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Assimilation Rates and Portability of Human Capital across Occupations

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Abstract

This study examines the impact of occupational fields on the economic assimilation and human capital portability of foreign-born workers in the U.S. labor market. Using IPUMS USA data, I employ an econometric model to compare wage trajectories of foreign- and native-born workers across occupational categories, with a focus on STEM and non-STEM fields. Key explanatory variables include immigration status, years since migration, and occupational classification, while demographic and educational factors serve as controls. Results indicate that foreign-born workers experience significant initial wage penalties, particularly in STEM occupations (-26.66%), but exhibit the highest annual wage growth (+2.85%). Non-STEM laborers face smaller wage differentials (-5.11%) but recover at a slower rate (+1.65%). High-skilled professionals encounter networking barriers, leading to a -11.19% wage disadvantage with moderate growth (+1.86%). These findings underscore the critical role of occupational field in economic integration. Policy interventions enhancing credential recognition and professional networking could facilitate smoother economic assimilation for foreign-born workers.

Introduction

Immigrants frequently undergo significant changes in their overall economic situation when migrating across national borders. Despite having comparable skills and qualifications they tend to face an initial wage penalty compared to their native-counterparts upon entering the labor market. Over time, wage trajectories may increase as a result of acquiring host-country-specific skills, occupational mobility, or labor market experience, processes collectively known as economic assimilation. The assimilation rate and portability of human capital is defined as the skills and knowledge acquisition through educational and professional institutions. These parameters might vary across occupational fields due to factors such as qualification recognition, language proficiency, and industry-specific barriers. There might be other time-sensitive factors in place such as visa deadlines and sponsorship conditions that specifically apply to immigrants forcing them to agree to under-market wages. Therefore immigrants tend to be less attached to specific regions within the US due to family making them more geographically flexible to accept higher-paying career options. That comparable higher mobility could result in an accelerated wage growth compared to their region-bound native counterparts. This study examines how occupational fields impact the initial wage outcomes and growth growth over time as a measure of assimilation rates and human capital portability. It specifically addresses the question: How does occupation affect the economic assimilation and portability of human capital of immigrants in the U.S. labor market? By comparing STEM and non-STEM fields, as well as classifying into more detailed fields of occupations such as service or managerial and professional speciality occupations, this research gives insight into the impact of occupations on the economic integration of foreign-born workers in the U.S. labor market.

Literature Review

The existing literature in the immigration economics sector on immigrant assimilation and the portability of human capital provides valuable insights into the integration of international labor into the domestic labor market and wage dynamics over time. However, there are gaps remaining particularly regarding the effect of occupational fields on wage trajectories. This paper aims to supplement the previous research by exploring the impact of different occupational fields on assimilation rates and human capital transferability.

In the field of wage assimilation for immigrants one of the foundational contributions comes from Chiswick (1978). Chiswick examines the effect of Americanization on the earnings of foreign-born men by comparing wage gaps between foreign-born male workers and native male workers in the United States. The wage growth estimation over time accounts for the so-called ‘Americanization’ as assimilation when acquiring U.S. specific capital. Chiswick (1978) finds that right after entering the labor market foreign-born men experience lower wages than the natives with comparable skills and knowledge. However, earnings grow over time and after 10-15 years foreign-born men surpass their native counterparts. Expanding on the assimilation dynamics, Kossoudji

(1989) suggests that the wage growth does not only depend on higher wages in the same job but also the transition into higher paying jobs with similar measured qualifications. These papers explain that the crossover point indicates a larger wage growth for immigrants workers compared to their native counterparts but does not account for how occupational fields might impact the assimilation rate.

More insight into the human capital portability topic supplemented by the returns to eduction approach is provided by Friedberg (2000) and Baker and Benjamin (1994). Friedberg (2000) distinguishes between the acquisition of foreign human capital and domestic human capital. The research shows that experience and education gained abroad have lower returns with 7.6% compared to 8.8% in education and 0.3% compared to 1.4% in professional settings, but domestic education significantly increases the assimilation rate (Friedberg, 2000). Baker and Benjamin (1994) find that the return to education and experience that is acquired internationally is significantly lower than the domestic counterpart in Canada, much like Friedberg (1900) concludes for the United States. They also highlight the importance of considering cohort effects with different timing and policies resulting in variation in the economic outcomes, but do not account for occupational differences.

In the related literature on native-born individuals, research demonstrates how the field of study plays a fundamental role in the outcome of wages. Altonji et al. (2015) analyzes how the field of study in college and graduate educational settings impacts the wage outcomes. Results show that STEM degrees result in the highest returns, followed by business and law, and ultimately humanities and education. There is a similar pattern in the German labor market, in which Grave and Goerlitz (2012) reveal large entry-level wage differentials across different fields of study among German university graduates. Similarly, STEM graduates exhibit higher earnings than those in humanities and arts. The findings of individuals with a technical and quantitative educational field earning higher wages than arts and humanities disciplines within the native population already indicate a correlation between occupation and earnings that could be transferred to the international labor population.

Overall these studies build a broad foundation for understanding the assimilation rate of immigrants and the variation of wage outcomes due to the field of study. However, the existing literature does not account for how the occupational characteristics impact the assimilation rate and the returns of human capital. Through the addition of occupational fields into the analysis of economic assimilation, this study expands on the economic assimilation and human capital capital portability research. Previous studies mainly focused on general wage assimilation, differences in the returns of foreign and domestic education, and the wage differentials across fields of study, whereas this research uniquely explores how these dynamics are influenced by occupations.

Empirical Strategy

This study employs an econometric framework to examine the evolution of wages of

$$y_{it} = \beta_0 + \beta_1 I_i + \beta_2 I_i Y_{i,t} + \beta_3 I_i Y_{it}^2 + \beta_4 I_i C_i + \beta_5 I_i C_i^2 + X_{i,t}\Gamma + \epsilon_{it}$$

Variable	Discription	Expectation	Justification
y_{it}	annual earnings based on hourly wage of individual i at time t	dependent	outcome variable
I_i	immigrant status dummy variable (1 = immigrant, 0 = native-born)	negative	immigrants with wage penalty due to lack of country-specific experience and cultural differences
$Y_{i,t}$	years since migration	positive	assmilation rate due to host country labor market exposure and language aquisition
C_i	immigrant arrival cohort	varies	control for different cohorts over time
X_γ	vector of demographic and geographic controls	mixed	control for individual characteristics
ε_{it}	error term	-	unobserved factors impacting earnings

immigrants. The baseline model is specified as follows:
where y_{it} is the annual earning based on hourly wage of individual i at time t. I_i is a dummy variable specifying on whether the individual is an immigrant. $Y_{i,t}$ denotes the number of of years the immigrant has spent in the United States. In the Swedish labor market Duvander (2001) finds time spent in the host country to be the only factor influencing the likeliness of unemployment, while language skills, origin country of the partner, and the effect of Swedish education do not significantly impact the risk of unemployment. C_i captures the immigrant arrival cohort, which captures the change of the cohort quality over time. The quadratic terms in the model for $Y_{i,t}$ and C_i account for possible nonlinearities in wage assimilation. The vector Xγ controls a variety of demographic and geographic characteristics such as age, language proficiency, gender, and other work or educational experiences. These factors are controlled for as they might directly impact wage outcomes independently of occupational choice. Controlling for language proficiency is particularly important, as Chiswick and Miller (1995) give evidence for an endogeneity between earning and language skills. In the Australian labor market higher wages incentivize language learning and better language skills result in higher earnings. Similar findings stem from Matos (2017), who shows how language fluency positively influences wage outcomes. In the Portuguese labor market Brazilians as native Portuguese speakers face a -30.73% initial wage penalty compared to the non-native Portuguese speakers from Eastern Europe earning -32% less. Finally, ε_{it} represents the idiosyncratic error term.

