

Education Supports Racial and Ethnic Equality in STEM

Executive Summary

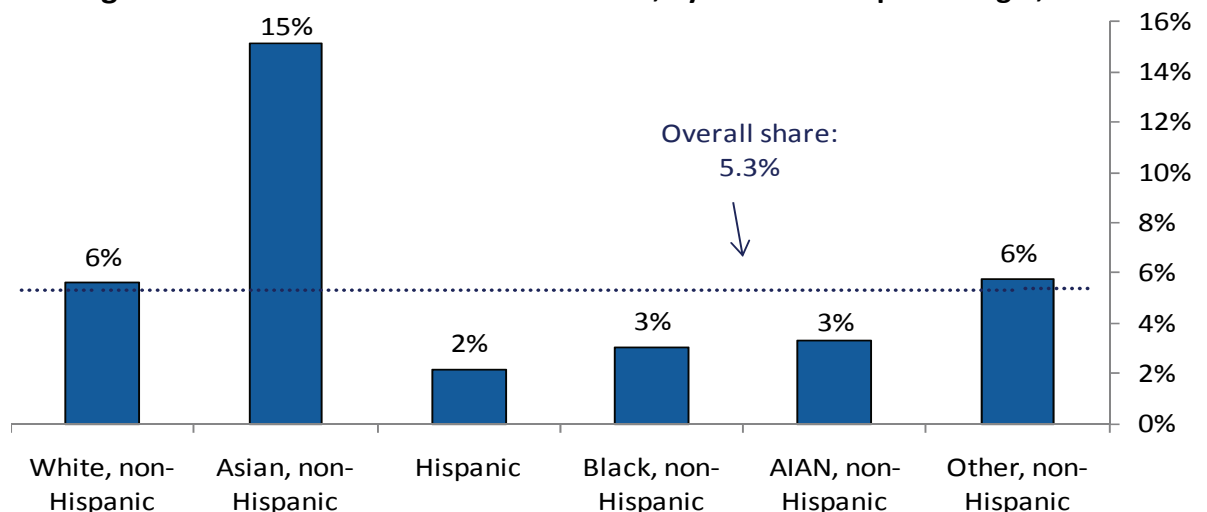
Science, technology, engineering, and math (STEM) workers are essential to American innovation and competitiveness in an increasingly dynamic and global marketplace. In this third report, we examine demographic disparities in STEM education and find that educational attainment may affect equality of opportunity in these critical, high-quality jobs of the future.

This report follows an analysis of labor market outcomes and gender disparities among STEM workers. We find that regardless of race and Hispanic origin, higher college graduation rates are associated with higher shares of workers with STEM jobs. But non-Hispanic Whites and Asians are much more likely than other minority groups to have a bachelor's degree. By increasing the numbers of STEM workers among currently underrepresented groups through education we can help ensure America's future as a global leader in technology and innovation.

Other key findings of this report include:

- Non-Hispanic Whites comprise the largest group of STEM workers, accounting for about seven out of ten STEM workers, which aligns closely with their share of the overall workforce.
- Non-Hispanic Asians are most likely (42 percent) to graduate college with a STEM degree, while the propensities of other groups are all fairly similar (17-22 percent).
- Half of all non-Hispanic Asian workers with STEM degrees have STEM jobs, compared to 30 percent of Hispanics and non-Hispanic Black and American Indian and Alaska Native workers.
- One in five STEM workers is foreign-born, of which 63 percent come from Asia.
- STEM workers in all demographic groups, including the foreign-born, earn more than their non-STEM counterparts. Hispanics and non-Hispanic Blacks receive a significantly larger STEM premium than do non-Hispanic Whites.

Figure 1. Share of Workers with STEM Jobs, by Race and Hispanic Origin, 2009



Source: ESA calculations from American Community Survey public-use microdata.

Note: Estimates are for employed persons age 16 and over. See box on next page for definitions of race and Hispanic origin used in this report.

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The Commerce Department's Economics and Statistics Administration has released two other reports on STEM workers. The first, *STEM: Good Jobs Now and for the Future*, was released in July 2011. The second, *Women in STEM: A Gender Gap to Innovation*, was released in August 2011. Both reports can be found at <http://www.esa.doc.gov/reports>.

This report uses six non-overlapping groups to study STEM workers by race and Hispanic origin: White alone, not Hispanic; Black alone, not Hispanic; Asian alone, not Hispanic; American Indian or Alaska Native alone, not Hispanic (AIAN); Other, not Hispanic; and Hispanic of any race. The "Other" race category includes Native Hawaiian or Other Pacific Islanders; other races not listed in this report; and people who reported two or more races. In some figures, AIAN and Other are combined in a category called "All other" when the number of AIAN observations is too small.

What is STEM?

