THE ECONOMIC ASSIMILATION OF ASIAN IMMIGRANTS:

A LONGITUDINAL STUDY

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Abstract

This paper examines the relationship between the timing of immigration and the earnings trajectories of Asian immigrants using data from the National Survey of College Graduates. The results show that the popular idea that immigrants experience lower initial earnings but faster growth so that they will eventually catch up with native workers requires some qualifications. First of all, the phenomenon of immigrant economic assimilation is not universal: Asian immigrants who completed education in America experience earnings trajectories similar to those of native workers. The earnings trajectories of Asian immigrants who completed education prior to immigration fall into the characterization of assimilation. And the earlier the migration in the life course, the better economic prospects they face in the U.S. However, even in the best scenario where immigration occurred immediately after graduation, foreign-educated Asian immigrants will only attain earnings parity with natives toward the end of their working lives.

Immigrant economic assimilation refers to the phenomenon that immigrants face an initial earnings disadvantage relative to their native-born counterparts at the time of immigration but experience faster wage growth; consequently, as immigrants stay longer in the U.S., they close the earnings gap with native workers. The idea that the earnings of immigrants will eventually equal those of native workers was popularized by Chiswick's (1978) study, "The Effect of Americanization on Earnings of Foreign-Born Men," in which he estimated that immigrants reach earnings parity with native workers after 10 to 15 years of stay in the U.S. The argument for immigrant economic assimilation is based on an analysis of the basis of their earnings disadvantage. New immigrants face an earnings disadvantage mainly for two reasons: because they do not speak English well and because their human capital attained prior to immigration is discounted in the U.S. labor market. Therefore, it is expected that as immigrants stay longer in the U.S. and thereby improve English fluency and accumulate U.S.-specific work experience, they will gradually overcome their initial earnings disadvantage. Chiswick (1978) argued that earnings of selected immigrant groups may eventually overtake those of native workers, since immigrants are a self-selected group and as such are probably more capable and motivated to attain economic success.

Although much disagreement exists on how quickly immigrants catch up with native-born workers and whether they eventually reach parity at all, researchers generally agree on the overall pattern of faster earnings growth and hence diminishing disadvantage for immigrants. Studies using different datasets and a variety of methods have invariably

found that immigrants who have stayed longer in the U.S. have relatively higher earnings than new immigrants (Borjas 1985, 1989; Duleep and Regets 1997; Longva and Raaum 2003). However, before we fully embrace economic assimilation as a universal path for immigrants, we must reexamine the phenomenon of assimilation on two particular points.

The first point is: *who* does the phenomenon of economic assimilation apply to? The foreign-born population in the U.S. is highly heterogeneous with regards to ethnicity, language, education, and length of stay in the U.S. and immigrants' labor market outcomes are likely to vary by all those characteristics. In particular, immigrants who grew up and received education in the U.S.—the so-called the 1.5 generation—are often indistinguishable from the native-born population in terms of language use, familiarity with American culture, as well as educational and labor market experience. Therefore, it is likely that the 1.5 generation will experience the same earnings trajectory as native-born workers, thus deviating from the typical assimilation path for the first generation immigrants. Hence the question "assimilation for whom."

The second question I would like to raise is economic assimilation *to whom*. Or put in another way, whom should we compare immigrants to when studying the phenomenon of assimilation? The obvious answer is the native-born population of similar characteristics, in particular, of *equivalent work experience*. The reason why I stress equal experience as a basis of comparison is that earnings growth curve is typically concave downward as a result of diminishing returns to work experience. This relationship between earnings and experience means that in comparison to an experienced

worker, an inexperienced worker usually has lower earnings but a faster instantaneous growth rate even if the two workers are on exactly the same earnings trajectory. Because earnings comparison of workers of various vintages will likely lead to a false impression of assimilation for the less experienced worker, we should only compare workers of equivalent experience. It is in this qualification that a problematic subtlety exists—what is meant by "equivalent experience" for immigrants and natives? While many immigrants have some foreign work experience, native workers do not have any. In particular, since past studies (e.g., Friedberg 2000) have found that foreign experience has lower returns than domestic experience, we may think that foreign work experience is not a good substitute for U.S. work experience. The question "assimilation to whom" arises because for those immigrants with some foreign work experience there does not exist a suitable comparison group of native workers with equivalent labor market experience. Clearly, how we compare these immigrants with foreign work experience will affect our conclusions regarding the magnitude, and even the existence, of the assimilation effect.

The purpose of this study is to examine the assimilation phenomenon in light of the two issues I have just raised: (1) whether economic assimilation describes the experience of immigrants in general or just a segment of the immigrant population, and (2) how the choice of comparison group affects the conclusions about the assimilation effect. While my general arguments apply to immigrants from all origin countries, in this paper I restrict the analyses to Asian immigrants in order to study the assimilation phenomenon among a relatively more homogeneous immigrant population. The results reveal that the

well-known phenomenon of immigrant economic assimilation requires a number of qualifications. First of all, young immigrants who migrated before the completion of education do not experience economic assimilation simply because they hardly encountered any earnings disadvantage upon entering the labor market in the U.S. In other words, Asian immigrants educated in the U.S. experience an earnings trajectory similar to that of native workers. Furthermore, while the earnings trajectory of foreign-educated Asian immigrants exhibits patterns of assimilation (i.e., lower initial earnings and faster growth) relative to native workers with the same amount of total experience, foreign-educated Asian immigrants generally do not have faster growth in earnings than native workers with the same amount of U.S. experience. An overarching finding from this study is that timing of immigration has a substantial consequence for the earnings trajectory of Asian immigrants. The earlier in the life course immigration occurred, the better immigrants will do in the U.S. labor market. If immigration occurred before the completion of schooling so that immigrants received at least partial education in the U.S., then they will have similar labor force outcomes as native-born workers. The more immigrants had invested in foreign work experience by the time of migration, the slower their earnings will grow in the U.S. and the lower their peak earnings will be.

TRANSFERABILITY OF HUMAN CAPITAL AND TIMING OF IMMIGRATION

Human capital theory maintains that individuals derive economic benefits from investment in people, which refers mainly, although not exclusively, to education and work

experience. From this perspective, the immigrant/native earnings gap likely results from a difference in the value of their human capital endowments. It has been argued that the value of human capital is country-specific because education and labor market experience acquired in different origin countries vary in quality and compatibility with the host society (Bratsberg and Terrell 2002; Friedberg 2000; Zeng and Xie 2004). For example, countries with lower pupil-teacher ratios and higher expenditures per student tend to have higher educational qualities. Human capital compatibility refers to the extent to which training and knowledge conferred by a foreign institution are transferable to the host society. This factor always discounts foreign human capital with the discount rate depending on the similarity between the origin society and the host society. In addition, foreign human capital may be undervalued due to credentialism. In evaluating job applicants' potential productivity, employers are likely to value human capital attained in the U.S more than that attained in a foreign country. This is because American employers are not familiar with foreign credentials and credentials carry little weight if employers do not recognize them. Thus, even if immigrants are no less productive than native workers, they may still encounter a disadvantage in the labor market, particularly in landing their first career-track jobs in the U.S.

A number of recent studies have further shown that the lower value of foreign human capital could explain most of the earnings disadvantage for immigrants. For example, in a study on immigrants to Israel, Friedberg (2000) found that foreign labor market experience yields almost no significant earnings return, and that the lower value of

foreign human capital can fully explain the earnings disadvantage of immigrants relative to comparable natives in Israel. In a study focusing on Asian Americans, Zeng and Xie (2004) identified foreign education as the source of Asian Americans' earnings disadvantage relative to whites. Their evidence the finding that when Asian Americans are divided into three subgroups—U.S.-born Asian Americans, U.S.-educated Asian immigrants and foreign-educated Asian immigrants—only foreign-educated Asian immigrants suffer an earnings disadvantage relative to U.S.-born whites.

The empirical finding that immigrants' earnings disadvantage is mostly attributable to the lower value of foreign education and work experience suggests that timing of immigration may play a crucial role in determining immigrant labor force outcome. Since human capital investment is concentrated during the first half of the life course, the earlier the migration, the more immigrants will invest in U.S.-specific human capital, and the higher their earnings will be. Immigrants who migrated early in the life course to obtain educational credentials from U.S. institutions and acquire all their work experience in the U.S. should experience an earnings trajectory similar to that of the native workers. Immigrants who migrated upon completion of schooling are expected to encounter an initial earnings disadvantage due to the lower value of foreign education. If immigration occurred some time after the completion of schooling, immigrants are likely to face an even greater earnings gap upon entering the U.S. labor market due to compounded disadvantage of foreign education and work experience. Therefore, I ask the following

question: How does the path of immigrant economic assimilation depend on timing of migration?

