DISCUSSION PAPER SERIES

IZA DP No. 2670

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March 2007

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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Discussion Paper No. 2670
March 2007

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IZA Discussion Paper No. 2670
March 2007

# ABSTRACT

## The International Transferability of Immigrants' Human Capital Skills*

This paper uses the approach in the under/over education literature to analyze the extent of matching of educational level to occupational attainment among adult native born and foreign born men in the U.S., using the 2000 Census. Overeducation is found to be more common among recent labor market entrants, while undereducation is more likely among older workers. Married men, veterans and those living in metropolitan areas are also more likely to be overeducated. Among immigrants, greater pre-immigration labor market experience is associated with poorer job matches, presumably due to the less than perfect international transferability of skills. A longer duration in the U.S., however, is associated with a lower probability of being overeducated and a greater probability of being undereducated. This is consistent with immigrants being favorably selected for occupational advancement but this effect becomes realized only after overcoming the disadvantages of the less than perfect international transferability of their pre-immigration skills.

JEL Classification: J240, J310, J620, F22

Keywords: immigrants, education, occupational attainment

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* We thank Derby Voon for research assistance. Chiswick acknowledges research support from the Institute of Government and Public Affairs, University of Illinois. Miller acknowledges financial assistance from the Australian Research Council.

**March 2007**

# THE INTERNATIONAL TRANSFERABILITY OF IMMIGRANTS' HUMAN CAPITAL SKILLS

## I. INTRODUCTION

An issue at the heart of the immigrant adjustment literature is the less-than-perfect international transferability of human capital skills. When immigrants arrive in a country they may find that the human capital skills they brought with them are not relevant to their adopted labor market. This may be obvious in the case of language skills, where many foreign languages, either for monolingual foreign language speakers or destination language bilinguals, have little value in the destination country (Chiswick and Miller, 1992). But it also appears to be the case that there is less-than-perfect international transferability of skills acquired on the job or through formal schooling in the country of origin.

This is particularly evident when human capital earnings functions are estimated separately for the native born and the foreign born. The results from such estimations typically show that there are only very modest earnings increments associated with pre-immigration labor market experience, particularly for immigrants from less-developed countries. They also show that the partial effect of schooling on earnings for the foreign born is much smaller than the partial effect of schooling for the native born.

These patterns were first systematically documented by Chiswick (1978). He showed that the partial effect of a year of schooling for the foreign born in analyses of 1970 US Census data was 5.7 percent, whereas the partial effect of schooling among the native born was 7.2 percent. Similarly, at 10 years of experience, the percent increase in earnings for an additional year of experience in the country of birth was only 1.4 percent among the foreign born, but 2.1 percent for experience among the native born. Similar patterns have been reported for the US for later Censuses, and for other countries (see, for example, Baker and Benjamin, 1994 for Canada, Chiswick, 1980 for Britain, Chiswick and Miller, 1985 for Australia, Chiswick, 1979 for Israel and Dustmann, 1993 for Germany).

Where immigrants' skills are not fully transferable to the destination country, they would be expected to have more years of schooling than native-born workers employed in the same job.

A second issue that arises in the immigrant economic adjustment literature is the more intense favorable selection in migration among immigrants, especially the less-well educated.[1] Chiswick (1978) argued that immigrants tend to be highly motivated and able persons. He hypothesized that "… among those with little schooling only the most able and most highly motivated migrate, while among those with high levels of schooling the immigrants are drawn more widely from the ability distribution" (Chiswick, 1978, p. 912). In this situation, immigrants, particularly the less-well educated, will be more likely to be observed working in jobs where the usual level of schooling is higher than the level of formal schooling of the immigrants. They will be able to be competitive because their higher levels of ability and motivation can substitute for their limited formal schooling.

The job placements under the less-than-perfect international transferability of human capital skills and also under the selection in migration scenarios have parallels with the descriptions of labor market processes contained in the recent overeducation/undereducation literature (see Hartog, 2000, and Kiker *et al*., 2000). This literature proposes that there is a "required" or reference level of education for each job. It has been reported that up to one-half of all workers may be employed in jobs where their actual level of education diverges from this reference level, either because they are overeducated (*i.e.*, have surplus education compared to the reference level), or undereducated (*i.e.*, have measured education deficiency compared with the reference level). In this context, immigrants, predominantly the better educated, whose human capital skills have not been fully transferable to the labor market of the destination country, will be categorized as overeducated. Those immigrants, predominantly the less-well educated, who work in jobs where the usual level of schooling is greater than their particular level of schooling, will be categorized as undereducated. Thus the refugee

[1] The favorable selectivity of immigrants can come from the supply side or the demand side of the market for international migrants. Favorable self-selectivity arises from the higher rate of return from migration received by the more able (supply side). It also arises from immigration policies that give preference to more highly skilled and more able applicants (demand side).

lawyer working as a law clerk ("overeducated") and the immigrants from a less developed country with 6 years of formal schooling driving a New York City taxi ("undereducated") both fit the model.

In this paper the perspectives of the overeducation/undereducation literature are applied to offer a comparative assessment of the occupational distributions of immigrants and the native born. Section II provides a brief overview of the overeducation/undereducation literature, and outlines how the concepts can be modified for the study of immigrants' labor market outcomes. Section III presents descriptive statistics on the adult male labor market, based on the 2000 US Census. The central focus of this section is a multinomial logit model of the determination of the distribution of workers across the "overeducated", "undereducated" and "correctly matched" categories. This model is estimated separately for adult male immigrants and the native born. Section IV contains separate analyses for selected birthplace groups, and Section V offers a conclusion.

