thus it is likely to observe that the natives who move downward may experience equal or even lower earning returns to their characteristics than for comparable immigrants. In a word, a fourth alternative type of assimilation may exist – that is, immigrants can be assimilated in returns to characteristics while experience little assimilation in characteristics. We shall call this
alternative as the “new mode of assimilation”, the fourth ideal type that now we can fill in the lower-left quadrant of Table 2. 1.

<table>
<thead>
<tr>
<th>Assimilation in characteristics</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assimilation in returns to characteristics</td>
<td>Low</td>
<td>Downward assimilation</td>
</tr>
<tr>
<td></td>
<td>Racial disadvantage model</td>
<td></td>
</tr>
<tr>
<td></td>
<td>New mode of assimilation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Straight-line assimilation; upward assimilation</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. 2 Assimilation models II

So far I have demonstrated: a) it is necessary to separate starting point of immigrants from the assimilation trajectory; b) the starting point refers to characteristics of immigrants upon arrival and the assimilation trajectory can follow one of the four ideal types. It should go without saying that the ideal types serve the purpose of conceptualization and in reality what we observe on immigrant assimilation might well be a mixture of them. An overview of the previous empirical studies on economic assimilation would be informative for us to develop a systematic study to test these models.
Empirical evidence

With respect to the overall earnings assimilation within generation, Borjas concluded that “the typical immigrant worker in the United States suffers a sizable earnings disadvantage (relative to native-born workers) upon arrival, and it is unlikely that this disadvantage disappears during the immigrant’s working life” (Borjas, 2006: 5). As shown in the following table, new immigrants in general earn less than the natives. Although immigrants do experience faster wage growth after arrival (Chiswick 1978; Lubotsky 2007: 864), immigrants from less developed countries hardly reach economic parity with comparable native-born counterparts (with Asian immigrants being exception, among whom it takes about 6-11 years to reach parity). In particular, the overall earnings assimilation is “considerably slower for Hispanic immigrants (predominately Mexican) than for other immigrants” (Duncan and Trejo 2009: 7).

<table>
<thead>
<tr>
<th>Year</th>
<th>Difference in wage between new immigrants and natives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>11%</td>
</tr>
<tr>
<td>1970</td>
<td>18%</td>
</tr>
<tr>
<td>1990</td>
<td>31%</td>
</tr>
</tbody>
</table>

Note: natives here refer to all native-born regardless of race and ethnicity. Source: Borjas and Friedberg 2007:5.

Table 2.3 Wage gap between new immigrants and natives

This earnings discrepancy is partly due to immigrants’ relatively low education attainment compared to the native population. Although the average education of immigrants did increase from 10.2 year in 1990 to 10.9 year in 2000, the education gap
grows as a result of faster increases in years of schooling among the non-Hispanic whites during the same period.

It is worth to note that after adjusted for age and education, foreign-born male immigrants still experience about 10% deficit in wage compared to those born by US-born parents (Table 1 in Borjas 2006). Earnings aggregated by ethnicity and education show that the wage disparity varies along with the level of education attainment from 1979 to 1998 (Bean and Stevens 2003). Measured with average earnings, in 1979 Latino men with college education earn about 19% less than comparable non-Hispanic Whites and for Asian men with college degree the differential is 9%. This wage gap widened through to 1989 for both Latinos and Asian men; only Hispanic men witnessed a convergence in earnings in the decade after. A similar trend of a widening wage gap occurred among Asian and Hispanic high school degree holders from 1979 to 1998, although Asian men who lacked a high school degree enjoyed about a 14% gain during the last ten years and similarly educated Latino men about 2%.

Earnings returns to education tend to be lower for immigrants than for native-born whites, a phenomenon frequently observed in countries with significant immigrant populations (for example, see Table 2.4). So far there is lack of consensus on the cause of the “discounted” human capital of immigrants; however, the failure of immigrants to reach parity with comparable natives in terms of returns to education does suggest that the assimilation process is a long way ahead for them to fully realize their human capital in the labor market of the host society.
Table 2.4 Earnings returns to education by nativity (in percentage)

The huge debate centering the economic assimilation of immigrants is on the generational assimilation. In particular, the literature focuses on the Hispanic population as the Asian immigrants are perceived as the model minority. Analyzing data from U.S. censuses and the Current Population Survey, Smith (2003) shows that the education deficit of Hispanic/Mexican men relative to native white men converges over generations. While first generation Hispanic/Mexican men born between 1920 to 1924 on average have about a 2.4 years education deficit, their grandchildren, presumably born between 1970 to 1974, have made such a great progress that their average year of schooling is only 0.7 less than the native white male average (Smith 2003). Similar patterns holds for the wage gap between the Hispanic/Mexican and the native whites except for the third generation. Mexican immigrants born during 1915-1919 earn about 30% less than the native white men, and this earnings gap is reduced to 18% and 15% among the second and the third generations, respectively. As the earnings gap is largely

<table>
<thead>
<tr>
<th>Year</th>
<th>Immigrants</th>
<th>Native-borne</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>1970</td>
<td>5.7</td>
</tr>
<tr>
<td>Canada</td>
<td>1971</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>1981</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>1986</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Note: The percentages indicate to what extent the earnings would increase if one has an additional year of education, for immigrants and natives respectively.
Source: Chiswick and Miller, 2008: 1318.
due to their relatively low education attainment, adjusting for the schooling deficits would further shrink the earnings gap.

Trejo (1997) is among the very few studies which investigate earnings assimilation by examining the similarity between the immigrant groups and the native whites in characteristics and in returns to characteristics. Analyzing earnings data in 1979 and 1989, he found that most of the earnings deficits of Mexican foreign-born as well as the second-generation immigrants are largely attributed to their low level of human capital (Trejo 1997: 1257). Using the Blinder-Oaxaca decomposition technique, he shows that in 1979 about 84% of the earnings differential between the third-generation Mexican and the third-generation white men is due to differing characteristics such as education, English proficiency, and experience. Similarly, about 75% of the wage gap between the two groups is due to the differences in characteristics in 1989 (Trejo 1997: 1256). The declining share of the contribution of convergence in characteristics within the overall earnings assimilation calls for more attentions to the returns to characteristics. Nonetheless, built on the linear regression model, findings from this decomposition approach only informs us about the “average” effect, and little is known about the rest of the distribution.

While these findings suggest an optimistic, straight-line assimilation trajectory across generations, it is worth noting that the third generation of Mexican immigrants coming to United States long time ago does not consist of the majority of the Mexican ethnic group in United States today (show some numbers). What lies in the heart of the debate on immigrant economic assimilation, is the offspring of post-1965 Hispanic
immigrants, a group characterized with below-average education and confronted with a period of economic restructuring. This is the time when manufacturing moved abroad and service sector began to dominate the U.S. economy. While it was manufacturing that recruited a large number of blue-collar workers and offered decent earnings and benefits which facilitated the assimilation of the earlier European immigrants, the polarized service economy leaves it unclear whether low-skilled Hispanic immigrants can catch up with their native white peers (Waldinger 2007).

It becomes possible now to examine the assimilation trajectory across generations as the offspring of the post-1965 immigrants march into the labor market. Compared to the third-and-above generation white men, the second and third-plus generation Hispanics and Mexicans have about one year schooling deficit (Bean & Stevens 2003: 136-7). Besides, the wage disparity between the Mexican and the third-plus generation whites is prevailing for all levels of education attainment (Bean & Stevens 2003: 139). Moreover, the third-and-above generation Mexicans tend to experience even greater earnings differentials than the second-generation counterparts, which resonates the downward assimilation trajectory as predicted in the segmented assimilation model2.

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2 This is very much debatable since other researchers have found evidence for a more optimistic vision of the future of the second and third generation Mexicans. Measured with labor market outcomes such as employment and working hours, Waldinger and his colleagues shows that second and third generation Mexican men of working age have about as equal chance to be employed as the native whites (3rd generation), although they do work fewer weeks than the third-generation native whites, controlling for education, experience and other relevant characteristics (Waldinger, Lim and Cort 2007: 20-22). Besides, second- and third-generation Mexican men are more likely than the native whites to work in the low-wage jobs, and less likely to work for large organizations. The authors attribute these disadvantages to the education deficits of the second and the third generation (Waldinger, Lim and Cort 2007: 25-27).
Contributions

Clearly, a consensus on the assimilation pattern of the immigrants has yet to emerge. Moreover, few studies have analyzed assimilation by examining both the convergence in characteristics and that in returns to characteristics. As I demonstrated earlier, conceptualizing assimilation through these two dimensions would allow us to develop an overarching framework, which synthesizes the existing assimilation theories and allow further testing of hypotheses.

While some studies do touch upon traits versus treatment (e.g., Trejo 1997; Waldinger et al 2007: 30), methodologically the analytical framework employed in these studies fails to capture the effect of characteristics and the effect of premiums of characteristics appropriately. I offer a thorough explanation of this issue in Chapter 3. Briefly, models common in this type of research usually evaluate both the characteristics and the returns to characteristics by looking at the mean and the conditional mean, which may conceal the dynamics of assimilation as immigrants nowadays are polarized in terms of skill as well as some job-related traits. In fact, the mean comparison is sufficient only if the distributions of interested variable for the groups under comparison do not change over the time period being studied (DiNardo and Butcher 2002). If the wage structure widens, even without a change in the relative characteristics of immigrants to that of the natives, we will see widening gap between them (see LaLonde and Topel 1992).

It is also commonly seen in the assimilation literature that immigrants and native whites are pooled together with a dummy variable indicating their immigration status, where the returns to other characteristics are compulsorily forced to be invariant by
immigration status—an assumption too strong in the context of immigration study. Even with interaction items that allow the effect of covariates to differ between groups, again the interactions capture the “average” difference and thus are subject to the limitations discussed above.

Finally, without an appropriate decomposition, no valid conclusion can be drawn with respect to what matters more for immigrant groups in order for achieve economic parity with the native whites population. For example, in Trejo (1997) the wage differentials for Mexican immigrants are calculated by taking the difference between the average wage of the Mexican and the average wage of the native whites. These average earnings correspond to those who happen to have “average” characteristics, thus comparisons based on the means are reduced to comparisons of a given point in the Mexican’s earnings distribution and in the native white’s earnings distribution. While the prevalence of the mean-comparison approach is understandable given the canonical status of point estimates in statistical methods, it is by no means sufficient from a public policy perspective because assimilation studies serve the ground for immigration policy-making and it is the majority of the population that is of greatest concern and determines the efficacy of policy implementation.

For the reasons outlined above, studies which did utilize the conventional decomposition techniques to evaluate the contribution of assimilation in characteristics and in returns to characteristics are subject to similar restrictions, as the decomposition is based on results from regression models that focus on conditional means.
The major theoretical models outlined earlier on serve the core of this dissertation. Moreover, the ethnic and gender aspects will be incorporated into the ideal types to develop research questions that guide the empirical analysis. Specifically, I shall explore the ethnic varieties with respect to the modes of assimilation by testing the four models for Hispanic and Asian immigrant men and women separately.\footnote{Although Asian immigrants in general achieve at least comparable education to native whites, they are reported to earn less than native whites with similar level of education (see Hirschman and Wong 1981). Besides, previous study shows they are more likely to experience job mismatch and underemployment (Gordon and Mamdamba 2001). Zeng and Xie (2004) further examined the place of education and found no earnings difference across U.S.-born whites, U.S.-born Asian Americans, and U.S.-educated Asian immigrants. According to them, the discounted education returns among the Asian immigrants is largely due to the foreign-education Asians who make about 16% less earnings than native whites with same schooling. Those studies suggest different patterns of assimilation of the Asian immigrants from those of the Hispanic immigrants, thus it is worthwhile to examine how human capital of the Asian immigrants and other job-related characteristics are evaluated in the U.S. labor market across generation compared to the native whites.}
Chapter 3

Methods and Data

A huge body of literature has been devoted to understanding the earnings assimilation of immigrants in the United States (e.g. Chiswick 1978; Borjas 1985; Borjas 1995; LaLonde and Topel 1992; Lubotsky 2007). A common feature of these studies is that they largely focus on the individual trajectory of wage growth, and earnings assimilation is evaluated with the difference in the average relative wage for one immigrant arrival cohort at two time points after adjusting for productivity-related covariates. In this chapter I shall discuss the limitations of this kind of analytic framework and offer a new analytic approach for studying earnings assimilation. I will show that: a) it is insufficient for us to understand immigrant assimilation by focusing on the earnings trajectory at the individual level; b) the mean-comparison approach may fail to capture the nature of immigrant assimilation at the societal level; c) an analytic framework that measures assimilation at the societal level while also taking into account individual characteristics would complement the individual, mean-comparison approach and would yield a better understanding of assimilation.

Critiques on the standard analytic framework for earnings assimilation

To facilitate my discussion, let me begin with the very basic question with respect to earnings assimilation: to what extent are immigrants in the U.S. assimilated to the native
population in terms of earnings? I believe this is the core question of the economic assimilation literature and I shall discuss it both descriptively and analytically.

Previous studies very often measure earnings assimilation descriptively by comparing the average wage of immigrants (\( \bar{W}_I \)) and that of the native (\( \bar{W}_N \)). The extent of assimilation is reflected either through the wage ratio (\( \frac{\bar{W}_I}{\bar{W}_N} \)) or the wage gap (\( \frac{\bar{W}_I - \bar{W}_N}{\bar{W}_N} \)). When the wage ratio equals to one, or the wage gap is zero, it is believed that immigrants have achieved economic parity with the native and therefore they are well assimilated.

However, the average earnings only represents a single point at the earnings distribution, thus focusing only on the mean may fail to capture the earnings differences between the two groups at the rest of their earnings distributions, especially when the groups under comparisons are characterized with different earnings distributions.

In Figure 3. 1 I give an example to show why the mean-comparison approach is insufficient to summarize the extent of assimilation, statically. Assume the bell-shape solid curve gives the earnings distribution of group A and the bi-modal curve represents the earnings distribution of group B. Both of the two groups have exact the same average earning; however, it is unlikely that we would conclude group B is well assimilated into A, given their distinct wage structures.

---

While many econometrical studies on earnings assimilation use the native-born as the reference group, I shall follow Bean and Stevens (2003) and have third-and-above generation whites as the reference group.
Figure 3. 1 Different earnings structures with the same average earnings I

The mean-comparison approach may fail to capture the dynamics of assimilation as well. Imagining the two modes of the curve for group B are moving away from the origin (0,0), that is, group B is getting more and more polarized, economically speaking (see Figure 3.2). Again it is unlikely we would think that group B is still well assimilated into group A to the same extent, although the two groups do have identical average earnings. Therefore, the mean-comparison approach can only give us some sense about the difference between the two groups at a single point, but this fails to inform us about the full range of outcomes among immigrants as compared to the native population.
Now we see that the difference in the average earnings between immigrants and the native population only describes partially the extent of assimilation, as it is limited to a single point of the earnings distribution. I shall also note that it is also insufficient to capture assimilation by comparing the variances out of the same logic. While variance captures the extent of dispersion in earnings, it does not speak to the relative positions the members of a given group are taking in regards to another group. However, as the word “assimilation” denotes a process of convergence between immigrants and the native population, we should expect that perfectly-assimilated immigrants would have same earnings structure (characterized by the earnings distribution) as that of natives. Any mean-based measure would thus be insufficient to summarize assimilation as long as it does not reflect the relative positions the immigrants have achieved as compared with the native population across the earnings distribution.
So far I have discussed the limits of the mean-comparison approach in describing assimilation. Now let me proceed to the standard approach to analyze assimilation. The standard analytic framework models the earnings of immigrants as a linear function of productivity-related characteristics and the time effect, an arrival cohort effect and a period effect (e.g. Borjas 1995; Antecol, Kuhn and Trejo 2006). The wage of immigrant person $j$, denoted as $w_{ij}$, is determined by a vector of socioeconomic and demographic characteristics ($X$), and age ($A$), the length of residence measured in continuous years ($y_j$), a vector of dummy variables indicating the calendar year in which the migration occurred ($C$), as well as the dummy variables to take into account the period effect.

$$\log w_{ij} = X_j \phi_i + \delta_i A_j + ay_j + \sum \beta_i C_i + \gamma_i^0 \pi_j^0 + \gamma_i^1 \pi_j^1 + \varepsilon_{ij} \quad (1)$$

The earnings of the native-born then is given by

$$\log w_{nl} = X_n \phi_i + \delta_n A_i + \gamma_n^0 \pi_i^0 + \gamma_n^1 \pi_i^1 + \varepsilon_{nl} \quad (2)$$

In this model the returns to socioeconomic and demographic characteristics are allowed to vary by immigration status, whereas the period effects are set to be equal for immigrants and the native in order to make the model identifiable. Conventionally, the coefficient of the duration variable is considered to measure the effects of earnings assimilation of the immigrants\(^5\). Moreover, the relative earnings growth made by a given

---

\(^5\) Although this seems to be the standard approach among the sociological investigations on earnings assimilation, economists have not reached a consensus in the measure for earnings assimilation. For example, Borjas (1985) use the difference in the relative earnings of a given arrival cohort $k$ (relative to natives with similar characteristics) between 1980 and 1970 to measure the rate at which the earnings profiles of that immigrant cohort and natives are converging. Later on, he made the point that the age-earnings profiles of immigrants and natives converge if $\delta_i + \alpha > \delta_n$ (Borjas 1995: 217). Therefore, whether to use $\alpha$ or $\delta_i + \alpha - \delta_n$ as the measure for the effects of assimilation on earnings largely depends on personal choices.
arrival cohort over the period of observation is often calculated to reflect how much assimilation this group has achieved during that period of time (e.g. Borjas 1985).

Such a framework is not free from the limitations that I have discussed for the descriptive mean-comparison approach. As we have seen in most of the previous studies, the coefficient of the duration variable $a$ is taken as an estimate for the assimilation effects on earnings. In another word, this coefficient indicates how much more earnings on average an immigrant could make by living in the United States for another one year. This again falls into the mean-comparison approach, as we are comparing the mean earnings of immigrants who have identical traits along other dimensions but only differ in the length of residence by one year.