THE COMPARISON PROBLEM IN STUDYING ASSIMILATION

That foreign work experience receives lower returns than domestic labor market experience has also cast doubts on whether the well-documented faster earnings growth for immigrants relative to native workers should necessarily be interpreted as an assimilation effect. Let us assume that foreign work experience may be translated into equivalent U.S. work experience at a constant rate, which is called the *transfer rate*. For example, a transfer rate of 1/3 means that an immigrant worker with 3 years of foreign work experience is as productive as a native worker with 1 year domestic experience. Given a transfer rate of 1/3, the best way to compare immigrant/native workers' earnings is to match immigrant workers with n years of foreign experience with native-born workers with $n/3$ years of domestic experience. Without the knowledge of the transfer rate, the conventional comparison is based on parity of total work experience, which compares immigrants with n years of foreign experience to native workers with n years of domestic experience. Unfortunately, this approach may lead to an illusion of assimilation effect due to diminishing returns to work experience.

[Figure 1 About Here]

Let me demonstrate this with a hypothetical example. Figure 1 illustrates one particular scenario of immigrant and native workers' earnings trajectories. As is clear

from figure 1b, upon entering the U.S. labor market, all immigrants are sent on track of the same earnings trajectory as native workers except that their initial earnings are generally lower. As the figures show, if we compare native workers and immigrants on parity of U.S. work experience (see figure 1b), we do not see any sign of assimilation: immigrants merely follow the footsteps of native workers and the immigrant/native earnings gap persists throughout the life course. If we compare native workers and immigrants on parity of total work experience (see figure 1a), however, we would notice faster earnings' growth for immigrants, which is typically taken as evidence of an assimilation effect. Thus, depending on whether the comparison is based on parity of total experience or U.S. experience, we may come to different conclusions as to whether assimilation exists and how large the effect is.

The difficulty in testing for the assimilation effect is that ideally we would like to compare the instantaneous rates of growth for immigrants and natives who are as similar as possible on the observables, including labor market experience. However, while the majority of immigrants have some foreign work experience, native-born workers do not have any. For workers with some foreign experience, the problem of choosing an appropriate comparison group of native workers may be rephrased as a problem of choosing a transfer rate. In the example above, a transfer rate translates foreign experience into the equivalent U.S. experience, so that the growth rates of the immigrant and the native may be compared on equal footing. In general, the transfer rate lies between a lower bound of 0 and an upper bound of 1. These bounds have the following

interpretations: a rate of 0 means that foreign experience is completely disregarded and thus comparison should be based on parity of U.S. work experience, whereas a rate of 1 means that foreign experience is regarded as having the same quality as domestic experience and thus comparison should be based on parity of total work experience. However, in reality we do not know the true transfer rate, although we may infer from Friedberg's study that it is much closer to 0 than to 1. That is my rationale for proposing the alternative test of assimilation based on parity of U.S. experience to complement conventional analyses based on parity of total experience.

Indeed, many previous studies of assimilation argued that differences between U.S. experience and foreign experience contribute to immigrants' initial earnings disadvantage. Some have also attempted to estimate separate returns to immigrants' post-immigration experience and pre-immigration experience. Nevertheless, past studies have invariably tested the assimilation effect by comparing immigrants to native workers on parity of total experience (e.g., Chiswick 1978; Borjas 1985, 1989; Duleep and Regets 1997). As I shall show in this paper, comparison of immigrant/native earnings growth based on the alternative criterion—parity of U.S. experience—will complement our understanding of the assimilation phenomenon.

DATA

In this study I analyze data from the 1993-99 National Survey of College Graduates (NSCG). The initial survey of the NSCG was administered in 1993 to a sample of college

graduates who were identified by the 1990 Census Long Form as holding bachelor's or advanced degrees. A subgroup of the 1993 baseline sample, namely, those who were either educated in a science and engineering (S/E) field or working in an S/E occupation, were then surveyed biennially in 1995, 1997, and 1999. The NSCG panel of scientists and engineers represents a very selective sample of the total U.S. population: less than 10% of the adult population are scientists and engineers by training or by occupation[1]. In addition, I restrict this analysis to White and Asian male workers. Due to sample selection, the results of this study do not generalize to the total U.S. population.

The 1993 NSCG dataset contains variables from the 1990 Census, which include education and annual earnings in 1989 as well as such background information as ethnicity and immigration status. Due to differences in question wording, the 1993 earnings are not comparable with those in the other years.[2] Consequently, my analysis includes 1989, 1995,

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[1] Strictly speaking, the NSCG panel only approximately represents its target population in 1993. If respondents obtained additional degrees between 1993 and 1999, they were moved from the NSCG sample to the National Survey of Recent College Graduates (NSRCG) sample within the Scientists and Engineers Statistical Data System (SESTAT).

[2] The 1993 NSCG asked respondents to report both salaries and pay schedule, and then annualized earnings based on that information. In the other years, respondents were instructed to report annual pre-tax earned income. The former method tends to overestimate annual earnings. As a result, the 1993 average earnings in 1989 dollars stood $3061, or 7.5%, higher than in 1995.

1997, and 1999 earnings from the Census but excludes 1993 earnings from the NSCG. A separate analysis ignoring this instrument inconsistency and utilizing all five years of earnings data suggests that the estimates reported in this study are insensitive to the exclusion of the 1993 earnings data.

The NSCG questionnaires asked respondents from which institutions they received their degrees. Based on whether their highest degrees were conferred by U.S. institutions or foreign institutions, I categorized Asian immigrants into foreign-educated and U.S.-educated. Thirteen of the foreign-educated immigrants in the panel obtained new degrees from U.S. institutions after 1990, thus migrating from the category of FEAI to that of UEAI. Since the purpose of this analysis is to compare the earnings growths of UEAI and FEAI, it is convenient to treat place of education as a time-invariant variable. Therefore, I excluded from the sample observations with degrees obtained after 1990.

Table 1 displays the characteristics of the four groups of male workers: U.S.-born Whites (UBW), U.S.-born Asians (UBA), U.S.-educated Asian immigrants (UEAI) and foreign-educated Asian immigrants (FEAI). Degree, major and English fluency are time-invariant variables in this analysis,[3] while earnings, work experience, and years since migration vary with time. The descriptive statistics in Table 1 show that UBW and UBA

[3] The educational variables are time-invariant because observation with degrees granted on and after 1990 are excluded from the sample. Immigrants' English fluency should improve over time, but is treated as time-invariant in the analysis because it is measured only once in 1990.

are similar on all the variables examined here, whereas UEAI and FEAI are noticeably different not only from native workers and but also from each other. For example, UEAI in this S/E sample are more likely to hold master's degrees (57% vs. under 27% for the other groups), whereas FEAI are more likely to hold doctoral degrees (11% vs. under 2% for the other groups). Compared to native-born workers, both immigrant groups are concentrated in engineering and are less likely to have been educated in non-S/E majors. The two groups, however, have very different representations in computer and math sciences: 18.4% of the UEAI are computer and math majors compared with 5.5% of the FEAI. This is probably due to the fact UEAI on average are much younger than FEAI, and as such are more likely to engage in the newer fields of study such as computer science. As Table 1 shows, UEAI are short of 4-5 years of work experience compared to native-born workers, whereas FEAI have 3-4 years more experience. In spite of their younger age structure, UEAI have been in the U.S. longer than FEAI. Finally, UEAI have higher earnings than native workers in 1995, 1997 and 1999, while FEAI have the lowest earnings in all four years. The earnings of UBW and UBA are similar.

Note that for UEAI, years since migration (*YSM*) exceeds years since graduation (*YSG*); the opposite is true for FEAI. If we divide total work experience into pre-immigration work experience and post-immigration experience, then a mean *YSG* of 16.8 years and a mean *YSM* of 10.8 years for FEAI suggest that on average FEAI have 6 years of foreign work experience and 10.8 years of U.S. work experience. By the same

method, UEAI have on average spent 7.5 years in U.S. schools before entering the labor market.

