AMERICAN ACTION FORUM

How Changes in Immigration Can Impact Future Worker Shortages in the United States and Silicon Valley

Ben Gitis, Douglas Holtz-Eakin
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Executive Summary

By 2020 – a mere five years away – we project the United States and Silicon Valley economies will face crucial labor force skill shortages. Our analysis and policy recommendations make the case for a multi-pronged approach to meeting the projected skills gaps: increase the growth rate in immigrant workers across the economy; adjusting visas to better reflect skills mismatches; improving training and education opportunities for the existing immigrant workforce; and allowing training and education earned abroad to be applied to degree attainment and U.S. licensure processes here. Regardless of the policy mix chosen, failing to address these challenges will undermine the United States' global competitiveness.

United States

United States Private Sector Projected Worker Shortages				
	Current Projection		**Immigrant Worker Growth Increases 25%**	
Education	**Workers**	**Percent**	**Workers**	**Percent**
Total	7,506,256	4.9%	6,361,152	4.2%
Less than High School Degree	5,271,950	29.3%	5,171,993	28.8%
High School Degree	1,234,352	3.0%	959,900	2.4%
Some College, Associates	123,040	0.3%	-103,048	-0.2%
Bachelor's, Master's, Professional, Doctorate	876,915	1.8%	332,306	0.7%

In 2020 the United States will be short roughly 7.5 million private sector workers, with substantial shortfalls occurring across all skill levels. While improving training for the existing workforce, increasing the growth rate in the immigration workforce at all skill levels would substantially reduce overall shortages. We find that increasing the growth rate of immigrant workers by 25 percent across all skill levels would decrease the United States' labor shortage to 6.4 million, mostly by eliminating middle- and high-skill labor shortages.

Silicon Valley

Silicon Valley Private Sector Projected Worker Shortages				
	Current Projection		Immigrant Worker Growth Increases 25%	
Education	**Workers**	**Percent**	**Workers**	**Percent**
Total	72,536	5.0%	46,415	3.2%
Less than High School Degree	52,911	30.9%	49,192	28.7%
High School Degree	66,851	17.3%	63,761	16.5%
Some College, Associates	31,190	8.1%	25,066	5.9%
Bachelor's, Master's, Professional, Doctorate	-78,416	-17.6%	-91,603	-19.1%

Silicon Valley meanwhile will be short 72.5 thousand private sector workers, with the shortfalls occurring at lower- and middle-skill jobs. Increasing the growth rate of immigrant workers by 25 percent across all skill levels would decrease the region's shortage from 72.5 thousand to 46.4 thousand.

Policy Options

Changes in immigration policies and patterns can help fill the middle-skill gaps in the Silicon Valley and meet our nation's economic needs. Policy options that could increase the immigrant workforce to fill these jobs include:

1. ***Broad Immigration Reform that Ensures Employers' Labor Needs Are Met***

   Congress could enact broad immigration reform policies that ensure that future labor needs are met through the legal immigration system. The employment-based visa program needs to be reformed to reflect the different workforce needs of employers and our country and to include flexibility for the visa quotas to adjust to economic realities.

2. ***Adjust the Mix of Visas to Better Match Skill Needs of Employers***

   The proportion of working age immigrants entering the United States with at least a Bachelor's degree has increased substantially. In particular, in 2013 over 50 percent of working age immigrants entering the United States and over 60 percent entering Silicon Valley had at least a Bachelor's degree. One option would be to expand visas that target immigrants with an Associate's level education or to create new temporary and permanent work visas that are specifically for workers at this skill level.

3. *Increase Educational and Skills of Existing Immigrant Workforce*

State educational policies could encourage and enable immigrant workers already living in the United States and Silicon Valley to obtain an Associate's degree or comparable industry-recognized credential to meet the middle-skills gaps. Federal, state, and local governments could promote effective integration of education (adult education, community college, four-year institutions) and workforce support services. Integrating these systems can assist immigrant workers in accelerating language acquisition while concurrently developing knowledge and job skills needed to obtain occupational credentials. Government offices could share successful preparation models. State and local models, such as career pathways, can be applied to preparing immigrant workers for middle-skill jobs.

Employers could also provide development opportunities for native and immigrant staff, such as in-house training, partnering with community colleges and postsecondary institutions, and joining with community organizations to provide contextualized English language classes and supportive services.

4. *Obtain Credit for Work, Experience, and Credentials from Abroad*

Employers and the nation's economy benefit from having skilled immigrant professionals that are readily able to contribute their expertise and credentials gained from abroad. State educational policies could enable immigrant workers to receive credit for work, experience, and credentials attained from abroad. This could increase the value of education and training for immigrant workers because it would limit redundancy in their personal education, accelerate their degree completion, and save them time and money. Additionally, states could consider how immigrants can gain credit for training and work experience gained abroad when applying for licensure in the United States, while maintaining public health and safety standards.

Introduction

Silicon Valley's regional economy is among the fastest growing in the United States. From 2003 to 2013 real Gross Domestic Product (GDP) in the San Jose-Sunnyvale-Santa Clara metropolitan area grew at an average annual rate of 4.5 percent, significantly higher than the 1.8 percent average growth rate nationwide.[1] During that time period, employment in San Mateo and Santa Clara counties grew 9.8 percent, more than twice as quickly as the 4.8 percent job growth in the entire United States. Silicon Valley is certainly growing fast and employers will continue to demand a multitude of workers at all skill levels. But, with a national labor force participation rate at a historic low, will there be enough workers to fill all those job openings?

In this paper, we project the difference between the skills employers will demand in 2020 and the skills workers will supply to estimate potential skill gaps in the economy. In turn, we project that by 2020 the United States and Silicon Valley economies could be confronted with significant worker shortages at multiple skill levels. There are different options to developing a pipeline of skilled workers, and this paper focuses on how adjusting the growth of immigrant workers could substantially close the impending skill gaps in the United States and Silicon Valley.

Although we find that it would be helpful to use immigration to address future skill gaps, doing so would require substantial shifts from recent immigrant trends. In particular, from 2003 to 2013 the portion of immigrants coming to the United States and Silicon Valley with Bachelor's degrees has increased substantially and the portion with all other skill levels has decreased. As a result, absent a change in policy or immigration patterns, increasing the immigrant workforce would bring in additional high-skilled workers, but not a large number of low- or middle-skilled workers. Our analysis leads to policy recommendations to help fill middle-skill gaps by ensuring that immigrant workers can gain skills in the United States and apply their work experiences and credentials attained abroad.

Education and Immigration Characteristics in the United States and Silicon Valley

When examining the impact of immigration on the supply of skilled labor, it is important to analyze regions that actually rely on foreign born workers and a highly skilled labor force. This is why we compare labor market trends in the entire United States to trends in Silicon Valley, where there is a highly educated workforce and a large concentration of immigrants.

In this paper, we analyze growth of workers at four distinct education levels. These four categories of workers include those who (1) have not completed high school, (2) obtained a high school degree but did not complete any higher level of education, (3) completed some

[1] Bureau of Economic Analysis, U.S. Department of Commerce, Interactive Data, http://bea.gov/itable/index.cfm

college or obtained an Associate's degree but did not obtain a Bachelor's degree, and (4) obtained a Bachelor's, Master's, Professional, or Doctorate degree.

Table 1 compares educational attainment of workers ages 25 to 64 nationwide to Silicon Valley.[2]

Table 1: Worker Education Characteristics		
Education Level	**Nation**	**Silicon Valley[3]**
Less than High School	9.6%	10.2%
High School Degree	25.3%	14.3%
Some College, Associate's Degree	31.4%	25.4%
Bachelor's, Master's, Professional, Doctorate Degree	33.7%	50.0%

Overall, Silicon Valley has a much higher prevalence of highly skilled workers and a lower concentration of middle-skilled workers than the entire United States. In particular, 33.7 percent of workers in the United States have Bachelor's degrees. In Silicon Valley, those workers represent 50 percent of the workforce. However, the United States has a greater percentage of workers with high school and Associate's degrees than Silicon Valley.

Silicon Valley also has a much higher concentration of foreign residents than the entire United States. Table 2 compares the immigrant population in the United States to Silicon Valley.[4]

Table 2: Immigrant Residents		
Immigrant Status	**Nation**	**Silicon Valley[5]**
Foreign	13.0%	36.2%
Native	87.0%	63.8%

In the entire United States, immigrants represented 13 percent of the population in 2013, but, in Silicon Valley they were 36.2 percent of residents. In other words, a person in Silicon Valley is almost three times more likely to be an immigrant than a person in the United States as a whole.

Going forward, Silicon Valley will continue to demand skilled workers at a higher rate than the entire United States. The California Employment Development Department projects that between 2012 and 2022, 8 of the 30 occupations with the most job openings in San Mateo County and 13 of the top 30 in Santa Clara County will require a Bachelor's degree or more.[6] The Bureau of Labor Statistics meanwhile projects that only 3 of the 30

[2] American Community Survey 5 Year Estimates, Census Bureau, http://www.census.gov/
[3] Defined by San Mateo and Santa Clara Counties
[4] American Community Survey 5 Year Estimates, Census Bureau, http://www.census.gov/
[5] Defined by San Mateo and Santa Clara Counties
[6] Employment Projections, Employment and Development Department, State of California, http://www.labormarketinfo.edd.ca.gov/data/employment-projections.html

occupations with the most job openings in the entire United States will require a Bachelor's degree or more.[7]

In the following, we utilize recent employment trends to estimate if there will be enough workers (both native and foreign) to meet employment needs in 2020 at all skill levels in the United States and Silicon Valley.

Methodology for Estimating Workforce Skill Shortages

United States

There are three steps to projecting education shortfalls in the labor market by 2020. First, we project the number of workers the labor market will have at each of four education levels. Second, we project the number of workers at each of those four education levels that employers will demand. And finally, to yield the shortage (or surplus) of workers by skill level we calculate the difference between the projected number workers at each education level employers will demand and the number of workers at each education level who will actually exist.

To project the number of workers who will exist across all skills, we use Current Population Survey (CPS) March Supplements to estimate the compounded annual growth rate of workers at each of the four education levels in each industry from 2003 to 2013.[8] We perform this exercise for all workers, immigrant workers, and non-immigrant workers with the national population weights available in the CPS data files. Assuming those long-term average growth rates will remain constant going forward, we project the growth in workforce levels in each industry from 2013 to 2020 for all, native, and foreign workers at each education level.

When estimating the number of jobs at each skill level employers will seek, we use data reported by the Georgetown Center on Education and Workforce (CEW) to calculate the compounded annual growth rates of workers demanded at each skill level in every industry.[9] Then starting with actual employment levels in 2013, we use these compounded annual growth rates to project the growth in the number of jobs available in 2020 that will require less than a high school education, a high school degree, some college or an Associate's degree, and a Bachelor's, Master's, Professional, or Doctorate degree.

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[7] Economic and Employment Projections, Bureau of Labor Statistics, http://www.bls.gov/news.release/ecopro.toc.htm

[8] Current Population Survey, 2014 Annual Social and Economic Supplement and 2004 Annual Social and Economic Supplement, U.S. Census Bureau, obtained online at the National Bureau of Economic Research, http://www.nber.org/data/current-population-survey-data.html

[9] Recovery: Job Growth and Education Requirements Through 2020, Center on Education and the Workforce, Georgetown University, June 2013, https://cew.georgetown.edu/report/recovery-job-growth-and-education-requirements-through-2020/

Finally, by comparing the projected number of workers who will be in the labor force at every education level in 2020 to those employers will require, we estimate the future shortages or surpluses in workers by skill level in each industry.

Silicon Valley

To our knowledge, a detailed data set similar to the CPS is not available for Silicon Valley. To project the potential worker shortages or surpluses specifically in Silicon Valley, we use the exact same data and methods as we did for the United States with one key difference. Instead of using the national population weight in the CPS, we use regional Silicon Valley demographic characteristics to weigh the national data set so it more closely resembles Silicon Valley's population. The demographic information we use to weigh the national CPS data came from the Census Bureau and includes four main categories: race, Hispanic ethnicity, immigrant status, and age.[10]

By combining the four main demographic categories we derive 112 unique demographic subcategories. We then calculate relative probabilities and apply them to the entire national sample as weights for the 112 different subcategories of people. In essence the relative probabilities indicate the number of people each observation in the national sample would represent in Silicon Valley. For instance, one relative probability indicates that for every person in the national sample who in 2013 was foreign, Asian, not Hispanic, and between the ages of 25 to 34, there were 2.3 people who met those characteristics in Silicon Valley.

Limitations to the Silicon Valley Analysis

There are three central limitations to our Silicon Valley analysis that are important to understand.

First, to derive the relative probabilities, we use the four main categories to estimate the percent of people who fall into each of the 112 subcategories in the national sample and in Silicon Valley. We then divide the percentage of people in each subcategory in Silicon Valley by the percentage in national sample. With the CPS, we could directly find the percent of the sample that falls under each of the 112 demographic subcategories in the national sample. For Silicon Valley, we only have direct information for the distribution of people in the region for each of the 4 major demographic categories. Thus, to find the percent of people in each of the 112 unique categories we multiply together the percentages of the four major categories. For instance, we find the percent of people in Silicon Valley who are foreign, Asian, not Hispanic, and between the ages of 25 to 34 by multiplying the percent of people in Silicon Valley who are foreign by the percent who are Asian, the percent who are not Hispanic, and the percent who are ages 25 to 34. The major limitation with this part of our analysis is that we assume that each subgroup has the

[10] Since no Census Bureau data set for Silicon Valley's demographics in 2003 was available, we used the Census demographic data from the closest year, which was 2000. Likewise, we used 2012 demographic data for 2013, since Census has yet to publish the 2013 Silicon Valley demographic data.

same demographic characteristics as the entire region. For instance, 32.2 percent of the entire region of Silicon Valley is Asian and our methods result in us assuming that 32.2 percent of people who are foreign, not Hispanic, and ages 25 to 34 are also Asian.

Second, the Silicon Valley population weights help the national data resemble that specific region, which allows us to track the growth in workers at all education levels within the region. This in turn allows us to project the growth in skills supplied by Silicon Valley workers to 2020. But, it does not allow us to make Silicon Valley specific projections for the growth in skills required by employers. As a result, for our Silicon Valley analysis, we assume that the projected growth rates in workers demanded in each industry matches the national growth rates and that the distributions of workers demanded by skill level in 2020 will match the national distributions.

Third and finally, although we weigh the national sample from the CPS to reflect the Silicon Valley population, we do not actually analyze a sample of people from that region of the country. As a result, if there are trends unique to Silicon Valley that are not captured in our weights, we are not able to account for them.

Despite these limitations, we are confident that our analysis provides informative projections of skills needs across industries within the Silicon Valley by 2020.

Projected Labor Shortages

Our projected skills shortfalls and surpluses in 2020 for the private sector of the entire United States and just Silicon Valley are shown in Table 3.[11] Estimated shortfalls and surpluses for each industry are available in the Appendix.

Table 3: Private Sector Projected Worker Shortages: Nation vs. Silicon Valley

	Nation		Silicon Valley	
Education	**Workers**	**Percent**	**Workers**	**Percent**
Total	7,506,256	4.9%	72,536	5.0%
Less than High School Degree	5,271,950	29.3%	52,911	30.9%
High School Degree	1,234,352	3.0%	66,851	17.3%
Some College, Associates	123,040	0.3%	31,190	7.4%
Bachelor's, Master's, Professional, Doctorate	876,915	1.8%	-78,416	-16.3%

Overall, we find that both the entire nation and Silicon Valley will face substantial and similar worker shortages in 2020. In the United States, there will be about 7.5 million or

[11] In measuring private sector skill gaps, we exclude all shortages or surpluses in government and education.

4.9 percent fewer workers than demanded by employers. Silicon Valley employers meanwhile will be short 72.5 thousand workers, which translates to a 5.0 percent shortfall.

In the United States, a worker shortage will occur at every skill level. In 2020, the nation will be short 5.3 million workers (29.3 percent) who did not complete high school, 1.2 million (3 percent) with a high school degree, 123 thousand (0.3 percent) with some college or an Associate's degree, and 876.9 thousand (1.8 percent) with a Bachelor's degree or higher.

Silicon Valley, however, will face a greater shortage for middle-skilled jobs. In particular, the region will be short 66.9 thousand workers with a high school degree. This means that the gap between employer demands and worker supply for high school degree holders will be 17.3 percent, over five times larger than the 3.0 percent gap nationwide. Silicon Valley will also have a 7.4 percent shortage of workers with some college or an Associate's degree, which is much larger than the national shortfall of 0.3 percent.

Finally, the table shows that while the entire nation will be short highly skilled workers, Silicon Valley will have surplus of workers with at least a Bachelor's degree. In particular, we project that the region will have 78.4 thousand or 16.3 percent more workers with a Bachelor's degree or above than employers will demand.

It is important to note that the projected surplus of workers with at least a Bachelor's degree in Silicon Valley could be due to the limitations of this analysis previously highlighted. In particular, due to lack of data we assume that the projected growth rates in workers demanded in each industry in Silicon Valley matches the national growth rates and that the distributions of workers demanded by skill level in 2020 will match the national distributions. In reality, however, it is likely that employer demand for workers with at least a Bachelor's degree will grow faster in Silicon Valley than the rest of the nation. As a result, we suspect that the surplus of worker's with at least a Bachelor's degree shown in Table 3 may be overstated or may not actually exist.

Immigrant Workers' Impact on the Shortfall in Skill Levels

Adjusting the growth rate of immigrant workers at all skill levels reveals how important immigrants can be to the future of the labor force. In particular, keeping the number of immigrant workers from growing would cause the skill gaps to widen substantially. Increasing the growth of immigrant workers, however, would reduce the projected skill shortfalls. In general, we find that the higher the education level, the more responsive the worker shortfalls and surpluses are to increasing or decreasing the growth of immigrant workers.

Stopping Growth of Immigrant Workers

If instead of growing at the same rate as the previous ten years, immigrant workers in each skill level did not change and stayed at their 2013 levels, then the private sector labor

shortages in 2020 would increase substantially both nationally and in Silicon Valley. This is illustrated in Table 4.

Table 4: Private Sector Worker Shortage if Immigrants Increase 0%: Nation vs Silicon Valley

	Nation		Silicon Valley	
Education	**Workers**	**Percent**	**Workers**	**Percent**
Total	11,155,656	7.3%	138,787	9.5%
Less than High School Degree	5,286,009	29.4%	45,922	26.8%
High School Degree	2,173,156	5.4%	71,218	18.5%
Some College, Associates	931,342	2.1%	50,372	11.9%
Bachelor's, Master's, Professional, Doctorate	2,765,149	5.6%	-28,725	-5.9%

If the number of immigrants at each education level did not change after 2013, then the overall worker shortage in 2020 would grow from 7.5 million to 11.2 million nationally (4.9 percent to 7.3 percent) and from 72.5 thousand to 138.8 thousand in Silicon Valley (5.0 percent to 9.5 percent). In general, the higher the education level, the quicker the worker shortage would rise.

Nationally shortages for workers with high school degrees and greater would grow substantially. The shortfall would rise from 1.2 million to 2.2 million (3.0 percent to 5.4 percent) for workers with a high school degree, 123 thousand to 931.3 thousand (0.3 percent to 2.1 percent) for workers with some college or an Associate's degree, and 876.9 thousand to 2.8 million (1.8 percent to 5.6 percent) for workers a Bachelor's degree or above. Generally, the higher the education level the more the shortage would grow if immigrant workers were to simply stay at their 2013 levels.

In Silicon Valley, keeping immigrant workers at 2013 levels would cause the shortages of workers with high school degrees and some college or Associate's degrees in 2020 to increase and the surplus of workers with Bachelor's degrees or above to decrease. In particular, the 2020 shortage of workers with high school degrees would increase from 66.9 thousand to 71.2 thousand (17.3 percent to 18.5 percent). The shortage of workers with some college or Associate's degrees would rise from 31.2 thousand to 50.4 thousand (7.4 percent to 11.9 percent). Meanwhile, the surplus of workers with Bachelor's degrees or above would fall from 78.4 thousand to 28.7 thousand (16.3 percent to 5.9 percent).

Increasing Growth of Immigrant Workers

Increasing the annual growth rate of immigrant workers at each skill level would reduce the projected 2020 private sector skill shortfalls. Table 5 shows the shortages and surpluses of workers if the annual growth rate of immigrant workers at each skill level increased by 25 percent.

Table 5: Private Sector Worker Shortage if Immigrant Growth Rate Increase 25%: Nation vs. Silicon Valley

	Nation		Silicon Valley	
Education	**Workers**	**Percent**	**Workers**	**Percent**
Total	6,361,152	4.2%	46,415	3.2%
Less than High School Degree	5,171,993	28.8%	49,192	28.7%
High School Degree	959,900	2.4%	63,761	16.5%
Some College, Associates	-103,048	-0.2%	25,066	5.9%
Bachelor's, Master's, Professional, Doctorate	332,306	0.7%	-91,603	-19.1%

The nationwide private sector total labor shortage would fall from 7.5 million to 6.4 million (4.9 percent to 4.2 percent) and the Silicon Valley private sector labor shortage would decrease from 72.5 thousand to 46.4 thousand (5.0 percent to 3.2 percent). Like above, worker shortages and surpluses are more responsive to increasing immigration growth at the higher end of the skill distribution. Specifically, increasing the growth rate of immigrant workers would reduce the middle- and high-skilled worker shortages the most.

Nationally, the shortages of workers with some college or Associate's degrees would disappear entirely and the shortages of workers with Bachelor's degrees or greater would decline substantially. The shortage of workers with some college or an Associate's degree would become a 0.2 percent surplus and the shortage of workers with a Bachelor's degree or greater would fall to 0.7 percent.

In Silicon Valley, the shortage of workers with some college or Associate's degrees in the private sector would fall from 31.2 thousand to 25.1 thousand (7.4 percent to 5.9 percent). Meanwhile, increasing the growth rate of immigrant workers with a Bachelor's degree or greater would increase the surplus of workers in that category from 78.4 thousand to 91.6 thousand (16.3 percent to 19.1 percent).

How Immigrants Influence Labor Force Skill Levels

Immigrant workers expand the talent pool that employers can utilize to meet their workforce needs. Overall, we find that in recent history a greater proportion of working-age immigrants coming to the United States and Silicon Valley have been entering with at least a Bachelor's degree, while the proportion with all other skill levels has been falling. Meanwhile, once in the United States and Silicon Valley very few immigrants upgrade their skills by attaining higher education.

Immigrants are more frequently coming to the United States and Silicon Valley with High Skills Levels

The evidence suggests that the proportion of new immigrants coming to the United States and Silicon Valley with at least a Bachelor's degree has increased substantially over time. Table 6 compares the skills of prime working age immigrants (25 to 54) who came to the United States from 2002 to 2004 to the skills of those who entered from 2012 to 2014.[12]

Table 6: Prime Working Age Immigrant Entrant Skill Levels in United States

Educational Attainment	2002-2004	2012-2014	Percentage Point Change
Less than High School Degree	26.8%	21.2%	-5.7
High School Degree	19.6%	17.2%	-2.4
Some College, Associate's Degree	15.3%	9.3%	-6.0
Bachelor's, Master's, Professional, Doctorate Degree	38.3%	52.4%	14.1

Over the ten-year period, the proportion of prime working age immigrants who came to the United States with at least a Bachelor's degree increased by a substantial 14.1 percentage points from 38.3 percent in the 2002 to 2004 period to 52.4 percent in the 2012 to 2014 period. Meanwhile, the percentage of entrants at all other skill levels fell over the ten-year time frame.

Table 7 shows how skills of immigrant entrants who moved to Silicon Valley changed over the same time period.

Table 7: Prime Working Age Immigrant Entrant Skill Levels in Silicon Valley

Educational Attainment	2002-2004	2012-2014	Percentage Point Change
Less than High School Degree	19.7%	13.6%	-6.0
High School Degree	15.8%	12.9%	-2.9
Some College, Associate's Degree	18.0%	12.0%	-6.0
Bachelor's, Master's, Professional, Doctorate Degree	46.6%	61.4%	14.9

The proportion of immigrants entering Silicon Valley with at least a Bachelor's degree increased at an even faster rate than it did nationwide. Over the ten-year time period, the proportion of immigrants entering with at least a Bachelor's degree increased by 14.9 percentage points from 46.6 percent to 61.4 percent. Just like for the entire United States, the proportion of prime working age immigrants entering with low- and middle-skill levels decreased.

[12] Author's analysis of 2014 and 2004 CPS March Supplements.

Tables 6 and 7 indicate that immigrant workers entering the country are already well situated to increase the high skilled labor force. However, they are not well positioned to fill low- and middle-skilled jobs. This is particularly important in Silicon Valley, where we found that in 2020 there would be a surplus of workers with Bachelor's degrees and a shortage of workers with some college or an Associate's degree.

Once in the Country, Few Immigrants Upgrade their Skills

Recent data suggest that once immigrants arrive in the United States and Silicon Valley, they do not upgrade their skills as frequently as native residents. This is particularly true for middle-skilled education, as immigrants obtain some college or an Associate's degree at a slower rate than any other education level. Using data from the Survey of Income and Program Participation (SIPP), we analyze how immigrants and non-immigrants enhanced their education levels from 2008 to 2013.[13]

Table 8 reveals what happened among all immigrants in the United States.[14]

Table 8: Immigrant Learning in United States

Education Attainment	2008	2013	Percentage Point Change
Less Than High School Degree	30.2%	23.2%	-7.0
High School Degree	20.7%	26.5%	5.8
Some College, Associate's Degree	23.9%	24.1%	0.2
Bachelor's, Master's, Professional, Doctorate Degree	25.2%	26.2%	1.0

From 2008 to 2013, the proportion of immigrants who completed some college or an Associate's degree was virtually unchanged, only increasing by 0.2 percentage point. The proportion with at least a Bachelor's degree only increased 1 percentage point.
Table 9 reveals that meanwhile non-immigrants upgraded their skills more rapidly.

Table 9: Non-Immigrant Learning in United States

Education Attainment	2008	2013	Percentage Point Change
Less Than High School Degree	13.6%	7.0%	-6.6
High School Degree	24.0%	26.6%	2.5
Some College, Associate's Degree	34.6%	36.1%	1.4
Bachelor's, Master's, Professional, Doctorate Degree	27.7%	30.3%	2.6

[13]Survey of Income and Program Participation 2008 Panel, U.S. Census Bureau, retrieved from the National Bureau of Economic Research, http://www.nber.org/data/survey-of-income-and-program-participation-sipp-data.html
[14] Author's analysis of SIPP data.

From 2008 to 2013, the proportion of non-immigrants in the United States with some college or an Associate's degree increased by 1.4 percentage points and the proportion with at least a Bachelor's degree increased by 2.6 percentage points.

Table 10 reveals that immigrants in Silicon Valley are not upgrading their skills much more rapidly than immigrants in the entire United States.

Table 10: Immigrant Learning in Silicon Valley

Education Attainment	2008	2013	Percentage Point Change
Less than High School Degree	27.7%	17.9%	-9.8
High School Degree	19.6%	27.2%	7.5
Some College, Associate's Degree	26.9%	27.1%	0.2
Bachelor's, Master's, Professional, Doctorate Degree	25.8%	27.8%	2.0

Over the five-year time period, the proportion of immigrants in Silicon Valley with some college or an Associate's degree only increased by 0.2 percentage point. The proportion of immigrants with at least a Bachelor's degree grew by 2 percentage points, which was quicker than the increase that occurred nationally.

Table 11 indicates that non-immigrants in Silicon Valley upgraded their skills at rates similar to the entire nation.

Table 11: Non-Immigrant Learning in Silicon Valley

Education Attainment	2008	2013	Percentage Point Change
Less than High School Degree	15.9%	9.5%	-6.4
High School Degree	21.8%	24.9%	3.1
Some College, Associate's Degree	33.8%	35.1%	1.3
Bachelor's, Master's, Professional, Doctorate Degree	28.4%	30.4%	2.0

By 2013 the proportion of non-immigrants in Silicon Valley with some college or an Associate's degree increased by 1.3 percentage points. In addition, the proportion with at least a Bachelor's degree increased by 2 percentage points. This means that in Silicon Valley, while immigrants obtain a Bachelor's degree at the same rate as non-immigrants, they still lag behind in the some college or Associate's degree category.

Policy Implications

While trends in the last ten years show that immigrant workers are well situated to fill jobs that require a Bachelor's degree, our projections suggest that the United States and particularly Silicon Valley will face substantial shortfalls in workers with low- to middle-education levels. As a result, in order to use immigration as a tool to reduce worker shortages, particularly at the middle-skill level, changes in immigration policies and

patterns would be useful. Four ways policy could increase middle-skilled workers in the United States and Silicon Valley are: (1) broad immigration reform that ensures employers' labor needs are met; (2) adjust the U.S. visa mix so that a larger portion of immigrant workers entering the United States have middle education levels; (3) increase the educational and skills attainment of immigrant workers that are already in the United States; and (4) enable immigrants in the United States to obtain credit for their work, experience, and credentials gained from abroad.

Broad Immigration Reform

Employers in the United States and Silicon Valley need a reliable supply of workers to maximize their productivity. Congress should enact broad immigration reform policies that ensure that future labor needs are met through the legal immigration system. This includes solutions that allow immigrant workers to upgrade their skills through efficient and effective education and workforce programs and for employers in the United States and Silicon Valley to access these workers. Further, the employment-based visa program needs to be reformed to reflect the different workforce needs of employers and our country and to include flexibility for the visa quotas to adjust to economic realities.

Adjust the U.S. Visa Mix

Over a ten-year period, the proportion of working age immigrants entering the United States with at least a Bachelor's degree increased substantially. In particular, in 2013 over 50 percent of working age immigrants entering the United States and over 60 percent entering Silicon Valley had at least a Bachelor's degree. These trends are likely largely explained by the fact that the U.S. visa system is designed to primarily grant legal residence to immigrant workers with very high skills and has given more and more preference to those with at least a Bachelor's degree over time.

Examining worker admissions under permanent worker visas (aka green cards) in Table 12, it is easy to see how the U.S. visa system over time has given more preference to high skilled workers.

Table 12: Permanent Admissions for Workers			
Permanent Worker Visa	**2004[15]**	**2013[16]**	**Percentage Point Change**
Total Admissions	72,407	72,203	-
Priority Workers (EB-1)	18.4%	22.5%	4.1
Second Preference (EB-2)	21.9%	43.1%	21.2
Third Preference (EB-3)	57.0%	27.7%	-29.3
Skilled	27.1%	11.9%	-15.2
Professional	2.1%	1.9%	-0.2
Unskilled	27.8%	14.0%	-13.8
Fourth Preference (EB-4)	2.6%	2.4%	-0.3
Fifth Preference (EB-5)	0.1%	4.3%	4.2

Between 2004 and 2013, the total number of workers admitted to the United States on a permanent worker visa has remained virtually unchanged at about 72 thousand. However, during that time period, the percentage of workers admitted with visas that require at least a Bachelor's degree, EB-1 and EB-2, increased substantially. In particular, the percent of permanent workers admitted with an EB-1 visa rose 4.1 percentage points from 18.4 percent to 22.5 percent and the proportion admitted with an EB-2 visa rose a dramatic 21.2 percentage points from 21.9 percent to 43.1 percent. As a result, visas that require a high level of educational attainment now account for two-thirds of all permanent worker admissions in the United States.