## II. THE OVEREDUCATION/UNDEREDUCATION LITERATURE

The overeducation/undereducation literature suggests that each occupation in the labor market has a "required" or reference level of education that is needed for satisfactory job performance (see Hartog, 2000, Kiker *et al.*, 2000, McGuinness, 2006). Within any occupation, however, there may be workers with levels of education greater than the reference level ("overeducated"), or less than this reference level ("undereducated"). The over- and under-education literature seeks to explain, theoretically, the existence of these discrepancies between actual and required levels of education. It also seeks to quantify the extent of overeducation and undereducation, and how the incidence varies across workers with well defined sets of characteristics. This type of analysis has not, to our knowledge, been extended to a systematic comparative assessment of the foreign born and the native born.

### Theory

Five main phenomena can be advanced to account for overeducation/undereducation, the educational "mismatch" by occupation of individuals.

These are based on (i) search and match theory, (ii) human capital theory, (iii) assignment theory, (iv) technological change theory, and (v) a screening hypothesis.[2]

*Search and Match Theory* explains the "mismatch" as caused by imperfect information in the labor market. This mismatch is viewed as a temporary phenomenon because it can be corrected by allowing a deliberate search or adjustment process to take place over time. In this case, workers may have taken up jobs for which they are overeducated when they first enter the labor market, and then move up the occupational ladder to jobs that are a match to their schooling level. Hence, overeducation is seen as an inevitable part of the transition from school or home production to market work, and will be concentrated among labor market entrants and re-entrants (Groot and Maasen van den Brink, 2000). This transition will be associated with the incidence of overeducation falling with labor market experience, as job matches improve.

Among immigrants, it would be expected that worker response to imperfect information may be an important aspect of behavior over the initial years in the destination country, particularly for those from countries with labor markets and institution that differ appreciably from those of the destination country[3]. As well as worker responses in a situation of imperfect information, the actions of employers who have imperfect information on what overseas credentials mean will also be important. As worker experience adds to the signal regarding their skills, the mismatching decreases.

An alternative view on the search process has been outlined by Hartog (2000). He contends that mismatch could be due to all workers engaging in wealth maximizing behavior and searching for jobs with higher required levels of education. In this situation, a worker with a given level of education will only move if the move increases his/her job level. Consequently, the incidence of undereducation could rise with age or experience. Both immigrants and the native born should engage in this type of search activity, and

[2] Hartog (2000) provides an overview of the main features of the first three of these theories, while Kiker *et al*. (1997) contains an account of technological change theory. This paper adds the screening hypothesis.

[3] These job search processes will have implications for the relationship between job tenure and job level and the incidence of mismatch. However, the effects that are likely to arise are ambiguous (see Hartog, 2000).

hence should each display a similar pattern of changes in the incidence of overeducation and undereducation with years in the labor market of the host country.

*Human Capital Theory* recognises the existence of several alternative forms of human capital, including formal schooling, job experience and skills acquired through formal on-the-job training. Sicherman (1991) pointed out that there is a trade-off between schooling levels and other forms of human capital. In other words, workers could substitute educational attainment for the lack of job experience. These workers would be willing to take jobs that require less education than their actual schooling levels with the intention of gaining experience for the benefit of their future job mobility. Hence, this implies that overeducation arises due to workers' deliberate choices, and it should be a transitory situation, as overeducated workers are expected to find better job matches after gaining sufficient job experience. Undereducated workers, however, may be able to substitute job experience for their insufficient educational attainments. If this is the case, they will find there is a premium to staying in their current job where their job experience is recognized, and so undereducation will tend to be a permanent situation. In this framework, young workers are more likely to be overeducated and older workers are more likely to be undereducated. This situation is intensified by the increase in technology over time and the secular rise in the level of schooling. Younger workers have more schooling and learned the new technology in school, while older workers, with fewer years of schooling, have acquired many of these skills on the job. These alternative ways of acquiring new skills results in the overeducation of young workers and the undereducation of older workers.

According to the immigration literature, immigrants have difficulty transferring both formal schooling and labor market experience from their country of origin to the destination country, though formal schooling appears to have a higher degree of international transferability than does labor market experience.[4] This would suggest that immigrants may substitute schooling for (non-recognized) labor market experience, but they may not be able to as readily substitute experience for a lack of schooling. Overeducation should therefore be more prevalent among immigrants, particularly recent

[4] By their very nature, the skills acquired in formal schooling are less firm specific and often less industry and occupation specific, than skills acquired on the job.

arrivals, than among the native born, and it should decrease with duration of residence in the host country.

The human capital account of the overeducation/undereducation phenomenon needs to be cognizant of the difference between effective schooling and measured schooling among immigrants. Due to the less-than-perfect international skill transferability, a year of schooling among the foreign born does not necessarily equate to a year of schooling among the native born. Hence immigrants who are correctly matched on the basis of effective schooling may give the appearance of being overeducated. However, with duration in the destination, the gap between effective and measured schooling should decrease, as effective schooling increases, perhaps because the immigrants have acquired other skills, such as destination language skills, which are complementary to schooling. In this situation, actual overeducation will decline with duration of residence even if there is no change with duration of residence in the level of education.

When focusing on the immigrant labor market, the degree to which ability/motivation can be used to substitute for a lack of schooling needs to be considered. This will be important if there is favorable or positive self-selection in migration on the basis of ability/motivation. Where immigrants with lower levels of schooling are drawn disproportionately from the more able and more highly motivated, it would be expected that they would be more likely to be placed in jobs with relatively higher usual levels of schooling. In this situation, immigrants will be more likely to be undereducated than the native born. This higher incidence of undereducation need not necessarily diminish with duration of residence in the host country.

Kiker *et al.*'s (2000) *Technological Change Theory* formally addresses the issue raised above concerning the tendency for school-provided skills to be improved to keep up with the pace of any technological change in a country. Those who acquired these skills will be considered "more educated" than those who are currently engaged in the labor force. Over the short term, due to adjustment costs, firms will not be able to replace their existing workforces by these "more educated" workers. Hence, the presence of undereducated workers in the labor force will be a disequilibrium phenomenon. However, firms will gradually reset their hiring standards and employ "more educated"

workers, and these workers will be considered overeducated as compared to those who entered the workforce earlier. This factor is likely to be more important in a technologically dynamic economy than in one in which technology remained unchanged.