[Table 1 About Here]

METHODS

Biases in Cross-sectional Estimates of Assimilation Effect

Early studies of immigrant earnings have used cross-sectional data to construct and compare the earnings trajectories for native workers and immigrant workers. For example, Chiswick's study (1978) analyzed the 1970 Census Public Use Micro Sample data and found that immigrants experience faster wage growth than native workers and that their earnings overtake those of natives after 10-15 years in the U.S. However, longitudinal data are preferable to cross-sectional data for investigating earnings growth, as there are two inherent problems with cross-sectional data which may lead to biased estimates of immigrant earnings growth.

The first is selective emigration. For example, if immigrants with lower earning potential tend to return to their home countries after a period of stay in the U.S., then at any given cross-section, we would observe a more selective group of earlier immigrants than of recent immigrants, resulting in an overestimated rate of wage growth for immigrants (Borjas 1989; Edin, LaLonde, and Åslund 2000). In longitudinal data, the problem of selective emigration exists in the form of panel attrition. As Table 1 shows, in 1999 the sample sizes for the four groups shrink to below one half of their baseline numbers.

Moreover, immigrants have slightly higher attrition rates than do native workers: the attrition rates for UBW, UBA, UEAI and FEAI in the 1999 panel are respectively 55%, 56%, 61% and 62%. Unlike in cross-sectional studies, however, longitudinal data allow us to find out who left the study and thus address the attrition problem through inverse probability weighting. To do this, I estimated the probability that each individual worker appears in a particular panel and weighed each person-period by the inverse of that probability. By giving more weight to those individuals who are less likely to be observed in follow-up panels, this procedure corrects for selective panel attrition based on observed variables.[4]

Another pitfall of estimating earnings growth based on cross-sectional data is the inseparability of the age effect and the cohort effect in a cross-section. The earnings difference between a worker with 10 years of experience and one with 20 years of experience, for example, represents both the age effect and the cohort effect, as the second worker not only has 10 years more experience than the first worker, but also graduated 10 years earlier. Many studies of immigrant earnings (Borjas 1985; Duleep and Regets 1997; Longva and Raaum 2003) have emphasized the importance of separating the two effects in studying immigrant assimilation. In particular, Borjas (1985) argued that the quality of immigrants declined during the second half of the 20th century. Figure 2 illustrates how

[4] The variables used to correct for attrition bias include degree, English proficiency, major, marital status, race, foreign birth, foreign education, and age.

cross-sectional data could lead to an overestimation of immigrant wage growth when earlier cohorts on average earn more than recent cohorts. Note that earnings "growth" observed in a cross-section, represented by the dotted line, is steeper than within-cohort growth along the solid lines. With longitudinal data, we are able to decompose the cross-sectional "growth" into inter-cohort "growth" and within-cohort growth under certain assumptions.

[Figure 2 About Here]

In order to understand how the "quality," as measured by earnings, of different immigration cohorts might have varied over time, let us briefly examine two primary factors that determine the quality of immigrants: the eligibility criteria set by the immigration policy in the host country (i.e., the demand factor) and the quality of the immigrant pool attracted to the host country (i.e., the supply factor). In 1965 the U.S. immigration policy changed from a quota system based on national origin to the current policy based on the principle of family reunification. Since then the major source of immigrant inflow has shifted from Europe to Asia and Mexico. This change in the ethnic composition of incoming immigration cohorts is likely to have an impact on the earnings of immigrants as a group.

The quality of immigrants in comparison to native workers also depends on the levels of social and economic development in the origin countries relative to that in the host country. To the extent that countries in various parts of the world experience different pace of development over time, the relative quality of immigrants should change

accordingly. During the 1970s-80s, some parts of East Asia and Southeast Asia experienced phenomenal economic growth and social development. The effect of this rapid development on the quality of Asian immigrants, however, is two-fold. On the one hand, due to the increased availability of public education and higher education in the origin countries, recent immigrants on average are much better-educated than earlier immigrants (Yang 1999). On the other hand, the rapid expansion of education suggests that over time the educated population has become less selective, with the effect that earnings within levels of educational attainment may have actually decreased. In other words, it is possible that the average earnings of recent immigrants are higher than those of earlier immigrants, but that their earnings conditional on educational attainment are lower. Since this study deals with a highly selective sample—the scientist and engineer population—it is particularly important to account for immigration cohort differences.

Earnings Growth Model

Before discussing a multi-level earnings growth model, let us consider the following growth model for cross-sectional data:

$$y_{ij} = \alpha_{0j} + \alpha_{1j} POSTEXP_{ij} + \alpha_{2j} POSTEXP_{ij}^{\ 2} + \alpha_3 PREEXP_{ij} + \alpha_4 PREEXP_{ij}^{\ 2} + \alpha_5 POSTEXP_{ij} \cdot PREEXP_{ij} + \varepsilon_{ij} \quad , (1)$$

where y_{ij} is log of earnings for individual i in group j for j = 0, 1, 2, 3, indicating UBW, UBA, UEAI and FEAI respectively. *POSTEXP* is U.S. work experience, which is measured by *YSG* (years since graduation) for UBW, UBA, and UEAI, and by *YSM* (years since migration) for FEAI. *PREEXP* is pre-immigration experience for FEAI, measured

by *YSG-YSM*. Since UBW, UBA, and UEAI do not have any pre-immigration experience, *PREEXP* takes on the value of 0 for these three groups. As a result, the earnings of FEAI depend on both *POSTEXP* and *PREEXP*, while those of UBW, UBA, and UEAI vary with *POSTEXP* only. More independent variables such as education, major, and English fluency as well as interaction terms may be added to equation 1 to make it a realistic model for earnings growth curve. However, equation 1 currently contains all the essential terms for comparing earnings trajectories for UBW, UBA, UEAI, and FEAI.

Because we are interested in cross-group comparisons of earnings growth, group-specific growth curves are estimated. Note that the parameters for the quadratic growth curve α_{0j}, α_{1j}, α_{2j} vary by j. Moreover, for FEAI, returns to foreign work experience and U.S. work experience are separately estimated. An interaction term *POSTEXP* **PREEXP* is further included to allow FEAI's post-immigration earnings growth to vary by the amount of their foreign work experience.

Equation 1 communicates the idea of an earnings growth model in a cross-sectional setting. In this study, because longitudinal data are available from the NSCG, earnings growth is modeled in the framework of hierarchical linear models (HLM) (Raudenbush and Bryk 2002) with level 1 units—person-periods—nested within level 2 units—the individuals. The hierarchical earnings growth model has the following level 1 equation:

$$y_{ti} = \alpha_{0i} + \alpha_{1i} POSTEXP_{ti} + \alpha_{2i} POSTEXP_{ti}^{2} + \varepsilon_{ti}, \qquad (2)$$

where y_{ti} is the log of earnings for immigrant i at time t (t = 89, 95, 97, or 99), $POSTEXP_{ti}$ is U.S. work experience, α_{0i}, α_{1i}, α_{2i} are parameters with random components (see equation 4

to 6), and ε_{it} is the error term. Level 2 equations corresponding to α_{0i}, α_{1i}, α_{2i} are specified as follows:

$$\alpha_{0i} = \beta_{00} + \beta_{01} PREEXP_i + \beta_{02} PREEXP_i^2 + \sum_{j=1}^{3} \beta_{03j} GROUP_{j,i} + \gamma_{0i}, \quad (3)$$

$$\alpha_{1i} = \beta_{10} + \beta_{11} PREEXP_i + \sum_{j=1}^{3} \beta_{12j} GROUP_{j,i} + \gamma_{1i}, \quad (4)$$

$$\alpha_{2i} = \beta_{20} + \sum_{j=1}^{3} \beta_{21j} GROUP_{j,i} + \gamma_{2i}, \quad (5)$$

where $GROUP_j$ is the dummy variable for the jth category of workers (reference = UBW, 1 = UBA, 2 = UEAI, 3 = FEAI), and γ_{0i}, γ_{1i}, and γ_{2i} are random effects, distributed as multivariate normal (**0**, **T**), where **T** is a 3×3 covariance matrix.