The acronym STEM is fairly specific in nature—referring to science, technology, engineering and math—however, there is no standard definition for what constitutes a STEM job. Science, technology, engineering and math positions consistently make the lists of STEM occupations, but there is less agreement about whether to include other positions -- such as educators, managers, technicians, health-care professionals and/or social scientists. In this report, the Commerce Department's Economics and Statistics Administration (ESA) defines STEM jobs to include professional and technical support occupations in the fields of computer science and mathematics, engineering, and life and physical sciences. Three management occupations are also included because of their clear ties to STEM.¹ Education jobs are not included because of the nature of the available data.² In addition, social scientists are not included.³

Our STEM list contains 50 specific occupation codes (see Appendix Table 1), and in 2009, there were 7.4 million workers in these jobs, representing 5.3 per-

cent of the workforce. To put these jobs into context, we divide STEM occupations into four categories: computer and math, engineering, physical and life sciences, and STEM managerial occupations.⁴ Across all levels of educational attainment, the largest group of STEM jobs is within the computer and math fields, which account for close to half (47 percent) of all STEM employment. Second are engineering and surveying occupations, representing approximately one-third of all STEM employment, while 12 percent are in the physical and life sciences, and 8 percent in STEM management jobs.⁵

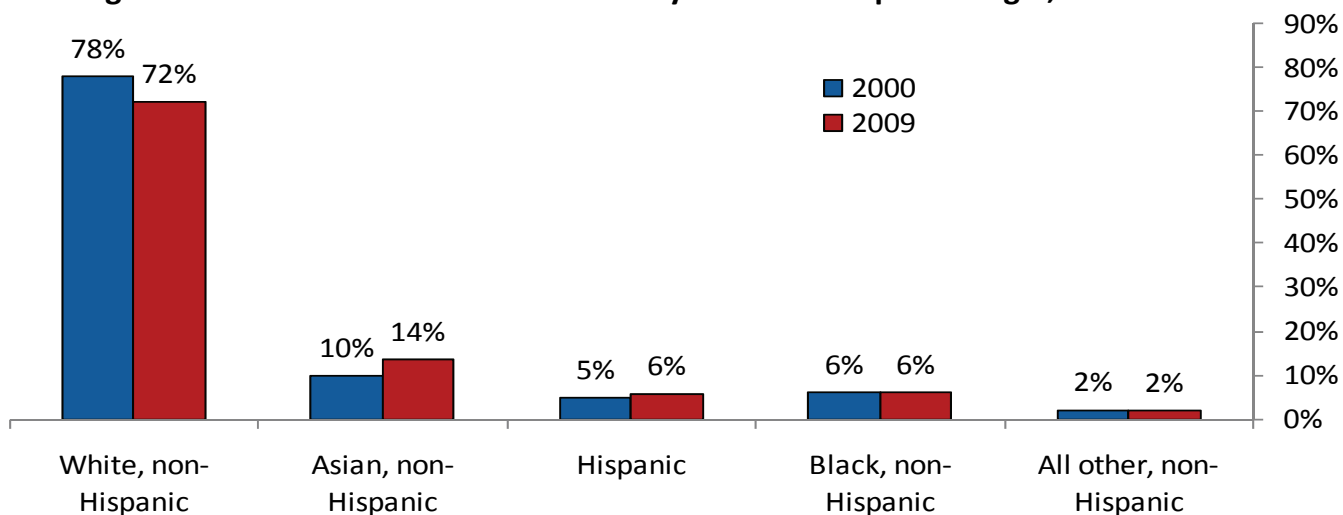
Parallel to our list of STEM occupations, we also identify a set of STEM undergraduate degree fields that span computer science and mathematics, engineering, and life and physical sciences (see Appendix Table 2). We define STEM degree holders as persons whose primary or secondary undergraduate major was in a STEM field. Consistent with the occupations selected for this report, we exclude business, healthcare, and social science majors.⁶

STEM Employment by Race and Hispanic Origin

According to the U.S. Census Bureau's 2009 American Community Survey (ACS), almost three out of four STEM jobs (72 percent) are held by non-Hispanic Whites (See Figure 2), which is close to their overall representation in the U.S. workforce (68 percent). In contrast, non-Hispanic Asians make up 14 percent of all STEM workers but only five percent of the U.S. workforce — almost three times as many non-Hispanic Asians hold a STEM job as would be expected based on their overall representation in the workforce. However, only half as many non-Hispanic Black or Hispanic workers have STEM jobs relative to their overall representation in the U.S. workforce. (Non-Hispanic Blacks and Hispanics each account for six percent of all STEM workers, but 11 percent and 14 percent, respectively, of overall employment.)

Over the past decade, the share of non-Hispanic Whites in the STEM workforce has fallen about six

Figure 2. Distribution of STEM Workers by Race and Hispanic Origin, 2000 and 2009



Source: ESA calculations from 2000 Census and American Community Survey public-use microdata.

Note: Estimates are for employed persons age 16 and over. The data for each year may not sum to 100% due to rounding.

percentage points (from 78 percent to 72 percent as shown in Figure 2), as did their share of the overall workforce. Hispanics have accounted for most of the increase in the overall U.S. workforce since 2000 (their share rose from 10 percent in 2000 to 14 percent in 2009), yet the Hispanic share of the STEM workforce increased by only one percentage point (from five percent to six percent). Conversely, the non-Hispanic Asian share of STEM workers increased by four percentage points (from 10 percent to 14 percent), whereas their share of the overall workforce rose by only one percentage point (from 10 percent to 11 percent). Non-Hispanic Blacks did not see any change in their share of STEM workers, while their share of the overall workforce increased by one percentage point (from 10 percent to 11 percent).

