The Labor Market for STEM Skills

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Why does STEM matter?

1. Enhanced global, national, and regional consumer welfare via enhanced innovation and entrepreneurship

2. Greater prosperity through higher incomes of STEM workers and their colleagues and spending multipliers

3. Private benefits to those who acquire the skills and the owners of companies who employ them
Defining STEM as a set of skills
What is a STEM Job?

Conventional View:

• Definition uses no clear standard

• Professional jobs only

• 5% of US workforce

• 80 percent have a bachelor’s degree or higher
How Brookings defines STEM

- Based on O*NET survey of worker knowledge
- 21% of US workforce
- 50 percent have a bachelor’s degree or higher
- Higher correlation with wages and cognitive skill
### Major Occupational Categories Sorted by STEM Score, with Share of Jobs that are STEM, 2011

<table>
<thead>
<tr>
<th>Major Occupational Categories</th>
<th>High-STEM, Percentage of Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture and engineering</td>
<td>100%</td>
</tr>
<tr>
<td>Life, physical, and social science</td>
<td>87%</td>
</tr>
<tr>
<td>Healthcare practitioner and technical</td>
<td>76%</td>
</tr>
<tr>
<td>Computer and mathematical science</td>
<td>100%</td>
</tr>
<tr>
<td>Installation, maintenance, and repair</td>
<td>53%</td>
</tr>
<tr>
<td>Management</td>
<td>27%</td>
</tr>
<tr>
<td>Construction and extraction</td>
<td>40%</td>
</tr>
<tr>
<td>Education, training, and library</td>
<td>9%</td>
</tr>
<tr>
<td>Business and financial operations</td>
<td>42%</td>
</tr>
<tr>
<td>Farming, fishing, and forestry</td>
<td>8%</td>
</tr>
<tr>
<td>Production</td>
<td>23%</td>
</tr>
<tr>
<td>Arts, design, entertainment, sports, and media</td>
<td>16%</td>
</tr>
<tr>
<td>Sales and related</td>
<td>0%</td>
</tr>
<tr>
<td>Legal</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: The Hidden STEM Economy (Brookings Institution, 2013)
The US STEM Labor Market
The STEM Labor Market

- Long-run shortage, temporarily ameliorated by the recession

- Weak response in supply, even as salaries have increased
Wage Premium for STEM Skills, Controlling for Experience, Education, and Sex, 1950-2012

Growth in real median earnings by occupation, 2000-2013
(Source: BLS Current Population Survey)

- Architects and engineers
- Computer and math scientists
- Healthcare practitioners
- All occupation

Earnings index, 2000=1
Average salaries of software developers compared to all other workers, in 2013 dollars
(Source: Analysis of Current Population Survey, via IPUMS)
From 2009-2013, 3 out of every 10 jobs created on net have been in computer and healthcare practitioner occupations.

Growth rate in employment by occupation, 2009-2013

Source: BLS CPS
U.S. Hiring Difficulty Index, 3-month average
Source: Brookings analysis of JOLTS data, 2004-2014

Index = job openings last month per hire this month
Percent of small businesses reporting few or no qualified applicants, 2009 to May 2014

Openings per unemployed worker, April 2014
(Source: Conference Board, HWOL)

- Computer and mathematical science: 4.3
- Healthcare practitioners and technical: 3.1
- Architecture and engineering: 2.5
- Community and social services: 2.0
- Business and financial operations: 1.5
- Installation, maintenance, and repair: 1.0
- Management: 1.1
- Life, physical, and social science: 0.7
- Legal: 0.9
- Education, training, and library: 0.6
- Healthcare support: 0.5
- Office and administrative support: 0.5
- USA: 0.5
- Arts, design, entertainment, sports, and media: 0.5
- Sales and related: 0.4
- Transportation and material moving: 0.4
- Personal care and service: 0.3
- Protective service: 0.3
- Production: 0.2
- Building and grounds cleaning and maintenance: 0.2
- Food preparation and serving related: 0.2
- Installation, maintenance, and repair: 0.1
- Agriculture, forestry, fishing, and hunting: 0.0
- Building and grounds cleaning and maintenance: 0.0
Median duration of job advertisements posted in 2013-Q1 in days by STEM skill and minimum education required

<table>
<thead>
<tr>
<th>Education Level</th>
<th>Median Duration (STEM)</th>
<th>Median Duration (Non-STEM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD/Professional degree</td>
<td>25</td>
<td>14</td>
</tr>
<tr>
<td>Master's</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>Bachelor's</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>Associate's degree</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>High school</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>No requirement mentioned</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: “Still Searching: Job Vacancies and STEM Skills” (Brookings)
Median duration of 2013-Q1 vacancy advertisement by occupation
(Source: Brookings analysis of Burning Glass)

STEM vacancies are the hardest to fill.
The Computer Skills Most Commonly Requested by Employers by number of advertised vacancies in 2013
(Source: Brookings analysis of Burning Glass)
Regional Variation in STEM Markets
Percentage of Advertised Vacancies in STEM Occupations for metro areas with at least 50,000 vacancies, 2013
(Source: Brookings analysis of Burning Glass)

Percentage of Ads in STEM fields
- 0.30 - 0.38
- 0.39 - 0.42
- 0.43 - 0.44
- 0.45 - 0.49
- 0.50 - 0.59
Average occupational hiring difficulty by regional unemployment rate

(Source: Brookings analysis of Burning Glass and 2012 Census microdata via IPUMS)

- **High unemployment (>10%)**: Median duration of opening (days) = 7.4
- **Moderately high unemployment (<=10%, >=5%)**: Median duration of opening (days) = 8.5
- **Moderately low unemployment (<5%, >=3%)**: Median duration of opening (days) = 13.7
- **Low unemployment (<3%)**: Median duration of opening (days) = 14.3