The hierarchical model as given by equations 2-5 is a random intercept and random slope model: each worker in the sample has his own baseline earnings and growth curve. We can rewrite this model in the form of a mixed model by substituting equations 2-5 into equation 3 as follows,

$$\begin{aligned} y_{ti} = {} & (\beta_{20} + \sum_{j=1}^{3} \beta_{21j} GROUP_j + \gamma_{2i}) POSEEXP_{ti}^{\ 2} + \\ & (\beta_{10} + \beta_{11} PREEXP + \sum_{j=1}^{3} \beta_{12j} GROUP_j + \gamma_{1i}) POSTEXP_{ti} + \quad . \quad (6) \\ & \beta_{00} + \beta_{01} PREEXP_i + \beta_{02} PREEXP_i^2 + \sum_{j=1}^{3} \beta_{03j} GROUP_{j,i} + \gamma_{0i} \end{aligned}$$

Notice that equation 6 includes all the terms in equation 1—*PREEXP, PREEXP*^{2}*, *POSEEXP, POSTEXP*^{2}*, *PREEXP*POSTEXP*. Furthermore, as in equation 1, the intercept as well as the coefficients of *POSEEXP* and *POSTEXP*^{2} also vary by *GROUP*, which allows us to test group differences in earnings trajectory. Therefore, equation 6

may be regarded as the multi-level version of the cross-sectional earnings growth model for group comparison.

Now I expand equations 3-5 to include some additional independent variables, which give the following equations.

$$\alpha_{0i} = \beta_{00} + \beta_{01} PREEXP_i + \beta_{02} PREEXP_i^2 + \sum_{j=1}^{3} \beta_{03j} GROUP_{j,i} + \sum_{k=1}^{3} \beta_{04k} DEGREE_{k,i} + \sum_{l=1}^{5} \beta_{05l} MAJOR_{l,i} + \sum_{m=1}^{3} \beta_{06m} ENGLISH_{m,i} + \gamma_{0i}, \quad (3^*)$$

$$\alpha_{1i} = \beta_{10} + \beta_{11} PREEXP_i + \sum_{j=1}^{3} \beta_{12j} GROUP_{j.i} + \sum_{k=1}^{3} \beta_{13k} DEGREE_{k,i} + \gamma_{1i}, \quad (4^*)$$

$$\alpha_{2i} = \beta_{20} + \sum_{j=1}^{3} \beta_{21j} GROUP_{j,i} + \sum_{k=1}^{3} \beta_{22k} DEGREE_{k,i} + \gamma_{2i}, \quad (5^*)$$

where

- $DEGREE_{k,i}$ is the dummy variable for the *k*th degree type (reference = bachelor's, 1 = master's, 2 = professional, 3 = Ph.D.) for individual *i*,
- $MAJOR_{l,i}$ is the dummy variable for the *l*th major (reference = computer and math sciences, 1 = life sciences, 2 = physical sciences, 3 = social sciences, 4 = engineering, and 5 = non-S/E majors) for individual *i*, and
- $ENGLISH_{m,i}$ is the dummy variable for the *m*th category of English fluency (reference = speaking English only or very well, 1 = well, 2 = not well, 3 = not at all) for individual *i*.

Notice that the term *DEGREE* in equations 4* and 5* allows for degree-specific trajectories. The system of equations 2, 3*, 4* and 5* is the actual model estimated in this paper.

As mentioned earlier, panel data allow us to separate the age effect from the cohort effect and estimate cohort-specific growth curves. The hierarchical model as given by equations 2-5* does not differentiate between immigration cohorts. In an extension to this model, I further examine earnings differences across immigration cohorts by adding a set of cohort indicator variables to equation 3*. In exploring cohort differences I constrain the various cohorts to have the same growth rates while allowing them to differ in intercept.[5]

In the assimilation literature (e.g., Chiswick 1978; Borjas 1989; Duleep and Regets 1999), immigrant earnings growth is typically specified in a form similar to the following equation:

$$y_{ij} = \alpha_0 + \alpha_1 YSG_{ij} + \alpha_2 YSG_{ij}^{\ 2} + \alpha_3 YSM_{ij} + \alpha_4 YSM_{ij}^{\ 2} + \varepsilon_{ij}, \qquad (7)$$

where *YSG* is years since graduation and *YSM* is years since migration. It can be easily shown by substituting *YSG* for *POSTEXP + PREEXP* and *YSM* for *POSTEXP* that equation

[5] I impose this constraint on the model because constructing cohort-specific growth curves across the entire range of working ages (say 30 years) based on longitudinal data covering a mere 10-year window involves much extrapolation. Constraining the cohorts to have the same growth rates allows me to pool information from the various cohorts in estimating a global growth curve.

7 is nested in equation 1. The two models are different in that the latter constrains that there is no interaction effect between *YSG* and *YSM*, a restriction absent in the former. In a longitudinal setting modeling earnings as a function of *PREEXP* and *POSTEXP* is also conceptually more advantageous. During the study period, immigrants' post-immigration experience increased but pre-immigration experience remained at its baseline level. Since foreign work experience *PREEXP* does not vary with time, it enters the model as a level 2 predictor (see equations 2-5). The problem with modeling log earnings as a function of *YSG* and *YSM* with longitudinal data is that while both *YSG* and *YSM* are time-dependent variables in the level 1 model, there exists only one time line; the difference of *YSG* and *YSM*, which is *PREEXP*, stays constant during the study period.

Comparing Immigrant/Native Earnings Growth Curves

The goal of this study is to compare earnings trajectories of UBW, UBA, UEAI, and FEAI. In particular, comparisons are focused on UEAI against UBW and UBA, and FEAI against UBW and UBA, corresponding to the following two hypotheses:

- U.S.-educated Asian immigrants have the same earnings trajectory as U.S.-born workers.
- Foreign-educated Asian immigrants experience earnings assimilation relative to U.S.-born workers.

Since the above hypotheses involve comparison of multiple groups (e.g., UEAI against UBW and UBA), I first test whether the two native groups, UBW and UBA, share

the same earnings trajectory. If they do, then I can combine UBW and UBA into one group and proceed with the immigrant/native comparisons. If UBW and UBA have different growth curves, then I need to compare immigrants to UBW and UBA separately. We can test whether two groups have the same earnings trajectory using a likelihood ratio test that compares the smaller model, where two groups share a common growth curve, against the larger model, where each group has its own curve.[6]

Hypothesis 2—the immigrant economic assimilation hypothesis—involves two conditions, both of which must be satisfied in order to conclude that FEAI experience economic assimilation relative to native-born workers. First, FEAI have lower earnings than native workers at 0 years of experience. Second, FEAI have a faster earnings growth than native workers. For simplicity, I will discuss how to compare initial earnings and growth rates across groups using the simple growth model in equation 1, as the method of comparison in the hierarchical model of equations 3-6* is the same.

In equation 1, the initial log earnings for UBW, UBA, and UEAI are α_{00}, α_{01}, and α_{02} respectively. FEAI's earnings upon entering the U.S. labor market vary by the amount of pre-immigration experience they came with, and are given by $\alpha_{03} + a_3 PREEXP + \alpha_4 PREEXP^2$. Note that for those FEAI who immigrated immediately

[6] In applying likelihood ratio tests to fixed effects in mixed models, it is important that the models are estimated using full maximum likelihood method. Models estimated by restricted maximum likelihood (REML) method are not comparable in testing fixed effects via likelihood ratio tests.

after graduation (i.e., *PREEXP* = 0), the initial earnings reduce to α_{03}, but for those FEAI with *PREEXP* > 0 α_{03} represents a non-existent quantity—the initial earnings they would have made had they been in the U.S. at the start of their working life. The rates of log earnings growth $\frac{\partial y}{\partial POSTEXP}$ for UBW, UBA, and UEAI are $\alpha_{1j} + 2\alpha_{2j} POSTEXP$, j = 0, 1, 2. The log earnings of FEAI have a growth rate of $\alpha_{13} + 2\alpha_{23} POSTEXP + \alpha_5 PREEXP$, which depends on both *POSTEXP* and *PREEXP*.

The tests of FEAI's lower initial earnings and faster growth are complicated by the previously mentioned problem of incomparability—that is, FEAI and native workers do not overlap in the distribution of foreign experience. The problem of incomparability is mostly clearly shown in Figure 1, where the earnings growth of native workers is represented by a single curve, but a family of curves is needed to illustrate the earnings growth of immigrants with different levels of foreign experience—if we wish to distinguish foreign experience and U.S. experience. Thus, in comparing the earning growth of immigrants and natives, I am dealing with a comparison between a family of curves and a single curve. Since native workers do not have any foreign work experience, *the only immigrants strictly comparable to native workers are those who came to the U.S. immediately after graduation*. For this reason, my conclusion about the assimilation effect will largely be based on the experience of that particular group of FEAI. In comparing FEAI with non-zero foreign work experience with native workers, I am faced with the dilemma of whether the comparison should be based on parity of total work experience (figure 1a) or parity of U.S. specific work experience (figure 1b). Instead of

pursuing a sharp but simplistic test of the assimilation hypothesis in this analysis, my approach here is to present a more nuanced description of the assimilation phenomenon.