The technological change theory implies that the incidence of overeducation among immigrants will be related to the levels of development of the countries of origin and destination. Immigrants from many Western countries are more likely to have a technology base to their schooling comparable to that of native-born workers in the highly advanced destination economies. Immigrants from less-developed countries are more likely to have a technology component to their schooling that is less relevant to the labor market in the advanced destinations. Accordingly, for a given level of education, immigrants from less-developed countries are more likely to report that they are overeducated than immigrants from advanced Western countries, as the immigrants from less-developed countries will find that they have fewer destination-relevant skills.

*The Screening Hypothesis* is an alternative perspective on the role of education. This views schooling as a means through which workers can signal their unobserved ability. If schooling is a screen, among the native born there should be little overeducation or undereducation directly after individuals leave school. However, as employers "promote" those who learned a lot (have above average skill or human capital for their level of schooling) and "demote" those who did not, then undereducation and overeducation, respectively, should both increase with time in the labor market.

Among immigrants, as risk averse employers may be unclear as to what schooling acquired abroad signals, there may be considerable overeducation at the time of arrival. This should diminish with duration of residence. Signaling cannot readily explain undereducation at the time of arrival among immigrants; nor can it account for variation in the extent of undereducation with duration of residence in the destination country.

*Assignment (or job matching) Theory* examines the mechanism that assigns heterogenous workers (the supply of human capital by workers with different characteristics, such as education) to heterogenous jobs (the demand for different types of workers by firms with different job requirements) (Sattinger, 1993). This theory can be illustrated in a general hedonic model where education is used as a characteristic to index workers. Equilibrium in the labor market will be determined by the interaction of supply

(of workers) and demand (job requirements). In equilibrium there may be differences between the skill of the worker (actual education level) and the complexity of the job held (required education level) but these differences do not have any particular meaning (Hartog, 2000) and the theory does not appear to have particular relevance to the immigrant labor market.

Table 1 provides a summary of the predictions of these accounts of overeducation and undereducation that are relevant to the immigrant labor market.

**Table 1**
**Predictions of Theories of Overeducation and Undereducation for the Immigrant Labor Market**

| Theory | Undereducation | Overeducation |
|---|---|---|
| Search and Match Theory | • No implications | • More prevalent for immigrants from countries with labor markets and institutions distant from the destination country<br>• Declines with duration of residence |
| Human Capital | • More prevalent for immigrants than for the native born due to self-selection in migration and ability/motivation substituting for human capital<br>• No change with duration of residence | • More prevalent among immigrants than for native born due to less-than-perfect international transferability of human capital<br>• Declines with duration of residence |
| Screening | • No implications | • More prevalent for immigrants from countries with labor markets and institutions distant from the destination country<br>• Declines with duration of residence |
| Technological Change | • No implications<br>• No change with duration of residence | • More prevalent for immigrants form less developed countries |
| Assignment Theory | • No implications | • No implications |

Measurement

Three broad approaches to the measurement of the educational requirements of jobs have been advanced in the overeducation/undereducation literature, namely Job Analysis, Worker Self-Assessment, and Realized Matches. Job Analysis is the use of "objective" evaluations of the required level of education for the job titles in an occupational classification, such as the Occupational Information Networks, or O*NET database[5] (see, for example, Rumberger, 1981).

Worker Self-Assessment refers to workers' self-reports on either minimum levels of education required to perform the tasks in their jobs, or on whether they have more or less education than is actually required in their particular jobs (*e.g.*, Duncan and Hoffman, 1981).

The final method, and that which is most amenable for use with Census data of the type used in this study, is the Realized Matches procedure. This is based on the actual educational attainments of workers in each occupation. Two alternatives have been used. The first, typified by Verdugo and Verdugo (1989), is based on the mean and standard deviation of educational attainments within each occupation. Workers whose educational attainments are greater than one standard deviation above the mean value for their occupation are categorized as "overeducated". Conversely, workers whose educational attainments are more than one standard deviation below the mean value for their occupation are categorized as "undereducated". Finally, workers whose educational attainments fall within plus or minus one standard deviation of the mean value for their occupation are considered to be adequately educated.

Cohn and Khan (1995) and Kiker *et al.* (1997) have preferred the use of the modal year of education in the worker's occupation in the Realized Matches procedure. When using the mode, workers whose educational attainments are greater than the modal value are categorized as "overeducated"; those whose educational attainments are less than the modal value are categorized as "undereducated"; and workers whose level of education is the same as the modal value for their occupation are termed adequately educated.

[5] See the O*NET website: http://online.onetcenter.org.

A range of limitation and benefits have been identified in the literature for each of these three measures (see Hartog, 2000). For example, it has been argued that workers' tendency to inflate the education requirements of their jobs, and their lack of knowledge of hiring standards, limits the usefulness of the Worker Self-Assessment method. In addition, worker answers to questions such as on the level of education required to perform in a job may variously solicit responses that focus on the usual job tasks or the seldom required more demanding job tasks. The pattern of responses may vary across workers.

Similarly, concern has been expressed over whether the Job Analysis data are really objective, as the assessment made may simply reflect the characteristics of workers currently in jobs rather than the characteristics "needed" to perform the tasks required in the jobs.[6] However, it is generally reported that the conclusions from empirical studies are not sensitive to the type of measurement used (see Hartog, 2000).[7]

In this research the Realized Matches procedure will be used. Both the mode and the mean with a one standard deviation threshold are used as the bases for the computations, though for space considerations, the paper presents only detailed findings for the mode-based allocation of workers to the overeducation, undereducation and correctly matched categories.

## III. THE INCIDENCE OF MISMATCH IN THE US LABOR MARKET IN 2000

Table 2 lists information on the modal level of schooling and on the distribution of the workforce across the three mutually exclusive and exhaustive categories of (i) overeducated, (ii) undereducated and (iii) correctly matched workers. This information has been compiled using the 2000 US Census data on employed males aged 25 to 64

[6] The skills needed to perform a job are, of course, endogenous. They are a function of the level and technology of physical capital and the skills of workers in other occupations with which they interact directly or indirectly.