Moreover, studies of this kind usually evaluate assimilation for arrival cohorts by plotting the average traits of immigrants at time 1 and time 0 into the earnings functions for the immigrants and the native and calculate the difference $\left( \hat{w}_{iX_1} - \hat{w}_{nX_1} \right) - \left( \hat{w}_{iX_0} - \hat{w}_{nX_0} \right)$. This is often explained as the average wage growth for an arrival cohort due to assimilation. The difference in covariates between the immigrants and the native is adjusted by comparing immigrants with observationally identical native persons. Again this is a mean-comparison approach as the estimated regression equations only provide “a grand summary for the averages of the distributions corresponding to the set of covariates” (Mosteller and Tukey, 1977).

In addition, the regression coefficients are estimated on the basis of observations for immigrants and the native at different time points. While these coefficients can be taken as the average “prices” of corresponding productivity-related characteristics, they are
unable to reflect the changes in the composition of covariates for a given immigrant
cohort during a certain period, a component of the assimilation process too important to
omit. Evaluating the wage growth by plotting the traits of “the average immigrant” would
not help much either, for the same reason that the mean-comparison approach misses a
great deal of information at the rest of the distribution. Thus focusing only on the
regression coefficients we lose insights of the changing profiles of immigrants and the
natives and will not be able to appreciate assimilation in characteristics.

Last but not least important, this framework assumes that the returns to characteristics for
a certain immigrant cohort in a given year \( t \) only change by a constant \( (\gamma^1_i - \gamma^0_i) \), and so
do the native-born. This might be not realistic, as the literature of income inequality has
documented a rising return to high skill workers with a decline in returns to the low-
skilled. Instead of assuming the returns to characteristics only changes at a constant rate,
we should let the period indicator interact with the characteristics and test whether such
an assumption is acceptable.

So far I have discussed the major flaws of the standard analytic framework for earnings
assimilation: a) the mean-comparison approach is insufficient to capture assimilation at
the distributional level; b) linear regression modeling only characterizes the relationship
between the covariates and the outcome variable on average, and does not address how
the outcome variable responds to the covariates at the distribution level; c) focusing only
on the regression coefficients misses the changes in characteristics at large, which is an
important component of assimilation process that should not be neglected.
A new framework to analyze assimilation

In this section I shall propose a new analytic framework for examining earnings assimilation that addresses the problems built in the standard framework. I shall start with the descriptive measure and then move to the analytic part. Although this framework is intended for analyzing earnings, it can also be applied to any kind of assimilation study as long as the outcome variable is continuous.

The descriptive measure

By now we have come to understand that any kind of mean-comparison approach is insufficient to describe assimilation at a distributional level. Having a long tradition of utilizing quantile statistics to analyze the income distribution, economists have made some progress in this pursuit and their work sheds some lights on the distributional analysis of earnings assimilation.

Borjas developed a distributional approach to compare the earning structure of the immigrants and that of the native population (Borjas 1995c). He looked at the earnings distribution of the native and divided it into ten intervals along the deciles:

\[(0, D_1^N],(D_1^N, D_2^N],..., (D_9^N, D_{10}^N],\]

where \(D_i^N\) satisfies

\[\int_{D_{i-1}^N}^{D_i^N} f_N(x)dx = 0.1.\]

Then he speculated that if the immigrants share similar earnings structure with the natives, we should be able to observe about 10% of immigrants have earnings belonging to the first interval, and 10% of the immigrants report their earnings falling in the second interval, and so forth. If, for example, 20% of the immigrants are found in the first
interval \((0, D_i]\), and only 1% of the immigrants are in the last interval \((D_9, D_{10}]\), we can conclude that immigrants are overrepresented at the bottom of the earnings distribution and under-representative at the high end along the economical ladder.

The measure I shall propose in the following for describing assimilation shares the intuition of Borjas’s approach. That is, if the earnings distribution of the immigrants is identical to that of the native, the probability that an immigrant belongs to a certain earnings interval \((D_i, D_{i+1}]\) is equivalent to that for a native person.

This can be written as

\[
\Pr(w_i \in (D_i, D_{i+1}]) = \Pr(w_n \in (D_i, D_{i+1}]) = 0.1 \ldots (3)
\]

Because

\[
\Pr(w_i \in [D_i, D_{i+1})) = \int_{D_i}^{D_{i+1}} f_i(x)dx
\]

and

\[
\Pr(w_n \in [D_i, D_{i+1})) = \int_{D_i}^{D_{i+1}} f_N(x)dx,
\]

(3) is equivalent to

\[
\int_{D_i}^{D_{i+1}} f_i(x)dx = \int_{D_i}^{D_{i+1}} f_N(x)dx = 0.1 (4)
\]

Now instead of dividing the earnings distribution of the native into ten intervals, let us imagine that we have infinite number of intervals \((a_i, a_{i+1}]\) \((i = 1, 2, \ldots n, n \to \infty)\). Since every interval is so short, we can approximately think the probability that an immigrant belongs to the earnings interval \((a_i, a_{i+1}]\) is

\[
f_i(x_i) \cdot (a_{i+1} - a_i)
\]

and that for an native person is given by

\[
f_N(x_i) \cdot (a_{i+1} - a_i), \text{ where } x_i \in (a_i, a_{i+1}].
\]

Then the odds ratio that an immigrant belongs into a certain earnings interval \((a_i, a_{i+1}]\) versus a native person is given by
When the immigrants and the native have identical earnings distribution, we have

\[
\frac{f_i(x_i)}{f_N(x_i)} = 1, \text{ for any } i = 1, 2, \ldots, n, n \to \infty .
\]

This is equivalent to

\[
\frac{2 \cdot f_i(x_i)}{f_N(x_i) + f_i(x_i)} = 1, \text{ for any } i = 1, 2, \ldots, n, n \to \infty .
\]

Therefore, a good measure for earnings assimilation should be able to summarize where the immigrants are assimilated into the native \((\frac{2 \cdot f_i(x_i)}{f_N(x_i) + f_i(x_i)} = 1)\) and where the immigrants are unassimilated with the native population in terms of earnings \((\frac{2 \cdot f_i(x_i)}{f_N(x_i) + f_i(x_i)} \neq 1)\). So we take natural log of the odds ratio, to make it zero where immigrants and natives share an identical earnings structure, and non-zero where their earnings structures differ. Moreover, the earnings are not uniformly distributed (except under some extreme circumstances, say absolute egalitarian society), so we would also want to weigh the odds ratios by the probability to observe such amount of earnings among the immigrant population, that is, \(\log \left( \frac{2 \cdot f_i(x_i)}{f_N(x_i) + f_i(x_i)} \cdot f_i(x_i)dx \right)\) (here \(dx\) is the width of the earnings interval \((a_i, a_{i+1}]\)). Note that \(\log \left( \frac{2 \cdot f_i(x_i)}{f_N(x_i) + f_i(x_i)} \cdot f_i(x_i)dx \right)\) is sensitive to the choice of reference group – if we use the immigrants as reference group, it becomes \(\log \left( \frac{2 \cdot f_N(x_i)}{f_i(x_i) + f_N(x_i)} \cdot f_N(x_i)dx \right)\), which is not equal to \(\log \left( \frac{2 \cdot f_i(x_i)}{f_N(x_i) + f_i(x_i)} \cdot f_i(x_i)dx \right)\). A solution to this is to sum the two so it would be neutral.

\[\text{6 The advantage of taking this form will be discussed later.}\]
to the choice of reference group. Finally we summarize all products over the entire earnings distribution, and come up with a summary measure for assimilation:

$$\sum_{i=1}^{\infty} \left[ \log \left( \frac{2 \cdot f_N(x_i)}{f_i(x_i) + f_N(x_i)} \right) \cdot f_N(x_i) \ dx + \log \left( \frac{2 \cdot f_i(x_i)}{f_N(x_i) + f_i(x_i)} \right) \cdot f_i(x_i) \ dx \right] .$$

This can also be noted continuously,

$$\int_{-\infty}^{\infty} \log \left( \frac{2 \cdot f_N(x_i)}{f_i(x_i) + f_N(x_i)} \right) \cdot f_N(x_i) \ dx + \int_{-\infty}^{\infty} \log \left( \frac{2 \cdot f_i(x_i)}{f_N(x_i) + f_i(x_i)} \right) \cdot f_i(x_i) \ dx \quad (5)$$

If we multiply (5) by ½, it becomes the Jensen-Shannon Divergence measure. It is both symmetric and equal to zero if and only if the two distributions are identical. However, a serious flaw of using Jensen-Shannon divergence as measures for assimilation is that it does not satisfy the triangle inequality. Fortunately (5) is non-negative, and its square root happens to be truly a metric (Endres and Schindelin 2003). I shall denote

$$AI(f_N : f_i) = \sqrt{\frac{1}{2} \left\{ \int_{-\infty}^{\infty} \log \left( \frac{2 \cdot f_N(x_i)}{f_i(x_i) + f_N(x_i)} \right) \cdot f_N(x_i) \ dx + \int_{-\infty}^{\infty} \log \left( \frac{2 \cdot f_i(x_i)}{f_N(x_i) + f_i(x_i)} \right) \cdot f_i(x_i) \ dx \right\} .}$$

AI is the short for “assimilation index”. This measure is related to the Kullback-Leibler divergence and has the following properties: a) it is non-negative, and scores zero if and only if the two distributions under comparison are identical; b) a larger value of the assimilation index “represents an increasingly dissimilar pair of distributions” (Edwards & Tuljapurkar 2005 PDR), thus informative to detect the extent of assimilation (with the maximum value of one); c) it is invariant to all monotonic transformations of the original measurement scale (Handcock and Morrison 1998).
Analytical framework

In this section I shall develop an analytical framework consistent with the descriptive measure I proposed above. For the reasons I discussed in Chapter II, investigations of earnings assimilation should examine both assimilation in characteristics and assimilation in returns to characteristics. Among the few studies which take this perspective, Trejo analyzed the earnings data by employing the Oaxaca-Blinder decomposition technique (Trejo 1997) for Mexican Americans. He found that among the third and above generation, Mexican American earn about 21 percent less than the native-born white and more than 75% of the wage gap can be attributed to their young age, lower education attainment and English language deficiency. The analytic framework I shall propose here can be seen as an extended version of the conventional decomposition framework.

So far I have demonstrated that the mean (or conditional mean)-comparison approach is not able to fully capture the differences between the earnings distribution of the immigrants and that of the native population. Also coefficients estimated from linear regression models only offer a grand summary for the averages of the distributions corresponding to the set of covariates, and are unable to inform us with important information with respect to the rest of the distribution. These shortages would therefore pass onto the conventional decomposition technique, as the decomposition technique is largely built upon the linear regression model. I shall illustrate this point as follows.

Let me start with a simple situation where we only have one covariate. We estimate this model for immigrants and for natives separately.

\[ y_{ij} = \alpha_i + \beta_j \cdot x_{ij} \]
\[ y_{nk} = \alpha_n + \beta_n \cdot x_{nk} \]
We can estimate the regression coefficients by minimizing a sum of squares function

\[ S_i = \sum_{j=1}^{l} (y_{ij} - \alpha_i - \beta_i x_{ij})^2 \]  and \[ S_n = \sum_{k=1}^{m} (y_{nk} - \alpha_n - \beta_n x_{nk})^2. \]  We denote the estimated coefficients as \( \hat{\alpha}_i, \hat{\alpha}_n, \hat{\beta}_i \) and \( \hat{\beta}_n \).

The conventional decomposition technique involves the following steps: a) using linear regression model we can obtain a set of estimated coefficients – the estimated linear regression equations are two straight lines which cross the mean of the outcome variable and the mean of the covariate, respectively.

\[
\bar{y}_i = \hat{\alpha}_i + \hat{\beta}_i \cdot \bar{x}_i \\
\bar{y}_n = \hat{\alpha}_n + \hat{\beta}_n \cdot \bar{x}_n
\]

b) It follows that

\[
\bar{y}_i - \bar{y}_n = \hat{\alpha}_i - \hat{\alpha}_n + \hat{\beta}_i \cdot \bar{x}_i - \hat{\beta}_n \cdot \bar{x}_n = \hat{\alpha}_i - \hat{\alpha}_n + \hat{\beta}_i \cdot \bar{x}_i - \hat{\beta}_n \cdot \bar{x}_n = (\hat{\alpha}_i - \hat{\alpha}_n) + \hat{\beta}_i \cdot (\bar{x}_i - \bar{x}_n) + (\hat{\beta}_i - \hat{\beta}_n) \bar{x}_n
\]

That is, the difference in the mean score of the outcome variable for the two groups can be decomposed into the difference in the intercepts \( (\hat{\alpha}_i - \hat{\alpha}_n) \), the difference in the average score of the covariates \( (\bar{x}_i - \bar{x}_n) \), and the difference in the coefficients \( (\hat{\beta}_i - \hat{\beta}_n) \). Clearly, as the linear regression model only characterizes the relationship between the covariate and the outcome variable at the mean, the Oaxaca-Blinder decomposition fails to disentangle the changes in compositions/effects/residuals at the distributional level. Any conclusions based on this framework would thus give us a partial account for earnings assimilation.
Fortunately, recent developments in quantile regression techniques make it possible to analyze earnings assimilation at the distributional level. It can be viewed as an extension to the traditional linear regression approach. Whereas the linear regression model informs us with the relationship between X and Y in their means, quantile regression draws a broader picture for the relationship between the covariates and the dependent variable, as the effects of covariates are estimated for each quantile in the distribution of the dependent variable. Therefore, quantile regression “facilitates a full characterization of the conditional distribution of earnings, and could offer advantages in the study of inequality when exogenous variables influence parameters of the conditional distribution of earnings other than the mean” (Chiswick et al, 2008: 354). By adopting the quantile regression technique into the assimilation study we can appreciate more subtleties across the earnings distribution and have a more complete view of the assimilation process under study.

**Using quantile regression to analyze earnings assimilation**

The proposed analytic framework for earnings assimilation draws largely on Machado and Mata (2005). I shall show that this framework is able to: a) analyze the assimilation process by assimilation in traits and assimilation in covariates across the earnings distribution; b) provide a summary measure of assimilation at the distributional level; c) decomposing changes in assimilation into changes in assimilation in traits and changes in assimilation in covariates.
First of all, we model the $\theta$ th quantile of the outcome variable (logged wage in this case) as a product of the characteristics and premiums to the characteristics. That is,

$$ Q_\theta(w \mid X) = X' \cdot \beta(\theta) $$

(6)

where $\beta(\theta)$ is a vector of coefficients (or premiums) and $X$ is a vector of the covariates (characteristics). For given $\theta \in (0,1)$, $\beta(\theta)$ can be estimated by minimizing in $\beta$ (Koenker and Bassett 1978)

$$ n^{-1} \sum_{i=1}^{n} \rho_\theta(w_i - X_i'\beta) $$

With

$$ \rho_\theta(u) = \begin{cases} 
\theta u & \text{for } u \geq 0 \\
(\theta - 1)u & \text{for } u < 0 
\end{cases} $$

One of the main advantage of the quantile regression technique is that we can view the conditional quantile $Q_\theta(w \mid X)$ as a function of $\theta \in (0,1)$, which “provides a full characterization of the conditional distribution of wages in much the same way as ordinary sample quantiles characterize a marginal distribution” (Bassett and Koenker, 1982, 1986, cited in Machado and Mata 2005).

In the context of assimilation study, the earnings of immigrants and the native are modeled separately with quantile regression models:

$$ Q_\theta(w_{t,i} \mid X_{t,i}) = X_{t,i}' \cdot \beta_{t,i}(\theta) $$

$$ Q_\theta(w_{N,j} \mid X_{N,j}) = X_{N,j}' \cdot \beta_{N,j}(\theta) $$
Here $\beta_{i,t}(\theta)$ stands for the prices of socioeconomic characteristics related to productivity for immigrants and $\beta_{N,t}(\theta)$ for the native in year $t$. It should be noted that the wage equations are structured in a way essentially consistent with the standard econometric models I discussed earlier in this chapter. The indicators for year of observation and for arrival cohorts and for length of residence seen in (1) and (2) are excluded in the model of immigrants’ earnings, and I shall discuss that why this is justified in the following.

Here I model the earnings for immigrants and the native using a single cross-sectional survey. Instead of having an indicator for the year of the survey and examining its effect on earnings, I look at whether the coefficients and composition of characteristics for immigrants change over time relative to the native and to what extent these changes have an impact on the overall assimilation. This would not be able to addressed with a pooled model like (1) and (2).

Moreover, as assimilation happens not only to the characteristics but also to the returns, it is the comparison between the immigrants and the native, not between the earlier immigrants and more recent immigrants that we are most concerned about. The measuring of assimilation along the two dimensions, not comparing immigrants arriving at different time points, is the main focus of this study.

Methodologically this new analytical framework differs from the conventional approach in that I estimate the models with quantile regression instead of the linear regression. The conditional earnings quantiles of a given group are modeled as a product of productivity-related characteristics and returns to these characteristics. We run the model separately
for immigrant groups and their native white counterparts so that it allows for the “premiums” of these characteristics to vary across ethnicity, nativity and gender.

The second step is to estimate the marginal wage distributions for the native and for the immigrants. While theoretically one can estimate the marginal wage distribution directly from the data, it would not necessarily conform to the conditional distribution modeled by (3) and, consequently, would not allow us to perform a counterfactual analysis.

In Machado and Mata (2005) this is achieved by estimating the \( \theta_i \) quantile of wages given the observed characteristics of the respondents \( i = 1, 2, 3, \ldots m \), where \( \theta_1, \theta_2, \theta_3, \ldots, \theta_m \) are drawn from a uniform (0, 1) distribution. By the Probability Integral Transformation Theorem, the corresponding \( m \) estimates of the conditional quantiles of wages at \( X'_{N,t} \). That is, \( \{X'_{N,t} \cdot \hat{\beta}_{N,t}(\theta)\}_{i=1}^{m} \) constitute a random sample from \( F(w_{N,t} | X_{N,t}) \), the (estimated) conditional distribution of earnings given \( X_{N,t} \) (Albrecht et al 2009: 384).

Thus the quantile regression coefficients \( \{\hat{\beta}_{N,t}(\theta)\}_{i=1}^{m} \) completely characterize the conditional distribution of earnings for the native-born.

To ‘integrate \( X'_{N,t} \) out’ and get a sample from the marginal earnings distribution, instead of keeping \( X'_{N,t} \) fixed at a given value, I generate a random sample of size \( m \) with replacement from the rows of \( X_{N,t} \), denoted by \( \{X'_{N,t;\ast}\}_{i=1}^{m}, i = 1, 2, 3, \ldots m \).