To examine the differential effects of immigration status on wage assimilation across occupational categories, the previous model estimates separately for STEM and non-STEM occupations. This split-sample approach allows us to compare the wage penalty (β_1) and assimilation rate (β_2) for immigrants in STEM versus non-STEM fields. As employers in STEM occupations tend to require highly specialized skills the initial wage penalty is hypothesized to be higher in STEM fields than non-STEM fields due to less credential transferability across national borders. Barriers to entry such as credential recognition or licensing requirements could limit the immediate utilization of the human capital in the U.S. labor market. Moreover, the assimilation process (β_2 and β_3) may differ between these groups, as STEM occupations typically involve distinct career trajectories and exhibit greater wage growth as immigrants gain employer trust and

obtain recognition of their credentials over time. By comparing the estimated coefficients, we assess whether occupational differences influence the speed and extent of wage convergence between immigrants and native-born workers in the U.S. labor market.

To get more insight into specific assimilation patterns based on occupation, this study expands by analyzing the assimilation rates across eight broad occupational groups. (1 Managerial and Professional Specialty; 2 Technical, Sales, and Administrative Support; 3 Service; 4 Farming, Forestry, and Fishing; 5 Precision Production, Craft, and Repair; 6 Operators, Fabricators, and Laborers; 7 Military; 10 STEM) By disaggregating the occupational fields into these categories, it is possible to understand more nuanced variations among wage penalties and assimilation trajectories due to common characteristics that might not be identifiable in the STEM vs. non-STEM approach. Different occupations vary in terms of skill transferability, licensing requirements, and employer perceptions of foreign credentials, all possible factors that may influence an immigrant's ability to close the wage gap with native-born workers. For instance, occupations in professional and managerial roles may exhibit a relatively larger wage penalty due to credentials and licensing requirements but therefore benefit from a larger wage growth as they might be able to gradually move up the corporate ladder and adapt to the U.S. corporate expectations. This expanded approach allows for a more detailed understanding of how occupational segmentation influences the economic integration of immigrants in the U.S. labor market.

This research aims to fill in important gaps within the immigration economics occupation area and to provide an analysis option for immigrants, policymakers, employers, and educators to understand how occupation has an impact on the assimilation rates and portability of human capital when migrating into the United States. The findings of the analysis will help immigrants to more efficiently integrate into the labor market in the United States by working in an occupation field with a high labor demand, smaller wage gaps, or occupations with higher assimilation rates and portability of human capital.

Descriptive Statistics

Variable Name	Observation	Mean	Std. Dev.	Minimum	Maximum
Age	15,576,675	40.61	14.40	16	65
Income Earning	11,614,114	40235.19	51384.07	1	1360000
Male	11,614,114	0.52	0.50	0	1
Female	11,614,114	0.48	0.50	0	1
White	11,614,114	0.79	0.41	0	1
Black	11,614,114	0.10	0.29	0	1
Hispanic	11,614,114	0.24	0.77	0	4
Years of Education	11,614,114	13.52	2.99	0	19
English Proficiency	11,614,114	1.12	0.46	1	4

In this data set the variable income earnings depends on the other explanatory variables listed in the table. All variables are listed with their means and standard deviations, giving insight about the demographic, economic, and educational characteristics of the dataset while also considering variations across different dataset groups such as immigrants and natives.

The average age within the population is 40.41 years indicates a middle-aged demographic, which is a result of the age restriction to the work force between 16 and 65 years restricting the sample size form 15,576,675 to 11,614,114 data points. The descriptive statistics are computed after the data cleaning process, during which the individuals with missing values from any of the variables are dropped. As a result, all variables in the descriptive table are based on the same number of observations. The standard deviation of 14.40 years illustrates a broad distribution of people in the work force ranging from teenager in the workplace to employees nearing the retirement age.

The immigrant amount within the data sample corresponds to 14.20% of the population. Considering the rest of the population is native, the immigrants only make up a small percentage of the whole population. As expected due to its categorical nature, the standard deviation of 0.349 of the immigrant binary variable shows limited variability.

When looking at income earnings there is an average annual income of $40,235.19 with a standard deviation of $51,384.07. Such a high standard deviation with an income range reaching from $1 to $1,360,000. These results complemented with the 0.47 Gini coefficient according to the U.S. Census Bureau for that time span implies economic disparities and wage inequality among the population containing both low-income individuals and high-income individuals.

The gender distribution with 52.08% male and 47.92% female is relatively even compared to the ethnic composition of the data set, which is predominantly white (79.10%) compared to 9.53% black and 23.54% hispanic. The standard deviation of 0.774 explains the greater variability due to multiple categories. The total ethnic distribution exceeds the 100% population mark, as individuals have the option to identify as multiple ethnic categories resulting in overlapping classifications.

The average years of education level is just above high-school level (13.52) and has a standard deviation of 2.99 years. That variation shows a large range of educational attainment data points likely impacting the income earnings outcomes impacting the overall socioeconomic outcomes.

English proficiency shows generally high language capabilities among the population. The four categories show a clear tendency towards the fluent english language proficiency with 92.75%, which is 10,771,977 out of the 11,614,114 observed individuals in the data set and are numbered as 1. Even the small rest of the data set is skewed up towards the fluent capabilities with 3.78% of the population having intermediate English knowledge (group 2), followed by 2.56% with basic understanding (group 3). Only 0.91%, which translates to 105,184 individuals out of the whole population with

11.614,114 datapoints, have no English skills at all (group 4). The weighted mean is 1.12 if 92.75% of the group has value 1, 3.78% has 2, 2.56% has 3, and only 0.91% of the group has the value 4. That indicates how the average English proficiency score is fairly low and close to the best value of 1, showing that the group as a whole has a high level of English language proficiency.

Overall, the dataset has a great proportion of middle-aged, predominantly white individuals with a diversity in income, gender, education, ethnicity, and nativity. All those topics provide many areas for further exploration for analyzing socioeconomic, demographic, ethnic, or nativity trends and patterns.

1990 Occupation Distribution in the Econometric Model

The three tables show the occupational distribution of the whole population, the immigrant population, and the native population in 1990 divided into ten categories. By further looking at the different characteristics of those groups, patterns and differences of the groups might be revealed.

The occupational distribution within the whole population records most individuals to be located in the technical, sales, and administrative support occupations (27.84%) and managerial and professional specialty occupations (26.88%), cumulatively accounting for more than half of the total workforce. The third largest share is the service occupations part (15.95%) followed by operators, fabricators, and laborers with 12.42%, accounting for a large percentage of blue-collar roles not including administrative sectors. STEM occupations only account for 4.06% followed by the smallest proportions farming, forestry and fishing occupations (2.71%), military occupations (0.80%), and unknown occupations (0.00%).

For immigrants technical, sales, and administrative support occupations (22.61%) and the technical, sales, and administrative support occupations (22.53%) remain popular, but also show that those occupations account for less than half. Moving from roughly 54.72% of the whole workforce to 45.15% of the immigrants indicates a substantial work towards white-collar roles. Service occupations however are more popular among immigrants with 20.23%. The three occupations slightly higher than the whole population distribution are operators, fabricators, and laborers (15.12%), STEM occupations (5.09%), and farming, forestry and fishing occupations (4.27%).

Native in technical, sales, and administrative support occupations and technical, sales, and administrative support occupations make up 56.31% exceeding the share of immigrants. Therefore natives in service occupations only account for 15.23% and operators, fabricators, and laborers account for 11.97% indicating a smaller share in blue-collar work. Farming, Forestry and fishing occupations at 2.45% is even less and so is the 3.88% representation in STEM occupations.

As a conclusion the dataset indicates immigrants to be more represented in the service, labor-intensive, and STEM occupations in the U.S. labor market. Natives are dominating

the white-collar roles. Economic and demographic trends in the 1990 occupation workforce illustrate a complementary labor market model between immigrants and natives. The diversity of immigrants across sectors fill critical gaps within the labor market both in the high-skilled and labor-intensive occupations.