STEM Employment and Education by Race and Hispanic Origin

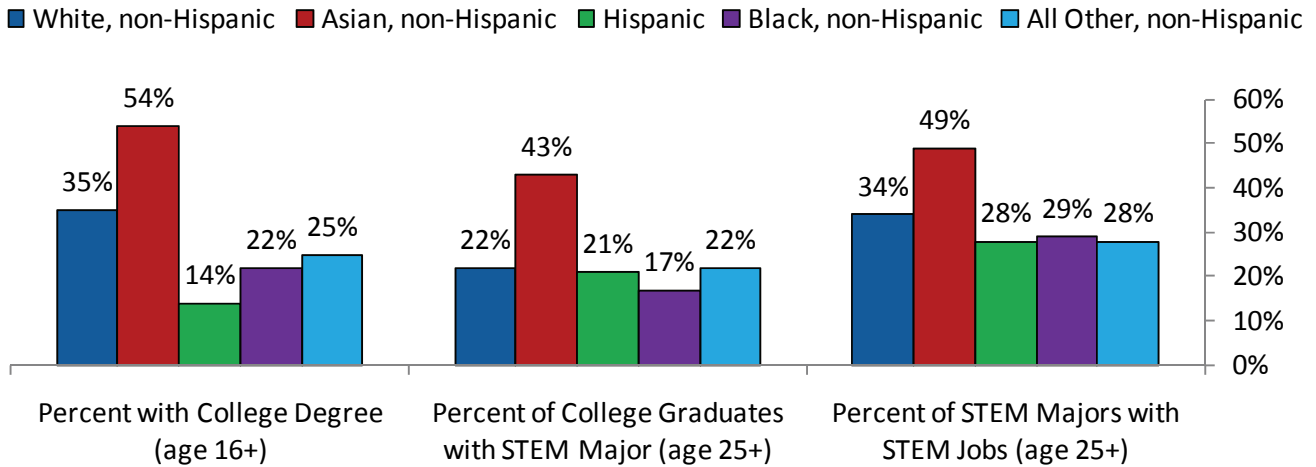
The propensity for workers to have STEM jobs is driven by three key decisions made along their career paths. First, Hispanics, non-Hispanic Blacks and American Indians or Alaska Natives (AIANs) are much less likely to obtain a bachelor’s or higher degree in comparison with non-Hispanic Whites and Asians. Second, Hispanics and non-Hispanic

Whites and Blacks who obtain college degrees are less likely than non-Hispanic Asians to major in STEM fields (although as we found in our earlier STEM reports, many college-educated STEM workers do not have STEM degrees). And third, STEM majors among Hispanics and non-Hispanic Blacks, Whites, and members of all other groups are less likely to obtain STEM jobs than non-Hispanic Asians.

The propensity to obtain a college degree (or higher) varies considerably by race and Hispanic origin. (See leftmost group of bars in Figure 3.) Only about one-fifth of non-Hispanic Blacks (22 percent) and less than one-sixth of Hispanics (14 percent) have bachelor’s degrees. More than half (54 percent) of Asians and more than one-third (35 percent) of non-Hispanic Whites, however, have at least a bachelor’s degree. (Only 17 percent of AIANs have bachelor’s degrees.)

The likelihood of having a STEM job is significantly higher among college-educated workers than those without a college degree, regardless of race and Hispanic origin. (See Figure 4.) One out of four non-Hispanic Asians with a bachelor’s degree or higher has a STEM job, but only 3 percent of those without such a degree have a STEM job. Ten percent of non-Hispanic Whites with a bachelor’s degree or higher have STEM jobs – only two percentage points

Figure 3: Factors Affecting Likelihood of Having STEM Job by Race and Hispanic Origin, 2009



Source: ESA calculations from American Community Survey public-use microdata.
 Note: Estimates are for employed persons.

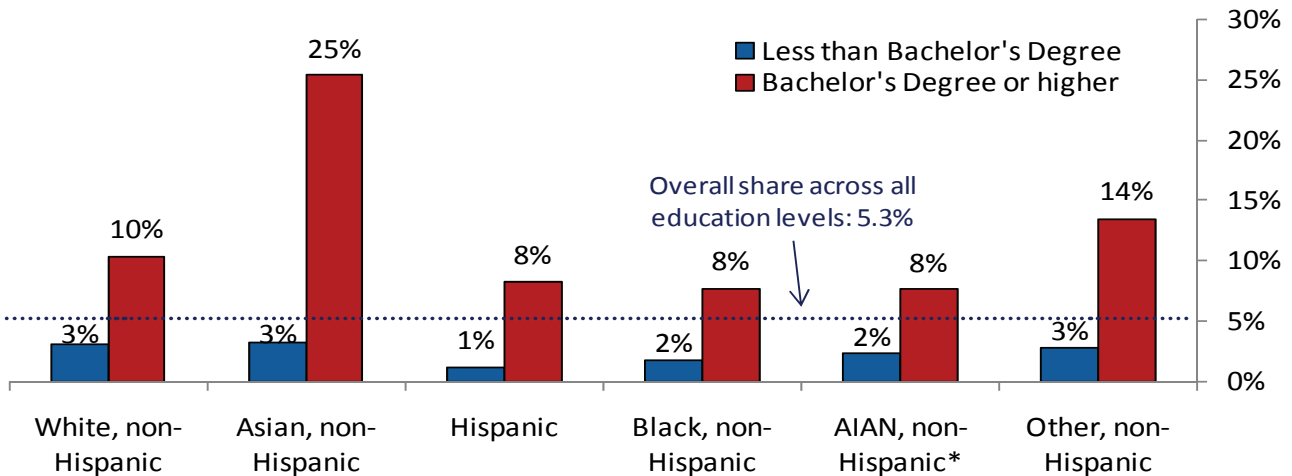
higher than is the case for Hispanics and non-Hispanic Blacks and AIANs.