[7] Hartog (2000, p. 135) reports that the point estimates of the earnings effects of overeducation, required education and undereducation are sometimes affected by the type of measure of the required level of education, but the general pattern of results, and hence the conclusions typically drawn, are not affected by the type of measurement used.

years. Workers have been allocated to the three categories listed in Table 2 using the modal educational attainment of **all** workers in each of the 510 three-digit occupation.

The modal level of schooling for native-born males aged 25-64 is 12 years, as is that of the foreign born in the same age group. Around 32 percent of native-born male workers are overeducated, 25 percent undereducated, and 43 percent are matched to the requirements of the jobs in which they work. In comparison, while 28 percent of the foreign-born workers are overeducated, the percentage representation in the undereducated and correctly matched categories for the foreign born differs appreciably from that for the native born. Thus, 44 percent of foreign-born workers are undereducated and only 28 percent are correctly matched to the requirements of their jobs.[8] The workers who are undereducated can be viewed as working in jobs that are above their measured skill level. To the extent that they are able to perform to a reasonable standard in these jobs, it implies that they have other unmeasured attributes, such as motivation, effort or labor market experience, that can compensate for their measured skill deficiency.

The incidence of overeducation and undereducation among the foreign born varies according to demographic characteristics. This is illustrated by the data presented in the separate panels of Table 2.[9]

**Table 2**
**Modal Schooling Level and Incidence of Over- and Under-Education by Nativity and other Characteristics, Males 25-64, 2000 US Census**

| | Modal Schooling (years) | % over-educated | % correctly matched | % under-educated |
|---|---|---|---|---|
| Native Born | 12.0 | 32.24 | 42.52 | 25.24 |
| Foreign Born | 12.0 | 28.25 | 27.87 | 43.89 |
| • Duration of Residence (years) | | | | |
| 0 – 4 | 16.0 | 29.81 | 29.89 | 40.30 |
| 5 – 9 | 12.0 | 29.24 | 27.79 | 42.97 |
| 10 – 14 | 12.0 | 26.44 | 25.07 | 48.49 |

[8] There is a much wider variance of schooling for the foreign born than for the native born.

[9] The very high modal level of schooling of the foreign born in the US, only 0 to 4 years (16 years of schooling), may be due to the inclusion in the data of the foreign born on student visas, many of whom leave the US after completing their graduate level or professional schooling.

| | | | | |
|---|---|---|---|---|
| 15 – 19 | 12.0 | 27.37 | 26.19 | 46.44 |
| 20 – 24 | 12.0 | 26.16 | 26.63 | 47.21 |
| 25 – 29 | 12.0 | 28.11 | 29.64 | 42.25 |
| 30+ | 14.0 | 30.98 | 31.43 | 37.59 |
| | | | | |
| • English Language Ability (Foreign born only) | | | | |
| English only | 14.0 | 31.72 | 35.80 | 32.49 |
| English Very Well | 16.0 | 40.96 | 32.97 | 26.08 |
| English Well | 12.0 | 27.93 | 27.85 | 44.22 |
| English Not Well | 12.0 | 13.73 | 19.60 | 66.67 |
| English Not at All | 5.5 | 6.34 | 12.14 | 81.51 |
| | | | | |
| • Region of Birth | | | | |
| United Kingdom | 16.0 | 37.69 | 38.02 | 24.28 |
| Ireland | 12.0 | 34.73 | 40.48 | 24.79 |
| Western Europe | 16.0 | 43.91 | 34.59 | 21.50 |
| Southern Europe | 12.0 | 23.99 | 25.12 | 40.88 |
| Eastern Europe | 12.0 | 40.02 | 37.01 | 22.96 |
| Former USSR | 16.0 | 50.11 | 33.05 | 16.84 |
| IndoChina | 14.0 | 27.11 | 33.30 | 39.60 |
| Philippines | 16.0 | 49.29 | 36.06 | 14.65 |
| China | 17.5 | 44.18 | 31.80 | 24.02 |
| South Asia | 16.0 | 53.09 | 33.91 | 13.00 |
| Other South Asia | 16.0 | 48.05 | 31.17 | 20.78 |
| Korea | 16.0 | 44.61 | 40.17 | 15.22 |
| Japan | 16.0 | 36.39 | 44.49 | 19.12 |
| Middle East | 16.0 | 46.62 | 31.92 | 21.46 |
| Sub Sahara Africa | 16.0 | 29.00 | 33.01 | 17.99 |
| North America | 16.0 | 35.34 | 40.18 | 24.47 |
| Mexico | 5.5 | 10.55 | 16.98 | 72.47 |
| Cuba | 12.0 | 26.92 | 28.68 | 44.40 |
| Caribbean | 12.0 | 24.01 | 32.29 | 43.70 |
| Central and South America–Spanish | 12.0 | 24.67 | 26.71 | 48.62 |
| Central and South America–non Spanish | 12.0 | 26.79 | 33.68 | 39.53 |
| Australia, New Zealand | 16.0 | 31.82 | 35.22 | 32.96 |

Note: The modal level of schooling of each occupation is computed using information on all workers. See Appendix A for details.
Source: 2000 United States Census, 1% PUMS.

There is a U-shaped relationship between the incidence of overeducation and duration of residence in the United States. That is, more recent arrivals, particularly arrivals in the last decade, and longer-term arrivals (25 or more years in the United States) are more likely to be overeducated than immigrants who have been in the United States for a medium length of time. Conversely, there is an inverted-U-shaped relationship between the incidence of undereducation and duration of residence in the

United States. However, the likelihood of being correctly matched to the requirements of the job does not vary greatly with duration of residence, with the exception of the 25-29 and 30+ duration of residence categories. These longer-term settlers are more likely than the native born to be correctly matched to the requirements of their jobs.