RESULTS

General Results

Results from the hierarchical earnings growth model are presented in Table 2. Let me first briefly mention the results for the control variables—degree type, major, and English fluency—and then focus on group differences in earnings growth. Upon entering the labor market, advanced degree holders earn 36-51% more than workers with bachelor's degrees only, and those with doctoral degrees have the highest earnings. However, professional degree holders experience the fastest earnings growth. In a few short years their earnings exceed those of doctoral degree holders and remain the highest for the remainder of the working ages. Earnings also vary appreciably by major, with engineers and computer/math scientists earning above the average, and life scientists and social scientists below the average. As expected, those who speak English only or very well have higher earnings than those who do not speak English well.[7]

The random effects for level 1 intercept, slope, and rate of acceleration are all statistically significant. This means that even after including the explanatory variables

[7] The sample size of those who do not speak English at all is extremely small (see Table 1). That is probably why they do not show up as the group with the lowest earnings.

currently in the earnings growth model, there still exists substantial between-person variation in earnings trajectory that is due to unmeasured person-specific characteristics. In addition, the level 1 random intercept and random slope for *POSTEXP* (γ_0 and γ_1) are negatively correlated with a correlation coefficient of -0.737, suggesting that individuals with lower initial earnings tend to have faster growth rates at baseline.

[Table 2 About Here]

Group Differences in Earnings Trajectory

Figure 3 displays the predicted earnings profiles for UBW, UBA, UEAI, and a particular group of FEAI—those with 0 years of foreign work experience—based on estimates from the hierarchical growth model. The two immigrant groups, UEAI and FEAI, have strikingly different earnings growth, with UEAI closely following the trajectories of the native-born workers, and FEAI falling into the characterization of economic assimilation. A closer look at Figure 3 and Table 2 reveals that UEAI in fact also experience an initial disadvantage and moderately faster growth rates relative to UBA and UBW. This, however, should not be interpreted as an assimilation effect for the following reasons. As Table 3a shows, UBW, UBA, and UEAI, in that order, have descending initial earnings and ascending growth rates for the first twenty years of work experience. Thus, while UEAI exhibit the pattern of assimilation relative to UBA and UBW, so do UBA to UBW. Likelihood ratio tests show that the trajectory of UEAI is not statistically different from that of UBA (p-value = 0.104), but both UEAI and UBA are different from UBW.

Therefore, when taking into account the earnings growth of UBA, I conclude that UEAI do not experience economic assimilation relative to native workers.

[Figure 3 About Here]

The earnings profile of those FEAI without any foreign work experience is aptly described by "assimilation toward natives," that is, they face an initial earnings disadvantage relative to native-born workers, and the disadvantage decreases with time. For example, upon entering the labor market in the U.S., FEAI with no foreign experience earn only half as much as native-born whites; it is projected that after 25 years their earnings will rise to 102% of those of UBW (see Table 3). As I have argued earlier, the preferred test of assimilation from the point of view of covariate comparability is to compare FEAI without any foreign work experience to native workers. Thus, results from the earnings growth model confirm the assimilation effect for foreign-educated Asian immigrants. However, the rate of assimilation for these immigrants is much slower than what Chiswick (1978) reported for the general immigrant population more than 20 years earlier, i.e., immigrants would reach parity after 10-15 years of stay in America. My results based on data from the 1990s indicate that FEAI without any foreign experience will reach earnings parity only after 25 years of U.S. work experience.

[Table 3 About Here]

The immigrant/native comparison presented in Figure 3 pertains only to those FEAI without any foreign work experience. Those FEAI, however, constitute only a small subset of immigrants, as the majority of immigrants come to the U.S. after having

worked abroad for some amount of time. Let us use the notation FEAI (x) to denote the group of FEAI with x years of pre-immigration experience. As is emphasized earlier, in comparing FEAI with foreign work experience to native workers, we are faced with the difficult choice of experience parity. If foreign work experience is 100% transferable, immigrants should be compared to natives with the same amount of total work experience (Figure 4a). On the other hand, if foreign work experience has a transfer rate of 0, then comparison should be based on parity of U.S. work experience (Figure 4b). Below I compare the earnings of FEAI with foreign work experience with native-born workers from these two perspectives respectively. For brevity, the comparison is focused on FEAI against one group of the native-born workers, namely, UBA. Complete comparison results are provided in Table 3.

[Figure 4 About Here]

First, let us examine the results with FEAI compared to native workers with the same amount of total work experience. As shown in both Figure 4a and Table 3a, all four groups of FEAI—FEAI (0), FEAI (5) , FEAI (10) and FEAI (15)—earn less than UBA with the same amount of total work experience, with the earnings disadvantage increasing in foreign work experience. While their earnings vary substantially by foreign work experience, all FEAI experience similar growth at rates faster than those of UBA. Consequently, as FEAI accumulate work experience in the U.S., their disadvantage steadily decreases. Based on this evidence, I conclude that *foreign-educated Asian*

immigrants experience economic assimilation relative to native workers with the same amount of total work experience.

The large earnings variation by foreign work experience among FEAI, as disclosed in Figure 4a, is particularly noteworthy. FEAI who immigrated earlier in their life course enjoy a clear earnings advantage relative to those who invested more in foreign work experience as a result of higher returns to U.S. work experience than to foreign work experience. As Figure 4a shows, while FEAI (0) will eventually reach earnings parity with native workers, earnings convergence will never occur for FEAI (5+). The large earnings variation within FEAI suggests that the comparison of FEAI (0) against native-born workers in Figure 3—which is also what most past studies have based their conclusions upon—describes merely the best scenario, not the average scenario, for FEAI. In this scientist and engineer sample, the average FEAI has 6 years of foreign experience (see Table 1); according to my estimates immigrants with 6 years of foreign work experience will never reach earnings parity with native-born workers.

Now, let us reexamine our results assuming that foreign work experience is completely nontransferable. By comparing immigrant/native earnings growth by parity of U.S. work experience, Figure 4b and Table 3b lend a very different perspective on the economic assimilation for immigrants.[8] If FEAI migrated to the U.S. with 5 years of

[8] Figure 2.4b is obtained from Figure 2.4a by shifting the curves for FEAI (5), FEAI (10), and FEAI (15) to the left by 5, 10, and 15 years respectively.

foreign work experience, they face an earnings disadvantage of about 15% relative to UBA who entered the U.S. labor market at the same time. Because FEAI (5) experience earnings growth rates similar to those of UBA, their earnings disadvantage of 15% remains throughout their working life. When FEAI (10+) start work in the U.S., they earn more than UBA, but lose their advantage quickly due to slower growth rates. Thus, Figure 4b suggests that *in general FEAI with foreign experience do not experience assimilation relative to native workers with the same amount U.S. work experience.*

In addition, Figure 4b and Table 3b also lead to two significant findings about returns to foreign work experience. The first is that foreign work experience has a significant, positive impact on FEAI's initial earnings in the U.S. labor market. As Table 2 shows, the effect of *PREEXP* on FEAI's log earnings is $0.079PREXEXP - 0.002PREEXP^2$, which is even greater than the returns to experience for UBW ($0.067POSTEXP - 0.002POSTEXP^2$). The other observation is a substantial negative interaction effect between *PREEXP* and *POSTEXP*. As shown in Figure 4b, immigrants who came with less pre-immigration experience enjoy faster post-immigration earnings growth and reach higher maximum earnings during the life course. This is a restatement of the previous observation from Figure 4a that it is to FEAI's advantage to immigrate as early as possible in the life course. These results about return to pre-immigration experience are very different from Friedberg's (2000) finding that foreign work experience yields almost no positive return for immigrant to Israel. This is probably due to the fact

that I allow for the interaction effect of *PREEXP* and *POSTEXP*, while Friedberg's model did not.

Cohort Differences

Figure 5 presents earnings growth of FEAI (0) by immigration cohort (Pre-1964, 1965-69, 1970-74, 1975-79, 1980-84, and 1985-89) referenced to UBA. The most recent immigration cohort, the 1985-89 arrivals, earns 9-15% less than earlier cohorts. Likelihood ratio test shows that the overall cohort differences are statistically significant (p-value = 0.013). However, the results do not support the claim of a steady decline in immigrant "quality" as far as the conditional earnings of Asian immigrants—i.e., expected earnings conditional on experience, degree, major, and English fluency—are concerned. With the cohorts of pre-1964, 1965-69, 1970-74, 1975-79, 1980-84 arrivals earning 15%, 9%, 12%, 14%, and 9% more the 1985-89 arrivals respectively, there does not appear to be any discernible pattern to the change in cohort quality. In addition, most of the pairwise differences among the cohorts are not statistically significant.

