Dynamics of Engineering Labor Markets: Do Employers Need Government Intervention?

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Georgetown University
Mortara Center for International Studies
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Engineers Wanted:
Is there a market failure?

The S&E Problem:
- Not enough—for what?
  - The jobs available?
  - For supply-induced innovation?
  - For diffusion of engineering skills?
  - “The Future”? Here and There (US and China)

- Why?
  - Lack of student interest?
  - Lack of student ability?

The Solution:
- A “New Sputnik Moment” …..or Markets?
U.S. trends in student mathematics performance

*National Assessment of Educational Progress (NAEP 2008)*

**Changes since 1973**

<table>
<thead>
<tr>
<th>Age Group</th>
<th>White</th>
<th>Black</th>
<th>Hispanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 9</td>
<td>Δ 25 points</td>
<td>Δ 34 points</td>
<td>Δ 32 points</td>
</tr>
<tr>
<td>Age 13</td>
<td>Δ 16 points</td>
<td>Δ 34 points</td>
<td>Δ 29 points</td>
</tr>
<tr>
<td>Age 17</td>
<td>Δ 4 points</td>
<td>Δ 17 points</td>
<td>Δ 16 points</td>
</tr>
</tbody>
</table>


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U.S. share of all OECD high-performing students: Science, math and reading

Science
- U.S.: 33.0%
- Canada: 5.0%
- Germany: 9.0%
- U.K.: 11.0%
- Japan: 17.0%
- Other OECD countries: 25.0%

Math
- U.S.: 14.1%
- Canada: 5.1%
- France: 5.1%
- U.K.: 5.1%
- Germany: 11.1%
- Japan: 15.2%
- Korea: 16.2%
- Other OECD countries: 28.3%

Reading
- U.S.: 33.7%
- Canada: 5.1%
- France: 5.1%
- U.K.: 5.1%
- Germany: 9.0%
- Japan: 6.9%
- Turkey: 5.0%
- Other OECD countries: 24.8%
- Other OECD countries: 25.0%
- Japan: 11.9%
- Korea: 16.2%

Source: These figures are reproduced from: Salzman and Lowell, 2008; “Making the Grade” Nature 453, 28-30.

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Intersection of highest degree in science & engineering and S&E occupation: 2006


Science and Engineering Indicators 2010

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# The Global Engineering Race?

## Growth of infrastructure between 1997 to 2007

<table>
<thead>
<tr>
<th>Length, Miles</th>
<th>United States(^1)</th>
<th>China(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstate/Expressway</td>
<td>608</td>
<td>30,519</td>
</tr>
<tr>
<td>Navigable Channels</td>
<td>(680)</td>
<td>8,510</td>
</tr>
<tr>
<td>Rail</td>
<td>(4,030)</td>
<td>7,436</td>
</tr>
</tbody>
</table>

(From: Lynn and Salzman, 2010) Sources:


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The Global Engineering Race?

Figure 2. Steel and cement consumption* in the United States and China, 1997-2007

Sources:

*USA cement consumption = production (excluding clinker) + import for consumption (excluding clinker) - exports
*China cement consumption = production - export

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Do Labor Markets Work (I)?
Do Labor Markets Work (II)?
Engineers in the Petroleum Industry: A Case of a Responsive Market?

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Why the increase in demand?

- Exploration
- New pipelines/Natural Gas
- Demographics – aging workforce
- Retirements and company policies
- Recruitment barriers in U.S./AK
Petroleum engineering graduates

Total graduates

Source: IPEDS; Tabulations: Kuehn & Salzman, 2010
Salary data from BLS & NACE

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Petroleum engineering graduates

Total and U.S. [citizen & perm. resident] grads

Source: IPEDS; Tabulations: Kuehn & Salzman, 2010
Salary data from BLS & NACE
Figure 7
Petroleum Engineer Graduates on Student (Temporary) Visas

- BS-pct
- MS-pct

## Immigration yield for Top 10 H-1B employers

### FY07-09

<table>
<thead>
<tr>
<th>H-1B Rank</th>
<th>Company</th>
<th>H-1Bs FY07-09</th>
<th>Greencard Apps FY07-09</th>
<th>Immigration Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Tata</td>
<td>2,368</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>3</td>
<td>Satyam</td>
<td>3,557</td>
<td>37</td>
<td>1%</td>
</tr>
<tr>
<td>2</td>
<td>Wipro</td>
<td>7,216</td>
<td>125</td>
<td>2%</td>
</tr>
<tr>
<td>10</td>
<td>Accenture</td>
<td>1,396</td>
<td>28</td>
<td>2%</td>
</tr>
<tr>
<td>1</td>
<td>Infosys</td>
<td>9,625</td>
<td>476</td>
<td>5%</td>
</tr>
<tr>
<td>9</td>
<td>Intel</td>
<td>1,454</td>
<td>163</td>
<td>11%</td>
</tr>
<tr>
<td>8</td>
<td>IBM</td>
<td>1,550</td>
<td>382</td>
<td>25%</td>
</tr>
<tr>
<td>6</td>
<td>Deloitte</td>
<td>1,896</td>
<td>588</td>
<td>31%</td>
</tr>
<tr>
<td>7</td>
<td>Cognizant</td>
<td>1,669</td>
<td>702</td>
<td>42%</td>
</tr>
<tr>
<td>4</td>
<td>Microsoft</td>
<td>3,318</td>
<td>2,214</td>
<td>67%</td>
</tr>
</tbody>
</table>

Solving the S&E “Shortage”: Are Markets “the Problem”?

Is government market intervention the response to the price of a free-market solution?

Source: IPEDS; Tabulations: Kuehn & Salzman, 2010
Salary data from BLS & NACE

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A College Degree, but Not a College Job

A growing share of recent college graduates are having to settle for jobs that do not require a college degree, and they are earning far less than their peers as a result.

Employment status of college graduates under age 25

<table>
<thead>
<tr>
<th>All College Graduates 2009</th>
<th>Working in jobs that require a college degree</th>
<th>Median annual income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not working</td>
<td>22.4%</td>
<td>College degree required: $26,756</td>
</tr>
<tr>
<td></td>
<td></td>
<td>College degree not required: $15,896</td>
</tr>
<tr>
<td>Working in jobs that do not require a college degree</td>
<td>55.6%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Computer Science/Math Majors</th>
<th>Median annual income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>College degree required: $34,100</td>
</tr>
<tr>
<td></td>
<td>College degree not required: $17,561</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Humanities Majors</th>
<th>Median annual income</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>College degree required: $20,953</td>
</tr>
<tr>
<td></td>
<td>College degree not required: $14,051</td>
</tr>
</tbody>
</table>

Source: Andrew Sum, Northeastern University

THE NEW YORK TIMES