The consequence of this, however, is that fewer visas are being made available for workers with middle skills. In fact, the proportion of permanent workers admitted to the United States with the visa that allows for middle skills, EB-3, has declined significantly. The proportion of permanent workers admitted with an EB-3 visa dropped 29.3 percentage points from 57 percent to 27.7 percent. Within EB-3, the visa under the "skilled" category requires at least two years of training and most closely aligns with an Associate's level education.[17] However, the proportion of permanent workers admitted with a "skilled" EB-3 visa declined 15.2 percentage points from 27.1 percent to 11.9 percent.

Table 13 shows the distribution of workers admitted under temporary employment visas, such as the H-1B.

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[15] Author's Analysis of Table 5 in "Yearbook of Immigration Statistics: 2004 Immigrants," Office of Immigration Statistics, U.S. Department of Homeland Security, http://www.dhs.gov/publication/yearbook-immigration-statistics-2004-immigrants

[16] Author's analysis of Table 7 in "Yearbook of Immigration Statistics: 2013 Lawful Permanent Residents," Office of Immigration Statistics, U.S. Department of Homeland Security, http://www.dhs.gov/publication/yearbook-immigration-statistics-2013-lawful-permanent-residents

[17] "Employment-Based Immigration: Third Preference EB-3," United States Citizenship and Immigration Services, Department of Homeland Security, http://www.uscis.gov/working-united-states/permanent-workers/employment-based-immigration-third-preference-eb-3

Table 13: Temporary Admissions for Workers[18]		
Temporary Worker Visa	**2004**	**2013**
Total	675,647	1,613,868
Temporary workers in specialty occupations (H1-B) (Bachelors required)	57.3%	29.4%
Agricultural workers (H-2A)	3.3%	12.7%
Nonagricultural workers (H-2B)	12.9%	6.5%
Workers with extraordinary ability or achievement (O-1)	4.0%	4.1%
Workers accompanying and assisting in performance of O1 workers (O-2)	0.9%	1.3%
Chile and Singapore Free Trade Agreement aliens (H-1B1)	0.0%	0.0%
Registered nurses participating in the Nursing Relief for Disadvantaged Areas (H-1C)	0.0%	0.0%
Trainees (H-3)	0.3%	0.3%
Internationally recognized athletes or entertainers (P-1)	6.0%	5.3%
Artists or entertainers in reciprocal exchange programs (P-2)	0.6%	0.8%
Artists or entertainers in culturally unique programs (P-3)	1.5%	0.6%
Workers in international cultural exchange programs (Q-1)	0.3%	0.2%
Workers in religious occupations (R-1)	3.2%	0.9%
North American Free Trade Agreement (NAFTA) professional workers (TN)	9.8%	38.0%
CNMI-only transitional workers (CW-1)	0.0%	0.1%

Overall, the number of workers admitted with temporary worker visas has spiked over the last ten years from 675,647 in 2004 to 1,613,868 in 2013. Despite the number of temporary worker admissions increasing under most visa categories (particularly for NAFTA workers), employment admissions with a nonagricultural visa (H-2B), which is intended for low-and middle-skill workers, remained flat at about 100,000 per year. As the table shows, this resulted in nonagricultural worker visa admissions falling from 12.9 percent of temporary worker admissions in 2004 to only 6.5 percent in 2013.

Since we project that Silicon Valley will have a substantial shortage of workers with some college or an Associate's degree in 2020, the region could benefit from expanding visas that target immigrants with an Associate's level education or creating new temporary and permanent work visas that are specifically for workers at this skill level.

Increase Educational and Skills Attainment of Immigrants Already in the United States

Federal and state educational policies could encourage and enable immigrant workers already living in the United States and Silicon Valley to obtain an Associate's degree or comparable industry-recognized credential to fill middle-skills gaps. As indicated above, once in the United States, immigrants do not upgrade their education as frequently as non-immigrants. This is particularly true when it comes to obtaining some college or an

[18] Author's analysis of Table 25, "Yearbook of Immigration Statistics: 2013 Temporary Admissions (Nonimmigrants)," Office of Immigration Statistics, U.S. Department of Homeland Security, http://www.dhs.gov/publication/yearbook-immigration-statistics-2013-temporary-admissions-nonimmigrants

Associate's degree, as the proportion of immigrants at those education levels remained virtually unchanged in both the United States and Silicon Valley from 2008 to 2013.Encouraging immigrants to obtain an Associate's degree or comparable industry-recognized credential in the United States not only helps meet employers' demands for middle-skill workers, but also can benefit immigrants themselves. A study of 4,000 immigrant professionals by the World Education Services, IMPRINT, and George Mason University's Institute of Immigration Research found that immigrants "who had invested in additional U.S. education were more likely to be employed and successful than those who had only received education abroad."[19]

The Workforce Innovation and Opportunity Act, enacted on July 22, 2014, presents an opportunity to improve education and workforce services for all job seekers, including immigrants. With the help of this bill, federal, state, and local officials can promote effective integration of education (adult education, community college, four-year institutions) and workforce support services. Integrating these services can assist immigrant workers accelerate language acquisition and concurrently attain educational or other industry-recognized credentials needed for the growing industries and occupations in their local or regional economies.

Coordinating education and workforce support services is particularly important for immigrants because they frequently face cultural, linguistic, and socioeconomic barriers to successfully advancing their education and achieving their employment goals. In particular, immigrants may face unique barriers such as lack of professional networks and limited English language abilities.[20] In Silicon Valley, more than half of working adults speak a language other than English in the home, of which 58 percent are fluent in English and 42 percent are English Language Learners (ELL).[21] Of those ELLs in the Silicon Valley, 57 percent have a high school diploma or less.[22] Coordination and alignment of education and workforce support programs may help ensure that immigrants who seek to improve their employability can do so efficiently.

One potentially successful strategy to prepare immigrant and non-immigrant job seekers for employment is career pathways.[23] The federal government, states, philanthropic organizations, and local services are investing in career pathways initiatives, which align adult basic education, occupational training, postsecondary education, and supportive services to provide comprehensive and flexible education and training programs.[24] Career pathways programs aim to meet the needs of working students, including immigrants and

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[19] Amanda Bergson-Shilcock and James Witte, "Steps to Success: Integrating Immigrant Professionals in the United States," World Education Services, September 2015, pg. 2, http://www.imprintproject.org/stepstosuccess/
[20] *Ibid*.
[21] "English Language Learner Adults in Silicon Valley: Community Assets, Gaps, and Career Pathways," Silicon Valley ALLIES Innovation Initiative, April 2015, pg. 14.
[22] *Ibid,* pg. 16.
[23] The definition of career pathways is codified in the Workforce Innovation and Opportunity Act, Pub. L. No. 113-128, §3(7), 128 Stat. 1430.
[24] "Career Pathways Toolkit: A Guide for System Development," Employment and Training Administration, U.S. Department of Labor, September 2015, https://blog.dol.gov/2015/09/03/building-better-career-pathways/

English language learners.[25] Further research is needed on 1) how career pathways can help immigrant workers, including ELLs, enroll in and successfully complete educational and training programs, including those leading to an Associate's degree or other industry-recognized credentials, and 2) how career pathways can build an immigrant workforce for growing, non-traditional industries and occupations to meet employer demand.

