Skills Challenges Threatening U.S. Competitiveness in the Global Economy

National Skills Conference
Dublin
October 26, 2006

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Topics

I. Challenges Facing U.S. Skills Needs

II. Skills Needs in Regional Innovation-Driven Economies
   - A. Massachusetts
   - Silicon Valley, California

III. Concluding Comments

I. Challenges Facing U. S. Skills Needs: Highlights from Recent Reports*

[1] Education: Science & Engineering (S&E); Math & Science

[2] The Workforce

[3] Research and Development (R&D)

[4] Globalization and U.S. Skills Needs

* *See separate handout, Bibliography*

[1] Education

- Between 1980 and 2000, the total # of S&E degrees awarded in the U.S. grew on avg. 1.5% a year, considerably less than the 4.2% annual growth of S&E occupations.

- S&E doctoral degrees awarded in the U.S. peaked in 1998. They grew slightly in 2003, due primarily to foreign students.

- In 2003, foreign students earned 60.3% of the Engineering doctorates awarded in the U.S , and 50% of those in Math/Science.

Education (cont.)

- These countries are building an S&E infrastructure at home.
  - China graduates almost 4 times as many engineers as the U.S. So. Korea with 1/6th the population, graduates roughly the same # as the U.S.
  - From 1991 to 2001, S&E doctorates awarded in China grew by 580% (to 8,153); in India, growth was 26% (to 6,318). In the U.S., growth was 8.4% (to 27,160).
- In 2004, foreign applications to U.S. graduate engineering programs fell by 36%.
- U.S. students continue to lag behind their peers in many developed countries in tests of math and science performance. For example, in 2003 the U.S. ranked 24th of 29 OECD countries in overall performance in math of 15 year-old students.

[2] The Workforce

- U.S. BLS projections for 2002-2012 forecast employment in S&E occupations will increase about 70% faster than the overall growth rate for all occupations.
- Retirements will also create vacancies. 29% of all S&E degree holders in the U.S. labor force are age 50 or over.
- 25% of all college educated workers in S&E occupations in 2003 were foreign born.

Workforce (cont.)

- Between 2000 and 2003, about 90% of the recipients of S&E doctorates from China and India planned to stay in the U.S. This % is expected to fall as the economies of these countries increasingly offer good work opportunities for well-educated workers.

- Since 9/11/2001 immigration policy has deterred foreign nationals from coming to study or work in the U.S.

[3] Research and Development (R&D)

- The U.S. is 5th among OECD countries in R&D expenditures as a % of GDP (2.7%).

- U.S. federal funding of R&D peaked in the 1980s. Private sector R&D investments, which tend to be cyclical and focus on shorter-term results rather than basic research, now far exceed federal investment.

- In the 2005 federal budget Congress cut funding for the National Science Foundation (NSF) for the first time in 16 years.

R&D (cont.)

- The growth rate of researchers in the U.S. is growing at about 1/3 below that of the OECD average.
- The U.S. share of S&E papers published and citations worldwide is falling.
- U.S. patent applications from Asia are outpacing those from the U.S.

[4] Globalization and U.S. Skills Needs

- The global knowledge economy is growing and including an expanding number of countries.
- Out-sourcing and off-shoring are no longer focused on low- cost, low-skill functions.
- The U.S. share of high-tech exports has been in a 20-year decline, falling from 31% in 1980 to 18% in 2001. Since 2001 the trade balance for high-tech products has been in deficit.
- Global supply chains require partnerships and collaboration across borders.

Globalization (cont.)

- Dominance of the U.S. in areas such as S&E degrees, patents, and academic citations is being challenged. The U.S. will increasingly be dependent on R&D and research from other countries.

- While the U.S has been a leader in innovation, it often lags other countries in the adoption of technologies (e.g., robots, cell phones, the Internet).

- *In sum, there is no shortage of challenges facing the U.S. regarding its future skills needs if it intends to remain competitive in the global economy!*

II. Skills Needs in Regional Innovation-Driven Economies

- **Massachusetts (MA)**
  - The annual *Index of MA Innovation Economy* tracks 20 indicators, comparing the performance of MA with 8 other Leading Technology States (LTS). [www.masstech.org]
  - The population of MA is approximately 6 mil.

- **Silicon Valley**
  - The annual *Index of Silicon Valley* documents and analyzes trends in the Valley, which is located in the southern part of the San Francisco Bay area in Northern California. [www.jointventure.org]
  - The Silicon Valley population is approximately 2.4 mil.

A. Massachusetts: Key Employment Clusters

- Financial services
- Innovation services (i.e., scientific research & development, scientific and technical consulting, engineering, legal…)
- Post-secondary education
- Software & communication services
- Computer and communications hardware
- Defense manufacturing & instrumentation
- Life sciences (medical devices, biotech, and pharmaceuticals)
- Health Care

B. Silicon Valley: Key Employment Clusters

- Software
- Creative and Innovative Services
- Semiconductor & Semiconductor Equip. Mfg.
- Computer & Communications Hardware Mfg.
- Electronic Component Mfg.
- Biomedical

Key Factors Underlying These Two 'High-Tech' Regions

1. Dynamic network of colleges and universities (including MIT and Stanford University)

2. Well-educated and highly-skilled workforce, including a strong scientific and technical component

3. R&D

4. Entrepreneurial culture

5. Venture capital

6. Focus on the 'front-end' of production life cycles (innovation; research; experimentation; new products, processes, & technologies; prototype production)

Other Common Characteristics

- Both are relatively high cost regions.
  - Relatively high salaries, but also relatively high education levels and productivity.
  - Relatively high housing costs.
- