The Effects of Human Capital and Cultural Capital Characteristics on the Economic Attainment Patterns of Male and Female Asian-born Immigrants to the United States: Multi-level Analyses

Dudley L. Poston, Jr.

Department of Sociology
Texas A&M University
College Station, TX 77843-4351

dudleyposton@yahoo.com
979-862-4057

I thank Claire Chiu-Juan Chiang, Hong Dan, David Gotcher, and Chiung-Fang Chang for help in generating the data-sets and analyses for this paper.

Forthcoming in *Asian and Pacific Migration Journal*, Vol. 11, #2, 2002

(This Draft Completed on February 28, 2002)

The Effects of Human Capital and Cultural Capital Characteristics on the Economic Attainment Patterns of Male and Female Asian-born Immigrants to the United States: Multi-level Analyses

Dudley L. Poston, Jr.

Department of Sociology

Texas A&M University

College Station, TX 77843-4351

Introduction

This paper assesses the economic attainment patterns of Asian-born male and female immigrants to the U.S. Specifically, using hierarchical linear models, multi-level analyses of the patterns are undertaken separately for males and females. The specific question we ask is to what extent do the human capital characteristics of the male and female immigrants themselves, as well as the contextual, i.e., cultural, capital characteristics of their country-men and country-women, influence their levels of economic attainment. The analyses include more than only the assessments of the effects on earnings of the human capital characteristics of the male and female immigrants from

Asia. They include also the effects on earnings of cultural capital characteristics. This important addition is a response in part to the suggestion of Portes and Bach (1985: 268) that the "distinct social context which receives and incorporates ... (immigrant groups) decisively affect ... (their) collective fates, regardless of the skills ... (that they bring to the U.S.)."

Asian immigrants to the U.S. are frequently thought of as a homogeneous group. Often they are referred to as a "model minority" owing to their high socioeconomic attainments and the significant amounts of social support they receive from their country-men and women. We show in this paper that not only are they not a homogeneous group socioeconomically, but also, there are significant differences in the levels of social capital available to them from other persons in the U.S. hailing from their countries.

We model the economic attainment patterns in 1989 of 53,456 male immigrants born in one of 27 Asian countries, and 43,844 female immigrants born in one of 24 Asian countries. The degree to which their individual-level, i.e., human capital, factors, as well as their group-level, i.e., cultural capital or contextual, factors are related to their patterns of annual earnings is appraised. The multi-level analysis is conducted using hierarchical linear models (Raudenbush et al., 2000; Raudenbush and Bryk, 2002). To date, multi-level investigations of demographic behavior have largely, although certainly not exclusively, been restricted to fertility and contraceptive behavior, as well as child survival (see, for instance, Smith, 1989; Entwisle et al., 1989; Hirschman and Guest, 1990; Pebley et al, 1996; Sastry, 1996; among many others). We are not aware of any truly multi-level analyses of the economic behavior of immigrants, such as those undertaken here.

In this paper, two human capital variables are used as individual-level predictors of the economic attainments of male and female immigrants, namely, their educational attainment and their professional status. And two cultural capital, i.e., contextual, variables are used as group-level predictors of their economic attainments, namely, mean

school years of education for each of the Asian immigrant populations living in the U.S., and the percentage of each of the Asian populations living in the U.S. that is naturalized.

In the next section we present the rationale that has guided the model development and variable conceptualization. Here we also discuss the data and variables to be used in the analysis, and the methodological approach to be followed.

Rationale, Data, Variables and Methods

The principal data source for this paper is the five percent file of individual census questionnaires from the Public Use Microdata Samples of the 1990 U.S. Census of Population. The foreign-born workers analyzed are limited to males and females who were born in an Asian country (see the list of Asian countries in Table 1). These samples of male and female Asian immigrant workers are restricted to persons aged 25-64, who reported themselves working in the United States in 1989 at a job, and who received positive earnings in 1989 of at least $1,000. Persons who were attending school or in the military in 1990 are excluded because these activities tend temporarily to depress earnings (see Neidert and Tienda, 1984: 307). The samples are also confined to males and females who worked at least 10 weeks in 1989 and who worked an average of at least 10 hours per week. Finally, we used the general rule that to be included in the analysis an Asian-born male and female group needs to have a sample population of at least 100 members. This restriction resulted in our being able to obtain data for males from 27 Asian countries, and for females from 24 Asian countries. Since the data-base is a five percent sample of the U.S. population, this means that each group of male workers analyzed, after the above sample constraints have been applied, has a minimum actual size in the United States population in 1990 of roughly 2,000.

Table 1 lists the 27 Asian countries for males and the 24 Asian countries for females, along with their mean earnings in 1989, and the size of their respective samples; the countries have been ranked according to the average earnings of the males. Male

immigrant workers born in Japan and in Sri Lanka report the highest average annual earnings, both over $50,000. Males born in Cambodia or Laos, on the other hand, have the lowest incomes, both below $23,000. Female workers born either in Singapore, Hong Kong, India, Taiwan or Burma report the highest incomes, all over $24,000. Females born in Jordan, Cambodia or Laos report the lowest incomes in 1989, all three under $14,600.

A recent analysis of the earnings of immigrants to the U.S. and other countries (Reitz, 1998) indicates that male and female immigrants earn significantly less than nonimmigrants, and this is especially the case in the U.S. The data in Table 1 do not contradict this finding; the Reitz finding is one based on immigrants considered as a single body. The data in Table 1 do indicate, however, that there is considerable variability in the earnings patterns of immigrants to the U.S., and, that moreover, immigrants from some countries earn considerably more than nonimmigrants.

The country assignments of the Asian-born male and female workers shown in Table 1 are based on the respondents' answers to the country of birth question on the 1990 census questionnaire. Regarding Korea, we have combined into the "country of Korea" all respondents who identified their country of birth as Korea, North Korea, or South Korea.

We assume that the distribution of male and female annual earnings may be conceptualized as a function of human capital endowments. Hence the dependent variable of **annual earnings** represents the sum of earnings and self-employed income based on self-reported information in the 1990 census for the year of 1989. The top panel of Table 2 presents summary statistics for these level-1, i.e., individual-level, variables. The more than 53 thousand Asian men in the sample reported average earnings in 1989 of $35,874; and the almost 44 thousand Asian females in the sample had average earnings of $20,961.

The dependent variable of earnings is measured in actual dollars. We opted against using another functional form of earnings, e.g., its natural logarithm, because we

hold that the dollar earnings variable is more amenable to interpretation in terms of direct dollar payoffs, provides a better linear fit with its micro-level regressors across subsamples of the population, and is more appropriate within the context of human capital theory (Hodson, 1985; Mosteller and Tukey, 1977). Nevertheless, as Petersen (1989: 227) has written, "researchers will continue to disagree on the relative merits of the linear versus log linear form for earnings ..., and they will all be correct in one way or another, depending on their viewpoints." [1]

We use two human capital variables as individual-level predictors of earnings, namely, educational attainment and professional status. These two were among the most influential human capital variables of some sixteen such candidate variables used in an earlier analysis of the economic attainment patterns of immigrants from 92 countries of the world (Poston, 1994).

Regarding the first human capital characteristic, the literatures in sociology and economics consistently indicate that the most important and influential human capital predictor of annual earnings is **educational attainment** (Becker and Chiswick, 1966; Becker, 1975; Martin and Poston, 1977; Martin et al., 1980; Poston, 1994). This variable is measured here as the number of years of schooling completed. The Asian men and women in our sample have an average level of educational attainment of 14.3 and 13.3 years, respectively (Table 2, top two panels).

Numerous analyses have shown the importance of occupational variables in accounting for variability in earnings (Portes and Bach, 1985; Hodson, 1985; Nee and Sanders, 1985). We thus include a dummy variable representing **professional status**, coded 1 if the Asian male (or female) worker is in an executive, administrative or

[1] We add that in addition to the models estimated in this paper we have also estimated models in which the dependent variable was the average hourly wage earned in the year, and another set in which the dependent variable was the natural log of earnings. The results of these models were similar to the results reported below in which the dependent variable is actual dollars.

managerial occupation, 0 if not. On average, 37 percent of the Asian males, and 28 percent of the Asian females are in professional jobs (Table 2).

Other human capital variables that were candidates for inclusion in the analysis were the number of years the individual immigrant has been residing in the U.S., the ability to speak English proficiently, and labor force experience. We opted against including them in the final models shown below because they were highly correlated with the two human capital variables we included, and/or they were insignificantly associated with annual earnings after controlling for the other predictors. Of course, the latter result is frequently due to the former.

We now address the inclusion in the analysis of macro, i.e., level-2, or cultural capital or country-group variables for the Asian male and female workers. These macro, cultural capital variables are introduced because we expect that the Asian country-specific social and structural contexts that receive and incorporate the Asian male and female immigrant populations into the U.S. labor force and society should have a decisive effect on their economic livelihood and success. Portes and Bach (1985: 201) have noted, “immigrants do not arrive on the shores of the United States as isolated individuals clutching only their personal resources as tools for resettlement ... In addition to individual capacities, immigrants have access to the resources of the larger social groups of which they are a part.” Based on previous research (Poston and Jia, 1989), we use two aggregate variables to serve as proxies for the various kinds of opportunity structures and cultural capital that should influence the economic fate of the male and female immigrant populations from Asia.

The first aggregate cultural capital variable is **mean school years of education completed**. This variable is measured for the entire immigrant population 25 years of age and over residing in the U.S. from each of the respective Asian countries. We hypothesize that the higher the average level of education of the Asian country-group, the more talented and skilled will be the population, and thus the greater the access to

opportunities and networks that will be available to the foreign-born Asian males and females from that country. The data in Table 2 (bottom two panels) indicate that this variable has an average value for the 27 country-groups in the male model of 12.9 years, and an average for the 24 countries in the female model of 12.8 years; in both models, this variable ranges from a low of 7.3 years for country-men and women from Laos living in the U.S., to a high of 15.4 years for those from Sri Lanka.

The second cultural capital variable is the **percentage of the population that is naturalized**. Our hypothesis here is that the higher the rate of naturalization of the specific Asian population, the more so the population is integrated and assimilated into the society, and, therefore, the more it will be able to make available economic livelihood possibilities to Asian male and female immigrants. Using data from the 1990 census, we have calculated this cultural capital variable for the entire populations of each of the Asian countries who have been living in the U.S. since at least 1980. We do not include in the denominators Asians who arrived in the U.S. after 1980 owing to the U.S. residency requirements for naturalization. Persons who have arrived in 1980 or earlier had lived in the U.S. for enough years to be eligible for naturalization. The descriptive information in Table 2 reports that the naturalization rate, among the 27 countries in the male model, has an average score of 68.6 percent, and an average score of 67.2 percent for the 24 countries in the female model. In both models the country with the lowest rate is Laos, 32.4 percent; the country in the female model with the highest value is Burma, 83.9 percent; in the male model it is Palestine, 84.7 percent.[2]

Given our interest in ascertaining the extent to which the immigrants' annual earnings are influenced by individual-level, i.e., human capital, and group-level, i.e.,

[2] There are several other level-2, contextual variables we considered including in the analysis, such as the length of time the immigrant population has been sizably represented in the United States, its degree of regional diversification, and its absolute and/or relative size in the United States. The two level-2 variables we decided to employ had stronger effects on earnings than those just mentioned. Moreover, we were restricted to using only a few level-2 predictors because our analysis is based on only 27 level-2 units (Asian county-groups) for males, and only 24 for females.

cultural capital, characteristics, hierarchical linear modeling (HLM) is the preferred method of analysis (Raudenbush et al., 2000; Raudenbush and Bryk, 2002). HLM estimates linear equations that explain individual-level outcomes for persons, in this case male (or female) Asian immigrants, who themselves are nested in groups, i.e., countries. HLM does not need to assume that the person and country characteristics of the individual workers come from simple random samples, as would be the case were ordinary least squares (OLS) regression employed (Arnold 1992: 59).

Strictly speaking, HLM involves undertaking regressions of regressions. For the male analysis, separate regressions of the earnings patterns of the male workers are first estimated, one for each of the 27 Asian countries; these are referred to as level-1, or within-country, equations. Their intercepts and coefficients are then used as the dependent variables in equations across countries, referred to as level-2, or between-country, models. In this HLM strategy, the "variance around each parameter from the first level is also taken into account in the regression ... at the next level" (Arnold 1992: 61); this will be further observed below. Maximum likelihood and generalized least squares estimation procedures are used to generate the HLM coefficients and variances. The process is then repeated for the female analysis. We turn now to the results of the analysis.

Results

In this paper we undertake two sets of HLM analyses for males and females separately; the first is a preliminary one that leads to the second, which provides the major results regarding the impacts on earnings of the human capital and cultural capital factors.

1. ANOVA Model. We begin with an analysis of variance (ANOVA) model that gives preliminary information about the dependent variable of annual earnings;

specifically, the ANOVA model indicates how much of the variation in annual earnings occurs at the individual- level, and how much at the country-level.

The overall individual-level equation to be estimated, for males and females separately, is

$$Y_{ij} = \beta_{0j} + r_{ij} \qquad \textbf{(\#1)}$$

where Y_{ij} is the annual earnings of each individual male (or female) worker *i* from Asian country *j*; β_{0j} is the intercept of country *j* from the country-level equations (see below); and r_{ij} is an error term for each individual *i* in each country *j*.

First, however, the country-level equations must be estimated to provide the intercepts for each of the countries, i.e., β_{0j}. Each country's average level of annual earnings, β_{0j}, is thus modeled as a function of the grand mean of earnings plus a random error, as follows:

$$\beta_{0j} = \gamma_{00} + u_{0j} \qquad \textbf{(\#2)}$$

These two equations (#'s 1 and 2) are then combined into one individual-level equation, as follows:

$$Y_{ij} = \gamma_{00} + u_{0j} + r_{ij} \qquad \textbf{(\#3)}$$

This equation is a one-way ANOVA model with a grand mean γ_{00}, with a country (level-2) error effect, u_{0j}, and with an individual worker (level-1) error effect, r_{ij}. Table 3, top panel, shows the maximum likelihood estimates of the variance parameters associated with this baseline ANOVA model, first for males (Model Ia), and then for females (Model Ib).

For males, at level-1 or the individual level, i.e., within the country-groups, the variance in annual earnings (referred to as σ^2) is 1,180,384,760. For males, at the level-2 or country level, i.e., between the country-groups, the variance in annual earnings (referred to as τ_{00}) is 73,544,621. These variance estimates indicate that most of the variation in the annual earnings of Asian male immigrants is at the individual level, i.e., within country-groups, although there is a non-trivial proportion of variance in earnings between the country-groups of Asian men.

To be more specific, we may estimate the intraclass correlation (Raudenbush and Bryk, 2002: 24), which in this case represents the proportion of variance in earnings that is between country-groups, using this formula:

$$\rho = \tau_{00} / (\tau_{00} + \sigma^2) \qquad \textbf{(\#4)}$$

$$\rho = 73{,}544{,}621 / (73{,}544{,}621 + 1{,}180{,}384{,}760) = 0.059$$

This means that 5.9 percent of the variance in annual earnings for male immigrants occurs between country-groups, and that, therefore, 94.1 percent of the variance occurs at the individual level, i.e., within the country-groups of Asian male workers. For female immigrants from Asia, the partitioning of their variance in earnings results in an estimate of 3.3 percent of the variance occurring between the Asian country-groups, and 96.7 of the variance occurring among the individual female workers. It is these two sets of variances we endeavor to explain, or account for, in the hierarchical linear modeling.

We may also determine if the estimated values of the variance in the country-level means for both males and females are significantly different from zero. If not, we would then assume that all country-groups of Asian men (or women) have the same mean earnings, and that a multi-level analysis would not be necessary. In the top panel of Table

3, we report the values of the χ^2 test statistic for males and for females. The χ^2 values of 3378.6 with 26 degrees of freedom for males, and 1088.1 with 23 degrees of freedom for females, are both highly implausible ($p < .001$) under the null hypothesis. We conclude that there is a statistically significant amount of variation among country-groups of Asian men, and of Asian women, in their mean levels of annual earnings. Multi-level analyses of their earnings attainments are hence appropriate.

The second and final stage of the HLM analysis is referred to by Raudenbush and Bryk (2002: 27) as an "intercept and slopes as outcomes" model. We refer to it here as the final fitted model. It involves, first, for males and females separately, expanding the above level-1 model (equation #1) so that it now includes the two human capital predictors of annual earnings, namely, the worker's years of completed education, and whether or not the worker is in a professional occupation. Micro-level (level-1) equations of this form are then estimated for each of the 27 country-groups for males, and for each of the 24 country-groups for females.

In the individual-level equation, the two human capital independent variables have been "centered" about their means, that is, their values have been subtracted from their country-means, so that their new means are now zero. Centering is used so "to be able to interpret the intercepts of the within-unit (i.e., within country-group) equations ... as the average (earnings) before the effects of the (independent variables) have been taken into account" (Arnold, 1992: 77-78). We have starred these two level-1 predictors to indicate that they have been centered about their means. Here is the level-1 equation:

$$Y_{ij} = \beta_{0j} + \beta_{1j} (EDUC_{ij} *) + \beta_{2j} (PROF_{ij} *) + r_{ij} \qquad \textbf{(\#5)}$$

In the above equation, each country-group's distribution of earnings is characterized by three parameters: the intercept, β_{0j}; the slope, β_{1j} of education on earnings; and the slope, β_{2j} of professional occupational status on earnings. Because the

individual-level predictors have been centered around their country-group means, the intercept, β_{0j}, becomes the country-group outcome variable, average annual earnings.

These three parameters, β_{0j}, β_{1j}, and β_{2j}, vary across the 27 country-groups in the male level-2 model, and across the 24 country-groups in the female level-2 model, and are the following:

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad \textbf{(\#6)}$$

$$\beta_{1j} = \gamma_{10} + u_{1j} \quad \textbf{(\#7)}$$

$$\beta_{2j} = \gamma_{20} + u_{2j} \quad \textbf{(\#8)}$$

where γ_{00} is the average of the country means on earnings across the population of country-groups; γ_{10} is the average of the education-earnings regression slopes across the population of country-groups; γ_{20} is the average of the professional-earnings regression slopes across the population of country-groups; u_{0j} is the unique increment to the intercept that is associated with country-group *j*; u_{1j} is the unique increment of country *j* to the education-earnings slope; and u_{2j} is the unique effect of country *j* to the professional-earnings slope.

For the final fitted model for males, and for females, we need also to expand these above level-2 equations (#'s 6-8) so that each country-group's mean earnings attainment score (β_{0j}), and each of the country-group's two regression slopes (β_{1j} and β_{2j}), will be predicted by the two cultural capital, i.e., level-2 predictors, namely, the average number of school years completed, and the naturalization rate. We have also centered both of these level-2 predictors around their means, and have starred them to indicate centering. Expanding these equations leads to the following:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\,(\text{MEAN SCHOOL YEARS})_j^* + \gamma_{02}\,(\text{NATURALIZATION})_j^* + u_{0j} \quad \textbf{(\#9)}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}\,(\text{MEAN SCHOOL YEARS})_j^* + \gamma_{12}\,(\text{NATURALIZATION})_j^* + u_{1j} \quad \textbf{(\#10)}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}\,(\text{MEAN SCHOOL YEARS})_j^* + \gamma_{22}\,(\text{NATURALIZATION})_j^* + u_{2j} \quad \textbf{(\#11)}$$

The above country-level equations (#'s 9-11) are then combined into the individual-level equation (#5 above), yielding the following combined equation; this equation is estimated separately for males and for females:

$$\begin{aligned} Y_{ij} = \; & \gamma_{00} + \gamma_{01}\,(\text{MEAN SCHOOL YEARS}_j^*) + \gamma_{02}\,(\text{NATURALIZATION}_j^*) + \\ & \gamma_{10}\,(\text{EDUC}_{ij}^*) + \\ & \gamma_{11}\,(\text{MEAN SCHOOL YEARS}_j^*)\,(\text{EDUC}_{ij}^*) + \\ & \gamma_{12}\,(\text{NATURALIZATION}_j^*)\,(\text{EDUC}_{ij}^*) + \\ & \gamma_{20}\,(\text{PROF}_{ij}^*) + \\ & \gamma_{21}\,(\text{MEAN SCHOOL YEARS}_j^*)\,(\text{PROF}_{ij}^*) + \\ & \gamma_{22}(\text{NATURALIZATION}_j^*)\,(\text{PROF}_{ij}^*) + \\ & u_{0j} + u_{1j}\,(\text{EDUC}_{ij}^*) + u_{2j}\,(\text{EDUC}_{ij}^*) + \\ & u_{1j}\,(\text{PROF}_{.ij}^*) + u_{2j}\,(\text{PROF}_{.ij}^*) + r_{ij} \end{aligned} \quad \textbf{(\#12)}$$

Equation #12 is the principal HLM equation to be estimated. It indicates that the individual Asian male (or female) worker's outcome on earnings attainment, Y_{ij}, may be viewed as a function of the following:

-- the overall intercept, γ_{00}, which in this case is the grand mean of earnings; this reflects the earnings of an Asian male (or female) worker with average values on the two human capital predictors, and from a country-group with average values on the two cultural capital predictors,

-- the main effect of MEAN SCHOOL YEARS, γ_{01},

-- the main effect of the NATURALIZATION RATE, γ_{02},

-- the main effect of the male (or female) worker's EDUCATION, γ_{10},

-- the main effect of the male (or female) worker's PROFESSIONAL STATUS, γ_{20},

and

-- the following four cross-level interactions involving

-- MEAN SCHOOL YEARS with EDUCATION, γ_{11},

-- NATURALIZATION with EDUCATION, γ_{12},

-- MEAN SCHOOL YEARS with PROFESSIONAL STATUS, γ_{21},

-- NATURALIZATION with PROFESSIONAL STATUS, γ_{22},

and, finally,

-- a random error involving country-group components ($u_{q\,j}$) and an individual male (or female) worker error component ($r_{i\,j}$), namely,

$u_{0j} + u_{1j}\,(\text{EDUC}_{i\,j}^{*}) + u_{2j}\,(\text{EDUC}_{i\,j}^{*}) + u_{1j}\,(\text{PROF}_{.i\,j}^{*}) + u_{2j}\,(\text{PROF}_{.i\,j}^{*}) + r_{i\,j}$

One of the advantages of an HLM equation such as equation #12 above is that the level-2 variables interact with the level-1 variables, and that the error structure contains both microlevel terms and macrolevel terms. Equation #12 is not the typical linear model assumed in standard OLS models because such models require that the random errors must be independent, normally distributed, and have constant variance. The errors in equation #12 are of a much more complex form; for instance, the components u_{0j}, u_{1j}, and u_{2j} are common to every male (or female) worker within country-group *j*; and the errors have unequal variances. An OLS equation would assume that components u_{0j}, u_{1j}, and u_{2j} are zero for every j^{th} country-group (see Raudenbush and Bryk, 2002: 21-22).

The estimated gamma (γ) coefficients are shown in Table 4; the coefficients for males are shown in the top panel of the table, and the coefficients from the female model in the bottom panel. We examine first the coefficients representing the various effects of the human capital and cultural capital predictors on earnings in the male model. These

gammas (γ_{qq}) may be interpreted in the same way as unstandardized regression coefficients in an OLS equation.

As already noted, $\boldsymbol{\gamma_{00}}$, is the intercept, and has a value of 36,638.87. This means that the annual earnings of an Asian male immigrant to the U.S. with average values on all four of the independent variables would be about $36,639.

MEAN SCHOOL YEARS, $\boldsymbol{\gamma_{01}}$, is positively related to earnings attainment, $\boldsymbol{\gamma_{01}}$ = 2,939.91, $\boldsymbol{t}$ = 5.6. For each additional mean year of education for an Asian country-group, the country-group's average annual earnings for males is increased by about $2,940, and this is a highly significant effect. The NATURALIZATION RATE is also positively related to the country-group's average annual earnings, $\boldsymbol{\gamma_{02}}$ = 38.1, t = 0.5, but is not statistically significant.

The main effect of the Asian male worker's education on earnings, $\boldsymbol{\gamma_{10}}$, is positive and significant, $\boldsymbol{\gamma_{10}}$ = 2,379.36, $\boldsymbol{t}$ = 21.1. This means that for each additional year of education of an Asian male worker, there is an average increment in his annual earnings of almost $2,400. The main effect of the worker's professional status, $\boldsymbol{\gamma_{20}}$, on earnings is also positive, as hypothesized, and significant, $\boldsymbol{\gamma_{20}}$ = 15,841.60, $\boldsymbol{t}$ = 15.2. On average, Asian male workers who are professionals have annual earnings more than $15,840 higher than Asian male workers who are not professionals.

Regarding the cross-level interactions, the results indicate that there is a definite tendency for Asian country-groups with high MEAN SCHOOL YEARS for their male immigrants to have larger education-earnings slopes than country-groups with low means; see the gamma parameter $\boldsymbol{\gamma_{11}}$ = 291.55, $\boldsymbol{t}$ = 5.1. That is, for each one year increment in a country's MEAN SCHOOL YEARS, the slope of educational attainment on earnings for male immigrants from that country is increased, on average, by $292. Similarly, there is also a tendency for Asian country-groups with high NATURALIZATION rates to have higher education-earnings slopes than country-groups with low rates; $\boldsymbol{\gamma_{12}}$ = 14.22; and this interaction is significant (one-tailed test). Men from

Asian countries with populations living in the U.S. that are highly educated are better able to convert their education into earnings than are men from countries with populations in the U.S. that are not so highly educated. And men from Asian countries with high naturalization rates are better able to convert their education into earnings than men from countries with low naturalization rates.

The next two cross-level interactions represent the effects of the two level-2 cultural capital variables on the cross-level interactions involving the professional status - earnings slope. However, neither of these gamma coefficients is significant at the .05 level (one-tailed test).

In the female model (bottom panel of Table 4), the more educated the Asian country-group, the higher the female earnings, γ_{01} = 1,309.84, t = 7.6. The average earnings of female immigrants in increased by $1,310 for each additional increment of education completed by members of her country-group. As in the male model, there is no significant direct effect of the country-group's naturalization rate on average female earnings.

However, there are significant direct effects on income for females according to her own levels of education and whether she is a professional (γ_{10} and γ_{20}). For each additional year of education of an Asian female worker, there is an average increment in her annual earnings of almost $1,218. And females who are professionals earn, on average, $9,286 more than female workers who are not professionals.

In the female model, only one of the cross-level interactions is statistically significant, γ_{11}. Among females, for each one year increment in their country's MEAN SCHOOL YEARS, the slope of educational attainment on earnings is increased, on average, by $185.

The bottom panels of Table 3 (Models IIa and IIb) report for the male and female models the residual variance estimates in annual earnings at level-1, that is "within country-groups," or σ^2. Also, reported are residual "between country-group variances" in

annual earnings, i.e., τ_{00}, for the intercepts in the level-1 model. We may compare these residual variance estimates with analogous estimates from previously estimated models where the independent variables were not included; these comparisons will enable us to obtain values of explained variance that tell us how well the final fitted models performed in accounting for the male and female variances in earnings at level-1 and at level-2.

First we will consider the variances in earnings at level-1. The proportion of the level-1 variance in annual earnings, R^{2*}, that is explained by the two human capital independent variables, may be determined as follows:

$$R^{2*} = [\sigma^2 \text{ (ANOVA model)} - \sigma^2 \text{ (fitted model)}] / \sigma^2 \text{ (ANOVA model)}, \qquad \textbf{(\#13)}$$

where σ^2 (ANOVA model) is the within country-group variance in annual earnings in a model containing no level-1 human capital independent variables; and σ^2 (fitted model) is the within country-group variance in annual earnings in the final fitted model containing the two level-1 human capital independent variables.

For males, the two within country-group variances (σ^2) in Table 3, one variance from the ANOVA model and the other from the final fitted model, may be substituted into equation #13, as follows:

R^{2*} = [1,180,384,760 – 981,382,934] / 1,180,384,760 = 0.168.

For females, the equation is:

R^{2*} = [367,321,994 –302,385,350] / 367,321,994 = 0.177.

The results of these two calculations indicate that the two human capital variables of educational attainment and professional status together explain almost 17 percent of the level-1 variance in annual earnings among males, and almost 18 percent of the variance in earnings among females. These are moderately good models, although there is a good amount of variance in both the male and female models that is unexplained.

We now inquire about the degree to which the two level-2 cultural capital independent variables account for the between country-group variances in annual earnings for the males and for the females. The values of the between country-group residual variances (τ_{00}) in the two bottom panels of Table 3 (Models IIa and IIb) may be compared with analogous values from previously estimated HLM models for males and females (referred to as "random coefficients models," [Raudenbush and Bryk, 2002: 75], but not shown here) that did not contain the two level-2 cultural capital predictors. The proportion of the level-2 variance explained, R^{2*}, for the male and female models, may be estimated as follows:

$$R^{2*} = [\tau_{00} \text{ (random coefficients model)} - \tau_{00} \text{ (fitted model)}] / \tau_{00} \text{ (random coefficients model)} \quad \textbf{(\#14)}$$

From Table 3 for males (model IIa) we obtain a value of 40,953,717 for $\boldsymbol{\tau_{00}}$ for the fitted model. The value of $\boldsymbol{\tau_{00}}$ for a random coefficients model (i.e., an HLM model for males in which the two level-2 predictors were not included – model not shown) is 74,814,504. We substitute these values of $\boldsymbol{\tau_{00}}$ into equation # 14:

$$R^{2*} = (74{,}814{,}504 - 40{,}953{,}717) / 74{,}814{,}504 = 0.453$$

For females, the corresponding value of $\boldsymbol{\tau_{00}}$ for a random coefficients model (not shown) is 13,041,727; equation #14 for females hence is:

$$R^{2*} = (13{,}041{,}727 - 3{,}615{,}167) / 13{,}041{,}727 = 0.723$$

This means that by introducing the two level-2 predictors of MEAN SCHOOL YEARS and the NATURALIZATION rate into the male model, 45.3 percent of the parameter variation in mean annual earnings among the country-groups has been

explained. And when we introduce the same level-2 variables into the female model, over 72 percent of the variance in earnings among the country-groups is explained. The level-2 model for females does a decidedly better job at accounting for variation at the aggregate level, than does the level-2 male model.