Employers can also play an important role in improving immigrant worker skills to fill middle-skill job openings. In a survey of 340 organizations of different sizes, industries, and locations, the Association for Talent Development noted that in 2013, organizations, on average, spent $1,208 per employee on training and development.[26] For example, many employers offer several types of development opportunities to staff such as a combination of mentoring, rotations, and on-the-job training.[27] Employers also partner with community colleges and postsecondary institutions to develop and offer customized virtual or classroom training for staff.[28] Immigrant workers may benefit from contextualized English literacy classes or supportive services, and benefit from employers that partner with organizations such as adult education and community-based organizations to provide these programs.[29]

Further, employers can incentivize staff to upgrade their skills by offering monetary bonuses, additional time off, and other rewards upon successful completion of training. Many workers participate in tuition assistance programs, where the employer contributes to part or all of the employees' cost to earn postsecondary degrees and credentials.[30]

Credit for Work, Experience, and Credentials from Abroad

Immigrant workers bring to the United States diverse expertise and skills developed through employment and other experiences from abroad. To reduce educational redundancies and improve education and training efficiency for immigrant workers, state educational policies could enable immigrants to more frequently receive credit for work, experience, and credentials attained from abroad.

Prior learning assessments (PLA) is one model that postsecondary institutions are using to allow students to gain academic credit for knowledge developed outside of the classroom, such as through employment, professional training, volunteer activities, or military training. PLAs have helped adult learners accelerate their degree completion. In a study of

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[25] *Ibid*.
[26] Laurie Miller, "2014 State of the Industry Report: Spending on Employee Training Remains a Priority," Association for Talent Development, November 2014, https://www.td.org/Publications/Magazines/TD/TD-Archive/2014/11/2014-State-of-the-Industry-Report-Spending-on-Employee-Training-Remains-a-Priority
[27] "First Findings from the EQW National Employer Survey," National Center on the Educational Quality of the Workforce, Department of Education, 1995, http://files.eric.ed.gov/fulltext/ED398385.pdf
[28] American Association for Community Colleges, http://www.aacc.nche.edu/AboutCC/Pages/college-industry_partnership.aspx
[29] Allene Gus Grognet, "Planning, Implementing, and Evaluating Workplace ESL Programs," Center for Adult English Languge Acquisition, June 1996, http://www.cal.org/caela/esl_resources/digests/planningQA.html
[30] Gigi Jones, "Who Benefits from Section 127? A Study of Employee Education Assistance Provided Under Section 127 of the Internal Revenue Code," Society for Human Resource Management, 2010, http://i.bnet.com/blogs/tax-break-college.pdf

62,475 students across 48 postsecondary institutions, the Council for Adult and Experiential Learning (CAEL) found that PLA students had a much higher and faster degree-earning rate and were more persistent in accumulating credit towards a degree than non-PLA students. In particular, 13 percent of PLA students earned an Associate's degree compared to 6 percent of non-PLA students; PLA students saved an average of 1.5 to 4.5 months of time towards the Associate's degree.[31] Also, Hispanic students who earned credit through PLAs had higher graduation rates and required less time to complete degree programs then non-PLA students.[32] Further, since PLAs can save students time and money, they can incentivize immigrant workers to upgrade their skills through educational attainment.

Additionally, states could consider how immigrant professionals can gain credit for training and work experience gained abroad when applying for licensure in the United States, while maintaining public health and safety standards. This can ensure that skilled professionals are more readily able to contribute their expertise to the benefit of employers in the United States and economy at large.

Conclusion

We find that by 2020 both the entire United States and Silicon Valley specifically will face substantial worker shortages. Silicon Valley in particular will have a significant shortage of workers for jobs that will require middle-level skills, such as an Associate's degree. One way to address these potential skill shortages is through immigration. If policymakers were to increase the growth rate of immigrant workers at all skill levels by 25 percent, the overall worker shortages would decline considerably. Given recent immigration trends, however, this effort would require substantial policy changes, such as reforming our immigration visa program to account for the nation's need for workers with middle skills or enabling more immigrants in the United States to advance their education.

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[31] Rebecca Klein-Collins, "Fueling the Race to Postsecondary Success: A 48 Institution Study of Prior Learning Assessment and Adult Student Outcomes," Executive Summary, The Council for Adult and Experiential Learning, February 2010, http://www.cael.org/pdfs/pla_executive-summary

[32] Rebecca Klein-Collins, "Underserved Students Who Earn Credit Through Prior Learning Assessment (PLA) Have Higher Degree Completion Rates and Shorter Time-to-Degree," Research Brief, The Council for Adult and Experiential Learning, April 2011, http://www.cael.org/pdfs/126_pla_research_brief_1_underserved04-2011

APPENDIX

Table A1: Projected Shortfall in the United States in 2020 by Industry					
Industry	**Less than High School Degree**	**High School Degree**	**Some College, associates**	**Bachelor's, Master's, Professional, Doctorate**	**Total**
Construction	1,160,748	253,654	160,712	-101,221	1,473,894
Financial Activities	188,544	484,103	626,174	70,719	1,369,539
Healthcare Services	233,132	-377,690	-819,317	1,539,612	575,736
Information Services	-21,715	247,788	307,475	-301,303	232,244
Leisure and Hospitality	718,223	-414,696	-298,635	238,684	243,576
Manufacturing	769,906	368,923	477,177	-220,408	1,395,597
Natural Resources	371,465	17,430	-444,331	-421,458	-476,894
Personal Services	449,146	168,936	46,775	-33,579	631,278
Professional and Business Services	534,863	-18,104	262,587	-311,362	467,984
Transportation and Utilities	165,624	-179,771	284,597	-281,186	-10,736
Wholesale & Retail Trade	702,014	683,779	-480,175	698,417	1,604,036
Government and Education	23,406	1,536,399	3,159,652	-4,232,218	487,239
Total	5,295,356	2,770,750	3,282,692	-3,355,303	7,993,496
Total Private (Excluding Gov and Education)	5,271,950	1,234,352	123,040	876,915	7,506,256