The propensity for college-educated workers to pick a STEM major varies across race and Hispanic origin, though. (See middle group of bars in Figure 3.) Out of the 41.5 million workers with at least a bachelor’s degree, 9.3 million (or 22 percent) have a STEM degree. Among workers with a bachelor’s degree or higher, Hispanics and non-Hispanic Whites and members of all other groups are similarly represented in STEM majors (ranging between 21 to 22 percent), while non-Hispanic Blacks have a lower likelihood (17 percent) of having a STEM de-

gree. Non-Hispanic Asians have the highest likelihood of having a STEM degree (43 percent).

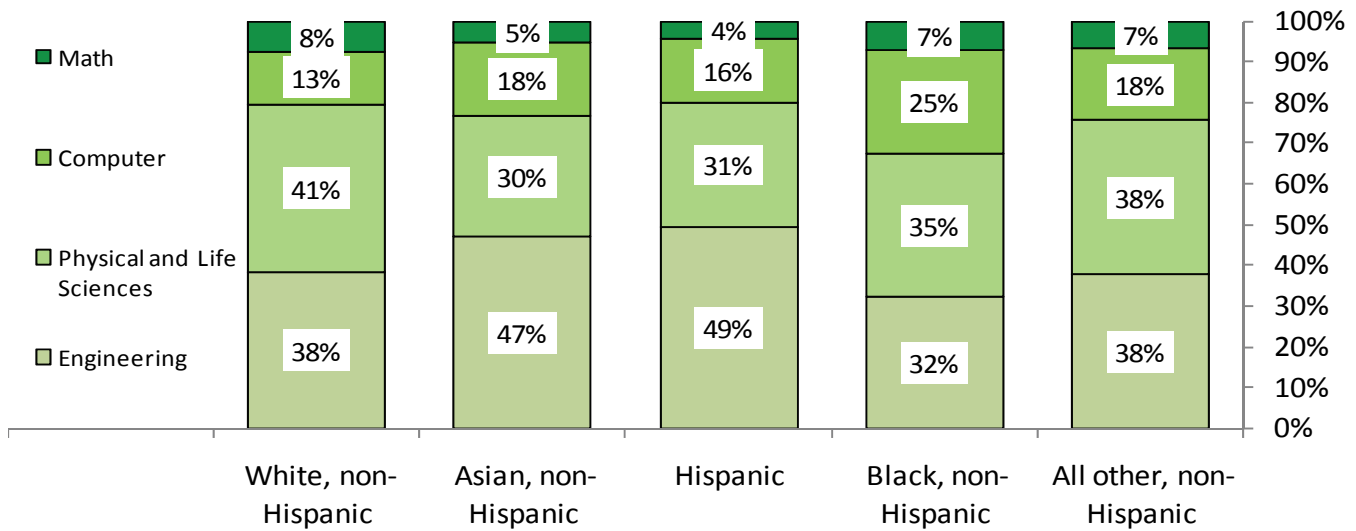
Engineering, and physical and life sciences are the most popular fields of study for college-educated workers with a STEM degree, together accounting for 67-to-80 percent of that workforce. (See Figure 5.) Among STEM degree categories, nearly half of all college-educated non-Hispanic Asians and Hispanics with a STEM degree majored in engineering, compared to 38 percent for non-Hispanic Whites and 32 percent for non-Hispanic Blacks. The share of STEM majors with a degree in physical or life sciences ranged between 30 and 41 percent of STEM

Figure 4. Share of Workers with STEM Jobs by Race, Hispanic Origin, and Education, 2009



Source: ESA calculations from American Community Survey public-use microdata.
 Note: Estimates are for employed persons age 16 and over. *AIAN refers to persons who identify as American Indian or Alaskan Native alone, not Hispanic.

Figure 5: Degree Fields of Employed STEM Majors, by Race and Hispanic Origin, 2009



Source: ESA calculations from American Community Survey public-use microdata.