Now \( \{X'_{N,t;\ast} \cdot \hat{\beta}_{N,t}(\theta)\}_{i=1}^{m} \) form a random sample of size \( m \) from the marginal earnings distribution for the native-born \( F(w_{N,t}) \). Similarly, a random sample from the marginal
earnings distribution for the immigrants \( F(w_{i,t}) \) would be \( \{X'_{1,i,t}\cdot \hat{\beta}_{1,i,t}(\theta_i)\}_{i=1}^m \) and let us denote it as \( \{w_{i,t}\}_{i=1}^m \).

Once we have the marginal earnings distributions for each year, we can obtain the counterfactual densities by weighting the marginal density of wages with appropriate weights. For example, the counterfactual earnings distribution for the immigrants in year \( t=2000 \) would be fully characterized by \( \{X'_{1,2000;i}\cdot \hat{\beta}_{1;1995}(\theta_i)\}_{i=1}^m \) if the returns to characteristics are identical to the “prices” for immigrants in 1995, where \( \{X'_{1,2000;i}\}_{i=1}^m \) is a random sample of size \( m \) with replacement from the rows of \( X'_{1,2000} \). Similarly, the counterfactual earnings distribution for the immigrants in 1995 given they experience the same returns to characteristics as the native do in the same year can be characterized by \( \{X'_{1,1995;i}\cdot \hat{\beta}_{X;1995}(\theta_i)\}_{i=1}^m \). Let us denote the respective counterfactual density as \( f(X'_{1,1995;i}; \hat{\beta}_{X;1995}(\theta_i)) \).

In the following discussion we shall extend the Machado and Mata’s methods by incorporating a summary measure of earnings assimilation into the decomposition framework. Changes in the wage distribution then can be decomposed into changes in the distribution of coefficients and changes in the distribution of covariates, and the changes in the distribution of residuals.

To facilitate the illustration let us concentrate on two groups, i.e., the immigrants and the native, and examine the extent of assimilation at two time points \( t=0 \) and \( t=1 \). Although our focus is earnings, the analytic framework can be applied to measure assimilation with
respect to some other continuous outcomes. We shall use N to stand for natives and I for
immigrants, and 0 to refer to the starting point of the period under study and 1 the ending
point for notations. The marginal earnings distributions for groups N and I at time 0 will
be denoted as \( F(N; 0) \) and \( F(I; 0) \). Denote the counterfactual earnings distributions for
immigrants to enjoy the native’s premiums to skills as \( F(X'_i(I; 0) \cdot \beta(N; 0; \theta_i)) \) and that
for the native given they experience immigrants’ returns to characteristics in the same
year as \( F(X'_i(N; 0) \cdot \beta(I; 0; \theta_i)) \). I follow the convention to use F stands for the probability
distribution function and lower f for the probability density function. I calculate the
assimilation index of the marginal earnings distributions of the immigrants and the
natives at time 0 and time 1, respectively.

\[
AI(F(I; 0) : F(N; 0)) = \sqrt{\frac{1}{2} \left\{ \int_{-\infty}^{+\infty} \log \left( \frac{2 \cdot f_{N;0}(x)}{f_{I;0}(x) + f_{N;0}(x)} \right) \cdot f_{N;0}(x) dx + \int_{-\infty}^{+\infty} \log \left( \frac{2 \cdot f_{I;0}(x)}{f_{N;0}(x) + f_{I;0}(x)} \right) \cdot f_{I;0}(x) dx \right\}}
\]

\[
AI(F(I; 1) : F(N; 1)) = \sqrt{\frac{1}{2} \left\{ \int_{-\infty}^{+\infty} \log \left( \frac{2 \cdot f_{N;1}(x)}{f_{I;1}(x) + f_{N;1}(x)} \right) \cdot f_{N;1}(x) dx + \int_{-\infty}^{+\infty} \log \left( \frac{2 \cdot f_{I;1}(x)}{f_{N;1}(x) + f_{I;1}(x)} \right) \cdot f_{I;1}(x) dx \right\}}
\]

It can be shown that

\[
AI(F(I; 0); F(N; 0)) = [AI(F(I; 0); F(N; 0)) - AI \left( F(X'_i(I; 0) \cdot \beta(N; 0; \theta_i)); F(N; 0) \right) - AI \left( F(X'_i(N; 0) \cdot \beta(I; 0; \theta_i)); F(N; 0) \right) + AI \left( F(z'_i(I; 0) \cdot \beta(N; 0; \theta_i)); F(N; 0) \right) + AI \left( F(z'_i(N; 0) \cdot \beta(I; 0; \theta_i)); F(N; 0) \right]
\]

The first bracket can be seen as the contribution of “residuals” to the overall divergence.
The second item \( AI \left( F(X'_i(I; 0) \cdot \beta(N; 0; \theta_i)); F(N; 0) \right) \) measures the contribution of the
differences in the distribution of the covariates and the last item measures the contribution of the differences in the distribution of the coefficients.

Therefore, overall assimilation can be decomposed into the contributions of the residuals (the first set of braces) and the contributions of the differences in the distribution of the covariates (the second) as well as the change in the contributions of the differences in the distribution of the coefficients (the last set of braces). According to my knowledge this is the first effort to quantify and decompose overall assimilation into assimilation in characteristics and assimilation in returns to characteristics at the distributional level.

Data

We shall apply the analytic framework outlined above to study the earnings assimilation of immigrant groups relative to native-born 3rd generation whites from 1994 to 2008 with data from the March supplements (also known as the Annual Social and Economic supplements) of the Current Population Survey. The covariates in the earnings model include age, experience, experience², education, and other controls relevant to productivity. The sample for the analysis consists of non-Hispanic whites, non-Hispanic Asian immigrants and Hispanic immigrants of working age (25-64). I shall restrict the sample of analysis to those who worked at least one week during the previous calendar year with positive annual earnings, and did not reside in group quarters.
CPS is a monthly survey of about 50,000 households conducted by the Bureau of the Census for the Bureau of Labor Statistics, which has been conducted for more than 50 years. The March supplement is the primary source of detailed information on income and work experience in the United States. The labor force and work experience data from this survey are used to profile the U.S. labor market and to make employment projections (U.S. Census Bureau 2009). With a wide range of socioeconomic and demographic variables that characterize U.S. households, families, and individuals, it allows for examination of the first, second, and third generations in adulthood (Slack and Jensen 2007). In fact, the CPS March supplement is considered to be the best source to study labor market outcome of immigrants so far (Farley and Alba 2002). In this project I will investigate the earnings assimilation process for Hispanic and Asian immigrants and their second and third generation offspring. Hispanic immigrants form the largest ethnic minority group in United States. According to the US Census Bureau's 2007 American Community Survey, there were 38,059,694 foreign born in the United States, which represents 12.6 percent of the total US population, and almost half of them report Hispanic or Latino origins (Terrazas and Batalova 2008). With its high fertility, the Hispanic ethnic group is projected to make up 29% percent of the total population of the United States by 2050 (Passel and Cohn 2008). Besides its demographic significance, this group is also characterized with below-average educational levels, lower earnings return to skill and poor English language proficiency as compared to other immigrant ethnic groups. Those disadvantages have raised wide concern with respect to its chance of being successfully assimilated into the mainstream. Analyzing Asian immigrants and Hispanic
immigrants separately will indicate whether assimilation in traits and assimilation in returns to traits differ for the two groups.

**Measurement**

**Dependent variable**

The main dependent variable I shall use in this study is the natural log of annual earnings, measured as a combination of total wage and salary income, total non-farm business income and total farm income received in the previous calendar year.

**Independent variables**

Education - it is well known that education attainment is a strong predictor of one’s earnings. Also, there is a consensus in literature that Hispanic immigrants have lower earnings return to their education than the 3rd generation whites when controlling for other characteristics. Here education will be measured continuously, in terms of years of education completed (please refer to Chapter 5 for a detailed description on how the various education degrees are converted into years of education).

Experience – this is calculated by the widely used formula (age – years of education - 6).

The square of experience - this is included to control for the quadratic effect of experience. Nativity/generational status – the reference group here is the 3rd generation non-Hispanic white. Third generation refers to the native-born with native-born parents. First generation is defined as the foreign born who come to Unites States, and the 2nd generation refers to those native-born with at least one foreign-born immigrant parents.
Region – four dummies indicate respectively the Northeast, the Midwest, the South, and the West region.

Metropolitan area – a dummy variable indicates whether one lives in a metropolitan area. This is included to control for the variations in wage due to difference in living costs.

Marital status – it contains two categories: those currently being married and those who are not married.

**Distributional analysis**

The analysis will be conducted in the order outlined below.

In Chapter 4 I shall start with a discussion on the sample size and the population composition. Then I shall examine the overall trends of earnings assimilation in United States by comparing the conventional summary measures (mean, median and standard deviation) of earnings between the immigrant subgroups (as defined by ethnicity and nativity) and native-born whites. In order to develop a sense of the magnitude of earnings assimilation at the distributional level, comparisons will be drawn between immigrant subgroups and native-born whites with respect to the entire earnings distribution in 1994, 1996, 1998, 2000, 2002, 2004, 2006, and 2008, correspondingly. The time points are chosen with two years in between in order to avoid the overlapped samples in the Current Population Survey.

In Chapter 5 I shall decompose the overall assimilation ($AI$) into assimilation due to convergence in characteristics ($AI_c$) and assimilation due to convergence in returns to characteristics ($AI_r$) for various immigrant groups (the analysis outlined below will be
applied to the first generation, the second generation, and the third and plus generation, correspondingly). This will be accomplished by applying the quantile-regression-based decomposition framework developed above. For each year under observation, I shall estimate the quantile regression models on the earnings of the foreign-born immigrants and the native third-generation whites separately. Then I could conduct decomposition and obtain $AI_c$ and $AI_r$. Eventually, I shall be able to have a set of assimilation indices for immigrant groups for years under study from 1994 to 2008. By plotting these indices I shall show for each group to what extent $AI_c$ and $AI_r$ account for overall assimilation $AI$. The proportion of assimilation due to convergence in characteristics is $AI_c/\text{AI}$ and the proportion of assimilation due to convergence in returns to characteristics is $AI_r/\text{AI}$.

**Caveat**

As an effort to examine earnings assimilation at the societal level, this study does not take into consideration emigration, death and other mechanisms that change the composition of the immigrant population. For any change in composition will be part of the evolution of the immigrant population in US and can be reflected in the measure for “assimilation in terms of characteristics”. Just as the return of European immigrants does not preclude United States from becoming a “melting pot”, the decrease in the size of immigrants through emigration, death would not prevent us from viewing the foreign-born
immigrants presented in United States as a whole and measure their assimilation collectively.

Secondly, using earnings instead of wage as the dependent variable, we compare immigrants with native whites with respect to the total amount of money they obtained from the labor market, which is different from the comparison of wages, and consequently bear different implications substantively. Wage comparisons show us whether the immigrants make same amount of earnings as the native whites within same duration of working period. What this kind of study does not show, is whether the immigrants have achieved same level of economical well-being as their native white counterparts by working additional hours, although they may not be paid with same level of hourly wage in the labor market. For example, a foreign-born Mexican female janitor who works 8 hours a day at the rate of 20$ per hour is able to make the same amount of earnings as a native white women who opts to work 4 hours a day with the hourly wage of 40$, assuming that they both work five days a week. If measuring with hourly wage, we would conclude that there is a large wage gap. However, if measuring with annual earnings, we would see no gap at all. Therefore, lessons drawn from earnings analysis are not necessarily applicable to circumstances where wage is subject of interest.

Besides, I would like to reiterate that it is very important to incorporate a distributional perspective into the immigrant assimilation literature. Just at the ecological fallacy warns us, inference at the aggregate level does not always hold at the individual level (Robinson 1950). Similarly, the identified association at the conditional mean may blind us from observing more details with respect to the influences of covariates on the dependent variable at the rest of distribution. As assimilation studies provide the ground for policy-
making with relate to immigration and integration, and it is the majority of the society that is of greatest concern to the policy-makers and determine the efficacy of policy implementation, it is necessary not just limited to the conditional mean, but analyze the relationship between the outcome variable and the covariates distributionally.
Chapter 4

Descriptive Analysis

How are the immigrants in United States assimilated economically as compared to the native white population? This is a question where consensus is yet to emerge. At times we hear from media accounts of successful immigrants who realized their American dream through exceptional hardworking and extraordinary entrepreneurial skills, and meanwhile, accusations of immigrants as being lack of economic resources and skills and thus living on welfare never cease. As we mentioned earlier, in spite of the large volume of studies on immigrants’ assimilation, evaluation of assimilation by comparing the entire earnings distributions between the immigrants and the native whites is rare or non-existent.

In this chapter we attempt to tackle this problem by comparing the earnings distribution of the immigrants and the native whites (here defined as whites who were born by American-born parents) over time. We shall draw such comparisons for men and women separately, and distinguish groups classified according to race/ethnicity and nativity. We focus on the age group 25-64, as we are mostly concerned about assimilation at the society level. Although arguably immigrants may come and go, with the data we use it is impossible to deal with how emigration would affect the observed assimilation outcomes. However, selection bias from emigration is beyond the scope of this study as we are mainly interested in understanding the people who consists of the U.S. population at
selected time points (1994, 1996, 1998, … ,2008) and among them how the immigrant population fare economically as compared to their native white counterparts.

First of all I would like to make some clarifications about the definition of race and ethnicity. The sample of analysis consists of three major ethnic groups: white, Asian, and Hispanics. In order to construct these groups as mutually exclusive, I excluded Asians and whites who claimed to belong to more than one ethnic group, such as white-Asian, and white-black. Besides, I use the question on whether one has Hispanic origin to identify the Hispanics. The final categories are: non-Hispanic white, non-Hispanic Asian, and Hispanics. Non-Hispanic Asians included those reported as either “Asian or Pacific Islander”, “Asian only”, “Hawaiian/Pacific Islander only”, or “Asian-Hawaiian/Pacific Islander”.

Within each ethnic group, I further break them into subgroups based on nativity. This variable has three categories: 1\textsuperscript{st} generation, 2\textsuperscript{nd} generation, and 3\textsuperscript{rd} and plus generation. 1\textsuperscript{st} generation refers to those who were born outside of United States by non-US-born parents. The 2\textsuperscript{nd} generation is composed of people born in United State with at least one parent being foreign-born. The 3\textsuperscript{rd} and plus generation are people who were born in United States by US-born parents. In particular, we call the 3\textsuperscript{rd} and plus generation white as “native white”. Those born in outlying U.S. territories or born abroad to US-born parents (less than 2\% of the overall sample) are excluded from the sample of analysis.

**Sample size and population composition**

In the table below I list the sizes of sample utilized in this project. Totally we have 501,287 individuals from the combined sample of CPS March Supplements 1994-2008.
The gender distribution of sample by survey year is given below. Figure 4.1 shows that the gender composition of the CPS sample is pretty stable over years. There are more men in the sample, however, the difference between men and women in terms of proportion is small and the size is about 6 to 7%.

<table>
<thead>
<tr>
<th>year</th>
<th>women</th>
<th>men</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>24471</td>
<td>27772</td>
<td>52243</td>
</tr>
<tr>
<td>1996</td>
<td>22450</td>
<td>25530</td>
<td>47980</td>
</tr>
<tr>
<td>1998</td>
<td>22968</td>
<td>26233</td>
<td>49201</td>
</tr>
<tr>
<td>2000</td>
<td>23363</td>
<td>26524</td>
<td>49887</td>
</tr>
<tr>
<td>2002</td>
<td>36624</td>
<td>41103</td>
<td>77727</td>
</tr>
<tr>
<td>2004</td>
<td>35773</td>
<td>40125</td>
<td>75898</td>
</tr>
<tr>
<td>2006</td>
<td>34710</td>
<td>39494</td>
<td>74204</td>
</tr>
<tr>
<td>2008</td>
<td>34881</td>
<td>39266</td>
<td>74147</td>
</tr>
</tbody>
</table>

Table 4.1 Sample size by year

Figure 4.1 Gender compositions, 1994-2008
The second table shows the ethnic compositions of sample by survey year within men and women, separately. From 1994 to 2008, among women the proportion of white declined from close to 90% to less than 80%. Such a change is not negligible. Meanwhile, proportion of women of Hispanic origin grew from 10% to about 16%, and the proportion of Asian women within the overall sample almost doubled, from 3.5% to 6.5%. Similar pattern was found among men.

<table>
<thead>
<tr>
<th>year</th>
<th>Hispanic</th>
<th>White</th>
<th>Asian</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>2469</td>
<td>21180</td>
<td>822</td>
<td>24471</td>
</tr>
<tr>
<td>1996</td>
<td>2726</td>
<td>18913</td>
<td>811</td>
<td>22450</td>
</tr>
<tr>
<td>1998</td>
<td>3058</td>
<td>19007</td>
<td>903</td>
<td>22968</td>
</tr>
<tr>
<td>2000</td>
<td>3533</td>
<td>18913</td>
<td>917</td>
<td>23363</td>
</tr>
<tr>
<td>2002</td>
<td>4474</td>
<td>30184</td>
<td>1966</td>
<td>36624</td>
</tr>
<tr>
<td>2004</td>
<td>4631</td>
<td>29262</td>
<td>1880</td>
<td>35773</td>
</tr>
<tr>
<td>2006</td>
<td>4975</td>
<td>27703</td>
<td>2032</td>
<td>34710</td>
</tr>
<tr>
<td>2008</td>
<td>5315</td>
<td>27301</td>
<td>2265</td>
<td>34881</td>
</tr>
</tbody>
</table>

Table 4.2 Ethnic compositions for women

Figure 4.2 Ethnic compositions for women
Now we want to look at the nativity compositions of sample by survey year, for men and women. Among women of Hispanic origin, more than half belongs to the 1st generation, i.e., they are born abroad by non-US-citizen parents. The proportion of the 3rd generation
dropped slightly from 1994 to 2008, and the percentage of the 2\textsuperscript{nd} generation rose in 2008.