The next panel of Table 2 has a focus on English language ability. The data show that the percentage of the foreign-born workers matched to the requirements of their jobs is positively related to their English language skills. The percentage of workers correctly matched falls from 36 percent for those who speak only English to little more than one-tenth among those who lack English speaking skills. So too does the proportion overeducated. However, the proportion undereducated (*i.e.*, with a schooling less than the mode) increases with a lower level of proficiency.

There are also noticeable variations in the extent of overeducation and undereducation across birthplace regions. Countries with a high incidence of overeducation are the Former USSR, Philippines, South Asia, Other South Asia and Sub Saharan Africa, while those with a low incidence of overeducation are Southern Europe, IndoChina, Mexico, Cuba, Caribbean, Central and South America – Spanish, and Central and South America – non-Spanish. Immigrants from countries with a high modal level of schooling in the US are generally characterized by a high incidence of overeducation, while immigrants from countries with a low modal level of schooling in the US have a high incidence of undereducation. The simple correlation coefficient between the incidence of overeducation and the modal level of schooling in Table 2 is 0.819. The simple correlation coefficient between the incidence of undereducation and the modal level of schooling from Table 2 is -0.861. However, the simple correlation coefficient between the incidence of workers being correctly matched to the requirement of their jobs and the modal level of education is much lower, 0.597.

This type of analysis was repeated using the mean level plus/minus one standard deviation of education in each occupation as the benchmark. Relevant details are reported in Appendix B, Table B.1. The important feature of this table is that the pattern of results is the same as reported above. In other words, the salient features of this type of analysis appear to be insensitive to the underlying methodology, of mode or mean as the measure of the match.

The data discussed above are reasonably consistent with the limited evidence on the incidence of overeducation and undereducation for the US. Table 3 summarises relevant studies. Results obtained using the Worker Self-Assessment (WA) and Realized Matches (RM) methods differ appreciably. Thus, the findings generated from the realized matches method give a relatively high rate of "correct" matches (around 75 to 80 percent) compared to less than 50 percent from the worker self-assessment method, and hence a relatively low rate of incidence of mismatches. This is expected, however, given the use of a threshold of plus or minus one standard deviation when the mean is used, and the fact that the standard deviation of years of schooling is over 2 years for most occupations. This generates an interval of four or five years of education that can be considered as the equivalent of the "required" level under the RM procedure that uses the mean level of education.[10]

**Table 3**
**Incidence of Over- and Undereducation (percentages) for the United States**

| | Evaluation Method | | | | | |
|---|---|---|---|---|---|---|
| Education | Realized Matches | | Worker Self-Assessment | | | |
| Category/Year | 1980[a] | 1985[b] | 1976[c] | 1976/78[d] | 1985[b] | 1985[e] |
| Overeducation | 11 | 13 | 42 | 41 | 33 | 32 |
| Undereducation | 10 | 12 | 12 | 16 | 20 | 21 |
| Correct match | 79 | 75 | 46 | 43 | 47 | 47 |

Notes:
[a] Verdugo and Verdugo (1989)
[b] Cohn and Khan (1995)
[c] Duncan and Hoffman (1981)
[d] Sicherman (1991)
[e] Daly *et al.* (2000)

[10] The extent of mismatch in the US documented in Table 3 has some patterns that are contrary to those established for European countries, such as the Netherlands, Spain and Portugal. It has been observed for these three countries that the incidence of overeducation has increased over time, while the incidence of undereducation has declined (see Hartog, 2000).

## IV. MULTINOMIAL LOGIT MODEL OF UNDEREDUCATION AND OVEREDUCATION

To allow for a more thorough analysis of the influence of duration of residence, language skills and other characteristics on the incidence of overeducation, undereducation and correctly matched categories, a multinomial logit model is estimated. This follows Kiker *et al.* (1997).

Thus, let $M_{ij}$ be the probability that worker $i$ is in the $j$th education category. There are three of these categories, $j = 1$ for overeducation, $j = 2$ for undereducation, and $j = 3$ for correctly matched. This probability may be expressed as:

$$(1) \qquad M_{ij} \mid X_i = \frac{e^{\beta_j X_i}}{\sum_{j=1}^{3} e^{\beta_j X_i}} \qquad i = 1,...,n \quad ; \quad j = 1,...,3$$

The vector $X$ is the set of characteristics hypothesized to affect the match between the worker's level of schooling and the skill requirements of the job in which he or she works. Kiker *et al.* (1997) include education, job tenure, experience and gender in $X$. In the current study, reflecting the emphasis on immigrants, the $X$ from the study by Kiker *et al.* (1997) is modified to include (where relevant) duration of residence, birthplace, English speaking skills, and citizenship. In addition, variables for marital status and region that are typically included in studies of labor market outcomes are included in the estimating equation.

The variable for the worker's actual level of schooling is, however, omitted from the model. Given the method of construction of the dependent variable, the use of the actual level of education as a regressor would introduce a link between the left-hand-side and right-hand-side variables that is based on this measurement issue, rather than on outcomes of worker behavior. For example, standard measurement error in reported education would produce a spurious correlation between years of schooling and over/under education. When models were estimated that included the actual years of education variable, the equations were dominated by this variable, in terms of the size of estimated education coefficients and their 't' statistics (regression available on request).

While Kiker *et al.* (1997) show that the same patterns in the coefficients of a multinomial logit model are generally obtained with the Realized Matches and Job Analysis methods, the coefficients on the education variable in their results for the Realized Matches variable were relatively large (see also McGoldrick and Robst, 1996). Consequently, the results reported below are based on a model that does not include education as an explanatory variable.

The empirical analyses are restricted to males aged 25-64 years who reported an occupation. Separate multinomial models have been estimated for the native born (left-hand panel of the Table 4) and for the foreign born (right-hand panel of the Table 4). The modal education level in the occupation has been used to define over/under education.