Results

In labor market economics the outcomes for individuals in terms of wages depend on multiple variables including level of education, birthplace, barriers to economic integration, credential recognition challenges, employer biases, networking barriers, and sector of occupation. Wage disparities between foreign- and native-born workers can help to understand the integration process of individuals born abroad into the workforce in the United States. The integration into the U.S. workforce uses two different measures which are wage penalties and assimilation rates. Initial wage penalties describe the percentage wage reduction faced by immigrant laborers compared to native-born counterparts when initially entering the U.S. labor market. Assimilation rate is the percentage wage increase per year of work experience in the U.S. labor market due to cultural, language, labor market and economic skill acquisition. The importance of labor market experience in the U.S. labor market for wage assimilation is illustrated by Kossoundji (1989), who finds that neither Hispanic or Asian adult migrants benefit from experience received in the home country and have to rely on U.S. labor market experience. The regression tables examine the wage penalty and assimilation rate dimension for STEM vs. Non-STEM workers with different education levels first. There will be a breakdown by education level distinguishing between the total and high- and low-skilled candidates. Then the model will compare more specific job groups. This occupational group analysis assesses wage penalties and assimilation rates across different job categories also considering the years of education for skill difference assessment. The importance of the consideration of skill differences is exemplified in the analysis of occupational mobility in the United States by Rodriguez-Planas (2012). Initial wage penalties increase with higher skill levels. Low-skilled migrants for example arriving between 1991 and 1995 face -35% wage penalties, whereas the medium- and high-skilled migrants earn around -39% to -41% less than their native counterparts.

STEM vs. non-STEM

The first major distinction is the wage penalty between individuals in STEM professions (Science, Technology, Engineering, and Mathematics) and the individuals in other job fields labeled as non-STEM. Comparing STEM with non-STEM occupations in different education levels examines whether STEM careers support the general perception of being more credential-dependent.

Table 1: Summary for foreign-born STEM occupation workers with different skill levels

	STEM								
	Total			High-skilled			Low-skilled		
	Coef.	t-value	Sig	Coef.	t-value	Sig	Coef.	t-value	Sig
Wage Penalty	-.2666	-8.33	***	-.2936	-8.29	***	-.6009	-1.50	-
Assimilation Rate	.0285	12.64	***	.0298	11.94	***	.0381	1.27	-

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if occ1990 == 10

Foreign-born workers in the STEM professions of the U.S. labor force face a significant wage penalty of -26.66% less than their native-born counterparts in the same occupation sector. Considering that STEM occupations are commonly viewed as sectors with high wage outcomes and strong labor demand, this is a controversy finding. The field choice analysis in the U.S. for college and graduate school by Altonji et al. (2015) shows that STEM majors on average earn between 50-80% more than education majors indicating the high wage outcomes of STEM majors. Similar differences between the earnings depending on the filed choice can be seen in the German labor market study (Grave & Goerlitz, 2012), in which the entry wages of arts and humanities are 36% less than social sciences and 40% less than engineers. These wage gaps remain statistically and economically significant over time. The initial wage disparity could be correlated to the employer company sponsoring an immigrants H1B visa for STEM occupations. Therefore the foreign employee is bound to work for this specific company penalizing the individual due to the lack of labor market mobility. Individuals that are born abroad might also experience a higher income dispersion due to degree recognition barriers and initial difficulties when it comes to the assessment of professional networks.

Even though the foreign-born candidates in the STEM occupations struggle to receive fair initial compensation, the assimilation rate is relatively larger (+2.85%). Each additional year of U.S. work experience for STEM abroad-born workers results in a wage growth increase of +2.85%. That high earnings increase can be explained by employer trust or the transition into better-paying roles through promotion or switching companies over time. Despite the penalization being immense, the STEM jobs catch up over time and adjust fast to the native counterparts' wages.

The high-skilled STEM workers with more than fifteen years of education have an even greater wage penalty (-29.36%) illustrating that employers are more hesitant to offer high salaries to highly-skilled immigrants in those professions. The increase in wage penalty compared to the total wage penalty shows that even in knowledge-based careers due to many years of education the foreign-born professionals have issues getting their credentials recognized and may be disadvantaged in networking. The two authors Bauer and Zimmermann (1999) explore occupational mobility of ethnic migrants. Table 4 indicates that professionals abroad have a 67.5% probability of downward economic mobility upon arrival, indicating that the downward mobility of German professionals aligns with the findings of the high initial wage penalties for STEM professionals in this research paper.

The disadvantage of an increase in the wage penalty can be outbalanced over time with a corresponding high assimilation rate (+2.98%), which is slightly higher than the total STEM and again significantly higher than other professions in the labor market. Such a high assimilation rate can be the result of gaining U.S. labor market work experience reducing the fear of employers about unfamiliar qualifications or different career paths. Foreign-born individuals will also have the opportunities to obtain additional qualification and networking within the industry for additional licensing and better opportunities. This phenomena of high initial wage disparities and higher assimilation rates as a U-shape that is steeper for high-skilled immigrants and more shallow for low-skilled or unskilled immigrants corresponds to fourth U-shape thesis of the Chiswick et al. (2005) paper about the longitudinal analysis of immigrant occupational mobility in Australia. That steeper U-shaped pattern of occupational mobility for higher education levels is also supported by Simón et al. (2014) exploring the immigrant occupational mobility in Spain. Friedberg (1992) had a similar analysis examining the nonlinear rate of catch up in the labor market of immigrants in the United States. According to this research, in the first years after immigration the rate is quite steep and levels off subsequently. The research by Toussaint-Comeau (2006) adds the cultural, economic, and social difference parameter of the origin country compared to the host country into the equation of occupational assimilation of Hispanic immigrants in the United States. The more dissimilar the host country, the steeper will the U-shape for high-skilled professional be.

The wage penalty and assimilation rate findings for low-skilled immigrants in STEM are both statistically insignificant. The estimated coefficients with a large initial wage disadvantage (-60.09%) and a high wage growth rate over time (+3.81%) lack statistical certainty and therefore can not be used for any conclusions. The lack of statistical significance could be a result of the comparably small sample size of only 2,188 observations compared to 229,016 for the high-skilled and 363,586 for the total foreign-born STEM employees.

The non-STEM occupations include jobs in administration, service, military, and manual labor. Non-STEM sectors differ a lot regarding their skills requirements, licensing and language barriers, as well as wage structures, while STEM careers mainly depend on credentials. The following analysis examines the wage penalty and assimilation rates for foreign-born non-STEM total, high-skilled, and low-skilled workers.

Table 2: Summary for foreign-born non-STEM occupation workers with different skill levels

	Non-STEM								
	Total			High-skilled			Low-skilled		
	Coef.	t-value	Sig	Coef.	t-value	Sig	Coef.	t-value	Sig
Wage Penalty	-.0511	-6.17	***	-.1117	-7.02	***	-.1131	-4.70	***
Assimilation Rate	.0165	27.9	***	.019	16.99	***	.0148	8.81	***

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990 != 10 & years_of_education)

The total wage penalty for immigrants in non-STEM careers is -5.11%. That is a significantly lower outcome compared to the STEM fields with a wage penalty of -26.66% and exceeds a difference of 20 percentage points. The wage penalty could be lower due to less strict credential and skill requirements or more uniformity processes particularly in administration, service, military, or manual labor. Another aspects is the reliance on soft skills and a merit-based pay structure rather than strict formal credential requirements making it easier to enter these sectors. The initial wage disparity provides more promising results for foreign-born labor in non-STEM sectors, but is does not necessarily mean that there are better long-term opportunities in those profession fields as assimilation rates differ.

The assimilation rate for foreign-born workers in non-STEM is +1.65% and indicates a slower wage growth per year compared to the STEM counterparts (+2.85%). The wage disadvantage is smaller, but therefore the wage catch-up to their native counterparts over time is slower than for the STEM occupations. The slower earnings increase of non-STEM fields could be a result of limited career progressions as there might be upward mobility biases or language proficiency barriers. Another reason could be industry-specific wage ceilings compared to STEM jobs, which result in an overall lower wage outcomes. Internal promotion systems could also be tied to structured pay scales rather than performance-based wage growth leading to slower wage growth opportunities.