<table>
<thead>
<tr>
<th>Year</th>
<th>1\textsuperscript{st} gen.</th>
<th>2\textsuperscript{nd} gen.</th>
<th>3\textsuperscript{rd} gen.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>1236</td>
<td>473</td>
<td>760</td>
<td>2469</td>
</tr>
<tr>
<td>1996</td>
<td>1402</td>
<td>523</td>
<td>801</td>
<td>2726</td>
</tr>
<tr>
<td>1998</td>
<td>1580</td>
<td>572</td>
<td>906</td>
<td>3058</td>
</tr>
<tr>
<td>2000</td>
<td>1846</td>
<td>638</td>
<td>1049</td>
<td>3533</td>
</tr>
<tr>
<td>2002</td>
<td>2369</td>
<td>804</td>
<td>1301</td>
<td>4474</td>
</tr>
<tr>
<td>2004</td>
<td>2417</td>
<td>829</td>
<td>1385</td>
<td>4631</td>
</tr>
<tr>
<td>2006</td>
<td>2629</td>
<td>889</td>
<td>1457</td>
<td>4975</td>
</tr>
<tr>
<td>2008</td>
<td>2753</td>
<td>1065</td>
<td>1497</td>
<td>5315</td>
</tr>
</tbody>
</table>

Table 4.4 Nativity composition of Hispanic women

White women are dominated by the 3\textsuperscript{rd} and plus generation (here we refer to as 3\textsuperscript{rd} gen.), i.e., people who were born in United States by US-born parents. The percentage of the 2\textsuperscript{nd}
generation fluctuated, and never exceeded 6%. The proportion of the 1\textsuperscript{st} generation is small; however, it is worth to note that their percentage grew rapidly, from 2.6% to 3.7%.

<table>
<thead>
<tr>
<th>year</th>
<th>1\textsuperscript{st} gen.</th>
<th>2\textsuperscript{nd} gen.</th>
<th>3\textsuperscript{rd} gen.</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>559</td>
<td>1124</td>
<td>19497</td>
<td>21180</td>
</tr>
<tr>
<td>1996</td>
<td>601</td>
<td>1118</td>
<td>17194</td>
<td>18913</td>
</tr>
<tr>
<td>1998</td>
<td>670</td>
<td>1119</td>
<td>17218</td>
<td>19007</td>
</tr>
<tr>
<td>2000</td>
<td>638</td>
<td>946</td>
<td>17329</td>
<td>18913</td>
</tr>
<tr>
<td>2002</td>
<td>1034</td>
<td>1451</td>
<td>27699</td>
<td>30184</td>
</tr>
<tr>
<td>2004</td>
<td>974</td>
<td>1297</td>
<td>26991</td>
<td>29262</td>
</tr>
<tr>
<td>2006</td>
<td>977</td>
<td>1155</td>
<td>25571</td>
<td>27703</td>
</tr>
<tr>
<td>2008</td>
<td>1022</td>
<td>1220</td>
<td>25059</td>
<td>27301</td>
</tr>
</tbody>
</table>

Table 4. 5 Nativity compositions of White women

The composition of Asian women is the opposite of what we just see from White women. Women of Asian origin are dominated with the 1\textsuperscript{st} generation, which compose of more than 70% of the whole Asian women population. The 3\textsuperscript{rd} and plus generation never make
more than 20% of this group. In addition, its proportion declined over years from 19% to about 15%. There is a growing trend for the 2\textsuperscript{nd} generation: during this period their percentage rose from 9% to 11.3%.

<table>
<thead>
<tr>
<th>year</th>
<th>1st gen.</th>
<th>2nd gen.</th>
<th>3rd gen.</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>601</td>
<td>65</td>
<td>156</td>
<td>822</td>
</tr>
<tr>
<td>1996</td>
<td>589</td>
<td>78</td>
<td>144</td>
<td>811</td>
</tr>
<tr>
<td>1998</td>
<td>687</td>
<td>80</td>
<td>136</td>
<td>903</td>
</tr>
<tr>
<td>2000</td>
<td>691</td>
<td>79</td>
<td>147</td>
<td>917</td>
</tr>
<tr>
<td>2002</td>
<td>1440</td>
<td>186</td>
<td>340</td>
<td>1966</td>
</tr>
<tr>
<td>2004</td>
<td>1399</td>
<td>194</td>
<td>287</td>
<td>1880</td>
</tr>
<tr>
<td>2006</td>
<td>1480</td>
<td>233</td>
<td>319</td>
<td>2032</td>
</tr>
<tr>
<td>2008</td>
<td>1665</td>
<td>257</td>
<td>343</td>
<td>2265</td>
</tr>
</tbody>
</table>

Table 4. 6 Nativity compositions of Asian women

Figure 4. 6 Nativity compositions of Asian women
Let us shift our attention to men. Like Hispanic women, men of Hispanic origin are dominated with the 1st generation. From 1994 to 2008, the percentage of the 1st generation among this group climbed from 57% to 64%. Meanwhile, the proportion of the 2nd generation stagnated at the level of around 15%, if not declining. Consequently, the proportion of the 3rd generation declined from more than a quarter to 21%.

<table>
<thead>
<tr>
<th>year</th>
<th>1st gen.</th>
<th>2nd gen.</th>
<th>3rd gen.</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>1908</td>
<td>536</td>
<td>890</td>
<td>3334</td>
</tr>
<tr>
<td>1996</td>
<td>2047</td>
<td>565</td>
<td>806</td>
<td>3418</td>
</tr>
<tr>
<td>1998</td>
<td>2409</td>
<td>613</td>
<td>951</td>
<td>3973</td>
</tr>
<tr>
<td>2000</td>
<td>2853</td>
<td>641</td>
<td>1094</td>
<td>4588</td>
</tr>
<tr>
<td>2002</td>
<td>3722</td>
<td>752</td>
<td>1321</td>
<td>5795</td>
</tr>
<tr>
<td>2004</td>
<td>3913</td>
<td>819</td>
<td>1431</td>
<td>6163</td>
</tr>
<tr>
<td>2006</td>
<td>4351</td>
<td>957</td>
<td>1447</td>
<td>6755</td>
</tr>
<tr>
<td>2008</td>
<td>4426</td>
<td>1047</td>
<td>1466</td>
<td>6939</td>
</tr>
</tbody>
</table>

Table 4. 7 Nativity compositions of Hispanic men

Figure 4. 7 Nativity compositions of Hispanic men
Similar to white women, the majority of the white men are 3rd and plus generation (more than 90%). Again the percentage of the foreign-born white men is very small; however, it almost doubled during this period from 2.4% to 4.1%.

<table>
<thead>
<tr>
<th>year</th>
<th>1st gen.</th>
<th>2nd gen.</th>
<th>3rd gen.</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>561</td>
<td>1328</td>
<td>21681</td>
<td>23570</td>
</tr>
<tr>
<td>1996</td>
<td>725</td>
<td>1318</td>
<td>19184</td>
<td>21227</td>
</tr>
<tr>
<td>1998</td>
<td>785</td>
<td>1204</td>
<td>19274</td>
<td>21263</td>
</tr>
<tr>
<td>2000</td>
<td>825</td>
<td>1084</td>
<td>19052</td>
<td>20961</td>
</tr>
<tr>
<td>2002</td>
<td>1262</td>
<td>1611</td>
<td>30343</td>
<td>33216</td>
</tr>
<tr>
<td>2004</td>
<td>1236</td>
<td>1321</td>
<td>29352</td>
<td>31909</td>
</tr>
<tr>
<td>2006</td>
<td>1159</td>
<td>1331</td>
<td>28077</td>
<td>30567</td>
</tr>
<tr>
<td>2008</td>
<td>1240</td>
<td>1308</td>
<td>27445</td>
<td>29993</td>
</tr>
</tbody>
</table>

Table 4. 8 Nativity composition of White men

Figure 4. 8 Nativity compositions of White men
Among men of Asian origin, the 1\textsuperscript{st} generation is the dominant group, which accounts for about three quarter of the population, although its proportion dropped slightly from 75.6\% in 1994 to 72.9\% in 2008. There has been a steady rise in the proportion of the 2\textsuperscript{nd} generation, with the 3\textsuperscript{rd} generation fluctuating during this period.

<table>
<thead>
<tr>
<th>year</th>
<th>1st gen.</th>
<th>2nd gen.</th>
<th>3rd gen.</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>656</td>
<td>79</td>
<td>133</td>
<td>868</td>
</tr>
<tr>
<td>1996</td>
<td>660</td>
<td>88</td>
<td>137</td>
<td>885</td>
</tr>
<tr>
<td>1998</td>
<td>783</td>
<td>73</td>
<td>141</td>
<td>997</td>
</tr>
<tr>
<td>2000</td>
<td>732</td>
<td>87</td>
<td>156</td>
<td>975</td>
</tr>
<tr>
<td>2002</td>
<td>1517</td>
<td>205</td>
<td>370</td>
<td>2092</td>
</tr>
<tr>
<td>2004</td>
<td>1516</td>
<td>207</td>
<td>330</td>
<td>2053</td>
</tr>
<tr>
<td>2006</td>
<td>1624</td>
<td>240</td>
<td>308</td>
<td>2172</td>
</tr>
<tr>
<td>2008</td>
<td>1701</td>
<td>280</td>
<td>353</td>
<td>2334</td>
</tr>
</tbody>
</table>

Table 4.9 Nativity compositions of Asian men

![Figure 4.9 Nativity compositions of Asian men](image-url)
Comparison of average earnings over time, by ethnicity and nativity

The table below shows the average earnings of women for each year by ethnicity.

Measured with arithmetic mean of annual earnings, all three groups experienced growth but differed in the speed of growth. For Asian women, mean earnings rose for about 23.1% from 26,192$ in 1994 to 32,244$ in 2008. All through this period, the mean earnings of Asian women is slightly higher than that of white women. Among white women, the growth rate for the same period is 29.7% and 25.5% for the Hispanic women. It is worth to note that the earnings trajectory of the Hispanic women is parallel to that of the white women, although a significant gap persisted and widened over time.

<table>
<thead>
<tr>
<th></th>
<th>Hispanic</th>
<th>White</th>
<th>Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>17543</td>
<td>22861</td>
<td>26192</td>
</tr>
<tr>
<td>1996</td>
<td>17963</td>
<td>24031</td>
<td>26327</td>
</tr>
<tr>
<td>1998</td>
<td>19123</td>
<td>25304</td>
<td>27299</td>
</tr>
<tr>
<td>2000</td>
<td>19640</td>
<td>26573</td>
<td>29696</td>
</tr>
<tr>
<td>2002</td>
<td>20484</td>
<td>27997</td>
<td>30556</td>
</tr>
<tr>
<td>2004</td>
<td>20619</td>
<td>28679</td>
<td>32921</td>
</tr>
<tr>
<td>2006</td>
<td>21147</td>
<td>28719</td>
<td>32330</td>
</tr>
<tr>
<td>2008</td>
<td>22020</td>
<td>29655</td>
<td>32244</td>
</tr>
</tbody>
</table>

Table 4.10 Mean earnings of women
The relative positions of the three ethnic groups change when measured with median earnings. While all three groups experience growth in median earnings, white women and Asian women converge in their median earnings, whereas the Hispanic women fell below. Again, the median earnings of the Hispanic women followed a trajectory parallel to that of the white women.

<table>
<thead>
<tr>
<th>year</th>
<th>Hispanic</th>
<th>White</th>
<th>Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>13905</td>
<td>19601</td>
<td>22022</td>
</tr>
<tr>
<td>1996</td>
<td>13990</td>
<td>19674</td>
<td>20986</td>
</tr>
<tr>
<td>1998</td>
<td>14999</td>
<td>20760</td>
<td>21175</td>
</tr>
<tr>
<td>2000</td>
<td>15000</td>
<td>22000</td>
<td>23716</td>
</tr>
<tr>
<td>2002</td>
<td>15997</td>
<td>22584</td>
<td>23525</td>
</tr>
<tr>
<td>2004</td>
<td>16290</td>
<td>22625</td>
<td>24435</td>
</tr>
<tr>
<td>2006</td>
<td>17060</td>
<td>23031</td>
<td>25590</td>
</tr>
<tr>
<td>2008</td>
<td>17688</td>
<td>24120</td>
<td>24924</td>
</tr>
</tbody>
</table>

Table 4.11 Median earnings of women
Using standard deviation to measure dispersion of the earnings data, I found that Asian women have the highest level of variation, followed by white women, and then the Hispanics. It is interesting that from 2000 upon, there was a growth in variation within the Asian women and then it declined from 2004, whereas an opposite pattern was found among the Hispanic women. In contrast, earnings dispersion within white women has been maintained at about the same level since 2002.
<table>
<thead>
<tr>
<th>year</th>
<th>Hispanic</th>
<th>White</th>
<th>Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>15101</td>
<td>18413</td>
<td>21557</td>
</tr>
<tr>
<td>1996</td>
<td>22871</td>
<td>24962</td>
<td>26130</td>
</tr>
<tr>
<td>1998</td>
<td>20726</td>
<td>26554</td>
<td>27277</td>
</tr>
<tr>
<td>2000</td>
<td>22556</td>
<td>23446</td>
<td>26909</td>
</tr>
<tr>
<td>2002</td>
<td>22080</td>
<td>30774</td>
<td>33202</td>
</tr>
<tr>
<td>2004</td>
<td>21221</td>
<td>30846</td>
<td>39389</td>
</tr>
<tr>
<td>2006</td>
<td>19146</td>
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<td>34552</td>
</tr>
<tr>
<td>2008</td>
<td>21377</td>
<td>29354</td>
<td>30741</td>
</tr>
</tbody>
</table>

Table 4. 12 S.D. of earnings of women

Figure 4. 12 S.D. of earnings of women

It is found that white men have greater mean earnings than men of Asian origin or Hispanic origin. Of course, given the relatively small difference in mean earnings between white and Asian men, we may conclude that the mean earnings of the two groups tend to converge, whereas Hispanic men experience a considerable absolute
earnings deficit from their white counterparts, and such a gap widened over time from less than 15,000 in 1994 to 20,000 in 2008. All of the three groups see their mean earnings grow over time, although the Hispanic men did not have their earnings rise at a comparable speed.

<table>
<thead>
<tr>
<th>year</th>
<th>Hispanic</th>
<th>White</th>
<th>Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>25133</td>
<td>39287</td>
<td>38174</td>
</tr>
<tr>
<td>1996</td>
<td>26593</td>
<td>43748</td>
<td>41655</td>
</tr>
<tr>
<td>1998</td>
<td>28282</td>
<td>46043</td>
<td>42857</td>
</tr>
<tr>
<td>2000</td>
<td>27900</td>
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<td>46235</td>
</tr>
<tr>
<td>2002</td>
<td>29901</td>
<td>50932</td>
<td>49696</td>
</tr>
<tr>
<td>2004</td>
<td>29996</td>
<td>50460</td>
<td>48459</td>
</tr>
<tr>
<td>2006</td>
<td>30038</td>
<td>51410</td>
<td>49956</td>
</tr>
<tr>
<td>2008</td>
<td>30206</td>
<td>50753</td>
<td>49464</td>
</tr>
</tbody>
</table>

Table 4. 13 Mean earnings of men

Figure 4. 13 Mean earnings of men
It is interesting to see that the earnings gap between white and Asian men is greater when measured with median earnings: the former enjoy a prevalent advantage over the latter all through this period. The Hispanic men is again falling behind, however, the earnings gap tend to be stable as the median earnings of Hispanic men follows a parallel trajectory as that of the white men. Of course, all three groups experience steady growth in annual earnings. It is worth to mention that the trends of earnings difference between white and Hispanic men vary according to the measure we use: earnings gap widened if we examine earnings gap of the two groups by comparing their means, whereas earnings gap stays constant if we examine earnings gap by comparing their medians. Such difference implies that the increase in mean earnings of the white men must be driven by earnings growth among higher-income white men earners, an occurrence which is not likely to happen among the Hispanic men.

<table>
<thead>
<tr>
<th>Year</th>
<th>Hispanic</th>
<th>White</th>
<th>Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>20639</td>
<td>34590</td>
<td>31062</td>
</tr>
<tr>
<td>1996</td>
<td>20767</td>
<td>34954</td>
<td>30604</td>
</tr>
<tr>
<td>1998</td>
<td>21350</td>
<td>35811</td>
<td>31140</td>
</tr>
<tr>
<td>2000</td>
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<tr>
<td>2002</td>
<td>22584</td>
<td>37640</td>
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<td>36200</td>
</tr>
<tr>
<td>2006</td>
<td>22605</td>
<td>38385</td>
<td>35826</td>
</tr>
<tr>
<td>2008</td>
<td>24036</td>
<td>39396</td>
<td>36180</td>
</tr>
</tbody>
</table>

Table 4.14 Median earnings of men
Figure 4. 14 Median earnings of men

Now let us switch to the earnings dispersion. During this period, all three groups saw their standard deviation grow. The white and Asian men have similar trajectories of earnings dispersion, and the Hispanic men remained to be the group which has the least variation in earnings.

<table>
<thead>
<tr>
<th>year</th>
<th>Hispanic</th>
<th>White</th>
<th>Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>19695</td>
<td>27140</td>
<td>28812</td>
</tr>
<tr>
<td>1996</td>
<td>27064</td>
<td>44594</td>
<td>49947</td>
</tr>
<tr>
<td>1998</td>
<td>31049</td>
<td>50233</td>
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<tr>
<td>2000</td>
<td>26788</td>
<td>41069</td>
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Table 4. 15 S.D. of earnings of men
So far we have looked at some summary statistics for earnings of three ethnic groups. As in this study we attempt to understand the earnings assimilation of immigrants, it would be appropriate to look at earnings statistics by generation status. Also, it is important to set up some criteria for the comparisons we want to make.

There are several ways of examining assimilation. We can always compare the earnings statistics within one ethnic group over generation – this shows us along the temporal dimension how the immigrant group of one specific ethnicity make progress. Earnings statistics of the first generation shows the current situation of this group. So comparing the earnings statistics of the first generation with that achieved by the second generation, whose ancestor arrived some twenty or thirty years earlier, we will be able to appreciate how far this group has gone forward (or backward) over time. And similarly we can compare the earnings profile of the third generation with that of the second generation to
measure the progress that the immigrant group made since they arrived in the host society two generations ago.

However, it is common in the literature to take an alternative framework for comparison. Here a group is selected to work as the reference group in all comparisons, and such selection is made upon the criteria that this group has to represent the “mainstream” of the host society. While the first way of comparison we discussed in the paragraph above shows how one single immigrant group progresses over time, more often we are interested in the relative progress that this group has made comparing to the mainstream of the host society. Therefore, to measure to what extent one immigrant group fare compares to the mainstream society, researchers use the “native white” as the reference group, which is a group of descendants of the earlier European immigrants. In this project, we follow this tradition and define the reference group as whites born in America by America-born parents, i.e., the third and plus generation white. Therefore, instead of comparing the immigrants with the descendants of their earlier immigrant co-ethnics, we compare the immigrants (the first, second and the third and plus generations) with this third and plus generation white.