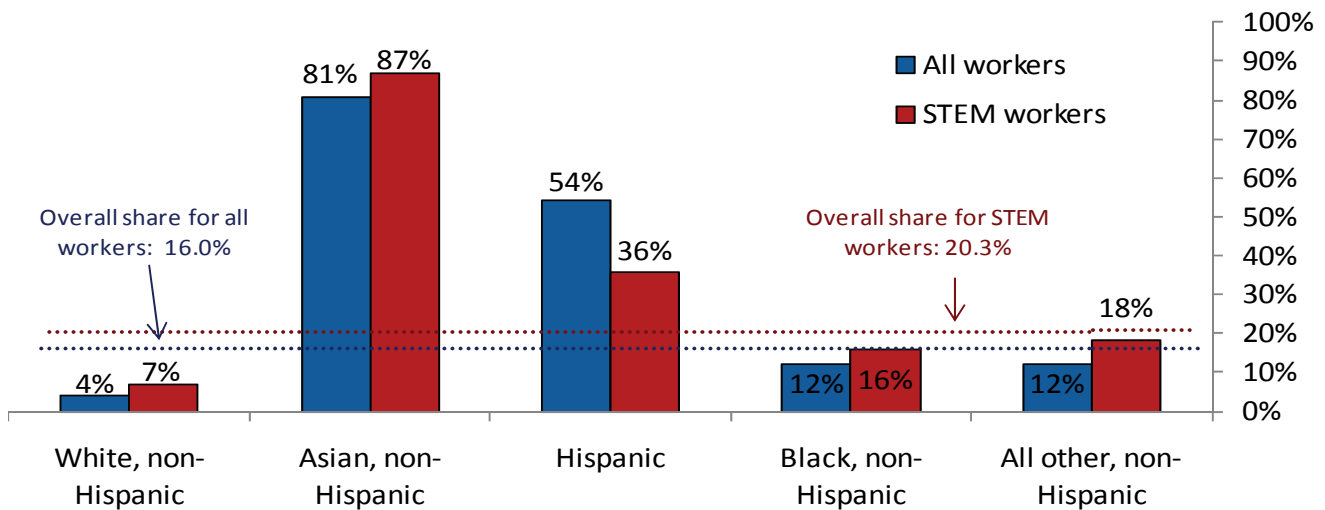
majors across race and Hispanic origin. Also noteworthy is that non-Hispanic Blacks had a higher propensity to major in computer science than did the other groups.

Looking at those with STEM degrees, fewer than three out of ten Hispanics, non-Hispanic Blacks and members of all other groups have STEM jobs (28-29 percent) compared with one-third (34 percent) of non-Hispanic Whites and nearly half (49 percent) of non-Hispanic Asians (see rightmost group of bars in Figure 3). However, about the same shares of workers with STEM degrees in each

demographic group had jobs in financial, health-care, and education occupations. Whites with STEM degrees are somewhat more likely to be in non-STEM management positions relative to other groups.

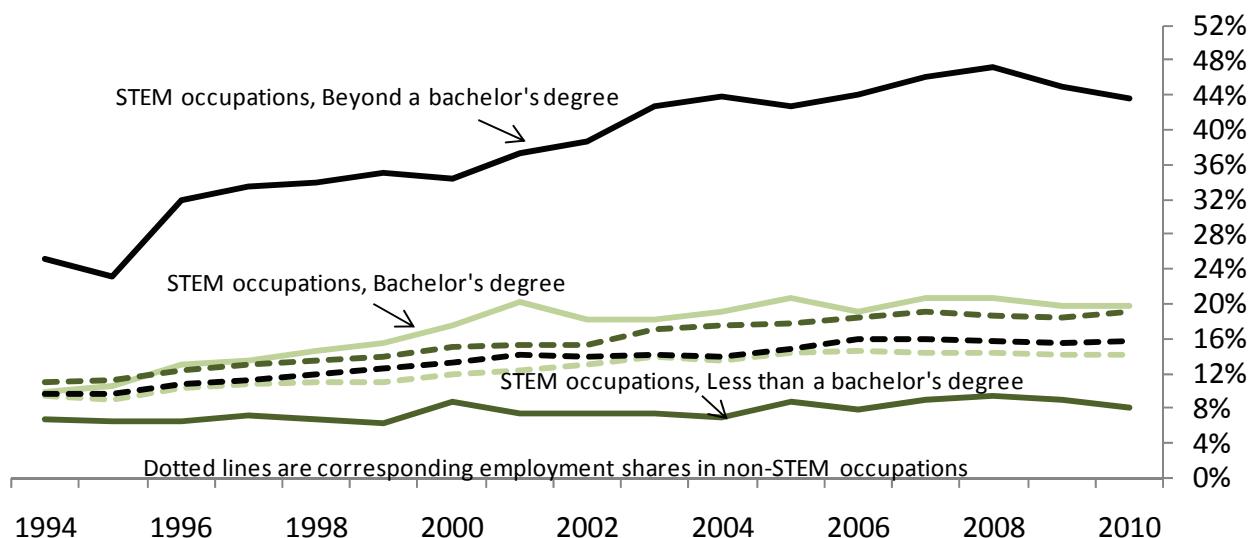
Data indicate that one of the most important factors explaining the relatively low propensity of non-Hispanic Blacks and Hispanics to have STEM jobs is their relatively low college graduation rates.

Figure 6. Foreign-born Share of All and STEM Workers, by Race and Hispanic Origin, 2009



Source: ESA calculations from American Community Survey public-use microdata.

Figure 7. Foreign-born Share of STEM Workers, by Educational Attainment, 1994-2010



Source: ESA calculations using Current Population Survey public-use microdata files for 1994 through 2010.
 Note: Estimates are for private full-time wage and salary workers age 25 and over.