Median duration of opening (days) for occupational group.
How does the STEM labor market look in Nevada?
Of Nevada's 20 Most Common Occupations with Vacancies Advertised in 2013, 9 are STEM jobs

- Secretaries and Administrative Assistants, Except Legal,
- Registered Nurses
- Sales Representatives, Wholesale and Manufacturing,
- Patient Representatives
- Bookkeeping, Accounting, and Auditing Clerks
- Retail Salespersons
- Auditors
- Software Developers, Applications
- Maintenance and Repair Workers, General
- Medical and Health Services Managers
- Information Technology Project Managers
- Computer User Support Specialists
- Office Clerks, General
- First-Line Supervisors of Retail Sales Workers
- Informatics Nurse Specialists
- Network and Computer Systems Administrators
- First-Line Supervisors of Office and Administrative...
- Financial Managers, Branch or Department
- Sales Managers
- Web Developers

Of Nevada's 20 Most Common Occupations with Vacancies Advertised in 2013, 9 are STEM jobs
In Nevada’s professional level STEM economy, relatively low demand is met with even lower supply.
STEM jobs in Nevada pay higher salaries at high and low levels of education.

Wages of STEM and non-STEM jobs by educational requirements of occupations, Nevada, 2013

Source: Brookings analysis of Bureau of Labor Statistics OES data and O*NET

- Bachelor's or higher:
  - STEM: $83,925
  - Non-STEM: $56,584

- Sub-bachelor's level:
  - STEM: $57,923
  - Non-STEM: $32,743
STEM workers in Nevada experience lower unemployment at both high and mid levels of educational attainment.

<table>
<thead>
<tr>
<th>Level of Education</th>
<th>STEM occupation</th>
<th>Non-STEM occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor's degree or higher</td>
<td>4.0%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Some college or associate's degree</td>
<td>6.3%</td>
<td>9.5%</td>
</tr>
</tbody>
</table>

(Source: Analysis of 2012 American Community Survey via IPUMS and O*NET)
Median duration of vacancies in Las Vegas for major occupations, 2013-Q1
(Source: Brookings analysis of Burning Glass data, 2013-Q1)
Computer workers have relatively high unemployment in NV, but other STEM professionals have the lowest unemployment rates in the state.
Unemployment Rates of Computer Occupations in Nevada with at Least 1000 Workers in 2012
(Source: 2012 American Community Survey via IPUMS)
Computer jobs advertised in Las Vegas require easier-to-find skills than those advertised in most metropolitan areas.

Mean advertisement duration in days of average skill requested in computer occupations advertised in 100 metropolitan areas with most vacancies, 2013
(Source: Brookings analysis of Burning Glass data)

San Jose, 44.2
Boulder CO, 41.4
Las Vegas, 39.8
Honolulu, 38.1
The Supply Problem
1987: Majors by field for STEM and non-STEM (Source: NSF)

- Non-STEM; 724,468; 72%
- Engineering; 74,423; 7%
- Computer sciences; 39,927; 4%
- Math; 16,515; 2%
- Biology; 39,047; 4%
- Physical Sciences; 20,155; 2%
- Health Professions; 64,399; 6%
- Engineering technologies; 19,138; 2%
- Agriculture Science; 5,355; 1%
- Science Technologies; 105; 0%
2012: Majors by field for STEM and non-STEM (Source: NSF)

- Science Technologies: 568 (0%)
- Engineering Technologies: 16,040 (1%)
- Agriculture Science: 16,365 (1%)
- Computer Sciences: 41,745 (5%)
- Math: 18,838 (1%)
- Biology: 96,912 (6%)
- Physical Sciences: 26,347 (1%)
- Engineering: 82,197 (5%)
- Health Professions: 152,734 (9%)

Non-STEM: 1,288,267 (74%)
Engaging young women in STEM can help narrow the STEM gap in Nevada

Female share of bachelor’s degree holders by STEM field, ages 18 to 30, Nevada, 2010-2012

Source: Brookings analysis of 2010-2012 American Community Survey via IPUMS
Closing the STEM opportunity gap will also require elevating STEM completion rates for under-represented young populations, especially African Americans and Latinos.
Why don’t more people get STEM training?

1. Success in STEM depends on knowledge acquired as a child. High wage premiums for STEM degree holders don’t make parents and teachers better at teaching STEM subjects or children more committed to learning them.

2. Switch-out rates are extremely high and correlated with math experience and skill, suggesting inadequate K-12 prep and higher-ed resources.

3. Cultural and social barriers prevent many women, blacks, and Latinos from pursuing a STEM degree.
How to boost STEM Skills

The to-do list

1) Enrich infant/toddler home life

2) Improve pre-K to 10th grade quality across the board

3) Allow students to take post-secondary level classes during last two years of high school

4) Lower cost of college and adopt best practices in retention and completion in higher-education

5) Expand access to adult training & improve curriculum alignment with demand

Who Needs to do it

1) Non-profits; state & local governments

2) Non-profits; state & local governments

3) Non-profits; state & local governments

4) Governments, non-profits and Higher Ed via innovation, tuition support, tutoring, and mentoring

5) Governments; Colleges; Businesses via philanthropic investments, apprenticeships, internships, and on-the-job training
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www.brookings.edu/metro

Hidden STEM Economy
http://www.brookings.edu/research/reports/2013/06/10-stem-economy-rothwell

Still Searching : Job Vacancies and STEM Skills
http://www.brookings.edu/research/interactives/2014/job-vacancies-and-stem-skills#/M10420