Now let us look at the mean earnings of the immigrants by ethnicity and generation, with the 3rd generation white as reference group. It is shown that the 1st generation Asian women have greater earnings on average than the 3rd generation white women, although the difference between the two never exceeds 3500$. The Hispanic women experience substantial growth in mean earnings, however, a large gap between this group and the native white women remained and even widened in absolute term over time. In 2007, the
first generation Hispanic women made about 11,000$ less than the native white women on average, whereas the difference was 8555$ in 1993.

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Table 4.16 Mean earnings of women: 1st gen. immigrants V.S. 3rd gen. white

Among the second generation, Asian women again demonstrate a great advantage over their native white counterparts on average earnings over the period under observation.
The second generation Hispanic women still have lower earnings than the native white women; however the gap is much smaller (ranging from $1178$ to $4282$) than what we observed for the first generation Hispanic women.

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Table 4.17 Mean earnings of women: 2nd gen. immigrants V.S. 3rd gen. white

Figure 4.17 Mean earnings of women: 2nd gen. immigrants V.S. 3rd gen. white
Speaking of the third generation, an interesting pattern emerges: although the Asian women still have greater earnings on average than the native white women, their earnings trajectory seems to converge to that of the 3rd generation white women over time; secondly, average earnings of the Hispanic women changes in an opposite direction to that of the Asian women, and meanwhile move towards the average earnings of the native whites.

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Table 4. 18 Mean earnings of women: 3rd gen. immigrants V.S. 3rd gen. white
Although we observe an advantage that first generation Asian women enjoy in mean earnings over their native white counterparts, the story for the Asian men is different. During the period of study, Asian men converge to the native white men by large in average earnings. While both white men and Asian men saw substantial improvement in earnings on average, the earnings trajectory of the Hispanic is much flatter, as a consequence, the earnings gap between them and the native white men was enlarged greatly, from around 17,000$ in 1994 to almost 24,000$ in 2008.

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Table 4. 19 Mean earnings of men: 1st gen. immigrants V.S. 3rd gen. whites
Among the second generation, the Asian men’s earnings trajectory fluctuated a lot around that of the native white men. Having a slight advantage (about 5,000$) in 1994 regarding the average earnings over the native white men, the Asian men made just about 60$ more than the reference group, indicating the convergence of their earnings trajectories over time. The earnings trajectory of the Hispanic men followed a somewhat parallel pattern to that of the native white men, and the earnings gap between the two rose slightly from about 10,000$ in 1994 to 13,004 in 2008.

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Table 4. 20 Mean earnings of men: 2nd gen. immigrants V.S. 3rd gen. whites
With respect to the third generation, Asian men converged to the native white men in average earnings from 1994 to 2008, although the earnings gap between the two enlarged slightly from about 300$ to 1,500$ in 2008. The Hispanic men again followed roughly a parallel trajectory to that of the native white men, with their earnings deficit growing from some 9,000$ in 1994 to 14,000$ in 2008.

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Table 4. 21 Mean earnings of men: 3rd gen. immigrants V.S. 3rd gen. whites
So far we have seen that, for both men and women, earnings gap between Hispanics and native whites narrowed from the first generation to the second generation. However, earnings deficits do not shrink similarly from the second generation to the third generation. Observing this phenomenon, some researchers warned that assimilation may not be fully achieved by the Hispanic immigrants since the third generation appears to stagnate at the economic status achieved by the second generation. I would rather take this as a “half empty” story, which means that it can be interpreted either optimistically or pessimistically. For we may also argue that from the first generation to the second generation there has been a great progress achieved by the Hispanic immigrants in closing the earnings gap. Although the third generation did not further narrow the earnings gap between them and the native whites, we should always keep in mind that
they are descendants of people who came some sixty to eighty years ago. It is well known that back to that time ethnic minorities were confronted with severe constraints as a result of discriminations in many aspects. Therefore, it might not be appropriate for us to anticipate that, in order to validate the occurrence of assimilation, the third generation should necessarily be more successful than the second generation in terms of economic attainment.

As discussed in Chapter 2, it is important for us to appreciate the fact that earnings assimilation reflects how similar one group is to another group regarding their earnings structures. As the structure of one variable is best characterized through its distribution, we’d better compare the distributions of immigrants and the native and measure assimilation by taking into account the differences across the whole distributions. By operating this way we recognize that assimilation and inequality are two separate concepts. Inequality can persist when one group is perfectly assimilated to another. In this case, two groups may have identical earnings distributions while people within each group do not make same amount of earnings. Similarly, assimilation may not be achieved when two groups under comparison have same level of inequality. An example of this would be two egalitarian societies where members of one society earn 10000$ a year and members of another society earn 20000$ a year.

To reiterate, it is crucial to make the distinction between assimilation and inequality. The former captures to what extent one group is alike to another group along a given measure. The latter measures to what extent the observed distribution of the outcome variable differs from a special distribution, where every individual has same score, which is the mean score of the observed distribution of the outcome variable. Using the two concepts
interchangeably can be confusing. For example, some people may take the fact as an evidence of failure in economic assimilation that many Hispanic immigrants are taking jobs which offer relatively lower earnings than the average earnings of the native whites. Such an argument was made under the assumption that assimilation is only achieved when an immigrant earned what a typical middle-class native white makes. Such assumption ignores the fact that among native whites, there are also people working on jobs that offer wages lower than the average wage of native whites. As noted by Alba and Nee, assimilation “does not imply that full equality of opportunities obtains within the mainstream, because life chances are still strongly differentiated by social class and other non-ethnic factors” (12). If only middle-class immigrants are considered to be fully assimilated, where should we put the native whites who make lower-than-average earnings? Should we not count them as “native white”?

Given the differences between assimilation and inequality discussed above, it will be appropriate for us to examine the earnings distributions for immigrants and the native whites separately, in order to get a sense of the trends of assimilation for various immigrant groups.

Before we initiate any comparison between immigrants and native whites, to get some idea about the dynamics of earnings distribution of the “mainstream” society, let us first examine the changes in earnings distribution of the native whites by plotting them over years. The following graphs present the probability density functions of log earnings from 1994 to 2008 for native white men and women, respectively. During this period there was a decline in the population share present at the lower end of the earnings distribution, which indicates that a great number of native white women stepped out of
poverty and saw their earnings greatly improved. In 2008, a greater proportion of native white women made more than 50,000$ than they did in 1994.

Figure 4. 22 Earnings distributions: native white women from 1994 to 2008
From Figure 4.22 we can see that the overall trend of the earnings distribution of native white women can be summarized as “progress”. Notably, the native white women have experienced great progress over time – for those who worked at least for one week during the previous calendar year, the chance is getting smaller over time that they are paid for less than 20,000$ a year. As the sample under analysis here only consists of women who have reported to work for at least one week during last calendar year, this progress is very likely a consequence of the increasing participation of women in full-time employment over time.
As for men, their earnings distribution gradually shifted towards the upper end, as shown in Figure 4.23. Over time bumps emerged beyond the earnings level 75,000$, implying that a greater population share were moving ahead with higher earnings. In 2008, there
are smaller population share at the bottom of the earnings distribution than in 1994, which indicated advancement in reducing poverty in absolute term.

Figure 4. 24 Earnings distributions: native white women from 1994 to 2008
In order to see the variations at the upper end of the earnings range, we plot the earnings density distribution for earnings values from zero to 600,000$. We noticed that for native white women, the major pattern of change is that the earnings distribution shifts
rightwards, indicating their progress in attaining greater earnings over time. While similar pattern occurred among native white men, we see multiple bumps along the higher end of the earnings spectrum, suggesting that a substantial share of population have moved forward and occupied positions which offer extremely high earnings.\footnote{It should be noted, that in 1994 the Census Bureau used one single threshold to topcode the income for groups regardless of their gender and race. ...}

Such a change resonates with the finding of rising income inequality. The standard income inequality measures basically capture variation. Therefore, when earnings distribution becomes more dispersed over time, a greater level of inequality would be measured. It is worth noting that compared to the population stocks at the lower end of the earnings range, the population size of people at the upper ends (the bumps) is very small. This observation raises the question about the validity of the “polarization of earnings distribution” argument. True, between the small bumps and the population stock consisting of the majority who make less than 200,000$ per year, there seems some vacuum and some people may argue that the earnings distribution has been hollowed out. However, the earnings distribution dynamics is more than that; what happened is that the majority of the population marched forward along the earnings axis, and meanwhile a very small of population went further to achieve those extremely high earnings. If we measure earnings inequality with Gini, Theil and other standard measures, we are examining the dispersion of the earnings distribution. But remember dispersion is only one character of the earnings distribution. When earnings distribution stretches, earnings data becomes more dispersed and thus total variation increases. However, we should distinguish the situation where earnings distribution stretches to the right as well as the opposite. For both native white men and women, the general trend is that earnings
distribution stretched rightwards over time, indicating that native whites as a whole group have made progress in raising their earnings.

Now, with the overall trend of earnings distribution dynamics in our mind, let us have a look at the earnings distributions of immigrant groups. For each year, we plot the earnings distributions for immigrant groups defined on the basis of ethnicity, generation, and gender.
Figure 4. 26  Earnings distribution of Hispanic women from 1994 to 2000
Among Hispanic women, the first generation dominants the lower end of the X-axis during all years under study, indicating that they are most likely to work in jobs with very little pay. Compared to the second and the third generations, the first generation Hispanic
women are less likely to make earnings beyond 25,000$ (which is about the average earnings of the native white women in 1998). Notably, earnings distributions of the second and the third generation overlap, to a large extent, with the earnings distribution of the native white women. Earnings distributions of the 2nd and the 3rd generations are never identical, however, given that the second generation is a little more likely to be found at the upper end of the earnings spectrum than the third generation.
Figure 4. 28 Earnings distribution of Asian women from 1994 to 2000
Figure 4. 29 Earnings distribution of Asian women from 2002 to 2008
For Asian women, the story is quite different. The first generation Asian women have almost the same earnings structure as the native white women do. The second and the third generations are having an advantage over native white women, since their earnings distributions are more leaning towards the upper end of the earnings spectrum. It goes without exception that, the second generation tend to be the most advantageous because they are most likely to be found at the upper end of the earnings spectrum.

![Earnings distribution graphs](image-url)

**Figure 4.30** Earnings distribution of Hispanic men from 1994 to 2000
As for the Hispanic men, the first generation concentrates at the lower end of the earnings spectrum, suggesting that they have yet to achieve a similar earnings structure with that of the native whites. The earnings distribution of the second generation overlaps with that of the third generation, and both of the second and the third generations are less likely to be found at the lower end of the income spectrum than the first generation, throwing doubts to the concern that Hispanic immigrants would follow a downward assimilation trajectory. Besides, the second and the third generations of Hispanic men still have long way to go before they attain similar earnings structure as the native white men: they are
more likely to report earnings lower than 40,000$ than the native white men, and there is no evidence to suggest that their earnings structures are going to converge to that of the native white men.

Figure 4. 32 Earnings distribution of Asian men from 1994 to 2000
Figure 4. 33 Earnings distribution of Asian men from 2002 to 2008

For Asian men, it can be shown that the first generation is more likely to be found at the lower end of the income range than the native whites. However, the second and the third generation have their income structure very similar to that of the native whites; moreover, they are more likely to appear in the upper end of the income spectrum, indicating their success in attaining economic parity to the native white population.
Chapter 5

Counterfactual Analysis

Independent variables

In chapter 4 we compared the earnings distributions of various immigrant groups defined according to ethnicity, generation status and gender with those of their corresponding native white counterparts. Since earnings are largely determined by one’s socio-demographic characteristics such as experience, years of education and geographic location, it is necessary to examine to what extent immigrant groups differ from native whites with respect to these characteristics.

The covariates I examine in this study include:

1. Years of education: this variable records the total years of full-time equivalent education. Following Chiswick, Le and Miller (2006: 24)\(^8\), I assign the following values to the education categories: completed less than fifth grade (2 years); completed fifth or sixth grade (5.5); completed seventh or eighth grade (7.5); completed ninth grade (9); completed tenth grade (10); completed 11th grade (11); completed 12th grade or high school (12); attended college for less than one year (12.5); attended college for more than one year or completed college (14); Bachelor’s degree (16); Master’s degree (17.5); Professional degree (18.5); Doctorate (20).
2. Experience: this variable is defined as with the formula (Age – Years of Education – 6). It is a standard measure for studies on labor market outcomes of individuals.
3. Square of experience: this variable is defined as the square of the year of experience.
4. Region: I use four dummy variables to indicate where one lives. They are Northeast, Midwest, South, and West. The omitted dummy variable is South, which is coded as 1 for people living in any of the following states during the time of interview: Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia, Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma, and Texas. For those living out of the states listed above, this variable is set to be zero. The dummy variable Northeast is coded as 1 for those who live in any of the following states

\(^8\) I should note that Chiswick et al. (2006) distinguishes between “completed 12th grade without diploma” and “completed 12th grade with diploma” by assigning the former 11.5 years and the latter 12 years. In this study people who fall into these two categories or reported to have “completed 12th grade, diploma unclear” are all counted as having 12 years of education.

5. Metropolitan residence: this is a dummy variable which indicates whether one lives in a metropolitan area or not. It is coded as 1 for people living in metro area and 0 for those not living in metro area.

6. Married: this is a dummy variable which indicates one’s marital status at the time of interview. It is coded as 1 for people currently being married, and 0 for those not married.

Year of education

In the literature of economic assimilation of immigrants, human capital is known as a very important determinant of labor market outcomes. In empirical analysis, human capital is very often measured with the years of education that one has attained. Therefore, we shall first compare the education profiles of immigrant groups with corresponding profiles of native whites. From Figure 5.1 we can see that measured with average years of education, Hispanic immigrants have not achieved parity with their native white counterparts. With respect to women, the average years of education for native whites rose steadily from 13.4 in 1994 to 14 in 2008. During the same period, the first generation of Hispanic immigrant women experienced similar growth in education attainment: there is about 0.9 year of increase in terms of average years of education for this group. In spite of a considerable advancement in education attainment, an ineligible gap, i.e., about 3 years difference in average years of education between native white women and the first generation Hispanic women persisted over the years. For the first generation men the trend is similar, except that the education gap is even wider.

Given the significant education gap between the first generation Hispanic immigrants and their native white counterparts, it is encouraging to see, that for the 2nd generation and 3rd plus generation, average years of education are always higher than that of their first generation fellows during the period of study and the education gap between these groups and the native whites has been narrowed to a large extent. In 1994, the 2nd generation Hispanic women obtained 12.5 years of education on average, and the education gap between this group and the native white women is 0.9 years. Fourteen years later the education gap was narrowed to 0.6 years, due to the fact that the average education attainment for the 2nd generation Hispanic women was raised by almost one year. Similar progress was documented for the 3rd generation Hispanic women. During the same period this group has raised its average years of education by 0.8 years.
Notably, these achievements are by no means an exclusively female phenomenon. From 1994 to 2008, the average years of education of the 2nd generation Hispanic men increased from 12.1 to 13.0, with an overall growth of 0.9 years. During the same period the 3rd generation Hispanic men experienced an increase of 0.5 years, with their average years of education rising from 12.3 years to 12.8 years. Overall, the remarkable advancement in education attainment between the first generation Hispanic immigrants and their second and third fellows implied that regardless the education gap between the first generation immigrants and their native white counterparts, there is a great chance that by the time of the second and the third generation this gap would be narrowed and eventually closed.
Figure 5.1 Mean years of education of Hispanic immigrants by generation and gender: 1994 to 2008
So far we have compared education attainment of Hispanic immigrants and their native white counterparts across generation for men and women separately. The measure we use for education attainment is the average years of education. Given that the years of education is an interval-ratio variable and that the mean score of this variable only reflects one point of the education distribution, we can examine the education distributions of these groups under study to understand the changes occurring at the distribution level which gave birth to the changes on average.

In Figure 5.2 we compare the education profiles of the Hispanic immigrant men across generation with that of the native white men by plotting the quantile functions corresponding to their education distributions. To get the quantile functions we plot the years of education for native white men at each percentile, and repeat the same procedure for the 1st generation, 2nd generation and the 3rd generation Hispanic men. Therefore, with the consequent plot we are able to compare the years of education for people who were at the 10th percentile within the native white group with the years of education attained by people who were at the 10th percentile within the 1st generation Hispanic men. In a word, with the quantile function plot we can compare people from different groups who were taking same relative positions within their own group.

Let us start with the education profiles of native white men. From Figure 5.2 we can see that, the education profile of the native white men, represented in red solid line, has gone through changes in the following way.

a. The upward curve at the low end of the education spectrum became steeper over time, indicating a decrease in the population share of people who had the lowest level of education. In particular, in 1994, about 10% of the native white men attained no more than 12 years of education, whereas in 2008, only 5% of the native white men had similar education attainment.

b. The figures also indicate that the population share of people who attained higher education has increased. A careful examination of the plots shows that in 1994, 30% of the native white men attained more than 15 years of education, whereas this percentage increased to 36% in 2008.

In all, the changes in the education profile of native white men from 1994 to 2008 can be summarized as progress occurring both from the top and from the bottom of the education spectrum, i.e., the reduction of the population share of people with little education and the expansion of people who attained higher education. Interestingly, we observed similar trends among the 2nd and the 3rd generation Hispanic men: for these two groups, the curves at the bottom of the education spectrum became steeper over the years, and the flattened curves at the top of the education spectrum longer. These trends and patterns clearly lend support for an optimistic view of assimilation.
Figure 5.2 Education profiles of Hispanic immigrant men by generation: 1994 to 2008
The reduction of the share of people with little education was also documented among the 1st generation Hispanic men. In 1994 about 13% of the 1st generation Hispanic men had an education lower than or equal to 5 years, whereas in 2008 less than 10% of the 1st generation Hispanic men had similar education attainment. Although the expansion of people who attained higher education is not evident among this group, we should remember that most of the 1st generation Hispanic immigrant men are labor migrants and they usually finished schooling before immigration. Their education profile is more of an outcome of the immigration selection mechanism, than an outcome of assimilation in the host country.