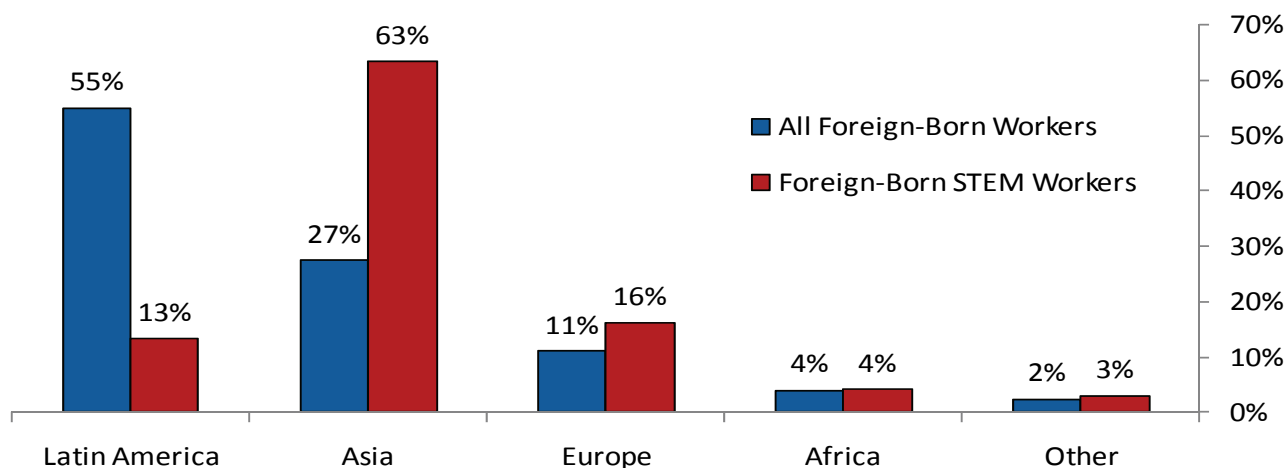
Foreign-born STEM workers

According to the 2009 ACS, there are about 1.5 million STEM workers in the U.S. who are foreign born – about 20 percent of the STEM workforce, which is slightly higher than the 16 percent share of foreign-born among all U.S. workers. (See Figure 6.) About half of foreign-born STEM workers are naturalized citizens (53 percent) and half noncitizens (47 percent). The share of foreign-born, however, varies significantly by race and Hispanic origin. Non-Hispanic Whites, the largest group of workers – representing almost three-fourths of all STEM

workers as shown in Figure 2 – are mostly native born (93 percent). Non-Hispanic Asian STEM workers, in contrast, are almost all foreign-born. Nearly nine out of ten non-Hispanic Asian STEM workers (87 percent) were born outside of the United States. This trend also applies to all non-Hispanic Asian workers, the vast majority of whom (81 percent) are foreign-born. One out of six non-Hispanic Black STEM workers is foreign-born.

Unlike the non-Hispanic groups, foreign-born workers represent a smaller share of Hispanic STEM workers (36 percent) than of all Hispanic workers

Figure 8. All Foreign-born Workers and STEM Foreign-Born Workers, by Birthplace, 2009



Source: ESA calculations from American Community Survey public-use microdata.
 Note: Estimates are for employed persons age 16 and over.

(54 percent). This largely reflects the fact that while Mexico accounts for more than 60 percent of foreign-born Hispanic workers, less than one percent of the foreign-born from Mexico work in STEM occupations. This low representation in STEM employment is also evident among foreign-born Hispanic workers from most of Central America as well as the Dominican Republic. However, Hispanic workers from other countries tend to be more broadly represented in STEM occupations. In particular, Hispanics born in some South American countries such as Venezuela (8.6 percent) and Chile (8.0 percent), and those from Spain (8.3 percent) are considerably more likely to work in STEM jobs than all Hispanics (2.2 percent) or foreign-born Hispanics (1.4 percent).

The foreign-born share of STEM workers with graduate degrees (44 percent) is about double the foreign-born share of STEM workers for all education levels. Moreover, the foreign-born share of STEM workers with graduate degrees has nearly doubled over the past 17 years, as has the foreign-born share of STEM workers with just a bachelor's degree (see Figure 7), which may in part be due to increasing global competition in STEM. Among STEM workers who do not have college degrees (only 8 percent), foreign-born workers are under-represented. Some of the increase in the foreign-born share of highly educated STEM workers may