High-skilled foreign-born non-STEM workers have a wage penalty of -11.17%, which is higher than the overall wage penalty for non-STEM workers. Professionals in those fields therefore have a higher wage penalty to the -5.11% total non-STEM workers of about 6 percentage points. The significant wage disparities might be due to the increased competition in high-skilled non-STEM careers with native counterparts. Employers in this case might prefer native-born candidates based on cultural familiarity or local industry knowledge. Many high-paying non-STEM careers also depend on industry networks and information hiring channels, in which native-born professionals might have better connections built throughout the years of academia.

The assimilation rate for high-skilled non-STEM individuals is 1.90% and therefore lower than for STEM workers with an assimilation rate (2.98%) but higher than the overall non-STEM assimilation rate of 1.65%. Less wage progression in comparison to the STEM fields might be a result of structural barriers in career progression, where technical skills do not immediately result in salary growth like in STEM but take seniority time and promotions to have an effect. Still the growth rate for high-skilled labor in the non-STEM category is higher than the total, which might be based on higher wage ceilings and more progression options.

For low-skilled foreign-born non-STEM workers with education equal or less than ten years the wage penalty is moderate with -11.31%. It is lower than the initial wage disadvantage for high-skilled non-STEM workers but remains statistically significant. At the same time the assimilation rate is the lowest with +1.48% showing that long-term wage growth is relatively limited. Low-skilled non-STEM jobs tend to have lower wage

ceilings in fields such as manual labor and therefore the wage spread overall is smaller. Because of that there is a smaller initial wage spread between foreign-born and native-born labor than for occupations with huge wage disparities and higher wage ceilings. Skill advancements do not automatically lead to wage increases but depend on the employers bargaining power. Some industries might even actively suppress wages, as foreign-born employees have less bargaining power and heavily rely on promotions announced by the upper management.

Overall, the economic results on the analysis of foreign-born workers vary significantly between STEM and non-STEM occupations and also by skill level. STEM faces larger wage penalties while experiencing a greater long-term wage growth especially for high-skilled STEM professionals. Despite employer skepticism and credential barriers they gain U.S. experience and certifications fast. Non-STEM on the contrary enters the workforce with smaller initial wage disparities but experience slower wage growth in the long-run due to structured pay scales, networking challenges, and wage ceilings. Weiss et al. (2003) explore a different market outcome for high-skilled immigrants from the former Soviet Union when entering the Israeli labor market. The paper finds that the lifetime earnings of Soviet Union specialists migrating to Israel were -57% lower than comparable natives with -43% being attributed to slow gradual experience and school credential adaptation. Same lifetime wage gaps are identified by Borjas (1995), who measured relative wages of immigrants to grow by 10% during the first two decades and still earn 15% to 20% less throughout their whole working life in comparison to natives.

In order to address these economic trajectory disparities, field-specific policy interventions are necessary. STEM workers need credential recognition easiness and employer education for degrees of foreign-born workers. For non-STEM workers it is more important to expand their career mobility programs and networking opportunities in order to increase their long-term wage growth prospects. Without corresponding interventions, high-skilled STEM workers will continue to have initial wage disparities and low-skilled non-STEM workers will stay in low-wage positions. For foreign-born individuals to improve their initial and long-term economic outcomes, fair wage progression and equal employment opportunities need to be ensured. An example for effective integration of immigrants into the labor market is provided by Amuedo-Dorantes (2007). He finds that employment opportunities in the Spanish labor market show that the initial employment gap for immigrant men is -12% but already after 5 years the employment gap is reduced to 2% due to the fast assimilation rate.

Table 3: Overview for foreign-born STEM occupation workers with different skill levels

Total STEM	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
Wage Penalty	-.2666	.0312	-8.33	-.3293	-.2038	***
Assimilation Rate	.0285	.0023	12.64	.0241	.0329	***
R-squared	0.1333		Number of obs	363,586		
F-test	665.42		Prob > F	0.0000		
***p<.01, **p<.05, *p<.1			***2.58<t, **1.96<t, *1.65<t			

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if occ1990_group == 10

High-skilled STEM	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
Wage Penalty	-.2936	.0354	-8.29	-.363	-.2242	***
Assimilation Rate	.0298	.0025	11.94	.0249	.0347	***
R-squared	0.0687		Number of obs	229,016		
F-test	201.03		Prob > F	0.0000		
***p<.01, **p<.05, *p<.1			***2.58<t, **1.96<t, *1.65<t			

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 10 & years_of_education >= 16)

Low-skilled STEM	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
Wage Penalty	-.6009	.4002	-1.50	-1.3857	.1838	-
Assimilation Rate	.0381	.0301	1.27	-.021	.0973	-
R-squared	0.062		Number of obs	2,188		
F-test	1.94		Prob > F	0.0000		
***p<.01, **p<.05, *p<.1			***2.58<t, **1.96<t, *1.65<t			

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 10 & years_of_education <= 10)

Table 4: Overview for foreign-born non-STEM occupation workers with different skill levels

Total Non-STEM	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
Wage Penalty	-.0511	.0083	-6.17	-.0673	-.0349	***
Assimilation Rate	.0165	.0006	27.9	.0153	.0176	***
R-squared	0.1657		Number of obs	8,058,494		
F-test	19051.41		Prob > F	0.0000		
***p<.01, **p<.05, *p<.1			***2.58<t, **1.96<t, *1.65<t			

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if occ1990_group != 10

High-skilled Non-STEM	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
Wage Penalty	-.1117	.0159	-7.02	-.1428	-.0805	***
Assimilation Rate	.019	.0011	16.99	.0169	.0212	***
R-squared	0.0851		Number of obs	2,492,434		
F-test	2758.3		Prob > F	0.0000		
***p<.01, **p<.05, *p<.1			***2.58<t, **1.96<t, *1.65<t			

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group != 10 & years_of_education >= 16)

Low-skilled Non-STEM	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
Wage Penalty	-.1131	.0241	-4.70	-.1602	-.0659	***
Assimilation Rate	.0148	.0017	8.81	.0115	.0181	***
R-squared	0.0454		Number of obs	462,866		
F-test	265.07		Prob > F	0.0000		
***p<.01, **p<.05, *p<.1			***2.58<t, **1.96<t, *1.65<t			

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group != 10 & years_of_education <= 10)

Occupation Groups

The second distinction considers foreign-born workers in the U.S. labor market across profession groups. STEM vs. non-STEM was a broad comparison of only two occupational categories, whereas the wage disparities and long-term growth between different profession groups will be more precise and take eight occupations into account. For that there is a slight adjustment in the formula needed to move towards more specific occupation separation. The following tables illustrate the wage penalties and assimilation rates of different occupations and different skill levels through numbers and graphs.

Table 5: Summary for foreign-born workers of different occupations

		Total					
		Total Wage Penalty			Total Assimilation Rate		
	Occupation	Coef.	t-value	Sig	Coef.	t-value	Sig
1	Managerial and Professional Specialty	-.1119	-6.24	***	.0186	15.19	***
2	Technical, Sales, and Administrative Support	.0117	0.75	-	.0102	8.82	***
3	Service	-.1354	-7.75	***	.0174	13.36	***
4	Farming, Forestry, and Fishing	-.1147	-2.41	**	.0205	5.7	***
5	Precision Production, Craft, and Repair	-.124	-4.92	***	.0163	8.85	***
6	Operators, Fabricators, and Laborers	-.0659	-3.46	***	.0134	9.06	***
7	Military	-.0158	-0.29	***	-.0108	-1.81	*
10	STEM	-.2666	-8.88	***	.0285	12.64	***

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 1-10)

Total immigrant wage penalty (large to small): STEM(***) → Service(***) → Craft(***) → Farming(**) → Managerial(***) → Operators(***) → (Military) → (Technical)

Total interaction assimilation rate (large to small): STEM(***) → Farming(***) → Managerial(***) → Service(***) → Craft(***) → Operators(***) → Technical(***) → Military(*)

Table 6: Summary for foreign-born workers of different occupations with high skill levels