We turn now to the implications of our analysis.

Discussion and Implications

In this paper we have estimated hierarchical linear models of the economic attainment patterns of male immigrant workers, and female immigrant workers, to the United States who were born in Asian countries. The major question motivating our analysis was to what extent do characteristics of the immigrants, and the characteristics of their country-men and women already living in the U.S., influence their levels of earnings in the U.S. in 1989. We examined the earnings patterns in 1989 of more than 53 thousand male immigrants born in 27 Asian countries, and almost 44 thousand female immigrants born in 24 Asian countries. For both the male and female immigrants we appraised the degree to which two individual-level, i.e., human capital, characteristics, namely, number of school years completed and whether the worker was a professional, as well as two group-level, i.e., cultural capital, characteristics, namely, the country's mean level of educational attainment and its naturalization rate, were related to the patterns of annual earnings of these individual male and female Asian immigrants. Separate hierarchical linear models were estimated for males and females.

At the individual level, for both males and females, we found that years of school completed and professional status were strongly associated with the amount of earnings attained; and we found at the country level, for both males and females, mean years of school was the most influential predictor. For instance, within Asian countries, both male and female immigrants to the U.S. with high levels of educational attainment (controlling for whether they were in professional jobs) and male and female immigrants in

professional jobs (controlling for their levels of education completed), were shown to have higher levels of earnings. Between the Asian countries, those countries with high average levels of education reported high average levels of earnings for males and for females, and vice versa. The cultural capital variable of the naturalization rate was shown in both the male and female models to be positively associated with mean annual earnings, but not statistically significant.

The above sets of findings are fairly consistent with prior research, particularly the finding pointing to the powerful influence of educational attainment, at both the micro and macro levels, on earnings achievement. And indeed, had we conducted two ordinary least squares (OLS) regressions of annual earnings, one micro and one macro, it is very likely that similar results would have been obtained. Our use of hierarchical linear models, however, permitted us to measure these micro and macro relationships in much more precise ways, in a more statistically correct way, and in a more combined way, than would have been possible with OLS regressions. We now elaborate on this point, drawing on a similar elaboration of Arnold (1992: 74-75).

In the first place, the HLM approach used here permitted us to determine how much of the variability in earnings among male and female Asian immigrants was due to variance within countries and how much was due to variance between countries. We found that by far the greatest amount of the variation in the annual earnings of Asian immigrants was at the individual level, i.e., within country-groups. For males, slightly more than 94 percent of the variance in earnings occurred among the individuals, and 5.9 percent of the variance occurred between the country-groups. For females, 96.7 percent of the variance in their earnings occurred among the individual women, and 3.3 percent among their country-groups. But in both cases, the amounts of variance occurring among the country-groups were statistically significant, hence requiring multi-level analyses. It was these two sets of variances that we then endeavored to explain, or account for, in the hierarchical linear modeling.

Secondly, for both males and for females, the HLM strategy involved producing for each Asian country a separate regression equation. In both the male and female hierarchical models, the intercepts and slopes from these equations were then averaged across the countries and "weighted by the inverse of the standard error of each estimate" (Arnold, 1992: 74). Thus the actual within-Asian country associations were averaged, but the regression results from those countries that had more precise estimates tended to count more in the overall equation than the coefficients from countries with less precise estimates.

Thirdly, for both males and females, the HLM analyses enabled us to specify the degree of association between the within-country relationships and two (level-2) cultural capital characteristics of the country-groups themselves. Similar to the preceding, when we used HLM to gauge the degree of association between country characteristics and average earnings, these estimates were weighted by the degree of precision of each Asian country's mean earnings estimate (Arnold, 1992: 74).

Fourthly, our employment of HLM permitted us to examine, for both males and females, the influence of the country characteristics on the two human capital-earnings slopes, specifically, the education-earnings slopes and the professional-earnings slopes. That is, we were able to ascertain the degree to which the two level-2 cultural capital variables of mean level of school completed and the naturalization rate influenced the individual-level associations between educational attainment and earnings, and professional status and earnings, in both the male and female models. This asset may well be the most important of the many advantages of hierarchical linear modeling, at least in the context of our investigation of the influences of micro and macro variables on the earnings attainment of male and female Asian immigrants. We consider this point in more detail.

A major conclusion in the literature on the socioeconomic achievement of foreign-born immigrants is the importance of considering the effects on achievement of

the opportunity structures of the specific immigrant environments. Immigrants to the U.S. do not arrive as isolated individuals with only their human capital skills available to them. Depending upon their specific country of birth, they have entrée to various kinds of cultural capital in the form of opportunity structures, networking environments, and other social contexts provided through their country-men and country-women already residing in the U.S. Many scholars have shown, particularly Alejandro Portes and his associates (Portes and Bach, 1980; 1985; Wilson and Portes, 1980; Wilson and Martin, 1982; among others) that these country-specific cultural capital contexts "which receive and incorporate ...(the immigrant groups) decisively affect ... (their) collective fates, regardless of the (human capital) skills ... (that they bring to the U.S.)" (Portes and Bach, 1985: 268).

Presumably, these cultural capital country-level characteristics in the form of opportunities and networks available to the immigrants, and the degree to which the immigrants avail themselves of them, better allow the male and female immigrants to use their human capital skills in the workplace than would be the case if these country-specific contexts were not available. Hierarchical linear modeling allows one to appraise in a very precise and statistically correct way the degree to which this is true. HLM permits the investigator to ascertain directly whether and to what extent the country-specific contexts influence the rates at which the human capital characteristics of immigrants are translated into earnings.