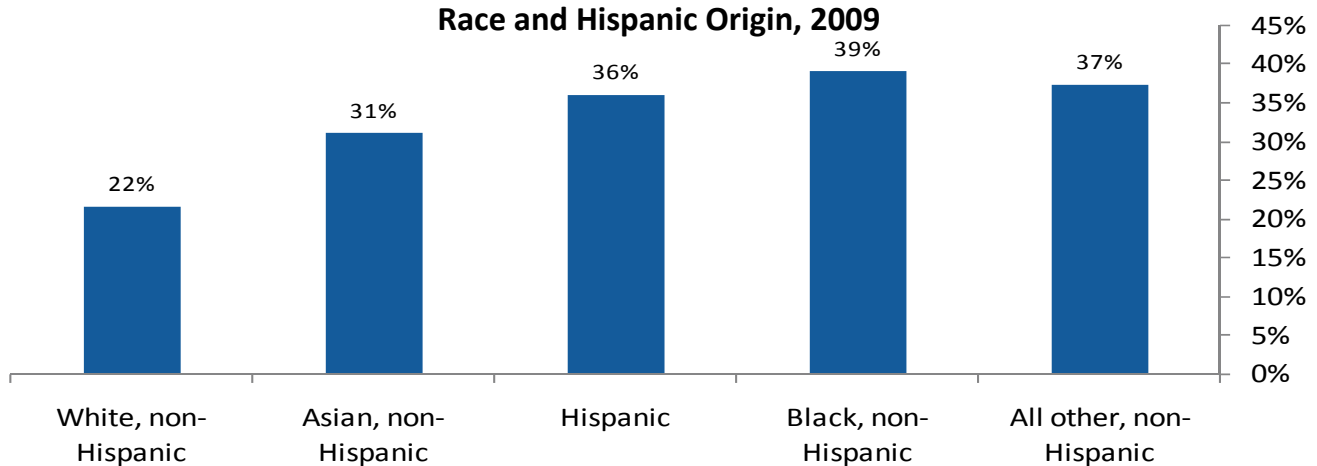
be due to a combination of the relatively high quality of U.S. colleges and universities – one of America's competitive advantages - and rising incomes in other countries that enable foreign students to pay for a high-quality U.S. STEM education. Quantifying these effects, however, is beyond the scope of this report.

More than half of all foreign-born workers in the United States were born in Latin America (55 percent), while only 27 percent of all foreign-born workers are from Asia. (See Figure 8.) However, these numbers are nearly reversed among foreign-born STEM workers, almost two-thirds (63 percent) of whom come from Asia. One in four foreign-born STEM workers come from China, while 11 percent come from India; no other country accounts for more than 5 percent of foreign-born STEM workers.

STEM Worker Earnings by Race and Hispanic Origin

Non-Hispanic White STEM workers on average earn 22 percent more than their non-STEM counterparts, based on regression analysis that controls for other characteristics that may be related to earnings.⁷ The STEM earnings premium is larger for other demographic groups - 31 percent for non-Hispanic Asians, 39 percent for non-Hispanic Blacks,

Figure 9. Regression-adjusted Wage Premium from Having STEM Job, by Race and Hispanic Origin, 2009



Source: ESA calculations from American Community Survey public-use microdata.
 Note: Estimates are for full-time year-round private wage and salary workers age 25 and over.

and 36 percent for Hispanics. (See Figure 9.) This indicates that non-Hispanic White workers, representing the majority (72 percent) of STEM workers in the U.S., get a significantly smaller boost from going into a STEM occupation than their otherwise similar Hispanic or non-Hispanic Asian and Black counterparts.

The STEM earnings premium is 24 percent for native-born STEM workers and 35 percent for foreign-born STEM workers. The boost in earnings associated with entering a STEM profession is about one-third larger among foreign-born non-citizens (41 percent) than foreign-born naturalized citizens (30 percent).

A portion of the wage premium from having a STEM job may be explained by occupational choices that vary across or within demographic groups that are not captured by the aggregate data on major industries. Some of the wage premium may also be due to other unidentified attributes that are simply not quantifiable. As a result, the regression-adjusted estimates for STEM wage premiums may vary depending on the exact specification of the regression model, that is, how much information we have on worker characteristics that likely impact earnings.

Our earlier STEM report, *“STEM: Good Jobs Now and for the Future,”* documented that in addition to earning a wage premium, STEM workers are also generally less likely to be unemployed than non-STEM workers, although the difference in the unemployment rate is much less among college-educated STEM and non-STEM workers. We find a similar pattern by race and Hispanic origin.

Conclusion

This report finds that non-Hispanic Blacks and Hispanics have been consistently underrepresented in STEM jobs over the past decade. Non-Hispanic Black and Hispanic workers are half as likely as all workers to have STEM jobs. In contrast, non-Hispanic Asian workers are nearly three times as likely as all workers to have STEM jobs. The varia-

tions observed across demographic groups may be attributable to a variety of factors, including differences among college graduation rates, propensities to choose a STEM field of study and preferences and other unobservable factors.

Foreign-born persons are only slightly overrepresented in STEM jobs relative to all jobs in the economy; foreign-born workers represent 20 percent of the STEM workforce, as compared to 16 percent of the total U.S. workforce. However, they are greatly overrepresented in STEM jobs among persons with graduate degrees. This is most likely due to America’s exemplary graduate schools that attract the best students from around the world, many of whom remain in the United States’ workforce, enhancing America’s competitiveness.

The aggregate statistics for these demographic groups mask some interesting variations seen within the groups. For example, Hispanics from different parts of North and South America exhibit quite different propensities to enter a STEM profession.

Echoing the findings of our earlier STEM reports, we find that STEM workers earn significantly more than comparable workers in non-STEM occupations, regardless of race, Hispanic origin, or nativity.

A common thread throughout this report and also touched upon in our earlier reports, is the importance of education as a gateway to high-quality STEM jobs. Enabling and encouraging equitable access to premium education is critical to ensuring that America maintains a wide and diverse source of STEM professionals that help to advance U.S. innovation and global competitiveness.