		High-skilled					
		High-skilled Wage Penalty			High-skilled Assimilation Rate		
	Occupation	Coef.	t-value	Sig	Coef.	t-value	Sig
1	Managerial and Professional Specialty	-.1584	-7.58	***	.0221	15.48	***
2	Technical, Sales, and Administrative Support	.0377	1.22	-	.0130	5.85	***
3	Service	-.3082	-5.94	***	.0240	6.29	***
4	Farming, Forestry, and Fishing	.0470	0.15	-	-.0013	-0.06	-
5	Precision Production, Craft, and Repair	-.1413	-1.48	-	.0081	1.17	-
6	Operators, Fabricators, and Laborers	-.1151	-1.49	-	.0199	3.23	***
7	Military	-.0885	-0.92	-	-.0163	-1.70	*
10	STEM	-.2936	-8.29	***	.0298	11.94	***

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 1-10 & years_of_eduction >= 16)

High-skilled immigrant wage penalty (large to small): Service(***) → STEM(***) → Managerial(***) → (Craft) → (Operators) → (Military) → (Technical) → (Farming)

High-skilled interaction assimilation rate (large to small): STEM(***) → Service(***) → Managerial(***) → Operators(***) → Technical(***) → (Craft) → (Farming) → Military(*)

Table 7: Summary for foreign-born workers of different occupations with low skill levels

		Low-skilled					
		Low-skilled Wage Penalty			Low-skilled Assimilation Rate		
	Occupation	Coef.	t-value	Sig	Coef.	t-value	Sig
1	Managerial and Professional Specialty	-.0375	-0.23	-	-.0092	-0.77	-
2	Technical, Sales, and Administrative Support	-.0128	-0.18	-	.0074	1.40	-
3	Service	-.0983	-2.26	**	.0113	3.80	***
4	Farming, Forestry, and Fishing	-.2589	-3.68	***	.0273	5.80	***
5	Precision Production, Craft, and Repair	-.0244	-0.40	-	.0130	3.10	***
6	Operators, Fabricators, and Laborers	-.0771	-1.82	*	.0134	4.45	***
7	Military	-.0526	-0.02	-	.1489	0.27	-
10	STEM	-.6009	-1.50	-	.0381	1.27	-

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 1-10 & years_of_eduction <= 10)

Low-skilled immigrant wage penalty (large to small): (STEM) → Farming(***) → Service(**) → Operators(*) → (Military) → (Managerial) → (Craft) → (Technical)

Low-skilled interaction assimilation rate (large to small): (Military) → (STEM) → Farming(***) → Operators(***) → Craft(***) → Service(***) → (Managerial) → (Technical)

Table 8: Graph for foreign-born workers' wage penalty of different occupations with different skill levels

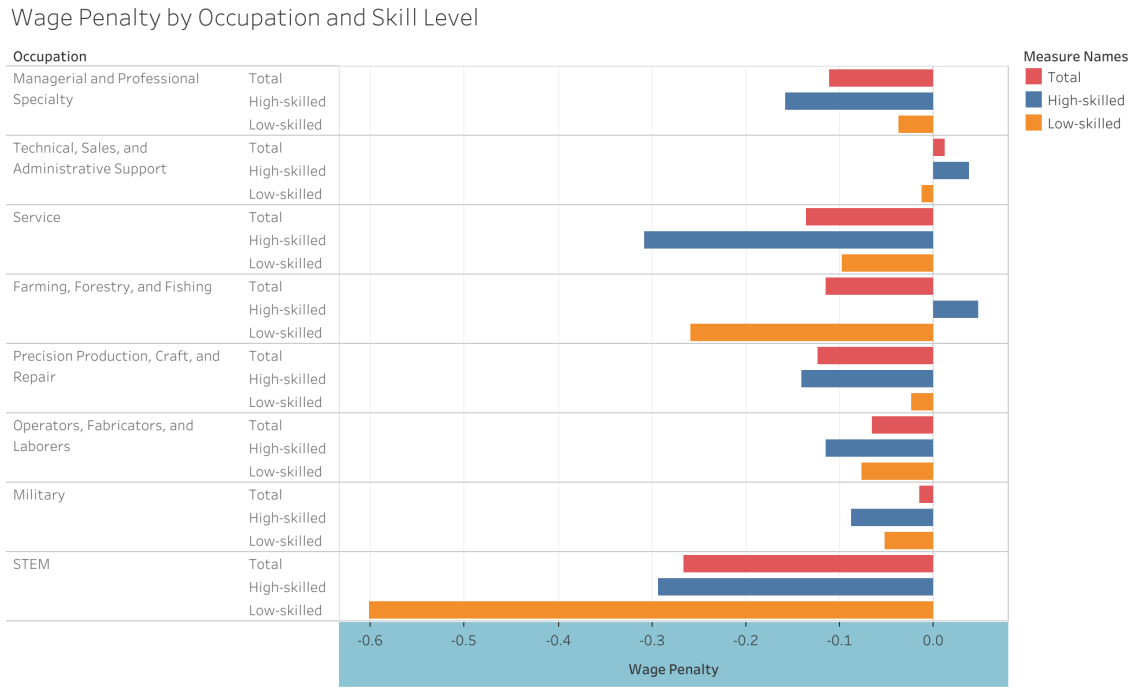
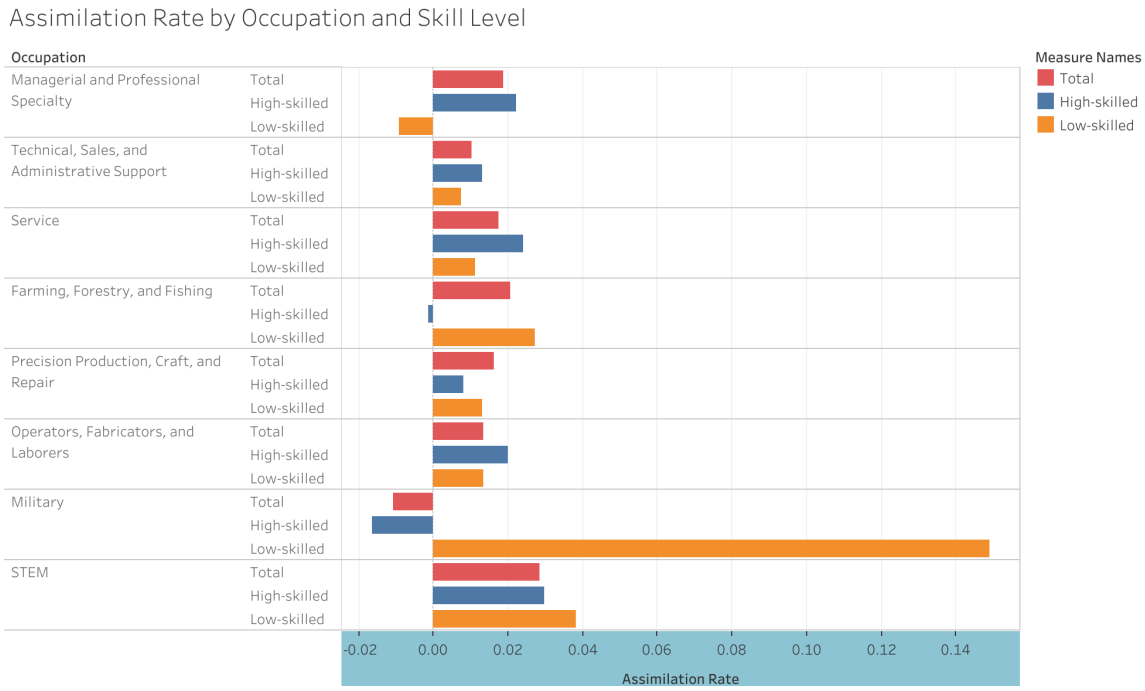


Table 9: Graph for foreign-born workers' assimilation rate of different occupations with different skill levels



Managerial and professional specialty occupations have a -11.19% wage penalty illustrating how in these job fields there is limited direct access to leadership roles and networking disadvantages. Especially high-skilled workers are penalized initially (-15.84%) as managerial roles rely on professional networks and industry credibility. Foreign-born workers often lack the necessary industry network relationships and credibility to decrease employer skepticism and enter in high-paying leadership positions. Leadership positions require familiarity with U.S. labor laws, corporate structures, and the business culture. Upon arrival immigrants might also feel pressured to accept accept available offers even under their market value as a result of financial urgency or time urgency due to visa timelines and sponsorship obligations. Despite the initial challenges foreign-born managers gradually move up the corporate ladder and get promoted adapting to U.S. corporate expectations. Immigrants tend to have less ties to specific regions in the absence of family or property allowing them to relocate to less competitive regions across thee United States with better-paying jobs, which could lead to accelerated long-term wage growth. Therefore the wage growth (2.21%) for high-skilled individuals is higher than the +1.86% total per year.