[Figure 5 About Here]

CONCLUSION

In this paper, I have examined the economic assimilation of Asian immigrants with emphases on two previously understudied issues: (1) Does the assimilation phenomenon apply to those immigrants who received their highest degrees from U.S. institutions? (2) When comparing immigrant/native earnings trajectories, we may either compare

immigrants to native-born workers with the same amount of total work experience or to workers with the same amount of U.S. work experience. How does the choice of comparison group affect our conclusions? My analysis of longitudinal data from the 1993-1999 National Survey of College Graduates leads to three major conclusions. Because the NSCG sample represents only the scientist and engineer population in the U.S., the following conclusions do not generalize to the total Asian American population.

First, place of education sorts immigrants into two earnings trajectories. While U.S.-educated Asian immigrants closely follow the earnings trajectory of U.S.-born Asians, foreign-educated Asian immigrants fall into the characterization of assimilation, i.e., lower initial earnings and faster earnings growth.

Second, there exists an unambiguous assimilation effect for foreign-educated Asian immigrants without any foreign work experience. Immigrants with foreign experience exhibit the pattern of assimilation relative to native workers on parity of total work experience, but not to native workers on parity of U.S. experience.

Third, there exist huge variations in earnings trajectories among immigrants with different levels of foreign work experience. In general, immigrants will have the best economic prospects if they immigrated to the U.S. immediately after graduation. However, even in this best scenario, they will only attain earnings parity with native-born workers toward the end of their working ages. For average foreign-educated Asian immigrants with 6 years of foreign work experience, earnings convergence will never occur.

Table 1: Descriptive Statistics

	UBW	UBA	UEAI	FEAI
Time-invariant variables				
Degree				
% Bachelor	64.72	64.30	37.71	65.96
% Master	26.86	23.25	57.45	18.19
% Professional	7.42	12.12	3.02	5.26
% Ph.D.	1.00	0.33	1.82	10.59
Major				
% Computer and math sciences	9.62	11.24	18.40	5.48
% Life and related sciences	7.66	9.50	3.26	11.25
% Physical and related sciences	7.72	3.71	3.64	11.76
% Social and related sciences	13.22	13.86	4.31	10.88
% Engineering	36.26	35.15	50.74	45.73
% Non-S&E degrees	25.53	26.53	19.65	14.90
English				
% Speak English only or very well	99.39	97.82	74.84	66.47
% Well	0.38	1.64	23.43	28.34
% Not well	0.23	0.55	1.63	5.04
% Not at all	0.01	0.00	0.10	0.15
Time-variant variables				
Mean years of experience in 1989	13.85	12.56	8.62	16.75
Mean years since migration in 1989	-	-	16.05	10.80
Mean earnings in 1989 dollars				
1989	37,062	35,599	35,096	30,763
1995	40,899	40,790	42,168	33,259
1997	44,087	45,205	46,092	36,768
1999	45,401	46,829	48,420	37,174
Unweighted sample size				
1989	29,589	873	2,024	1,305
1995	19,525	567	1,254	803
1997	17,940	533	1,150	679
1999	13,251	388	782	497

Note: Because the earning distribution is right skewed, the geometric mean, instead of the arithmetic mean, is used to calculate mean earnings.

Table 2: Estimated Fixed and Random Effects from Earnings Growth Model

Fixed effects	Coefficient	SE	*t*	*p*-value
Level 1 intercept (β_0)				
Intercept	10.065	0.015	683.68	0.000
PREEXP	0.079	0.008	10.10	0.000
PREEXP2	-0.002	0.000	-7.79	0.000
Master[a]	0.321	0.021	15.13	0.000
Professional	0.306	0.036	8.51	0.000
Ph.D.	0.411	0.083	4.95	0.000
Speak English well[b]	-0.114	0.022	-5.19	0.000
Speak English not well	-0.252	0.047	-5.42	0.000
Speak English not at all	-0.119	0.241	-0.50	0.620
UBA[c]	-0.125	0.065	-1.92	0.055
UEAI	-0.189	0.039	-4.82	0.000
FEAI	-0.633	0.064	-9.87	0.000
Life and related sciences[d]	-0.340	0.015	-22.31	0.000
Physical and related sciences	-0.154	0.016	-9.75	0.000
Social and related sciences	-0.303	0.013	-23.04	0.000
Engineering	0.049	0.011	4.29	0.000
Non-S&E degrees	-0.112	0.013	-8.81	0.000
Level 1 POSTEXP slope (β_1)				
Intercept	0.067	0.001	47.88	0.000
PREEXP	-0.004	0.000	-10.92	0.000
Master	-0.017	0.003	-6.78	0.000
Professional	0.031	0.004	7.52	0.000
Ph.D.	-0.025	0.010	-2.42	0.016
UBA	0.011	0.008	1.43	0.153
UEAI	0.024	0.005	4.43	0.000
FEAI	0.041	0.008	5.43	0.000
Level 1 POSTEXP2 slope (β_2)	(per 100 units)	(per 100 units)		
Intercept	-0.153	0.004	-40.72	0.000
Master	0.020	0.007	2.72	0.007
Professional	-0.076	0.011	-6.96	0.000
Ph.D.	0.036	0.029	1.25	0.213
UBA	-0.021	0.022	-0.93	0.352
UEAI	-0.059	0.017	-3.39	0.001
FEAI	-0.058	0.021	-2.73	0.007

Random Effects	SD	Var. Component	Chi-square (*d.f.*)	*p*-value
Level 2: γ_0	0.670	0.449	7908.49 (4672)	0.000
POSTEXP slope: γ_1	0.090	0.008	5898.62 (4681)	0.000
POESTEXP2 slope: γ_2	0.002	0.000	5549.22 (4682)	0.000
Level 1: ε	0.399	0.159		

Note:

a. The reference category is “Bachelor's degree.”

b. The reference category is “Speak English only or very well.”

c. The reference category is UBW.

d. The reference category is “Computer and math sciences.”

Table 3a: Growth Rates and Relative Earnings by Total Work Experience

Panel A: Growth rates							
	0	5	10	15	20	25	30
UBW	0.067	0.052	0.037	0.021	0.006	-0.009	-0.025
UBA	0.078	0.061	0.044	0.026	0.009	-0.008	-0.025
UEAI	0.091	0.070	0.049	0.028	0.007	-0.015	-0.036
FEAI (0)	0.108	0.087	0.066	0.044	0.023	0.002	-0.019
FEAI (5)	*	0.089	0.068	0.047	0.026	0.004	-0.017
FEAI (10)	*	*	0.070	0.049	0.028	0.007	-0.014
FEAI (15)	*	*	*	0.051	0.030	0.009	-0.012
Panel B: Earnings relative to UBW							
	0	5	10	15	20	25	30
UBA	88.2%	92.9%	96.9%	100.0%	102.1%	103.2%	103.3%
UEAI	82.7%	91.9%	99.2%	104.0%	105.9%	104.7%	100.5%
FEAI (0)	53.1%	64.2%	75.3%	85.8%	95.0%	102.1%	106.6%
FEAI (5)	*	55.9%	66.3%	76.4%	85.5%	92.9%	98.1%
FEAI (10)	*	*	57.6%	67.1%	75.9%	83.5%	89.1%
FEAI (15)	*	*	*	58.2%	66.6%	74.0%	79.9%

Table 3b: Growth Rates and Relative Earnings by U.S. Work Experience

Panel A: Growth rates

	0	5	10	15	20	25	30
UBW	0.067	0.052	0.037	0.021	0.006	-0.009	-0.025
UBA	0.078	0.061	0.044	0.026	0.009	-0.008	-0.025
UEAI	0.091	0.070	0.049	0.028	0.007	-0.015	-0.036
FEAI (0)	0.108	0.087	0.066	0.044	0.023	0.002	-0.019
FEAI (5)	0.089	0.068	0.047	0.026	0.004	-0.017	**
FEAI (10)	0.070	0.049	0.028	0.007	-0.014	**	**
FEAI (15)	0.051	0.030	0.009	-0.012	**	**	**

Panel B: Earnings relative to UBW

	0	5	10	15	20	25	30
UBA	88.2%	92.9%	96.9%	100.0%	102.1%	103.2%	103.3%
UEAI	82.7%	91.9%	99.2%	104.0%	105.9%	104.7%	100.5%
FEAI (0)	53.1%	64.2%	75.3%	85.8%	95.0%	102.1%	106.6%
FEAI (5)	75.2%	82.7%	88.2%	91.5%	92.2%	90.1%	**
FEAI (10)	96.7%	96.7%	93.9%	88.6%	81.2%	**	**
FEAI (15)	112.9%	102.7%	90.8%	77.9%	**	**	**

Note: The growth rates and relative earnings for FEAI are displayed by four levels of foreign work experience, with FEAI (x) denoting FEAI with x years of foreign work experience. Relative earnings are calculated with UBW as the reference group. The calculation of growth rates assumes bachelor's degree.