Appendix Table 1. Detailed STEM occupations and Standard Occupational Classification (SOC)

Occupation	SOC Code	Occupation	SOC code
<i>Computer and math occupations</i>			
Computer scientists and systems analysts	15-10XX	Network systems and data communications analysts	15-1081
Computer programmers	15-1021	Mathematicians	15-2021
Computer software engineers	15-1030	Operations research analysts	15-2031
Computer support specialists	15-1041	Statisticians	15-2041
Database administrators	15-1061	Miscellaneous mathematical science occupations	15-2090
Network and computer systems administrators	15-1071		
<i>Engineering and surveying occupations</i>			
Surveyors, cartographers, and photogrammetrists	17-1020	Materials engineers	17-2131
Aerospace engineers	17-2011	Mechanical engineers	17-2141
		Mining and geological engineers, including mining safety engineers	17-2151
Agricultural engineers	17-2021		
Biomedical engineers	17-2031	Nuclear engineers	17-2161
Chemical engineers	17-2041	Petroleum engineers	17-2171
Civil engineers	17-2051	Engineers, all other	17-2199
Computer hardware engineers	17-2061	Drafters	17-3010
Electrical and electronic engineers	17-2070	Engineering technicians, except drafters	17-3020
Environmental engineers	17-2081	Surveying and mapping technicians	17-3031
Industrial engineers, including health and safety	17-2110	Sales engineers	41-9031
Marine engineers and naval architects	17-2121		
<i>Physical and life sciences occupations</i>			
Agricultural and food scientists	19-1010	Physical scientists, all other	19-2099
Biological scientists	19-1020	Agricultural and food science technicians	19-4011
Conservation scientists and foresters	19-1030	Biological technicians	19-4021
Medical scientists	19-1040	Chemical technicians	19-4031
Astronomers and physicists	19-2010	Geological and petroleum technicians	19-4041
Atmospheric and space scientists	19-2021	Nuclear technicians	19-4051
		Other life, physical, and social science technicians	19-40XX
Chemists and materials scientists	19-2030		
Environmental scientists and geoscientists	19-2040		
<i>STEM managerial occupations</i>			
Computer and information systems managers	11-3021	Natural sciences managers	11-9121
Engineering managers	11-9041		

Appendix Table 2. Detailed STEM undergraduate majors

Computer majors

- Computer and information systems
- Computer programming and data processing
- Computer science
- Information sciences
- Computer administration management and security
- Computer networking and telecommunications

Math majors

- Mathematics
- Applied mathematics
- Statistics and decision science
- Mathematics and computer science

Engineering majors

- General engineering
- Aerospace engineering
- Biological engineering
- Architectural engineering
- Biomedical engineering
- Chemical engineering
- Civil engineering
- Computer engineering
- Electrical engineering
- Engineering mechanics physics and science
- Environmental engineering
- Geological and geophysical engineering
- Industrial and manufacturing engineering
- Materials engineering and materials science
- Mechanical engineering
- Metallurgical engineering
- Mining and mineral engineering
- Naval architecture and marine engineering
- Nuclear engineering
- Petroleum engineering
- Miscellaneous engineering
- Engineering technologies
- Engineering and industrial management
- Electrical engineering technology
- Industrial production technologies
- Mechanical engineering related technologies
- Miscellaneous engineering technologies
- Military technologies

Physical and life sciences majors

- Animal sciences
- Food science
- Plant science and agronomy
- Soil science
- Environmental science
- Biology
- Biochemical sciences
- Botany
- Molecular biology
- Ecology
- Genetics
- Microbiology
- Pharmacology
- Physiology
- Zoology
- Miscellaneous biology
- Nutrition sciences
- Neuroscience
- Cognitive science and biopsychology
- Physical sciences
- Astronomy and astrophysics
- Atmospheric sciences and meteorology
- Chemistry
- Geology and earth science
- Geosciences
- Oceanography
- Physics
- Nuclear, industrial radiology, and biological technologies

Endnotes

¹These occupations are computer and information systems managers, engineering managers, and natural sciences managers.

²Although our principal data source, the 2009 American Community Survey (ACS), collects detailed information on workers' occupations, they do not break out educators by their specific field. As a result, it is not possible to distinguish math and science professors from other professors. Data from the Bureau of Labor Statistics' Occupational Employment Statistics program show that there are roughly 200,000 post-secondary teachers in STEM fields, and so their exclusion is unlikely to materially affect our results.

³The National Science Foundation does count social scientists among "science and engineering jobs" in keeping with the agency's mission supporting "all fields of fundamental science and engineering, except for medical sciences." This report, however, follows a different approach.

⁴Note that persons in science occupations include not just scientists but also science technicians. Likewise, engineering and surveying occupations include engineering technicians and drafters, and computer occupations range from computer support specialists to computer software engineers.

⁵The estimates reported in this paragraph are based on 2009 data from the American Community Survey (ACS). The estimates are very similar to those cited in STEM: Good Jobs Now and For the Future (<http://www.esa.doc.gov/Reports/stem-good-jobs-now-and-future>), p. 2, which were based on 2010 data from the Current Population Survey. The estimates are very similar but not exactly the same because they were drawn from different samples of workers in two different years.

⁶In the few cases where both the primary and secondary undergraduate majors were in STEM fields, we used the primary major as the STEM major.

⁷Our earnings regression analyses control for many earnings-related characteristics, including age, gender, marital status, nativity and citizenship, educational attainment, region, major industry, and STEM occupation.

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