Service occupations have an overall wage penalty of -13.54% as a result of underemployment and employer biases in the wage trajectories, but high-skilled suffer disproportionately (-30.82%). Such a high income dispersion even exceeds the one for STEM occupations is largely due to the credentials not being recognized or high qualifications not needed in these specific service occupations in the U.S. labor market, which forces the professionals to go into low-paying service jobs. For low-skilled immigrants the wage penalty is -9.83% due to informal hiring practices benefitting natives with business connections and possible high-skilled foreign-born workers increasing the competition for lower payed positions. The assimilation rates indicate a slower wage growth (+1.13%) per year for low-skilled workers, whereas the high-skilled service workers can gain credibility, English proficiency, and experience faster ultimately helping them to transition towards higher paying jobs with an earnings increase of 2.40% per year. The initial employment positions and the actual qualifications imply a mismatch that require greater credential recognition and hiring practice efficiency.

Farming, forestry, and fishing professions show a major initial wage disparity for the low-skilled laborers (-25.89%) compared to the overall -11.47% in that category. The seasonal aspect of agriculture puts foreign-born workers in a position where the employer can easily suppress wages due to the low employee bargaining power. The insignificance for high-skilled worker indicates, that mainly low-skilled workers get into that job market. Workers gain a strong wage growth of +2.72% per year due to experience increase in the agricultural sector leading to better and eventually more formal employment contracts.

Precision production, craft, and repair starts with an initial wage disadvantage of -12.40% when entering the U.S. workforce. That could be because required skills such as electrical work or plumbing require specific certifications and apprenticeship experience. The earnings increase of +1.63% total and 1.30% for low-skilled can be

explained through the necessary qualifications and hand-on experience that can help to gradually close the wage gap.

Operators, fabricators, and laborers face moderate wage penalties of -6.59% and -7.71% for low-skilled labor intensive occupations. The wage disparities are smaller compared to most of the other profession groups, which is why their assimilation rate per year is smaller as well. +1.34% is the wage growth for the overall foreign-born workers in this sector and therefore equal to the low-skilled assimilation rate. Workers develop skills over time which help them in the transition towards higher-paying roles.

STEM as discussed in the STEM vs. non-STEM regression analysis has the highest overall wage penalty (-26.66%) with foreign-born workers having issues like credential barriers, employer skepticism, and work visa sponsoring by specific companies limiting and suppressing their initial salary. For high-skilled STEM workers the initial disadvantage is even greater (-29.36%). Beach and Worswick (1993) found similar results for Canada in their paper about a possible double-negative effect of the earnings of immigrant women. This paper highlights a wage premium between 12% and 14% for full-time immigrant women compared to their native counterparts, whereas the most highly educated female immigrants have an earnings disadvantage of -9.5% to -17%. These results come from issues in the international transferability of skills and credentials. Despite the high initial wage penalty (-26.66%) for STEM occupations estimated in the regression results, U.S. specific certifications and free agent options result in the most substantial wage growth (+2.85%). The earnings increase for high-skilled STEM workers is +2.98% helping them to close the wage gap with native-born STEM professionals even faster. That wage growth can be seen because after the employer-sponsored H1B STEM OPT ends, STEM professionals are considered free agents in the market and no longer bound to a specific employer raising their overall bargaining and negotiation power.

In sum foreign-born workers in the United States of America face wage penalties in pretty much every occupational field, especially when depending on credentials. STEM (-26.66%) and service (-13.54%) professions have the highest initial wage disadvantages when entering the U.S. labor force. High-skilled foreign-born workers with more than fifteen years of education experience the steepest wage gaps in service occupations (-30.82%) and managerial and professional specialty occupations (-15.85%) due to credibility barriers and networking. For low-skilled workers with less than eleven years of education the highest initial disparity lies in farming, forestry, and fishing professions (25.89%) due to seasonality and less bargaining power.

Despite these disadvantages, some fields such as STEM (+2.98%) and farming (+2.05%) show high assimilation rates compared to the following managerial and professional specialty occupations (+1.86%) and service professions (+1.74%) due to the low-skilled portion. High-skilled workers in service (+2.40%) and managerial and professional specialty occupations (+2.21%) experience steady wage improvements based on credibility and familiarity with U.S. norms in the workplace. The annual assimilation rate for almost every occupational field is positive and depends on industry

mobility, credential recognition, and experience accumulation. The effect of initial wage penalties and positive assimilation rates as the Americanization effect is also identified in the Chickwick (1978) paper. He finds that the earnings for foreign born men also show overall initial earnings disadvantages (-9.5%). The positive assimilation rates lead to equal earnings after 13 years and even 6.4% greater earnings for foreign born men after 20 years. In this research, STEM has the best long-term employment opportunities with workers gaining relevant skills, while other professions such as managerial and specialty occupations depend on professional networks, promotion based on seniority, and specific credentials accounting for a slower assimilation rate.

Structural occupational barriers such as credential recognition, employer biases, and professional mobility result in wage disparities but can be minimized through policy reforms or credential recognition programs to ease economic mobility and increase the speed of foreign-born worker integration into the U.S. labor market. In the Israeli labor market, Eckstein and Weiss (2004) acknowledge that the wages of immigrants grew by 77% over 10 years but still remain 32% below the wage numerical of native counterparts, indicating that policy reforms are needed for immigrants to fully close the wage gaps. Results from the SLID panel for the Canadian labor market show different results with lower assimilation rates for foreign born individuals as shown in previous cross-sectional data. Hum and Simpson (2000) find that the calculated wage growth without much scrutiny for immigrant men is 13.2% compared to 12.9% or native-born men and the wages of native women even grew more quickly with 10.8% compared to 7.5% for foreign-born women.

Table 10: Overview for foreign-born workers' wage penalty and assimilation rate of different occupations with different skill levels

Total Wage Penalty

Occupation	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
1 Managerial and Professional Specialty	-.1119	.0179	-6.24	-.147	-770.	***
2 Technical, Sales, and Administrative Support	.0117	.0157	0.75	-.0191	.0426	-
3 Service	-.1354	.0175	-7.75	-.1696	-.1011	***
4 Farming, Forestry, and Fishing	-.1147	.0475	-2.41	-.2079	-.0216	**
5 Precision Production, Craft, and Repair	-.124	.0252	-4.92	-.1735	-.0746	***
6 Operators, Fabricators, and Laborers	-.0659	.019	-3.46	-.1032	-.0286	***
7 Military	-.0158	.0551	-0.29	-.1237	.0921	***
10 STEM	-.2666	.032	-8.88	-.3293	-.2038	***

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 1-10)

Total Assimilation Rate

Occupation	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
1 Managerial and Professional Specialty	.0186	.0012	15.19	.0162	.021	***
2 Technical, Sales, and Administrative Support	.0102	.0012	8.82	.0079	.0124	***
3 Service	.0174	.0013	13.36	.0149	.02	***
4 Farming, Forestry, and Fishing	.0205	.0036	5.7	.0135	.0275	***
5 Precision Production, Craft, and Repair	.0163	.0018	8.85	.0127	.0199	***
6 Operators, Fabricators, and Laborers	.0134	.0015	9.06	.0105	.0163	***
7 Military	-.0108	.006	-1.81	-.0225	.0009	*
10 STEM	.0285	.0023	12.64	.0241	.0329	***

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 1-10)