* indicates that immigrants are abroad.

** indicates that immigrants are retired.

Figure 1a: Comparing Earnings Growth on Parity of Total Work Experience

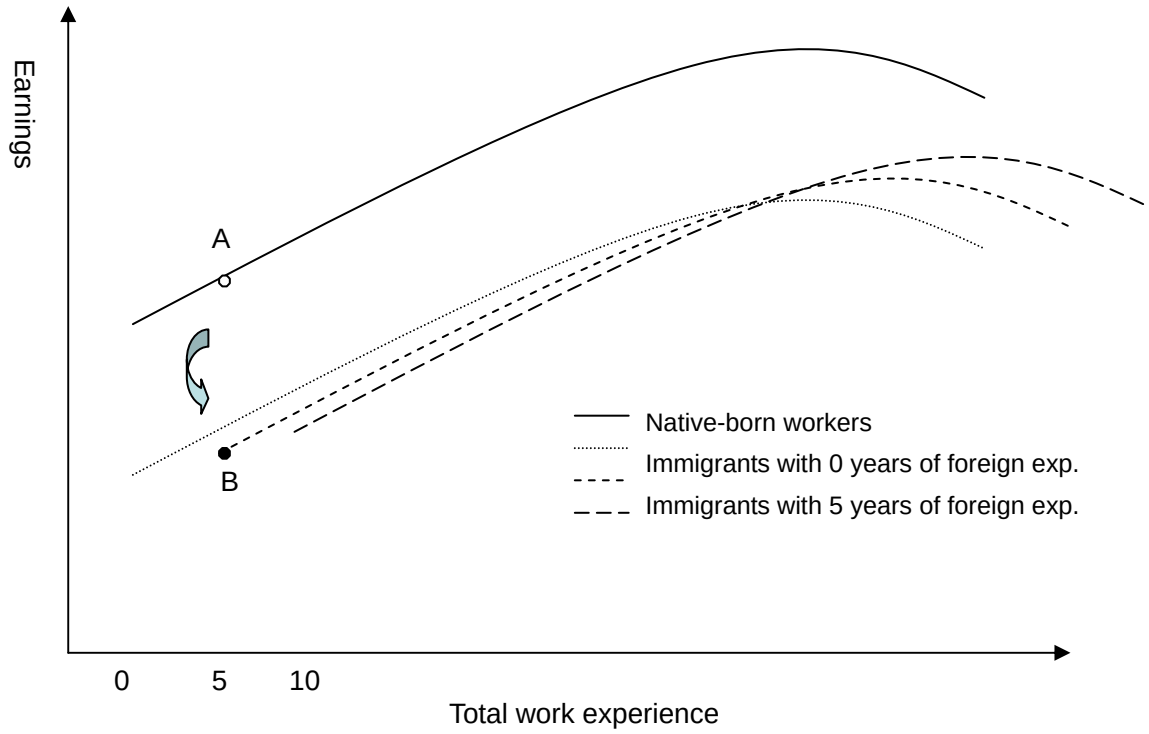


Figure 1b: Comparing Earnings Growth on Parity of U.S. Work Experience

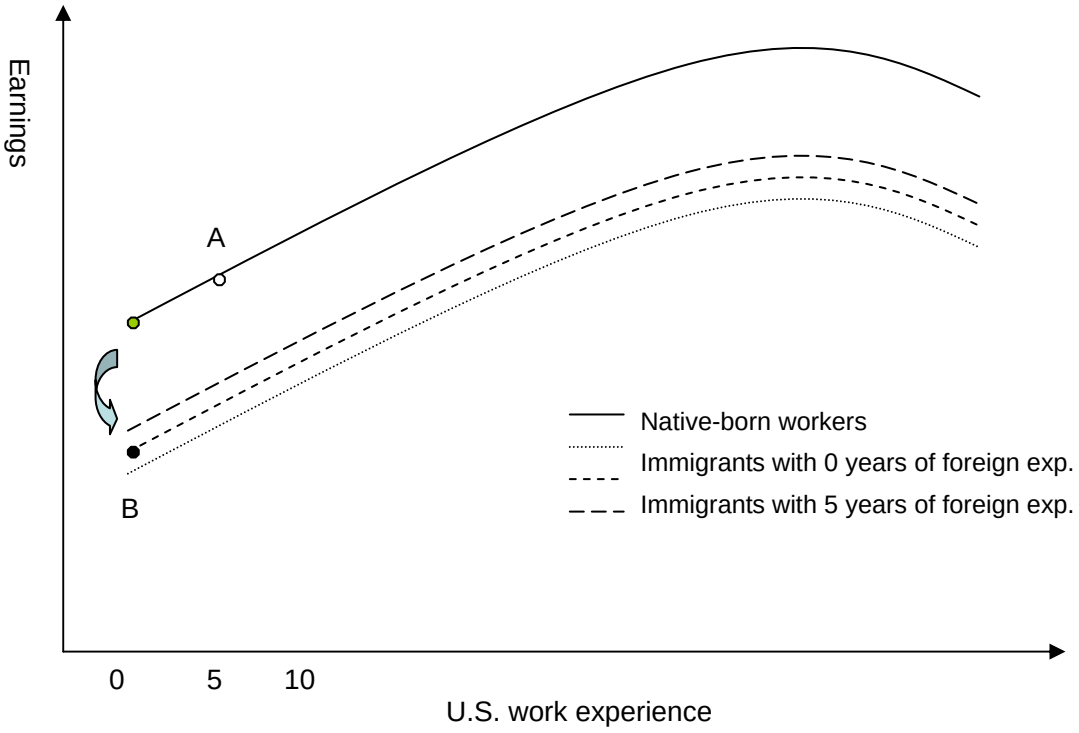
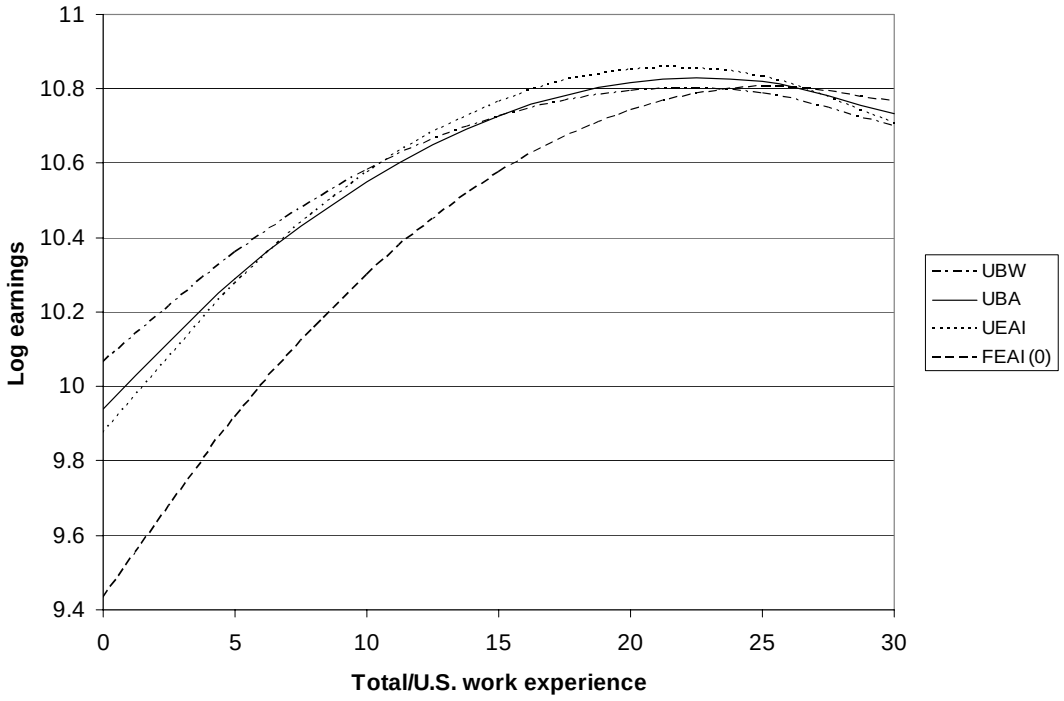