Specifically, our hierarchical linear models enabled us to ascertain, separately for males and for females, whether and to what degree the average years of school completed by, and the naturalization rate of, U.S. residents from Asian countries, influenced the extent to which the Asian immigrants converted their own educational achievement into earnings, and their own professional status into earnings. We reported strong evidence that Asian-born males and females from country-groups with high mean school years have higher education-earnings slopes than Asian males and females from country-

groups with low means. That is, for each increment in an Asian country's mean school years, the slope for male Asian immigrants of educational attainment on earnings was increased on average by $292. For female immigrants, the corresponding increase in their education-earnings slopes was, on average, $185.

The HLM analyses also reported a tendency for male and female immigrants from Asian countries with high naturalization rates to have larger education-earnings slopes than those from countries with low rates. For every one percent increment in a country's naturalization rate, the slope for immigrants from that country of educational attainment on earnings was increased by $14 for males, and by almost $1 for females; but only the coefficient for males was statistically significant.

However, for both males and females, our HLM investigations did not show evidence of statistically significant effects of the two country-group characteristics on the slopes of professional status on earnings. That is, the fact that a male or female immigrant was from an Asian country with high (or low) levels of average education, and high (or low) naturalization levels, had no statistically significant influence on the rates at which the male and the female immigrants converted their professional status into earnings. Without the kinds of hierarchical linear modeling undertaken in this paper, we would not have been able to make these kinds of empirical assessments.

A major contribution of this paper is its application of multi-level modeling in an analysis of the earnings attainments of male and female immigrant workers. There is work remaining in efforts to better understand these patterns. Extensions and revisions of this multi-level investigation include expanding it to cover all countries of origin (not only Asian countries), and to evaluate the impacts of level-1 and level-2 factors on other aspects of socioeconomic status, say, occupational status. Expanded investigations could well improve our understanding of the effects of human capital and cultural capital characteristics on the socioeconomic attainments of immigrant populations.

References

Anderton, Douglas L., and Deborah E. Sellers. 1989. "A Brief Review of Contextual-Effect Models and Measurement." *Historical Methods* 22: 106-115.

Arnold, Carolyn L. 1992. "An Introduction to Hierarchical Linear Models." *Measurement and Evaluation in Counseling and Development* 25: 58-90.

Becker, Gary S. 1975. *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education.* 2nd edition. New York: National Bureau of Economic Research.

Becker, Gary S., and Barry Chiswick. 1966. "Education and the Distribution of Earnings." *American Economic Review, Papers and Proceedings* 56: 358-369.

Blalock, Hubert M., Jr. 1957. "Percent Nonwhite and Discrimination in the South." *American Sociological Review* 22: 677-682.

Brown, David L. and Glenn V. Fuguitt. 1972. "Percent Nonwhite and Racial Disparity in Nonmetropolitan Cities in the South." *Social Science Quarterly* 53: 573-582.

Entwisle, Barbara, John B. Casterline, and Hussien A.-A. Sayed. 1989. “Villages as Contexts for Contraceptive Behavior in Rural Egypt.” *American Sociological Review* 54: 1019-1034.

Frisbie, W. Parker and Lisa Neidert. 1977. "Inequality and the Relative Size of Minority Populations: A Comparative Analysis." *American Journal of Sociology* 82: 1007-1030.

Hirschman, Charles, and Philip Guest. 1990. "Multilevel Models of Fertility Determination in Four Southeast Asian Countries." *Demography* 27: 369-396.

Hodson, Randy. 1985. "Some Considerations Concerning the Functional Form of Earnings." *Social Science Research* 14: 374-394.

Martin, Walter T. and Dudley L. Poston, Jr. 1977. "Differentials in the Ability to Convert Education into Income: The Case of the European Ethnics." *International Migration Review* 11: 215-231.

Martin, Walter T., Dudley L. Poston, Jr. and Jerry D. Goodman. 1980. "Converting Education into Income and Occupational Status: Another Look at the European Ethnics." *Pacific Sociological Review* 23:297-314.

Mosteller, F. and J. W. Tukey. 1977. *Data Analysis and Regression*. New York: Addison-Wesley.

Neidert, Lisa J. and Marta Tienda. 1984. "Converting Education into Earnings: The Patterns Among Hispanic Origin Men." *Social Science Research* 13: 303-320.

Pebley, Ann R., Noreen Goldman, and German Rodriguez. 1996. “Prenatal and Delivery Care and Childhood Immunization in Guatemala: Do Family and Community Matter?” *Demography* 33: 231-247.

Petersen, Trond. 1989. "The Earnings Function in Sociological Studies of Earnings Inequality: Functional Form and Hours Worked." *Research in Social Stratification and Mobility* 8: 221-250.

Portes, Alejandro, and Robert L. Bach. 1980. "Immigrant Earnings: Cuban and Mexican Immigrant Earnings in the United States." *International Migration Review* 14: 15-41.

Portes, Alejandro, and Robert L. Bach. 1985. *Latin Journey: Cuban and Mexican Immigrants in the United States*. Berkeley: University of California Press.

Portes, Alejandro, and Alex Stepick. 1985. "Unwelcome Immigrants: The Labor Market Experiences of 1980 (Mariel) Cuban and Haitian Refugees in South Florida." *American Sociological Review* 50: 493-514.

Poston, Dudley L., Jr. 1994. "Patterns of Economic Attainment of Foreign-Born Male Workers in the United States." *International Migration Review* 28: 478-500.

Poston, Dudley L., Jr., and Zhongke Jia. 1989. "The Socioeconomic Attainment Patterns of Foreign-born Workers in the United States." Paper No. 1.01, Population and Development Program Working Paper Series. Ithaca, New York: Cornell University, Population and Development Program.

Raudenbush, Stephen W., and Anthony S. Bryk. 2002. *Hierarchical Linear Models: Applications and Data Analysis Methods. Second Edition*. Thousand Oaks, California: Sage Publications.

Raudenbush, Stephen W., Anthony Bryk, Yuk Fai Cheong, and Richard Congdon. 2000. *HLM5: Hierarchical Linear and Nonlinear Modeling*. Lincolnwood, Illinois: Scientific Software International.

Reimers, D. M. 1985. *Still the Golden Door: The Third World Comes to America*. New York: Columbia University Press.