**Table 4**
**Multinomial Logit Model Estimates of Job Match, Males 25-64 by Nativity, 2000 US Census[a] [b]**

| | Native Born | | Foreign born | |
|---|---|---|---|---|
| Variables | LN (OE/CM)[c] | LN (UE/CM) | LN (OE/CM) | LN (UE/CM) |
| Constant | -0.287<br>(13.26) | -0.937<br>(39.43) | -0.213<br>(1.81) | -0.868<br>(8.30) |
| Experience (Exp) | 0.002<br>(1.76) | 0.002<br>(1.30) | 0.007<br>(1.99) | 0.063<br>(17.21) |
| Exp/100 | -0.003<br>(9.67) | 0.006<br>(20.99) | -0.002<br>(2.40) | -0.015<br>(2.14) |
| Married | 0.020<br>(2.94) | -0.168<br>(22.06) | 0.175<br>(8.59) | -0.235<br>(12.00) |
| Race (black) | -0.072<br>(6.47) | 0.252<br>(22.31) | 0.0006<br>(0.02) | -0.207<br>(5.87) |
| Veteran | 0.224<br>(28.68) | -0.234<br>(26.76) | 0.060<br>(1.48) | -0.231<br>(5.17) |
| Metropolitan | 0.083<br>(4.98) | -0.054<br>(3.09) | 0.080<br>(0.73) | -0.560<br>(5.96) |
| South | -0.087<br>(12.86) | 0.232<br>(31.82) | 0.013<br>(0.61) | 0.143<br>(7.10) |
| Speaks English Very Well | 0.133<br>(8.84) | 0.399<br>(25.17) | 0.319<br>(12.03) | -0.041<br>(1.43) |
| Speaks English Well | -0.022<br>(0.55) | 0.709<br>(19.31) | 0.103<br>(3.42) | 0.497<br>(16.74) |
| Speaks English Not Well | 0.276<br>(4.98) | 0.558<br>(9.86) | -0.282<br>(7.54) | 1.104<br>(33.75) |
| Speaks English Not At | 0.389 | 2.117 | -0.574 | 1.695 |

| | | | | |
|---|---|---|---|---|
| All | (1.00) | (6.91) | (8.31) | (34.86) |
| Years Since Migration (YSM) | | | -0.017<br>(6.15) | 0.062<br>(21.74) |
| $YSM^2/100$ | | | 0.023<br>(3.84) | -0.149<br>(23.48) |
| Citizen | | | 0.102<br>(4.60) | -0.629<br>(29.21) |
| $\chi^2$ | 18,264.63 | | 19,360.96 | |
| Pseudo $R^2$ | 0.016 | | 0.108 | |
| Prediction Success (%) | 44.29 | | 52.19 | |
| Sample Size | 533,306 | | 84,194 | |

Notes: (a) 't' statistics in parentheses.
(b) Computed using the Realized Matches procedure with the mode as the reference level of schooling.
(c) OE = Overeducated; CM = Correctly Matched; UE = Undereducated.
Source: 2000 US Census, 1% PUMS.

The estimates listed in the first column for the native born give the effects of the explanatory variables on the log odds of being overeducated (OE) compared to being correctly matched (CM). The estimates listed in the second column for the native born give the effects on the log odds of being undereducated (UE) compared to being correctly matched.

Additional years of labor market experience increase the log odds of being overeducated rather than being adequately educated (ln (OE/CM)) at a decreasing rate for the first 4 years of labor market experience. Thereafter the log odds of being overeducated decrease with years of labor market experience. In comparison, the odds of being undereducated rather than being adequately educated (ln (UE/CM)) increase at an increasing rate with labor market experience. Thus, overeducated workers are more likely to be recent labor market entrants, whereas undereducated workers are more likely to be in their pre-retirement years. This is the pattern predicted by one human capital perspective on undereducation/overeducation, whereby overeducation results from the deliberate choice of workers seeking work experience that will enhance their career prospects, and the undereducated workers are able to substitute experience for their lack of formal skills. It may also result from the increasing education standards over time, as has been emphasized in technological change theory.

The combined effects of the movements in the two log odds with labor market experience can be assessed by computing predicted distributions of workers across the three education categories (overeducated, undereducated, correctly matched). These predicted distributions are constructed using equation (1) to determine a predicted membership in each education category for each worker. In forming these predictions the actual characteristics of each worker other than that which is the focus of the particular panel in the table are used. The particular characteristic under consideration is then changed for each worker, as indicated in the left-hand column of the table (*e.g.* increase labor market experience by five years). The averages of these predictions for the sample are presented in Table 5.

The data in the first panel of Table 5 show that the incidence of overeducation for the native born falls by around eight percentage points during the first 30 years of labor market activity, while the incidence of undereducation rises by 11 percentage points. The incidence of native-born workers being correctly matched to the skill requirements of their jobs actually rises with labor market experience.

**Table 5**
**Predicted Distribution Across Education Categories by Selected Characteristics**

| | Predicted Distribution (%) | | | |
|---|---|---|---|---|
| Variable/Sample | Overeducated | Correctly Matched | Undereducated | Total |
| 1. Native Born: Experience | | | | |
| 1 year | 38.19 | 16.72 | 16.72 | 100.0 |
| 5 years | 38.12 | 17.00 | 17.00 | 100.0 |
| 10 years | 37.57 | 17.83 | 17.83 | 100.0 |
| 15 years | 36.49 | 19.24 | 19.24 | 100.0 |
| 20 years | 34.86 | 21.32 | 21.32 | 100.0 |
| 25 years | 32.68 | 24.19 | 24.19 | 100.0 |
| 30 years | 29.94 | 28.01 | 28.01 | 100.0 |
| | | | | |
| 2. Foreign Born: Pre-Immigration Experience | | | | |
| 1 year | 37.97 | 40.86 | 21.17 | 100.0 |
| 5 years | 36.82 | 38.38 | 24.81 | 100.0 |
| 10 years | 34.93 | 35.28 | 29.79 | 100.0 |
| 15 years | 32.61 | 32.21 | 35.18 | 100.0 |
| 20 years | 29.93 | 29.18 | 40.89 | 100.0 |