Earnings
A
B
Native-born workers
Immigrants with 0 years of foreign exp.
Immigrants with 5 years of foreign exp.
0
5
10
U.S. work experience

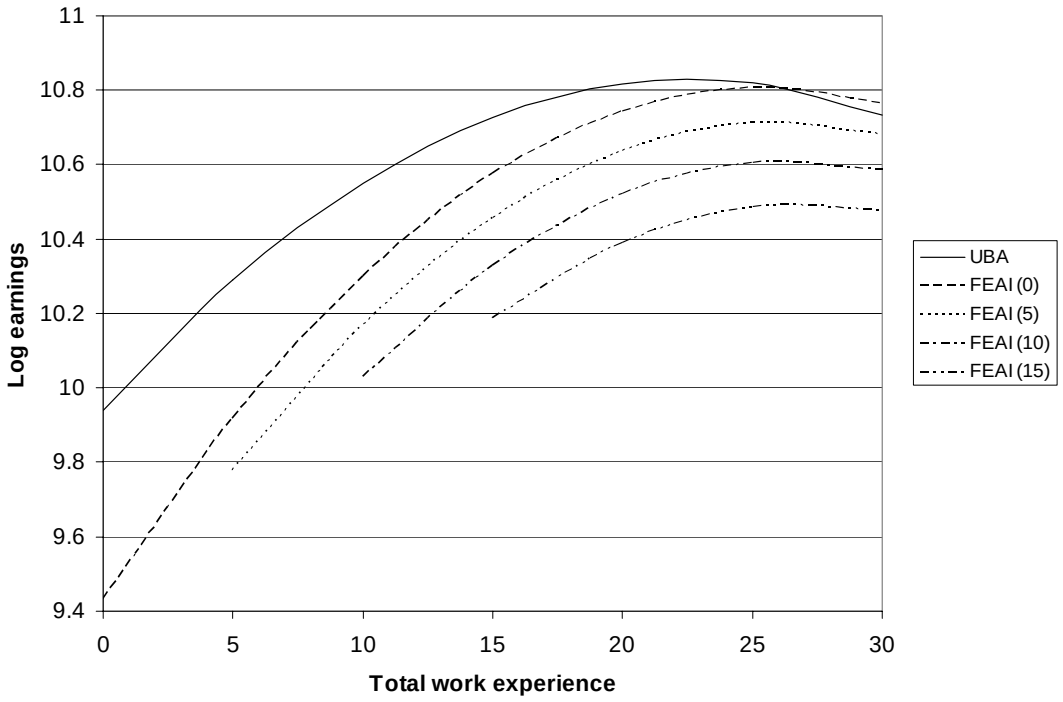
Figure 2: Decomposition of Cross-Sectional Earnings Growth

Figure 3: Earnings Growth of UBW, UBA, UEAI and FEAI with No Foreign Work Experience



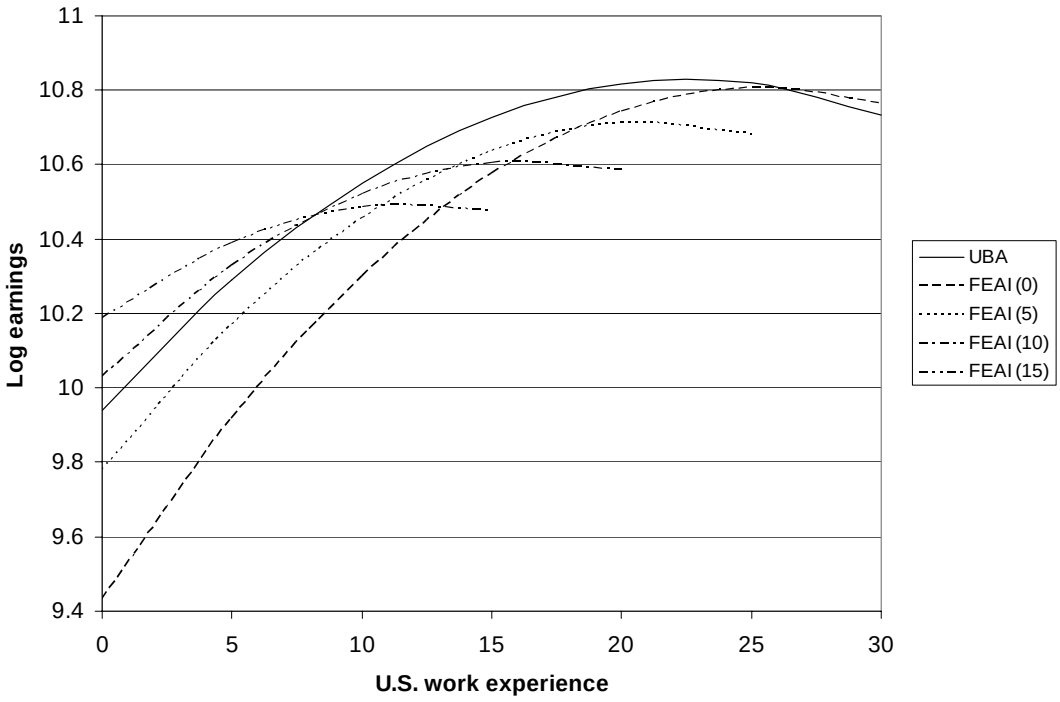
Note: FEAI (0) indicates FEAI with no foreign work experience.

Figure 4a: Immigrant/Native Earnings Growth on Parity of Total Work Experience



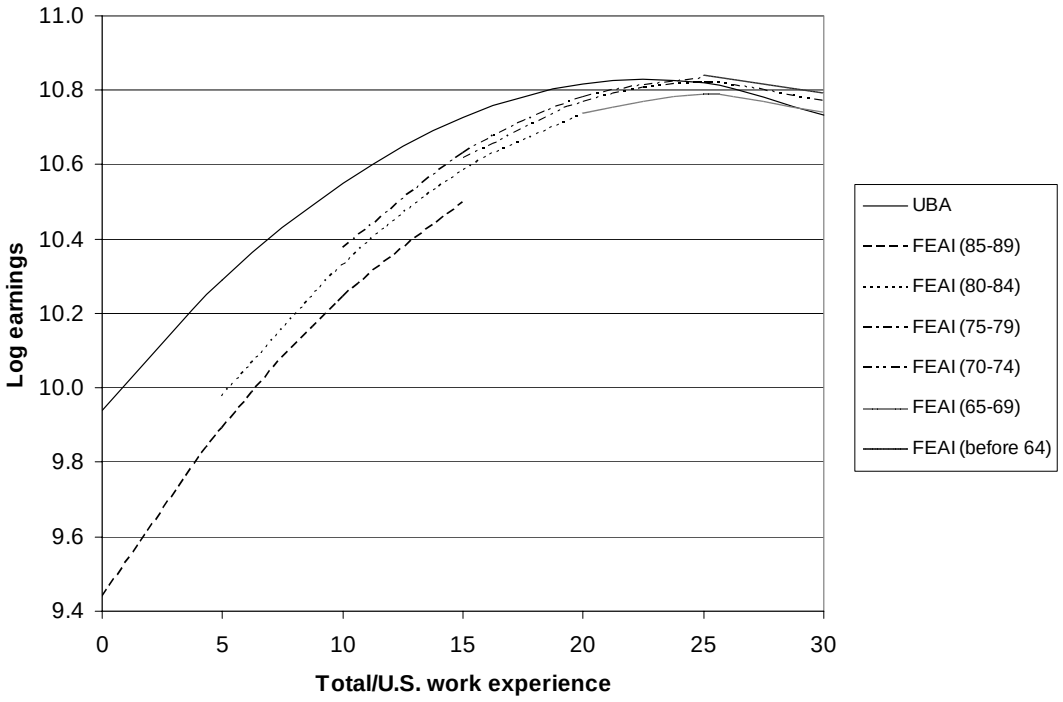
Note: FEAI (*x*) indicates FEAI with *x* years of foreign work experience.

Figure 4b: Immigrant/Native Earnings Growth on Parity of U.S. Work Experience



Note: FEAI (*x*) indicates FEAI with *x* years of foreign work experience.

Figure 5: Earnings Growth of FEAI by Immigration Cohort



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