Table A2: Projected Shortfall in Silicon Valley in 2020 by Industry					
Industry	**Less than High School Degree**	**High School Degree**	**Some College, associates**	**Bachelor's, Master's, Professional, Doctorate**	**Total**
Construction	9,316	9,280	2,344	-67	20,873
Financial Activities	890	5,019	2,091	5,559	13,560
Healthcare Services	2,294	6,872	6,097	-9,745	5,518
Information Services	-190	1,768	2,878	-4,719	-264
Leisure and Hospitality	11,790	3,775	9,554	-17,368	7,751
Manufacturing	5,982	9,143	247	-8,482	6,889
Natural Resources	3,705	1,571	-1,289	-2,330	1,656
Personal Services	5,134	3,841	3,784	-6,824	5,935
Professional and Business Services	5,009	3,809	12,824	-30,172	-8,530
Transportation and Utilities	462	8,377	4,608	-9,523	3,924
Wholesale & Retail Trade	8,520	13,397	-11,949	5,256	15,224
Government and Education	1,186	22,528	40,969	-62,435	2,248
Total	54,097	89,378	72,159	-140,851	74,783
Total Private (Excluding Gov and Education)	52,911	66,851	31,190	-78,416	72,536

Table A3: U.S. Shortfalls in 2020 by Industry if Immigrant Workers Grow 0%					
Industry	**Less than High School Degree**	**High School Degree**	**Some College, associates**	**Bachelor's, Master's, Professional, Doctorate**	**Total**
Construction	1,144,174	312,330	215,142	-49,596	1,622,050
Financial Activities	164,987	466,693	634,263	321,258	1,587,202
Healthcare Services	280,838	-225,571	-638,229	2,043,000	1,460,038
Information Services	-24,010	239,564	310,756	-251,446	274,865
Leisure and Hospitality	716,468	-293,955	-211,826	280,343	491,030
Manufacturing	691,859	372,945	491,623	-113,609	1,442,817
Natural Resources	362,098	83,279	-429,567	-418,764	-402,954
Personal Services	458,923	263,902	175,202	114,238	1,012,266
Professional and Business Services	600,906	74,552	403,699	205,770	1,284,928
Transportation and Utilities	243,959	-36,871	336,110	-155,515	387,684
Wholesale & Retail Trade	645,806	916,288	-355,833	789,470	1,995,731
Government and Education	117,546	1,526,770	3,199,163	-3,846,564	996,916
Total	5,403,555	3,699,927	4,130,505	-1,081,415	12,152,572
Total Private (Excluding Gov and Education)	5,286,009	2,173,156	931,342	2,765,149	11,155,656

Table A4: Silicon Valley Shortfalls in 2020 by Industry if Immigrant Workers Grow 0%					
Industry	**Less than High School Degree**	**High School Degree**	**Some College, associates**	**Bachelor's, Master's, Professional, Doctorate**	**Total**
Construction	8,989	7,042	1,856	168	18,056
Financial Activities	478	4,052	1,710	8,110	14,350
Healthcare Services	2,112	6,558	9,269	5,387	23,326
Information Services	-175	1,481	4,160	353	5,819
Leisure and Hospitality	8,649	4,118	10,088	-15,400	7,455
Manufacturing	4,848	10,952	9,718	-6,953	18,565
Natural Resources	2,239	1,894	-1,462	-1,962	708
Personal Services	2,929	4,081	5,574	-3,779	8,806
Professional and Business Services	8,372	7,434	14,954	-13,080	17,681
Transportation and Utilities	1,268	9,036	5,463	-5,999	9,768
Wholesale & Retail Trade	6,213	14,570	-10,960	4,430	14,254
Government and Education	519	22,068	40,094	-50,680	12,000
Total	46,441	93,286	90,466	-79,405	150,788
Total Private (Excluding Gov and Education)	45,922	71,218	50,372	-28,725	138,787

Table A5: U.S. Shortfalls in 2020 by Industry if Growth Rate of Immigrants Increases by 25%					
Industry	**Less than High School Degree**	**High School Degree**	**Some College, associates**	**Bachelor's, Master's, Professional, Doctorate**	**Total**
Construction	1,156,623	238,337	145,886	-115,619	1,425,226
Financial Activities	183,280	479,876	624,122	-1,626	1,285,653
Healthcare Services	220,321	-420,348	-870,365	1,392,535	322,144
Information Services	-22,271	245,861	306,632	-314,975	215,246
Leisure and Hospitality	717,785	-446,801	-322,305	227,693	176,372
Manufacturing	750,909	367,915	473,500	-248,784	1,343,540
Natural Resources	369,142	-2,961	-448,721	-422,156	-504,696
Personal Services	446,677	143,140	9,013	-78,452	520,378
Professional and Business Services	517,667	-43,033	222,325	-462,187	234,771
Transportation and Utilities	143,498	-221,319	270,549	-318,419	-125,691
Wholesale & Retail Trade	688,362	619,234	-513,684	674,296	1,468,209
Government and Education	-5,860	1,534,032	3,149,234	-4,342,351	335,055
Total	5,166,133	2,493,933	3,046,187	-4,010,045	6,696,207
Total Private (Excluding Gov and Education)	5,171,993	959,900	-103,048	332,306	6,361,152

Table A6: Silicon Valley Shortfalls in 2020 by Industry if Growth Rate of Immigrants Increases by 25%					
Industry	**Less than High School Degree**	**High School Degree**	**Some College, associates**	**Bachelor's, Master's, Professional, Doctorate**	**Total**
Construction	9,235	8,764	2,225	-98	20,126
Financial Activities	809	4,796	1,997	5,156	12,758
Healthcare Services	2,249	6,794	5,233	-13,518	758
Information Services	-194	1,712	2,484	-6,259	-2,258
Leisure and Hospitality	11,061	3,688	9,418	-17,773	6,394
Manufacturing	5,706	8,666	-2,667	-8,846	2,859
Natural Resources	3,386	1,481	-1,330	-2,421	1,116
Personal Services	4,657	3,780	3,285	-7,662	4,059
Professional and Business Services	4,053	2,778	12,245	-34,613	-15,536
Transportation and Utilities	242	8,205	4,378	-10,518	2,306
Wholesale & Retail Trade	7,987	13,097	-12,202	4,950	13,833
Government and Education	1,040	22,417	40,757	-65,480	-1,266
Total	50,232	86,178	65,823	-149,302	52,930
Total Private (Excluding Gov and Education)	49,192	63,761	25,066	-91,603	46,415

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