| | | | | |
|---|---|---|---|---|
| 25 years | 26.98 | 26.22 | 46.80 | 100.0 |
| 30 years | 23.89 | 23.36 | 52.75 | 100.0 |
| | | | | |
| 3. Foreign Born: English-Speaking Skills | | | | |
| English Only | 31.19 | 34.59 | 34.23 | 100.0 |
| English Very Well | 38.59 | 31.18 | 30.23 | 100.0 |
| English Well | 28.13 | 28.08 | 43.79 | 100.0 |
| English Not Well | 15.80 | 23.03 | 61.17 | 100.0 |
| English Not at All | 8.50 | 16.51 | 80.00 | 100.0 |
| | | | | |
| 4. Foreign Born: Duration of Residence | | | | |
| 1 year | 35.72 | 29.73 | 34.55 | 100.0 |
| 5 years | 32.46 | 28.52 | 39.00 | 100.0 |
| 10 years | 29.24 | 27.30 | 43.47 | 100.0 |
| 15 years | 27.01 | 26.50 | 46.44 | 100.0 |
| 20 years | 25.73 | 26.43 | 47.84 | 100.0 |
| 25 years | 25.38 | 26.98 | 47.64 | 100.0 |
| 30 years | 25.90 | 28.25 | 45.85 | 100.0 |

Source: Authors' calculation from Table 4.
Note: Rows may not sum to 100.0 due to rounding.

The pattern of effects for the foreign born are, in most respects, similar to those reported for the native born, though the magnitude of the effects are often different. Pre-immigration labor market experience is associated with more pronounced differences in the incidence of overeducation, undereducation and correct matches for the foreign born than is experience for the native born. This can be seen by comparing the first two panels of Table 5. Hence there is a difference of 14 percentage points in the incidence of being overeducated over the first 30 years of labor market activity, and a difference of 31 percentage points in the incidence of being undereducated. The incidence of being correctly matched to the skill requirement of the job is 18 percentage points lower among immigrants with 30 years of pre-immigration labor market experience than among immigrants with only one year of pre-immigration labor market experience. This indicates that labor market experience acquired abroad is difficult to match to the requirements of jobs in the US labor market. The pattern of effects with pre-immigration labor market experience evident in Table 5 is consistent with the international

transferability of human capital skills hypothesis emphasized in studies of immigrants earnings (see Chiswick, 1979).

English speaking skills have a strong influence on the distribution of foreign-born workers across the three education categories (Table 5, Panel 3). This information indicates strong positive relationships between English speaking proficiency and the incidence of overeducation and the incidence of correct matches. There is a strong inverse relationship between English speaking proficiency and the incidence of undereducation. These findings are likely to be largely reflective of a strong complementarity between formal education and English speaking skills.

Finally, among the foreign born, the patterns evident in the distribution of workers across the education categories with respect to duration of residence in the US mirror the effects among the native born for labor market experience. In particular, the likelihood of the worker being correctly matched to the skill level of his job falls with duration of residence, as does the likelihood of being overeducated. However, the likelihood of being undereducated rises with duration of residence in the US. This pattern is consistent with the job search after arrival being aimed at securing employment in jobs with higher required levels of education. It is also consistent with there being favorable selectivity in migration – when Americanized, immigrants get higher level jobs than their measured schooling levels would imply.

Results similar to those reported in Table 4 are derived when region of birth dummy variables for the birthplaces identified in Table 2 are added to the analysis. The only differences of note are (i) the years since migration and citizenship variables are statistically insignificant in the equation for the odds of being overeducated rather than being adequately educated (ln (OE/CM)) in the extended specification, and (ii) the effects associated with period of residence and citizenship are moderated, though they remain statistically significant, in the equation for the log odds of being undereducated rather than being adequately educated (ln(UE/CM)) in the extended model.

Married men, veterans of the U.S. Armed Forces and those living in Metropolitan areas are more likely to be overeducated and less likely to be undereducated among both the native born and foreign born. The veteran effect suggests that absence from the civilian labor force during what for others are defining years for occupational mobility

may put veterans at an occupational disadvantage. The metropolitan area effect may reflect the generally higher level of schooling, perhaps because of a greater access to schooling or poorer youth employment opportunities, in metropolitan compared to rural areas. It is unclear why married men would tent to have a higher level of education than is the norm in their occupation.

## V. SUMMARY AND CONCLUSIONS

The results in Table 4, together with the predictions displayed in Table 5, show that the incidence of overeducation, of undereducation, and of being correctly matched to the requirements of the job vary with workers' characteristics in the US labor market in ways that are consistent with the limited information available from other studies, such as Kiker *et al.* (1997). In particular, the data show that overeducation is more likely among recent labor market entrants, and undereducation is more likely among older members of the workforce. There is little variation with labor market experience in the likelihood of being correctly matched to the requirements of the job among the native born, or with post-immigration labor market experience among the foreign born. However, there is a marked inverse relationship between pre-immigration labor market experience and the likelihood of being correctly matched to the skill requirements of the job. This presumably reflects uncertainties on the part of US employers over the value of skills acquired on the job in foreign countries.

This difference in the impacts of pre- and post-immigration labor market experience among the foreign born is intuitively reasonable, and accords with discussion of immigrant adjustment in Chiswick (1978) (1979) and elsewhere. In particular, due to the less-than-perfect international transferability of human capital skills, there is less successful job matching of a foreign-born worker's skills the longer they have worked in the country of origin prior to immigration. After arrival in America, however, workers tend to move into jobs that require higher skill levels than indicated by the immigrant's level of schooling. The destination-specific skills that immigrants acquire in the US presumably substitute for formal schooling levels to enable the immigrant to perform satisfactorily in the job. This presumably arises from the favorable selectivity of immigrants for success is the destination labor market.