High-skilled Wage Penalty

Occupation	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
1 Managerial and Professional Specialty	-.1584	.0209	-7.58	-.1993	-.1174	***
2 Technical, Sales, and Administrative Support	.0377	.0310	1.22	-.0231	.0985	-
3 Service	-.3082	.0519	-5.94	-.4100	-.2065	***
4 Farming, Forestry, and Fishing	.0470	.3072	0.15	-.5551	.6492	-
5 Precision Production, Craft, and Repair	-.1413	.0957	-1.48	-.3289	.0464	-
6 Operators, Fabricators, and Laborers	-.1151	.0774	-1.49	-.2669	.0367	-
7 Military	-.0885	.0960	-0.92	-.2766	.0996	-
10 STEM	-.2936	.0354	-8.29	-.3630	-.2242	***

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 1-10 & years_of_eduction >= 16)

High-skilled Assimilation Rate

Occupation	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
1 Managerial and Professional Specialty	.0221	.0014	15.48	.0193	.0249	***
2 Technical, Sales, and Administrative Support	.0130	.0022	5.85	.0086	.0173	***
3 Service	.0240	.0038	6.29	.0165	.0314	***
4 Farming, Forestry, and Fishing	-.0013	.0210	-0.06	-.0424	.0398	-
5 Precision Production, Craft, and Repair	.0081	.0069	1.17	-.0055	.0217	-
6 Operators, Fabricators, and Laborers	.0199	.0062	3.23	.0078	.0320	***
7 Military	-.0163	.0096	-1.70	-.0352	.0025	*
10 STEM	.0298	.0025	11.94	.0249	.0347	***

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 1-10 & years_of_education >= 16)

Low-skilled Wage Penalty

Occupation	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
1 Managerial and Professional Specialty	-.0375	.1638	-0.23	-.3585	.2836	-
2 Technical, Sales, and Administrative Support	-.0128	.0703	-0.18	-.1507	.1250	-
3 Service	-.0983	.0435	-2.26	-.1835	-.0131	**
4 Farming, Forestry, and Fishing	-.2589	.0703	-3.68	-.3966	-.1212	***
5 Precision Production, Craft, and Repair	-.0244	.0617	-0.40	-.1454	.0966	-
6 Operators, Fabricators, and Laborers	-.0771	.0425	-1.82	-.1603	.0061	*
7 Military	-.0526	2.7720	-0.02	-5.5284	5.4232	-
10 STEM	-.6009	.4002	-1.50	-1.3857	.1838	-

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 1-10 & years_of_eduction <= 10)

Low-skilled Assimilation Rate

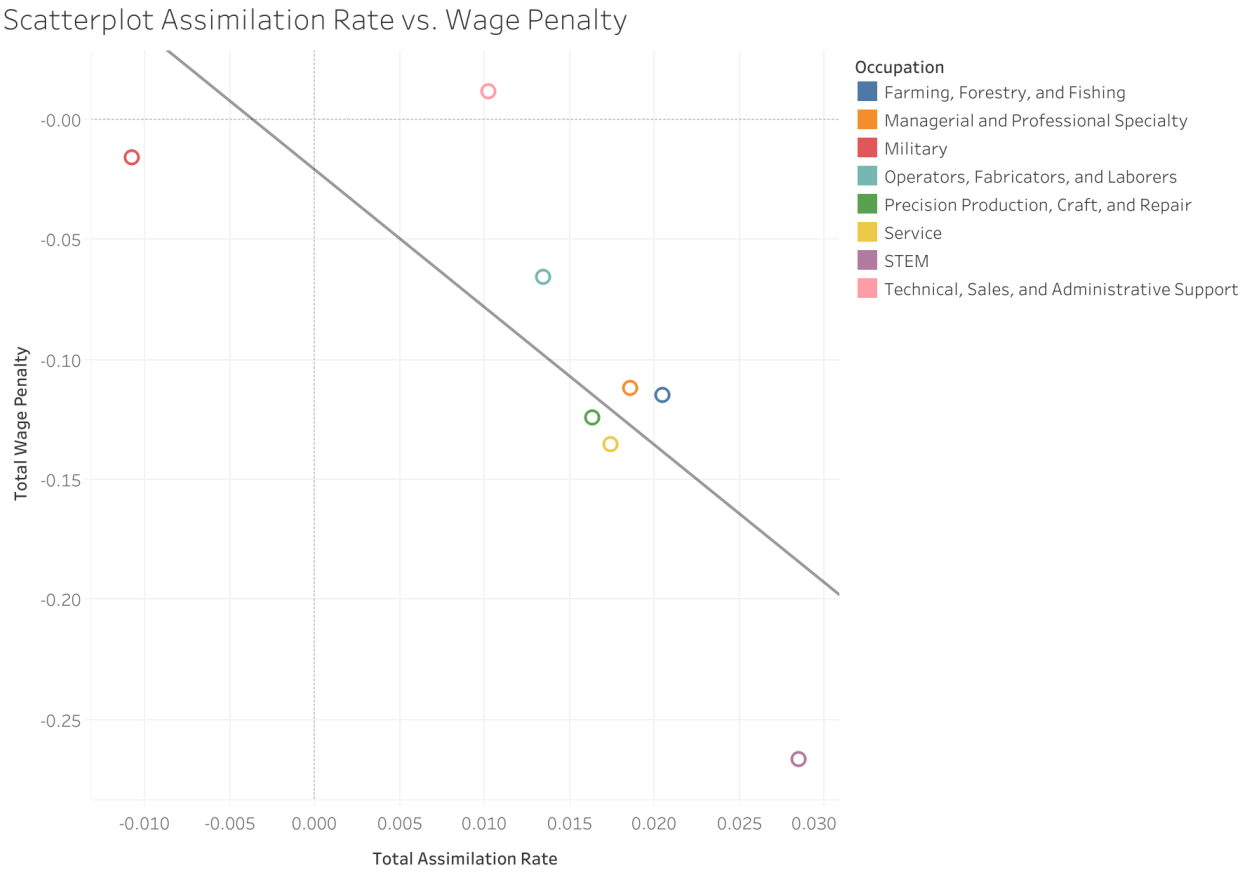
Occupation	Coef.	Std.Err.	t-value	[95% Conf.	Interval]	Sig
1 Managerial and Professional Specialty	-.0092	.0120	-0.77	-.0328	.0143	-
2 Technical, Sales, and Administrative Support	.0074	.0053	1.40	-.0030	.0179	-
3 Service	.0113	.0030	3.80	.0055	.0171	***
4 Farming, Forestry, and Fishing	.0273	.0047	5.80	.0181	.0365	***
5 Precision Production, Craft, and Repair	.0130	.0042	3.10	.0048	.0213	***
6 Operators, Fabricators, and Laborers	.0134	.0030	4.45	.0075	.01930	***
7 Military	.1489	2.7720	0.27	-.9399	1.2377	-
10 STEM	.0381	.0301	1.27	-.0210	.0973	-

***p<.01, **p<.05, *p<.1 ***2.58<t, **1.96<t, *1.65<t

reg ln_hourly_wage immigrant interaction1 interaction2 years_of_education english_proficiency white male i.year i.rimmig if (occ1990_group == 1-10 & years_of_education <= 10)

When it comes to the relationship between wage penalties and assimilation rates, the scatterplot helps to visualize patterns between those two variables for foreign-born workers. The black trend line indicates a relationship between total wage penalty and total assimilation rates. When wage penalty increases and becomes more negative such as STEM occupations, the total assimilation rate tends to increase. On the contrary the total wage penalty is low for military and technical, sales, and administrative support occupations, which results in a relatively lower total assimilation rate.

Table 11: Scatterplot for foreign-born workers' wage penalty vs. assimilation rates of different occupations



Discussion

The economic analysis of wage disparities and assimilation rates based on the occupational field requires the control for external factors. In the regression the two aspects i.rimmig and i.year account for unobserved heterogeneity among different foreign-born worker cohorts as well as macroeconomic conditions changing throughout the years. By isolating those fixed effects from the original research question to observe the occupational impact on economic outcomes for immigrants in the U.S. labor market, the results of the true impact captured are more reliable.