Reitz, Jeffrey G. 1998. *Warmth of the Welcome: The Social Causes of Economic Success for Immigrants in Different Nations and Cities*. Boulder, Colorado: Westview Press.

Sastry, N. 1996. "Community Characteristics, Individual and Household Attributes, and Child Survival in Brazil." *Demography* 33: 211-229.

Smith, Herbert L. 1989. "Integrating Theory and Research on the Institutional Determinants of Fertility." *Demography* 26: 171-184.

Williams, Robin. 1947. *The Reduction of Intergroup Tensions: A Survey of Research on Problems of Ethnic, Racial and Religious Group Relations*. New York: Social Science Research Council.

Wilson, Kenneth L. and W. Allen Martin. 1982. "Ethnic Enclaves: A Comparison of the Cuban and Black Economies in Miami." *American Journal of Sociology* 88: 135-160.

Wilson, Kenneth L. and Alejandro Portes. 1980. "Immigrant Enclaves: An Analysis of the Labor Market Experiences of Cubans in Miami." *American Journal of Sociology* 86: 295-319.

Table 1. Average Annual Earnings for Asian Male and Female Immigrants to the United States, by Country of Birth, 1989

Country	MALES Earnings	MALES Sample N	FEMALES Earnings	FEMALES Sample N
Japan	54,081	2,668	18,094	2,782
Singapore	...	...	26,217	118
Sri Lanka	50,440	187	23,203	118
India	46,748	6,966	24,790	3,726
Israel	44,898	1,181	23,279	542
Syria	44,480	524	20,825	179
Turkey	43,460	594	21,685	266
Taiwan	42,021	2,577	24,140	2,313
Iran	41,925	3,015	22,285	1,277
Palestine	40,954	313	...	...
Burma	40,418	253	25,052	206
Cyprus	40,339	148	...	...
Indonesia	39,681	526	...	...
Lebanon	37,004	1,187	18,429	435
Pakistan	36,387	1,378	23,273	391
Korea	36,233	5,205	19,115	5,468
Hong Kong	35,933	1,648	24,328	1,488
Malaysia	35,333	276	20,203	220
Iraq	35,325	624	17,542	253
Thailand	32,421	769	18,926	1,115
Jordan	33,248	449	14,553	103
Philippines	30,119	9,485	23,096	12,963
China	29,798	5,953	18,174	4,751
Afghanistan	27,752	242	16,057	107
Bangladesh	27,698	331	...	...
Vietnam	24,388	5,116	17,245	3,741
Cambodia	20,356	756	14,033	554
Laos	17,478	1,085	13,506	728

Table 2. Descriptive Statistics, Individual-level and Country-level Variables: Asia-Born Male and Female Immigrants to the U.S., 1990

Individual-Level, Males

Variables	N	Mean	SD	Minimum	Maximum
Annual Earnings	53,456	35,874	35,410	1,000	398,228
Years of School Completed	53,456	14.3	4.1	0	21
Professional (yes = 1)	53,456	.371	.483	0	1

Individual-Level, Females

Variables	N	Mean	SD	Minimum	Maximum
Annual Earnings	43,844	20,961	19,387	1,000	322,516
Years of School Completed	43,844	13.3	4.0	0	21
Professional (yes = 1)	43,844	.283	.451	0	1

Country-Level, Males

Variables	N	Mean	SD	Minimum	Maximum
Naturalization Rate	27	68.6	14.3	32.2	84.7
Average Years of School Completed	27	12.9	2.0	7.3	15.4

Country-Level, Females

Variables	N	Mean	SD	Minimum	Maximum
Naturalization Rate	24	67.2	14.5	32.2	83.9
Average Years of School Completed	24	12.8	2.1	7.3	15.4

Table 3. Variance Parameters Associated with Two HLM Models

Model/ Variables	Variance	df	χ^2
Ia. ANOVA Model (Males)			
Between Country-groups (τ_{00})	73,544,621	26	3378.6*
Within Country-groups (σ^2)	1,180,384,760		
Ib. ANOVA Model (Females)			
Between Country-groups (τ_{00})	12,407,575	23	1088.1*
Within Country-groups (σ^2)	367,321,994		
IIa. Final Fitted Model (Males)			
Between Country-groups (τ_{00})	40,953,717	24	2164.3*
Within Country-groups (σ^2)	981,382,934		
IIb. Final Fitted Model (Females)			
Between Country-groups (τ_{00})	3,615,167	21	322.6*
Within Country-groups (σ^2)	302,385,350		

*p<.05

Table 4.
Effects (Gamma Coefficients) of Individual and Country-Group Variables on the Earnings Attainments of Asian Male and Female Immigrants

Variable	Gamma (γ) Coefficient	Robust Standard Error	*t* Value
MALE MODEL			
On Intercept			
Intercept γ_{00}	36,638.87	1,184.30	30.94*
Mean Years of School γ_{01}	2,939.91	524.82	5.60*
Naturalization Rate γ_{02}	38.09	81.63	0.47
On Years of School Slope			
Intercept γ_{10}	2,379.36	112.94	21.07*
Mean Years of School γ_{11}	291.55	56.90	5.12*
Naturalization Rate γ_{12}	14.22	8.38	1.70*
On Professional Status Slope			
Intercept γ_{20}	15,841.60	1,042.46	15.20*
Mean Years of School γ_{21}	738.70	479.95	1.54
Naturalization Rate γ_{22}	108.16	77.95	1.39
FEMALE MODEL			
On Intercept			
Intercept γ_{00}	20,382.84	394.28	51.70*
Mean Years of School γ_{01}	1,309.84	171.85	7.62*
Naturalization Rate γ_{02}	38.96	28.82	1.35
On Years of School Slope			
Intercept γ_{10}	1,218.74	48.23	25.27*
Mean Years of School γ_{11}	185.48	20.84	8.90*
Naturalization Rate γ_{12}	0.88	3.86	0.23
On Professional Status Slope			
Intercept γ_{20}	9,286.48	762.57	12.18*
Mean Years of School γ_{21}	478.53	388.26	1.23
Naturalization Rate γ_{22}	4.15	60.95	0.07

*p<.05 (one-tailed)