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## APPENDIX A

## COMPILING THE REQUIRED EDUCATION DATA

**Education:** This is formed from the question "What is the highest degree or level of school that this person has completed". The categorical data in the Census were converted to a continuous variable using the following scheme.

| Education Category | Assumed level of Education |
|---|---|
| No schooling completed | 0 |
| Nursery school to 4th grade | 2 |
| 5th grade or 6th grade | 5.5 |
| 7th grade or 8th grade | 7.5 |
| 9th grade | 9 |
| 10th grade | 10 |
| 11th grade | 11 |
| 12th grade, no diploma | 11.5 |
| High School graduate | 12 |
| Some college credit, but less than 1 year | 12.5 |
| 1 or more years of college, no degree | 14 |
| Associate degree | 14 |
| Bachelor's degree | 16 |
| Master's degree | 17.5 |
| Professional degree | 18.5 |
| Doctorate degree | 20 |

The modal level of education for some birthplace groups is quite low. For example, for immigrants from Mexico it is 5.5 years. This is to be interpreted as the modal education category being "5th grade or 6th grade", and not as indicating the presence of two modes.

**Occupation:** All individuals who had worked between 1995 and 2000 were asked to provide information on their occupation. Information provided by all these respondents is used in preference to that on subsets (*e.g.*, only persons who worked in 1999). This will generate more precise estimates. Particularly when the mode is used, however, but also for the mean-based analyses, the use of alternative samples to construct the reference levels of education for each occupation has little impact on the results.

## APPENDIX B: Table B.1
### Mean Schooling and Incidence of Over- and Under-Education by Nativity and other Characteristics, Males 25-64, 2000 US Census

| | Mean Schooling (years) | % overeducated | % correctly matched | % undereducated |
|---|---|---|---|---|
| Native Born | 13.572 | 11.92 | 80.04 | 8.04 |
| Foreign Born | 11.791 | 13.94 | 61.59 | 24.48 |
| | | | | |
| • Duration of Residence (years) | | | | |
| 0 - 4 | 12.256 | 17.57 | 60.57 | 21.86 |
| 5 – 9 | 11.873 | 15.49 | 61.51 | 23.00 |
| 10 – 14 | 11.264 | 13.12 | 59.81 | 27.07 |
| 15 – 19 | 11.433 | 12.63 | 60.77 | 26.61 |
| 20 – 24 | 11.372 | 11.98 | 59.87 | 28.15 |
| 25 – 29 | 11.887 | 12.77 | 62.68 | 24.55 |
| 30+ | 12.648 | 13.41 | 67.15 | 19.44 |
| | | | | |
| • English Language Ability | | | | |
| English only | 13.406 | 14.91 | 71.02 | 14.06 |
| English Very Well | 14.022 | 21.74 | 67.05 | 11.22 |
| English Well | 11.701 | 12.69 | 63.73 | 23.58 |
| English Not Well | 8.975 | 6.27 | 51.80 | 41.93 |
| English Not at All | 6.770 | 2.88 | 38.60 | 58.51 |
| | | | | |
| • Region of Birth | | | | |
| United Kingdom | 14.966 | 20.42 | 71.86 | 7.72 |
| Ireland | 13.950 | 15.76 | 73.03 | 11.21 |
| Western Europe | 14.949 | 24.40 | 68.56 | 7.05 |
| South Europe | 11.985 | 10.76 | 67.53 | 21.70 |
| Eastern Europe | 13.821 | 20.80 | 71.22 | 7.98 |
| Former USSR | 14.899 | 32.20 | 62.01 | 5.80 |
| Indo China | 11.943 | 8.29 | 73.97 | 17.74 |
| Philippines | 14.327 | 23.80 | 71.86 | 4.35 |
| China | 14.676 | 27.42 | 60.85 | 11.73 |
| South Asia | 15.709 | 33.38 | 61.68 | 4.94 |
| Other South Asia | 14.407 | 28.26 | 61.75 | 9.99 |
| Korea | 14.904 | 25.76 | 68.92 | 5.33 |
| Japan | 15.222 | 20.46 | 73.46 | 6.08 |
| Middle East | 14.627 | 26.93 | 64.05 | 9.02 |
| Sub Sahara Africa | 14.518 | 27.60 | 65.10 | 7.30 |
| Other North America | 14.687 | 16.53 | 74.97 | 8.51 |
| Mexico | 8.337 | 3.59 | 49.48 | 46.93 |
| Cuba | 12.490 | 12.27 | 69.21 | 18.51 |
| Caribbean | 11.933 | 8.06 | 73.77 | 18.16 |
| Central and South America–Spanish | 11.062 | 10.07 | 62.25 | 27.68 |
| Central and South America–non Spanish | 12.461 | 7.60 | 76.49 | 15.91 |
| Australia, New Zealand | 13.554 | 15.27 | 71.63 | 13.10 |

Source: 2000 United States Census, 1% PUMS.

The data for Table B.1 have been computed by compiling the educational requirements of the jobs using the mean educational attainment of all workers in each three-digit occupation. 510 occupations are used in the analysis. Workers whose level of schooling is more than one standard deviation higher than the mean are categorized as "overeducated", while workers whose level of schooling is less than one standard deviation below the mean are labeled "undereducated". Workers whose level of schooling is within plus or minus one standard deviation of the mean educational attainment of the occupation of employment are categorized as "correctly matched".

Given the use of a threshold of plus or minus one standard deviation of the mean educational attainment in categorizing workers as "correctly matched", it is expected that the incidence of correctly matched workers would be much larger than when the mode is used, and the incidence of overeducation and undereducation smaller. This expectation is evident in the comparison of Table B.1 and Table 2, and is similar to the findings reported by Kiker *et al*. (1997, p. 116), where when the mean was used 86 percent of workers were correctly matched, 9 percent overeducated and 5 percent undereducated, yet when the mode was employed the percentage of workers correctly matched, overeducated and undereducated changed to 58 percent, 26 percent and 17 percent, respectively.