The year fixed effects i.year controls for macroeconomic conditions and overall changes of the labor market. Those differences in wages could be based on economic shocks, government policies, or the business cycle impacting the demand for foreign-born labor. Immigrants arriving in economic conditions such as recessions automatically face higher unemployment and lower wages in comparison to times of economic expansion where labor demand and therefore initial wages tend to be higher. Structural shifts could also increase the demand for labor in specific industries. Expanding and more profitable industries such as the technology sector could increase the demand for white-collar industries such as STEM and therefore influence the wages. The changes in minimum wages or tax changes could disproportionately benefit specific worker groups distorting the occupational research question results. Therefore effects of economic cycles and structural shifts in the economic condition of the labor market are removed for a more reliable interpretation of the occupational impact on wage outcomes.

Differences in the overall economic and structural system across immigrant arrival cohorts could distort the regression results when comparing immigrants with different kinds of characteristics and skills as research in the Canadian labor market shows. Baker and Benjamin (1994) found that entry earnings of Canadian immigrants of the IM7680 cohorts are 11% to 18% lower than the ones of the IM6670 cohorts and the IM8186 cohort entry earnings are between 19% and 20% lower than the IM7680 cohorts earnings indicating the change in the economic status of different cohorts. Inwood et al. (2018) also found over time cohort trends with immigrants arriving between 1901 and 1905 having an initial wage gap of only -14.4% compared to -18.1% for 1906-1910 cohorts. Friedberg (1992) also estimates different cohort earnings penalties with 1965-69 posting -7.59% and 1975-79 -27.85% wage disadvantages. Borjas (1995) also quantified the relative entry wage of migrant cohorts and found a decline by 9% in the 1970s and an additional 6% decrease in the 1980s. The latest cohort of immigrants in 1960 had a wage disadvantage of 13.9% and in 1990 of 38.0% (Borjas, 1999). These paper results are an exemplification for why the cohort fixed effect i.rimmig helps to eliminate biases based on the change of economic conditions, political immigration policies, or the structure of the labor market leading to differences in the cohort characteristics. Based on research the changes of observable socioeconomic cohort characteristics then result in immigrants earning different amounts of money depending on when they entered. Labor market conditions incentivize workers of different skill levels into different professions shifting the wage outcomes based on self-selection trends rather than occupational reasons. Also more lenient credential recognition policies and stricter visa requirements impact the skill composition of the cohorts and might wrongly attribute the wage differences to occupational reasons. Borjas (1987) examines the self-selection and earnings of immigrants and notes that a 10% GNP increase results in an immigrant earnings increase by 1.2%. That earnings increase would induce a self-selection for greater skills of the immigrant flow on an overall labor market level but could be replicated on a occupational level. These differences in labor market conditions of the various cohorts could influence the wage outcomes and economic growth options for international-born workers in the U.S. labor market. Without the cohort fixed effects the initial wage disadvantage and assimilation

rates could be impacted by the existing external factors changing the composition and characteristics of the cohorts instead of the actual differences among occupations.

Shortcomings & Future Research

This research in the field of immigration economics examines the impact of occupational fields on assimilation rates and portability of human capital. Despite the valuable insight into the impact of occupational fields on wage outcomes, there are shortcomings when it comes to the visa and work permit constraints for each of the profession groups, professional networking impacts, and deeper occupational specificity. Those shortcomings present future research opportunities to expand on in the literature and the analysis on profession classification. A more precise regression analysis could help in the development of policy implications for better economic integration and economic mobility of foreign-born workers in the U.S. labor market.

Visa and Work Authorization Effects

The type of work authorizations and visa status have an impact on wage negotiations and economic mobility. The different visa types such as H1B, Temporary Protected Status, or undocumented status have less negotiation options than foreign-born individuals with permanent residency or citizenship papers. Especially laborers with work authorizations sponsored by their employer tend to experience greater initial wage penalties. Changes in wage differentials do not only depend on occupations but also rely on legal and institutional barriers. Depending on the visa status the employers also face additional administrative and financial burdens. Sponsoring visas require legal fee payments, compliance requirements, and credential evaluations disincentivizing full credential recognition or leading to employers offering lower wages to offset the additional costs. Even though the bias is eliminated by the i.year to account for changes of these policies, future research could incorporate the visa status as the key explanatory variable of the wage assimilation and occupational mobility model to deeper understand the impact. More understanding in the topics of credential recognition and employer incentives could supplement the structural understanding of wage inequality with the goal to implement policy reforms.

Social and Professional Networks

The analysis of the direct impact of social and professional networks for future wage outcomes would be another topic to expand on this research paper. Industry connections might impact initial job access with initial wages and promotion opportunities abounding for wage growth. Native-born workers often take advantage of industry connections, industry exposure through relatives, alumni networks, and informal hiring practices. By incorporating surveys to understand the networking strength and employer referral data of each worker, the networking barriers in the occupational wage assimilation process could be quantified.

At the same time social and professional structures within the immigrant communities could serve as an opportunity to explore the networking strategies. Ethnic or religious communities that are being formed in the host country could impact the job placement and even improve the sharing of labor market specific skills leading to greater job access and wage growth. By incorporating data that measures the ethnic clustering in specific industries or specific geographic regions, the role of immigrant communities could be included into the analysis. These measurement could help researchers to understand how the overall and community-specific networks affect the assimilation rate across occupations.

Occupational Classification Limitations

The major limitation of this research paper is the broad occupational classification of all the IPUMS data. STEM vs. non-STEM and even service professions vs. managerial and professional specialty occupations is an opportunity to compare certain group characteristics, but generally oversimplifies the variations that are existing within each of the group. When grouping various engineers, mathematical and computer scientists, natural scientists, and metal and plastic processing machine operators into STEM professions, these existing categories might overgeneralize the results. Within each of the group there could be major income distortions and assimilation rate differences that are not captured due to overgeneralization. More detailed occupational breakdowns based on certain characteristics could explore subcategories to deeper understand the assimilation rates and portability of human capital across specific professions. It would be interesting to look at the impact of economic shifts such as the integration of Artificial Intelligence into economic sectors and how these trends affect the workers wages. STEM professionals, especially the technology professions portion, might face an increased labor demand which could positively impact the wage assimilation for high-skilled foreign workers in that profession. Future research could explore specific subcategories for wage growth in emerging tech fields and job displacement risks based on decreasing wages.

Conclusion

The assimilation rates and portability of human capital of foreign-born workers vary across different occupations in the U.S. labor market. Occupational fields have an impact on wage disparities and annual wage growth rates due to systemic barriers, credential recognition options, and economic mobility. These findings of structural factors contributing to labor market inequalities of foreign-born individuals might justify certain policy implications to improve wage equality, skill recognition, and economic mobility.

A central implication of the analysis is that occupation does play a defining role in the assimilation rates and portability of human capital. Workers in STEM professions overall face the highest wage disparities with this group experiencing the highest disadvantage (-26.66%). Therefore these occupations show the highest annual wage growth (+2.85%) per year. This observed pattern in occupational classification may be attributed to the

work authorization and visa status laws that require employer-sponsored working permits. The non-STEM employees by contrast face smaller initial income disparities (-5.11%) but also recover more slowly at a +1.65% annual assimilation rate in comparison to their native counterparts. These wage results can be explained by the limitations in economic mobility in fields that are less credential-reliant. Managerial and professional specialty occupations specifically face a higher wage disadvantage (-11.19%) due to networking barriers.

To address wage disparities and restrictions in economic advancements, policy reforms such as credential recognition improvement, employer mentorship programs, and networking options are needed. By introducing permanent residency and greater visa flexibility options, high-skilled workers would be encouraged to pursue a long-term career in the United States due to less wage suppression.

Future research could explore the visa status impact on wage outcomes, the importance of professional networks, or the occupational granularity for more precise and advanced insights into the labor economic topic. Ultimately, wage outcomes should be even more reliant on skills rather than the immigrant status, so that the U.S. labor force can contribute to innovation and economic growth in a more professional way while building an economically more inclusive society.

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