In Figure 5.3 we show the education profiles of Hispanic immigrant women by generation during the same period. The trends and patterns of the education profiles among Hispanic women are pretty much the same as what we have observed among Hispanic immigrant men: both of the reduction of population share of people with little education and the growth in the population share of people with higher education occurred among native whites, the 2nd and the 3rd generation Hispanic women, while the 1st generation Hispanic women made some progress in reducing the population share of people with little education. Comparing Figure 5.3 to Figure 5.2, we can see that assimilation in education profile is more salient among the 2nd and the 3rd generation Hispanic immigrant women, than among their male fellows.
Quantile function: Hispanic women vs 3rd-generation white women

Figure 5.3 Education profiles of Hispanic immigrant women by generation: 1994 to 2008
So far we have looked at the education profiles of the Hispanic immigrants by gender and generation. Now let us move to the Asian immigrants. First we shall look at the average years of education of Asian immigrants by generation and gender, and then we shall examine to what extent the education profiles of the Asian immigrant groups are assimilated to that of their native white counterparts.

From Figure 5.4 we can see that, among the Asian immigrant women, the 2nd generation has the highest score on average years of education, followed by the 3rd generation, and then the 1st generation. Compared to the Asian immigrant women, native white women have the lowest average years of education through all the years, with the only exception being 1996, when the native white women had a slightly advantage over the 1st generation Asian women, but still lost to the 2nd and the 3rd generations. During the rest of the years the 1st generation women only had a very slight advantage over their native white counterparts, as the two lines (blue and red) were almost overlapped with each other.

The story is somewhat different for Asian immigrant men. The 1st generation and the 2nd generation claimed to be the most advantageous in terms of average years of education during all the years, followed by the 3rd generation, and then the native white men. Between the 3rd generation and the native white men, the education gap is very small, but persistent.

The education advantage of the Asian immigrants over the native white population took place during a period when the average years of education rose significantly within native white population for both men and women. For native white men, average years of education grew from 13.5 in 1994 to 13.9 years in 2008, and for native white women this measure went up from 13.4 to 14 years. Therefore, the persistent advantage of the Asian immigrants over the native whites suggested that the Asian immigrants have managed to achieve similar growth in education attainment. Indeed, during this period the size of the growth in average years of education among Asian immigrant women is 0.4 years for the 1st generation, 0.5 years for the 2nd generation, and 0.6 years for the 3rd generation. Among Asian immigrant men the size of the growth is 0.3 years for the 1st generation, 0.3 years for the 2nd generation, and 0.4 years for the 3rd generation.
Figure 5.4 Mean years of education of Asian immigrants by generation and gender: 1994 to 2008

Measured with average years of education, we have shown that the Asian immigrants enjoy an advantage over native whites. But we should also note that Asian immigrants are by no means a homogenous group in terms of the composition of education levels. It is well known that the education distribution of the Asian immigrants is “polarized”, meaning that there are a large proportion of Asian immigrants with college degrees and above, and also a substantial proportion of Asian immigrants with very little education. By looking at the mean, we are unable to appreciate the variations in education attainment within the Asian immigrant groups. Therefore we need to examine the education profiles of the Asian immigrant groups in comparison to the education distributions of the native whites.
Figure 5.5 suggests that not all Asian immigrants enjoy this “educational advantage” over their native white counterparts. In 1994, people with their years of education below the 10th percentile within all 1st generation Asian immigrant men actually have attained less years of education than comparable native whites. In 1996, about 20% of the 1st generation Asian immigrant men, who had the lowest years of education among their peers, indeed received less education than comparable native white men. Moreover, education disparity between the least-educated white men and the least-educated Asian 1st generation immigrant men persisted from 1994 to 2008. In contrast, among the 1st generation Asian immigrant men, those who have managed to attain more education and thus stayed beyond the 20th percentile of their education distribution do have more years of education than their native white counterparts. Therefore, it can be said that most of the 1st generation Asian immigrants do better than comparable native white in terms of years of education, with the exception that the least-educated 1st generation Asian immigrant men are yet to catch up with their native white peers with respect to education attainment.

From Figure 5.5 we also find that the 2nd generation Asian immigrant men do have an educational advantage over their native white counterparts across the whole education distribution. The 3rd generation Asian immigrant men also enjoy this advantage, but to a less extent, given that the quantile curves of this group and that of the native white men are pretty close to each other and in certain years they were almost overlapped.

For Asian immigrant women, the story is about the same. The 1st generation has a polarized education profile. In 1996, about 30% of the least-educated 1st generation Asian women have less education than comparable native whites. In contrast, the Asian 1st generation women whose years of education surpassed the 30th percentile of their education distribution received more education than comparable native white women all through the years from 1994 to 2008. The 2nd generation has a predominant advantage over their native white counterparts – as in Figure 5.6 we see that the quantile curve for this group is always on top of that of the native white women. Besides, similar to the 3rd generation Asian immigrant men, the 3rd generation Asian immigrant women have almost identical education profile to that of the native white women, which lends support to the optimistic view of a generational progress in educational assimilation.
Quantile function: Asian men VS 3rd-generation white men

Figure 5.5 Education profiles of Asian immigrant men by generation: 1994 to 2008
Figure 5.6 Education profiles of Asian immigrant women by generation: 1994 to 2008
Age

Although in our model for analysis we do not include age, a discussion of the age profiles of native whites and the immigrant groups is considered necessary. This is because the variable *experience* included in our analytic model comes from a standard formula $Age - Years of Education - 6$ and we believe by comparing the age distributions of various groups under study we can gain a better understanding of the dynamics of the distributions of experience for these groups, which we shall discuss soon.

Let’s start with the summary measure, the average age for the native whites and Hispanic immigrant groups for men and women separately. From Figure 5.7 we can see that, for men and women, through all the years under study, Hispanic immigrants are younger than the native whites on average. Within the Hispanic immigrants, the 1st and the 3rd generations are older than the second generation. In fact, the native whites, the 1st and the 3rd generations are all aging during this period from 1994 to 2008: among men, the average age of native whites in 1994 is 41 years old, and in 2008 this number grew to 43.7; similarly, the average age of the 1st generation Hispanic immigrants rose from 37.6 in 1994 to 39.7 in 2008; for the 3rd generation Hispanic immigrants, the average age went up from 38.5 to 40.7. Similar patterns are found among women, except that the 1st and the 3rd generation Hispanic immigrant women have about the same average age over the years. In contrast, the 2nd generation Hispanic immigrants overall experienced a decline in average age during the same period: average age for women is 37.8 in 1994, and dropped slightly to 37.3 in 2008; average age for men is 37.8 in 1994 and 37.2 in 2008.

In Figure 5.8 we show the average age for Asian immigrants by generation and gender over years, with native whites as reference group. It can be seen that the 1st generation Asian men women tend to have about the same average age of their native white counterparts, if not younger than the native whites, while the 2nd and the 3rd differ substantially from the native whites. Before 2002, the 3rd generation Asian men and women are younger than their native white counterparts on average, which has been reversed since 2002: during the years followed, the 3rd generation Asian men and women all have higher average age than their native white counterparts. The 2nd generation Asian immigrants have quite different trajectory in terms of average age: the overall trend is that the average age of the 2nd generation Asian men and women declined over time: for men the average age of this group is 42.3 in 1994, and dropped to 36.9 14 years later; for women the average age of this group is 39.1 in 1994, and in 2008 it is 36.9.

It should be noted that, the decline in average age among the 2nd generation Asian and Hispanic immigrants is due to the demographic process that more and more Asian and Hispanic 2nd generation are entering adulthood. Because many of them are born to foreign-born parents who are post-1960s immigrants, a great share of this group are born during or after 1960s. As they grew up, more and more will enter the age range of 25-64
and thus be included in our sample. Besides, it is very likely that the proportion of young people is higher among the 2nd generation Asian and Hispanic immigrants than that of the native whites, and in the following distribution comparison we shall see whether this is true or not.

In Figure 5.9 we show the quantile plot of age profiles for native whites and Hispanic immigrants groups for men during the period under study. Again with the quantile plot we are comparing people from different groups who hold same relative positions within their own group. We can easily compare the age of people who are younger than 80% of the native white men and the age of people who are younger than 80% of the Hispanic 1st generation immigrant men in a given year. To get this we shall simply look at the age corresponding to the 20th quantile native white men (the red line), which is about 32.5, and the age corresponding to the 20th quantile Hispanic 1st generation men (the blue line), which is around 29. Indeed, at the first glance at Figure 5.9 we can tell that native white men are prevailingly older than the three immigrant groups at all quantiles as the red line is on top of all the other three curves. Interestingly, the 3rd generation Hispanic immigrant men have the most similar but still younger age profile to that of their native white counterparts among all the Hispanic immigrant groups. Except in 1994 and in 1996, where the quantile plot for the 3rd generation had some overlap with those of the 2nd generation and the 1st generation, the 3rd generation has always been older than the 1st and the 2nd generations, which is consistent with what we have seen with the average age.

For Hispanic immigrant women, the story is similar: the 2nd generation has the youngest age structure, and the native whites have the oldest age structure. However, it should be noted that the 1st and the 3rd generation Hispanic women have almost identical age structures, as the quantile plots for these two groups overlap a lot during the period from 1994 to 2008.

Now let us have a look at the age profiles of Asian immigrant groups. From Figure 5.11 we can see that, overall, the first generation and the third generation Asian immigrant men have very similar age structure as the native white men. If we compare the age structure of the second generation Asian immigrant men with that of the native white men, we found an interesting phenomenon: before 2000, the second generation Asian immigrant men concentrate more around the elder ages than the native white men, and such a pattern was gradually reversed as time went on. From 2000 onward, the age structure of the second generation Asian men is actually younger than that of the native white. More specifically, in 1994, among the second generation Asian men, those aged above the median age of this group are older than comparable native white men. In 2000, almost every second-generation Asian man is younger than their comparable native white men. For example, people whose age is at the 10th percentile within the second generation Asian men in 2000 are aged slightly below 30, whereas those aged at the 10th percentile within the native whites in the same year are aged about 33.

The shift in the age structure of the second generation Asian men reminds us that under the label of “the second generation” there are people born in different period under different circumstances. In 1994, half of this group is composed of people aged 40 and
above, indicating that these people were born in the United States before 1954, about ten years before the enactment of the Immigration Act of 1965. Since the 1960s a new wave of Asian immigrants flocked into this country. Therefore, when the second generation of the post-1965 immigrants grew into adulthood, the age structure of the second generation Asians became rejuvenated.

What we observed among the second generation Asian men holds in general for the second generation Asian women. Before 1998, the second generation Asian women who were older than 65% of members in their group were also older than their comparable native white counterparts. Such a pattern ceased to exist in 1998; from 2000 onward, we see that almost every second-generation Asian woman is younger than their comparable native white women. Again, the rejuvenation of the age structure of the second generation Asian women has a lot to do with the fact that the second generation born to the post 1965 immigrants grew up over time, and thus replace the old “second generation” who were born to immigrants coming to the United States before the 1960s.
Figure 5.7 Mean age of Hispanic immigrants by generation and gender: 1994 to 2008
Figure 5.8 Mean age of Asian immigrants by generation and gender: 1994 to 2008
Figure 5.9 Age distribution of Hispanic immigrant men by generation: 1994 to 2008
Figure 5.10 Age distribution of Hispanic immigrant women by generation: 1994 to 2008
Figure 5. 11 Age distribution of Asian immigrant men by generation: 1994 to 2008
Quantile function: Asian women VS 3rd-generation white women

Figure 5. 12 Age distribution of Asian immigrant women by generation: 1994 to 2008
Experience

So far we have examined the education profiles and the age profiles for Hispanic immigrants and Asian immigrants across generation, for men and women separately. In this section we shall investigate the experience profiles for these immigrant groups, given the importance of experience as a determinant for one’s earnings.

In Figure 5.13 and Figure 5.14 we plot the quantile functions of the experience distributions for Hispanic immigrants across generation from 1994 to 2008, with native whites being the reference group, for men and women separately. We can see that, the first and the third generations almost share identical experience structure with the native whites. Such an observation may seem at odds with the fact that the first and the third generations are overall younger than the native white at the first glance (Figure 5.9 and Figure 5.10); however, we should remember that here we measure experience using the formula \( \text{(Age-Year of education – 6)} \), therefore, even though the Hispanic immigrants are generally younger than the native white, it is still possible for them to have similar distribution of experience as long as they also receive less education than the native whites.

It is noteworthy that the second generation Hispanic immigrant men always have less experience than comparable native white men. Moreover, the gap between the experience structure of the second generation and that of the native whites seems to enlarge over time. We have similar observations for the Hispanic immigrant women.

From our previous discussions on education and age profiles, we know that the age structure of the second generation Hispanic immigrants has been rejuvenated as compared to native whites since 1994, and the education profile of the second generation Hispanic also became more and more similar to that of the native whites during this period; therefore, their relatively young age and their relatively high performance in education attainment suggest that overall this group would have less experience than their native white counterparts. Given the role of experience in determining one’s earnings, this observation reminds us that if overall the second generation Hispanic immigrants earned less than the native whites, it is necessary to further examine whether the earnings deficit is due to their relative shorter time of work experience than that of the native whites, or the earnings deficit is due to their relative lower returns to their work experience than that of the native whites. We shall examine this issue later in this chapter with counterfactual analysis.

The first and the third generations tend to have similar experience structures with the native whites: the first generation has slightly less experience than comparable native whites, and the third generation has slightly more experience than comparable native whites. The second generation is an exception. In 1994, second generation Asian men
who has more experience than 50% of their peers also had more experience in absolute term than comparable native white men; whereas in 1996, about 80% of this group had less experience than comparable native white men. As time went on, for both men and women, the gap in the experience structure between the second generation and the native whites became widened. Again such a trend of “dissimilation” of experience structure is a product of the rejuvenation of the age structure of the second generation Asians and the “assimilation” of the education profile of this group toward that of the native whites.
Figure 5.13 Experience distribution of Hispanic immigrant men by generation: 1994 to 2008
Figure 5. 14 Experience distribution of Hispanic immigrant women by generation: 1994 to 2008
Figure 5. Experience distribution of Asian immigrant men by generation: 1994 to 2008
Figure 5. 16 Experience distribution of Asian immigrant women by generation: 1994 to 2008
Region

Here we plot the percentage of immigrants living in the south in the years under study. In Figure 5.17 we can see that, from 1994 to 2000, around 30% of the native white men and women lived in the south. However, this percentage declined steadily from 2000 to 2004 and then rose again. Besides, the second and the third generation Hispanic immigrants are always more likely to reside in the south than the native white, for both men and women. Before 2000, the first generation men and women were either equally or slightly less likely than the native whites to be found living in the south, but these trends were reversed in the years afterwards.

In contrast, all three generations of the Asian immigrants, regardless of gender, are less likely to live in the south than their native white counterparts. From 1994 to 2008, for both men and women, the percentage of the first generation Asian immigrants went up steadily, from about 15% in 1994 to around 23%. The percentage of the second generation Asian men and women fluctuated during this period with moderate growth. However, we should note that for this group no more than 20% lived in the south in all years under study. The third generation Asian men and women were the least likely to live in the south. During this period, in spite of all the fluctuations, the proportion of this group living in the south never exceeded 10%.
Figure 5. 17 Percentage of Hispanic immigrants living in the south: 1994 to 2008
% of people who lived in the South at the time of interview

Figure 5. 18 Percentage of Asian immigrants living in the south: 1994 to 2008
Metropolitan residence

In Figure 5.19 we show the percentage of Hispanic immigrants living in metropolitan area by gender and generation from 1994 to 2008. It can be seen that the native whites has the lowest percentage living in metropolitan area, followed by the third generation Hispanic immigrants, and then the second generation. The first generation Hispanic immigrants are most likely to live in metropolitan area. Indeed, for this group, more than 90% of this group lived in those areas. Similar patterns were documented for the Asian immigrants in Figure 5.20.
Figure 5. 19 Percentage of Hispanic immigrants living in non-metropolitan area: 1994 to 2008
Figure 5. 20 Percentage of Asian immigrants living in non-metropolitan area: 1994 to 2008
Being married

In Figure 5. 21 we report the percentage of people currently married at the time of interview for native whites and Hispanic immigrants. We noticed that, among women, the native white were the most likely to report being married all through the years; around 70% of the native white women were married. Within the Hispanic immigrant women, the first generation has the highest percentage of being married, followed by the third generation, and then by the second generation.

It is interesting to observe that, from 1994 to 2000, among men, the first generation Hispanic immigrants were more likely to be married than their native white counterparts, although this trend was reversed after 2000. Within Hispanic men, again the order holds that the first generation has the highest percentage of being married, followed by the third generation, and then the second generation.

When comparing the married percentage of the native whites with those of the Asian immigrant groups (see Figure 5.22), an interesting pattern emerged. For both men and women, the first generation claimed the highest percentage of being married, followed by the native whites, and then the third generation. The second-generation Asian men and women were the least likely to report being married, which might be due to their relatively young age structure. However, age structure may not be used to explain the exceptional high-percentage representation of married people among the first generation, since the first generation Asian immigrants have pretty similar or even younger age structure with that of the native white (Figure 5. 11 and Figure 5. 12).
Figure 5. 21 Percentage of Hispanic immigrants currently married: 1994 to 2008
Figure 5. 22 Percentage of Asian immigrants currently married: 1994 to 2008
In Chapter 2 I developed an overarching framework (Table 2.2) under which competing theories in assimilation can be summarized along two dimensions. To reiterate, the downward assimilation trajectory of the segmented assimilation theory implies dissimilation in characteristics with assimilation or under-assimilation in returns, whereas the racial disadvantage model predicts assimilation in characteristics with dissimilation in returns to characteristics. The straight-line assimilation suggests assimilation in characteristics along with assimilation in returns to characteristics, which is shared by the upward assimilation trajectory of the segmented assimilation theory. In addition, it is possible that a new mode of assimilation exists that immigrants can be assimilated in returns to characteristics while experience little assimilation in characteristics.

In this chapter I shall test these competing theories by comparing the marginal earnings distributions of the immigrant subgroups and native-born white, and the counterfactual distributions of immigrant subgroups in two hypothetical situations: i) the immigrant subgroup are characterized with the same covariates as the native-born whites, i.e., they are fully assimilated in terms of characteristics; ii) the immigrant subgroup experience same returns as the native-born whites for their productivity-related covariates, i.e., they are fully assimilated in terms of labor market returns to their characteristics. Moreover, I shall evaluate to what extent that assimilation in characteristics and assimilation in returns to characteristics contribute to the overall assimilation by calculating the assimilation indices based on these counterfactual distributions.

In Chapter 3 we discussed the models for the counterfactual analysis in detail. Briefly speaking, we model the $\theta$th quantile of the earnings distribution of a given immigrant group at year $t$ as a product of their productivity-related covariates (indicated by $X'_{1,t}$) and the labor market returns to these covariates (noted as $\beta_{1,t}(\theta)$). The productivity-related covariates include years of education, experience, square of experience, three dummies indicating the region one lives (Northeast, Midwest and West), a dummy variable indicating metropolitan residence, and a dummy variable for currently being married. We build a similar model for the native-born whites as well. By modeling this way we allow for the within-group inequality to the extent that people at different locations in the earnings structure of their own group (as captured by the quantiles) may vary with respect to their labor market reward mechanism. For example, $\beta_{N,t}(10)$ captures the labor market returns to the covariates of the native-born whites whose earnings are at the 10th quantile of their earnings distribution in year $t$. This can be different from $\beta_{N,t}(90)$, which characterizes the labor market reward mechanism for the native-born whites who are richer than 90% of people in their own group in terms of earnings.

$$Q_\theta(w_{1,t} \mid X_{1,t}) = X'_{1,t} \cdot \beta_{1,t}(\theta)$$
In Bassett and Koenker (1982; 1986), it is established that under regularity conditions, the estimated conditional quantile function for each group is a strongly consistent estimator of their population quantile function. This is based on the Probability Integral Transformation Theorem, which states that: if \( U \) is a uniform random variable on \([0,1]\), then \( F^{-1}(U) \) has distribution \( F \). So we estimate the \( \theta_i \) quantile of earnings distribution given the observed characteristics of the respondents, where \( \theta_1, \theta_2, \theta_3,...,\theta_m \) are drawn from a uniform \((0, 1)\) distribution. By the Probability Integral Transformation Theorem, \( \left\{X' \cdot \hat{\beta}(\theta_i)\right\}_{i=1}^{m} \) constitute a random sample from \( F(Y|X) \), the (estimated) conditional distribution of earnings given \( X \) (Albrecht et al 2009: 384).

According to Machado & Mata (2005), to ‘integrate \( X \) out’ and get a sample from the marginal earnings distribution of the immigrants in year \( t \), we can generate a random sample of size \( m \) with replacement from the rows of \( X_{t,i} \), denoted by \( \{X'_{i}\}, i = 1,2,3,...m \).

Now \( \left\{X' \cdot \hat{\beta}(\theta_i)\right\}_{i=1}^{m} \) form a random sample of size \( m \) from the marginal earnings distribution for the respondents. When the quantile model is well-specified, the marginal distribution should look very close to the observed distribution (see the following graphs for example). Therefore, rather than looking at the original distributions generated from the raw data, we shall show the marginal earnings distributions for the discussions below. Moreover, once we have the marginal earnings distributions for each group every year, we can obtain the counterfactual densities by weighting the marginal density of wages with appropriate weights.
Figure 5. 23 Log earnings of foreign-born Hispanic immigrants and native-born whites in 2006: marginal distribution V.S. observed distribution

We shall start with the Hispanic immigrants by gender and generation. Taking the same idea of “comparing the comparable” as we did in the descriptive analysis part of this chapter, we shall compare the quantile functions of corresponding earnings distributions to better understand how well the immigrants at different quantiles of its own earnings distribution performed economically as compared to their native-born white counterparts who were taking same relative positions within their own group. In particular, we shall plot the quantile functions corresponding to the marginal earnings distributions of a given
immigrant subgroup (marked in brown color) and the native-born whites (marked in red),
and we shall also plot the quantile functions corresponding to the counterfactual earnings
distributions of this immigrant group if they share same covariates of the native-born
counterparts (in blue), or they enjoy same labor market returns to their covariates as their
native-born peers (in green).

From the following graph we can see that, in all the years under study, except the two
extremes of the earnings spectrum, the red line is always above the brown line, indicating
that the majority of the native-born white women are doing much better economically
than the first generation Hispanic women who share same relative positions within their
own earnings structure. Moreover, the earnings curve of the first generation Hispanic
women would have been moved up toward the curve of the native-born white women and
thus narrowed the earnings gap between the two groups if this immigrant group had the
same characteristics as native-born whites. Last but not least, in most of the years under
observation (all but the year 2004), we see that the green curve crosses over with the
brown curve, indicating an interesting phenomenon that I shall illustrate below.
Figure 5. Log earnings of women: 1st generation Hispanic V.S. Native-born whites
Figure 5. 25 Log earnings of women: 1st generation Hispanic V.S. Native-born whites
Remember that the green curve is the quantile function of the hypothetical earnings distribution of the first generation Hispanic women given that they received same returns to their characteristics as the native-born white women did, i.e., there was no discrimination in the labor market with respect to the reward mechanism. Therefore, the crossing over between the green curve and the brown curve suggests that for the first generation Hispanic immigrant women who fall below the quantile corresponding to the crossing point (around the 30th or the 40th percentile in most of the years), they would earn less if they were treated in the labor market the same as the native-born white women who occupy the same relative positions within the earnings structure of their own group. In addition, to those first generation Hispanic immigrant women who fall above the quantile corresponding to the crossing point, they would earn more if they were treated in the labor market the same as the native-born white women who occupy the same relative positions within the earnings structure of their own group.

This implies that the labor market reward mechanism operates in two opposite ways: in contrast to the popular portrait that poor immigrants received less returns to their productivity-related characteristics than comparable native whites, we found that a considerable proportion of first generation Hispanic immigrant women at the lower end of their earnings spectrum were in fact more favored in the labor market than comparable native-born white women. Moreover, it is the first generation Hispanic immigrant women who made higher earnings that received discounted returns to their characteristics, compared to their native-born white counterparts. To summarize, if we view discounted labor market returns to characteristics as an evidence for the racial disadvantage model, such model only applies to the first generation Hispanic immigrant women who earned more than about one thirds of their co-ethnics, but not all of them. For those first generation Hispanic immigrant women at the bottom part of their earnings distribution, it is the new mode of assimilation that is at work.

As for the second generation Hispanic women, we can see from the following graph that overall their earnings structure is very similar to that of the native-born white women, which is consistent with what we observed in Figure 4.22. Admittedly, there is still an earnings gap between this group and their native-born white counterparts, especially above the 20th quantile. That is, for second-generation Hispanic women who are not at the bottom of their earnings distribution, they are more likely to report lower earnings than comparable native white women.

Besides, a similar “bifurcation” in labor market returns is observed among this group; however, this only happens to a minimal extent as compared to the first generation. Secondly, during most of the years, earnings of the second generation Hispanic women would be increased across the whole earnings distribution and close the earnings gap, if they shared the same characteristics as their native-born white counterparts. Indeed, the gains in earnings by this group in the covariates-counterfactual scenario is greater than the possible gains in earnings in the coefficients-counterfactual scenario, which implies that for the second generation Hispanic women, in order to further advance their economic status, achieving the same productivity-related
characteristics as the native-born whites is more crucial than being treated “equal” in the labor market as the native-born white women. Moreover, the blue line, which summarizes the covariates-counterfactual scenario, almost always sits on top of the red line (if not overlapped), which suggests that the second-generation Hispanic women would make even more earnings than comparable native white women once they are fully assimilated in terms of productivity-related characteristics. This also suggests that the second generation Hispanic women are not discriminated in the labor market, or, they have been successfully assimilated in terms of returns to characteristics. As this group is well assimilated in returns but not yet fully assimilated in covariates, it is reasonable to consider that this group falls under the new mode of assimilation model. However, the gains in earnings for this group decrease over time if they obtained similar characteristics, indicating the differences in characteristics between the second generation Hispanic women and the native-born white women are shrinking as time goes by. Therefore, we believe that the straight-forward assimilation model captures this temporal trend much better and thus classify this group under this model instead. Similar patterns were found among the third generation Hispanic women as well.
Figure 5. 26 Log earnings of women: 2nd generation Hispanic V.S. Native-born whites
Figure 5. 27 Log earnings of women: 2nd generation Hispanic V.S. Native-born whites
Figure 5. 28 Log earnings of women: 3rd generation Hispanic V.S. Native-born whites
Figure 5. 29 Log earnings of women: 3rd generation Hispanic V.S. Native-born whites
As for men, the first-generation Hispanics fall behind their native white counterparts across their earnings spectrums. The red curve, which stands for the earnings distribution of the native white men, is always above the brown curve that represents the earnings structure of the first-generation Hispanic men. In addition, we can see that this immigrant group could advance their earnings and thus narrow the earnings gap between them and the native-born whites if they could attain the same productivity-related profile as the latter, as the blue curve corresponding to the covariate-counterfactual scenario moves on top of the brown curve.
Figure 5. 30 Log earnings of men: 1st generation Hispanic V.S. Native-born whites
Figure 5. 31 Log earnings of men: 1st generation Hispanic V.S. Native-born whites
Moreover, the bifurcation of labor market reward mechanism also exists. Again we may view this pattern of bifurcation in labor market returns as a mixture of the “racial disadvantage model” and the “new mode of assimilation”. The crossing point of the green curve and the brown curve is around the 10th quantile during all years under study, meaning that only about 10 percent of the first-generation Hispanic men would make fewer earnings if they are treated equally as comparable native whites. That is, first-generation Hispanic men at the bottom of their earnings distribution are actually favored in the labor market as compared to “similar” native white men who were also at the very bottom of the earnings distribution of native white men as a whole – similar in a sense that they shared the same relative position within the earnings structure of their own group. The other side of the story is that around 90% of the first generation Hispanic men-- those whose earnings is above the 10th quantile of the earnings distribution of this group-- are going to be better off if they receive same returns from the labor market as comparable native white men do. It seems that in order to further narrow the earnings gap between the 1st generation Hispanic men and the native white men, assimilation in characteristics and assimilation in returns to characteristics are required.
Figure 5. 32 Log earnings of men: 2nd generation Hispanic V.S. Native-born whites
Figure 5. 33 Log earnings of men: 2nd generation Hispanic V.S. Native-born whites
With respect to the second generation Hispanic men, we see that the earnings gap has been narrowed down compared to what we just saw between the first generation and the native white men. The bifurcation of labor market reward mechanism rarely exists for this group, as the green curve, which stands for the coefficient-counterfactual scenario, was moved upward as a whole. That is, all second-generation Hispanic men could make more earnings if they are treated “equally” as comparable native white men. This finding suggests that even among native born Hispanics, certain factors are at work that inhibit this group from being fully compensated in the labor market. It is in this regard that a pessimistic view about the assimilation trajectory may hold. However, we should also be reminded that gains in earnings are considerably small when this group is treated “equally” as the native white men, which suggests that we should not exaggerate role of discounted labor market reward mechanism on the overall earnings gap between native white men and the second generation Hispanic men. Besides, starting from 2002, assimilation in covariates would bring more progress to this group than assimilation in returns to covariates. That is, assimilation in productivity-related characteristics is more important than assimilation in returns to these characteristics for the second-generation Hispanic men in order to close the earnings gap. This implies that the second-generation Hispanic men have gradually achieved assimilation in returns, in spite of the fact that they are not yet fully assimilated in characteristics. Therefore, we shall classify this group under the new mode of assimilation model. Similar patterns were observed among the third-generation Hispanic men.
Figure 5. 34 Log earnings of men: 3\textsuperscript{rd} generation Hispanic V.S. Native-born whites
Figure 5. 35 Log earnings of men: 3rd generation Hispanic V.S. Native-born whites
Now let us look at the Asian immigrants. With respect to the first generation women, we noticed that the earnings structure of this group is almost identical to that of the native-born white women. Indeed, during all the years under study the brown curve either overlapped with, or seated slightly on top of the red curve, meaning that at across their earnings spectrum, first-generation Asian women earned as much as, if not more than, their native white counterparts. Moreover, being fully assimilated in terms of productivity-related characteristics, or being completely assimilated in terms of labor market returns to these characteristics, do not lead to substantial change in the earnings structure of this group.
Figure 5. 36 Log earnings of women: 1st generation Asian V.S. Native-born whites
Figure 5. 37 Log earnings of women: 1st generation Asian V.S. Native-born whites
As for the second generation women, they are not as fully assimilated overall as compared to their first-generation co-ethnics, which is also reflected in the greater values of their assimilation indices. Comparing their marginal earning distribution with that of the native-born white women, we can see this actually is due to the fact that second-generation Asian women are doing much better than their native-born white counterparts across their earnings structures, as the brown curve is almost always on top of the red curve in all the years under observation. Moreover, we found that for this group, being completely assimilated in characteristics works only to lower their earnings, if any change happens, except for those at the very top of their earnings spectrum in 2004 and in 2006. Furthermore, the green curve, which represents the counterfactual scenario of this group being fully assimilated in returns, is always below the brown curve. This indicates that if treated equally by the labor market as the native-born white women do, the second-generation Asian women would see a decline in their earnings across their earnings distribution. Besides, in most of the years the blue curve is always under the brown curve, meaning that if the second-generation Asian women had similar characteristics as the native whites, they would experience decline in earnings across the whole earnings spectrum. That is, the productivity-related characteristics of this immigrant group are in fact more favorable than those of the native whites in the labor market. Put it in another way, this group surpassed the native-born white women in terms of characteristics and returns to characteristics, which again raises the doubts for the “racial disadvantage model”, or a downward assimilation trajectory. It is in consideration of these advantages that we decide to classify this group under the straight-line assimilation model.
Figure 5.38 Log earnings of women: 2\textsuperscript{nd} generation Asian V.S. Native-born whites
Figure 5. 39 Log earnings of women: 2nd generation Asian V.S. Native-born whites
The third-generation Asian women resemble the second generation in many ways. First of all, generally this group made greater earnings than comparable native whites. Secondly, receiving equal returns as that of the native white women tends to lower their earnings across the earnings distribution. Thirdly, if they shared the same productivity-related covariates as the native whites, a majority of this group would see a decline in their earnings in all years except 1996. Again our findings lend little support to both the “racial disadvantage model” and the pessimistic view of a downward assimilation trajectory, and we shall classify this group under the straight-line assimilation model as well.
Figure 5. 40 Log earnings of women: 3rd generation Asian V.S. Native-born whites
Figure 5. Log earnings of women: 3rd generation Asian V.S. Native-born whites
Asian immigrant men have different stories from their female co-ethnics. Speaking of the first generation, they earned less than comparable native-born white men across the whole earnings spectrum, although the gap was converging over time. Such an earnings disparity cannot be accounted by the difference in the productivity-related characteristics between this group and their native-born white counterparts, for if they happened to be characterized with exactly the same covariates, their earnings would either go down, or remain unchanged (since the blue curve always falls below or overlaps with the brown curve). Instead, it is the discounted labor market returns to their characteristics that prohibited this group from further advancing their earnings and reaching parity with the native-born white men. By “discounted” here I mean this immigrant group receives less returns to their characteristics than native-born white men who share same relative positions within their earnings structure. This can be seen from the coefficients-counterfactual scenario, as the green curve is not only on top of the brown curve but also above the red curve in all the years under study. Specifically, the first generation Asian immigrant men could have earned more than what they have attained and even surpassed comparable native-born white men, if they were treated “equally” by the labor market as the native-born white men. This finding resonates with the “racial disadvantage model” and future research can be built up to explore possible factors that lead to the discounted-labor-market-returns phenomenon.
Figure 5. 42 Log earnings of men: 1st generation Asian V.S. Native-born whites
Figure 5. Log earnings of men: 1st generation Asian V.S. Native-born whites
As for the second generation, while their earnings distribution diverged more from the earnings structure of the native white counterparts, than that of the first generation did, this is more of a reflection of their better situation – as indicated in the following graph, this group usually earned as much as, or even more than their native-born white counterparts (only with the exception of years 1998 and 2006). It is also noted that the counterfactual scenarios, in terms of coefficients and covariates, do not produce consistent patterns over time. For example, earnings of the second-generation Asian middle-income-earners dropped if they received same returns in 1994, whereas the opposite happened in 1998, 2000 and 2006. Besides, complete assimilation in covariates resulted in an overall progress in earnings in 2000, 2002 and 2008; however, during the rest of the years, this counterfactual scenario caused a decline in earnings for middle-to-low income earners and boosted the earnings of high income earners. These inconsistent patterns, we believe, may be attributed to the relatively small sample size of this group (Table 4.9), given that a reasonable sample size for counterfactual methods should be no less than 500.
Figure 5. 44 Log earnings of men: 2\textsuperscript{nd} generation Asian V.S. Native-born whites
Figure 5.45 Log earnings of men: 2nd generation Asian V.S. Native-born whites
Similar instable results are found among the third generation Asian men with respect to the covariate-counterfactual scenario. Again this may has something to do with their relative small sample size (still less than 500). Notwithstanding the sample limits, we noticed that this group shares essentially the same earnings structure with the native-born white men, and the coefficients-counterfactual scenario does not alternate substantially their original earnings structure. This suggests that the third generation Asian men did not face any “discounted returns” in the labor market. Moreover, during most of the years being fully assimilated in characteristics seems to only lower the earnings of the majority of this group, with the only exception in 1994, which indicated that the productivity-related covariates of the third-generation Asian men are more favorable than that of the native whites in the labor market. Therefore, it is reasonable to put this group under the straight-line assimilation model.
Figure 5. 46 Log earnings of men: 3rd generation Asian V.S. Native-born whites
Figure 5. 47 Log earnings of men: 3rd generation Asian V.S. Native-born whites
So far we have compared the earnings distributions of Hispanic and Asian immigrants with earnings distribution of the native-born whites. The comparisons are made across generation, for men and women separately. We further simulated the hypothetical earnings distributions for these immigrant groups given that they shared the same productivity-related characteristics with the native whites, or they received equal returns to characteristics as the native whites do, in order to better appreciate to what extent assimilation in covariates and assimilation in returns to covariates contribute to the overall assimilation.

To summarize, for the first-generation Hispanic men and women, the gap between their earnings distributions and those of their native-born white peers can be narrowed if these immigrants are completely assimilated in terms of covariates. Besides, an “equal” treatment in the labor market would help to close the earnings gap between the middle-to-high Hispanic female earners and the comparable native-born white women, and increase earnings for virtually all the foreign-born Hispanic men (except those at the very bottom of their earnings distribution) and thus reduce the earnings disparity between this group and native white men.

As for the second and third generation Hispanic women, assimilation in covariates contributes more to the increase in earnings than assimilation in returns, even though the overall assimilation level is already quite high. In most of the years, if this group shared the same covariates as their native-born white counterparts, they would receive even greater earnings, which implies that this group has already been fully assimilated in terms of the labor market returns to covariates. For the second and third generation Hispanic men, it is primarily assimilation in covariates that would help to close the earnings gap between this group and the native-born white men, while assimilation in returns only improves their earnings to a minor extent.

Over all, the first-generation Asian women are well assimilated. In addition, their marginal earnings distribution either overlaps with, or sits on top of their counterfactual distributions both on covariates and on coefficients, which indicates that their earnings would not be increased if they are fully assimilated in covariates or completely assimilated in returns to covariates. In contrast, the first-generation Asian men face substantial earning deficits as compared to their native-born white peers, which is due to their discounted returns to productivity-related characteristics in the labor market. With respect to the second and the third generation Asian immigrant women, we found that they are characterized with productivity-related covariates which are favored in the labor market over those of the native whites; in addition, they receive a greater return to these characteristics as compared to their native white counterparts. Similar findings hold for the third generation Asian men.

The table below presents a summary of the assimilation models that can be used to classify the assimilation mechanism for various immigrant groups under investigation.
So far we have examined the earnings distribution of the various immigrant groups by comparing their marginal distribution, distributions under two counterfactual scenarios, with the marginal distribution of their native-born white counterparts. While by comparing the earnings distribution between immigrant groups and native whites we can examine qualitatively to what extent the earnings structure of a given immigrant group resembles that of their native white counterparts (as well as under counterfactual scenarios), it would be desirable for us to quantify the differences in earnings structure between the two groups with a single measure. The Assimilation Index introduced in Chapter 3 serves for this purpose and I shall summarize the level of assimilation with respect to earnings distribution for Hispanic and Asian immigrant men and women across generation. The Assimilation Index ($AI$) we are going to use is the square root of Jensen-Shannon Divergence measure and it is a true metric according to Endres and Schindelin (2003). The minimum value for $AI$ is 0, indicating that the two earnings distributions under comparison is completely identical. The maximum value for $AI$ is 1, which suggests that the two earnings distributions under comparison is totally different. By plotting the $AIs$ for a given immigrant group with their native white counterpart as reference group, we can track the trend of assimilation this specific group experienced during the period of observation.
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*Table 5.2 Assimilation Index of Hispanic immigrants, by gender and generation status: 1994-2008*
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**Table 5.3** Assimilation Index of Asian immigrants, by gender and generation status: 1994-2008
In Table 5.2 and Table 5.3 I display the assimilation indices for Hispanic and Asian immigrants, by gender and generation status from 1994 to 2008. Here the assimilation indices are calculated for all the immigrant groups under investigation on the basis of their marginal distribution, counterfactual distribution with same coefficients, counterfactual distribution with same covariates, using the marginal distribution of the native white counterparts as the reference. We shall also use line charts to visualize the trends.

The first generation Hispanic immigrant men has for a long time been a target of pessimistic views regarding their social and economic integration. This group consists of people with relatively low education and poor English proficiency – with these disadvantages it is considered to be very difficult for them to achieve economic parity with their native white counterparts. Indeed, this group has the highest scores on assimilation index among all of the three generations through all the years from 1994 to 2008: assimilation indices grew slightly and steadily from 0.3 in 1994 to 0.34 in 2000, and then fluctuated slightly over time and reached 0.32 in 2008. As the high score on AI indicates dissimilarity in earnings structure, it can be argued that earnings distribution of the first generation Hispanic men differed substantively from that of the native white men. Moreover, earnings disparity across the distribution between this group and the native white men would be largely decreased if the first generation Hispanic men are fully assimilated in either characteristics or returns to their characteristics, since under these two scenarios assimilation indices generally fluctuated around 0.2. It should be noted that, with only one exception (year 1996), full assimilation in returns contributes more than full assimilation in characteristics in closing the earnings gap across distribution.

Figure 5.48 Assimilation Index of 1st generation Hispanic men: 1994-2008
Measuring with assimilation index, the second generation and the third generation seem to have maintained same level of assimilation: their scores on AI are very close to each other in almost every year under observation, and they are all below 0.2. In 2008, assimilation indices of the two groups are 0.14 and 0.19, indicating that these two groups have achieved an earnings structure very similar to that of the native white men. Therefore, it makes little sense to believe that there is a downward assimilation pattern from the second generation to the third generation. Speaking of the mechanism of assimilation, being assimilated in returns and being assimilated in covariates both work to narrow their earnings gap with the native white men to a large extent, since assimilation indices under these scenarios are very small (less than 0.15). Furthermore, it is assimilation in covariates that contributes more in lowering down the dissimilarity between their earnings structure and that of the native white men, as the green line almost always stays under the red line.

Figure 5. Assimilation Index of 2nd generation Hispanic men: 1994-2008
Compared to Hispanic men, Hispanic women overall made more progress in achieving parity with native white women in earnings structure, as the scores of assimilation index for Hispanic women are all lower than those of the Hispanic men across generation. For the first generation Hispanic women, assimilation index varied over time between 0.21 to 0.25, suggesting substantive differences between this group and the native white women with respect to earnings structure. For the second generation, scores on assimilation index never exceeded 0.11, indicating that the earnings distribution of this group largely resembled that of the native whites. Although the third generation seems to have greater variation in the scores on assimilation index, assimilation indices for this group are pretty similar to those of the second generation in most of the years, due to the similar structure of their earnings distributions. Again, by comparing the earnings structure of the native white women and Hispanic women across generation, we found no evidence to support the argument that downward assimilation happened from the second generation to the third generation.

With respect to the mechanism of assimilation, the first generation Hispanic women differ from their co-ethnic men in that assimilation in covariates and assimilation in returns to covariates made about equal contribution in reducing the earnings gap at distributional level. For the second and the third generation, assimilation in covariates and assimilation in returns do not change their earnings structure substantively, as the assimilation indices for the counterfactual scenarios are very much close to the overall assimilation indices during all the years. However, it is worth to note that assimilation in covariates always matter more in reducing the earnings disparity distributionally.
Figure 5.51 Assimilation Index of 1st generation Hispanic women: 1994-2008

Figure 5.52 Assimilation Index of 2nd generation Hispanic women: 1994-2008
It is observed that Asian immigrant men had very similar earnings structure as their native white counterparts: for all the generations and through all the years under study, overall assimilation indices never exceed 0.15. In spite of the fluctuations during this period, assimilation index went to stabilize around 0.1, which indicates a relatively high level of assimilation. Interestingly, being fully assimilated in covariates or in coefficients tend to increase the differences in earnings structure between the first generation Asian men and their native white counterparts – this looks puzzling at the first glance, but remember that an earlier discussion of Figure 5. 42 and Figure 5. 43 reveals that this immigrant group receives less returns to their characteristics than native-born white men who share same relative positions within their earnings structure. Therefore, if they were treated “equally” by the labor market as the native-born white men, the first generation Asian immigrant men could have earned more than what they have attained and even surpassed comparable native-born white men, which consequently enlarges the earnings gap. On the other hand, if they happened to be characterized with exactly the same covariates, their earnings would either go down, or remain unchanged, which also work to enlarge the earnings gap and thus generate a higher score on the assimilation index.

As for the second generation, assimilation in returns to characteristics helps to close the earnings gap, while assimilation in characteristics works in the opposite way, in most of the years. The third generation Asian men follow similar trends, except that for this group being fully assimilated in covariates brought little change to their score on the assimilation index.
Figure 5. 54 Assimilation Index of 1st generation Asian men: 1994-2008

Figure 5. 55 Assimilation Index of 2nd generation Asian men: 1994-2008
For Asian women, the first generation experienced the highest level of assimilation: assimilation index for this group varied between 0.06 and 0.09, suggesting that the earnings structure of this group was very similar to that of the native white women. The second generation appeared to have different story: earnings structure of this group kept converging to that of the native white women from 1994 to 2002, and then started to diverge during the following 4 years and finally stabilized around 0.15. In line with the density plots of this group examined earlier on, we can see the trend of divergence was triggered by the second-generation Asian women moving at a greater speed towards the upper end of the earnings spectrum than the native white women. For the third-generation, despite of all the fluctuations, assimilation index dropped from 0.14 in 1994 to 0.09 in 2008, which indicates the convergence in earnings structure between the two groups.

With respect to the mechanism of assimilation, it is worth to mention that for the second generation Asian women being fully assimilated in covariates means lower score on assimilation index, that is, the earnings structure of this group under such a counterfactual scenario resembles more to that of the native white women than its marginal distribution. This is because the second generation Asian women are doing much better than their native-born white counterparts across their earnings structures, and being completely assimilated in characteristics works only to lower their earnings and narrow the earnings gap between this group and their native white counterparts. Similarly, being fully
assimilated in coefficients generates a lower score on assimilation index – for if treated equally by the labor market as the native-born white women do, the second-generation Asian women would see a decline in their earnings across their earnings distribution, which works to close the earnings gap as well.

Similar story was found among the third generation Asian women - the covariate-counterfactual scenario generates a lower score on the assimilation index because for this group receiving equal returns as that of the native white women tends to lower their earnings across the earnings distribution and thus narrows the earnings gap.

![Figure 5. 57 Assimilation Index of 1st generation Asian women: 1994-2008](image)

**Figure 5. 57 Assimilation Index of 1st generation Asian women: 1994-2008**
Figure 5. 58 Assimilation Index of 2nd generation Asian women: 1994-2008

Figure 5. 59 Assimilation Index of 3rd generation Asian women: 1994-2008
Chapter 6

Conclusion

It has been more than four decades since the enactment of the Immigration and Nationality Act of 1965. Waves of the so-called "new immigrants", i.e., people of non-white ethnicity who came from regions other than northern and western Europe since then, have established settlement in United States and some of their second generation now step into adulthood. To what extent these people are assimilated economically into the mainstream, forms the core of debates in the immigration literature. While competing theories and models are proposed by different schools to answer this key question, empirical evidences, based upon which these perspectives are developed, are exclusively derived from mean-comparison analyses. In other words, what we have known so far with respect to economical assimilation of immigrants in this country largely comes from comparisons of earnings which only involved typical immigrants and typical natives. The majority of the immigrants and the majority of the native-born Americans, are left outside of the scope of the scientific investigation. As the earnings structure of both the immigrants and that of the natives have undergone substantial changes since the 1970s, it is unclear whether conclusions drawn from mean-comparison studies can be generalized to the entire population.

To overcome this limit we compared the earnings distributions of Hispanic and Asian immigrants with that of their native-born white counterparts, moving beyond the mean-comparisons. By using the entropy-based assimilation index, we measured earnings assimilation and provided a thorough examination over the magnitude and trend of earnings assimilation for Hispanic and Asian immigrants from 1994 to 2008.

It is revealed that earnings assimilation varies across ethnicity, gender and nativity status. The first generation Hispanic men had the highest scores on assimilation index among all of the three generations through all the years from 1994 to 2008, which suggests that the earnings structure of this group differs substantively from that of the native white men. The second and third generation Hispanic men maintained a similar level of assimilation over time and their scores on assimilation index are consistently of small order, indicating that these two groups have achieved an earnings structure very similar to that of the native white men.

Among Hispanic women, the first generation has the highest score on assimilation index, showing that this group is yet to be fully assimilated with respect to earnings structure.
The second and the third generation have similar earnings structures and their scores on assimilation index are relatively small, meanings that their earnings structures largely resemble that of the native white women.

Asian immigrants overall seem to have achieved more parity with the native whites than the Hispanic immigrants, as all of them have relatively small scores on assimilation index, for both men and women and irrespective of nativity status. It is worth to mention that, the second generation Asian women, who attained the highest scores on assimilation index within Asian immigrants in all the years, moved at a faster speed toward the upper end of the earnings spectrum than the native white women; the very fact that they made larger gains in earnings than their native white women counterparts created a ostensible trend of "dissimilation" when their scores on assimilation index raised from 2000 to 2006.

Besides measuring earnings assimilation at the distributional level, we investigated the mechanism of earnings assimilation by separating assimilation in terms of characteristics from assimilation with respect to returns. This approach comes from the conceptualization that earnings is a product of characteristics and labor market returns to characteristics, and immigrants can be assimilated either in characteristics, or in returns to characteristics, or both. Although the sociological literature in assimilation has spoken to this issue implicitly, it is yet to be tested empirically due to the same methodological limit of the mean-comparison approach.

By simulating the hypothetical earnings distributions for the immigrant groups under study given that they shared the same productivity-related characteristics with the native whites, or they received equal returns to characteristics as the native whites did, we tested competing assimilation theories including the straight-line assimilation model, segmented assimilation model, racial disadvantage model as well as the new mode of assimilation model. It is found that the majority of the first-generation Hispanic men and women are yet to be fully assimilated both in characteristics and in returns, which lends support to the downward assimilation perspective. However, those first generation Hispanics who stand at the very bottom of their earnings distribution are well assimilated in terms of labor market returns to their characteristics, indicating that a new mode of assimilation is at work.

As for the second and third generation Hispanic women, assimilation in covariates contributes more to the increase in earnings than assimilation in returns, even though the overall assimilation level is already quite high. In most of the years, if they shared the same covariates as their native-born white counterparts, they would receive greater earnings and close the earnings gap. In fact, they would make even more earnings than comparable native white women once they are fully assimilated in characteristics. This implies that they have been well assimilated in terms of returns to characteristics. Besides, for these two groups the gains in earnings decrease over time if they obtained similar characteristics, which indicates that the differences in characteristics between them and their native white counterparts are shrinking over time. Therefore we conclude
that the straight-line assimilation model and the upward assimilation scenario provide a
good fit for them. As for the second and third generation Hispanic men, it is primarily
assimilation in covariates that would help to close the earnings gap between these groups
and the native-born white men, while assimilation in returns only improves their earnings
to a minor extent. This finding also lends support to the new mode of assimilation.

Over all, the first-generation Asian women are well assimilated. In addition, their
marginal earnings distribution either overlaps with, or seats on top of their counterfactual
distributions both on covariates and on coefficients, which indicates that their earnings
would not be increased if they are fully assimilated in covariates or completely
assimilated in returns to covariates. In other words, this group has been well assimilated
both in covariates and in returns to covariates. This finding resonates with the prediction
by straight-line assimilation model and the upward assimilation scenario.

In contrast, the first-generation Asian men face substantial earning deficits as compared
to their native-born white peers, which is due to their discounted returns to productivity-
related characteristics in the labor market. Indeed, this phenomenon of under-evaluation
of skills is prevailing among all first-generation men Asian regardless of their relative
position within their earnings structure, which is consistent with findings from previous
studies (Hirschman and Wong 1981; Zeng and Xie 2004). This finding resonates with the
racial disadvantage model and demands future research that explores possible factors that
lead to the discounted-labor-market-returns phenomenon.

With respect to the second and the third generation Asian immigrant women, we found
that they are characterized with productivity-related covariates which are favored in the
labor market over those of the native whites; in addition, they receive a greater return to
these characteristics as compared to their native white counterparts. Similar findings
hold for the third generation Asian men. These findings provide support to the straight-
line assimilation model and the upward assimilation scenario.

Based on what we have found about the magnitude and the mechanism of earnings
assimilation for various immigrant groups, we conclude that, overall, the Asian
immigrants, the second and the third generation Hispanic immigrants are well
assimilated. It is the first generation Hispanic men and women that demand the greatest
attention because the majority of them still have long way to go before being fully
assimilated in characteristics and in labor market returns. Besides, the first generation
Asian men, being the exception among the Asian immigrants, deserve special attention as
well. For their productivity-related characteristics are under-evaluated in the labor
market.

In this study we use annual earnings as the dependent variable, since we believe that this
is the single most important indicator that reflects the economical well-being of
immigrants. It should be noted that our research design differs conceptually from studies
where hourly wage is the outcome variable. For the focus here is whether immigrants and native whites have similar earnings distributions, controlling for their productivity-related characteristics. As earnings may be conceptualized as the product of hourly wage and number of working hours, it is possible that using hourly wage as the dependent variable we may draw different conclusions.

To investigate this matter, we ran counterfactual analysis for Hispanic women and Asian women using the 2008 data, adding the number of hours worked into the model. Findings from this new model, to a large extent, resemble what we have found from the main model. For example, among the 1st generation Hispanic women, those with the lowest earnings (below the 5th percentile) will keep their earnings unchanged, should they receive same premium to their characteristics; and the rest of them would have their earnings increased. In essence, this is consistent with our previous finding that labor market rewarding mechanism differs between low-income earners and middle-to-high income earners among the first-generation Hispanic women. It is also found that everyone of this group would have earnings increased, if they were fully assimilated in characteristics. Therefore, we may still classify this group under the downward assimilation perspective.

For the second and third generation Hispanic women, their earnings structures largely resemble that of the native white women. In addition, being treated equally as the native white women in the labor market, or being fully assimilated in characteristics does not introduce substantive changes to their earnings structure; this confirms that they are well assimilated both in characteristics and in labor market returns and thus the straight-line assimilation model applies.

Among the first generation Asian women, those whose earnings are between 10th percentile and the 80th percentile will experience a slight increase in earnings and outperform their native white counterparts, if being treated equally as the native white women in the labor market. Similar patterns hold for the 3rd generation Asian women whose earnings are above the 30th percentile of their own earnings distribution. However, the gain in earnings is of such a minor degree that it is appropriate to argue that the earnings structures under the coefficient-counterfactual scenario largely remain intact. We also found that, for the 2nd generation Asian women, receiving equal returns to their characteristics does no change their earnings. Therefore, it is reasonable to believe that all the Asian women are well assimilated in returns to covariates.

Moreover, regardless of generation status, all the Asian women would have their earnings decreased, or remain unchanged, if they are fully assimilated in terms of characteristics, which suggests that they have already been well assimilated in characteristics. Therefore, we may classify the Asian immigrant women under the straight-line model or the upward assimilation perspective.

Finally, we should keep in mind that these preliminary analyses only employed the female sample in a single year. Whether these findings also hold for men in general, and
women in other years, is worth of further investigation and opens up a venue for future research.
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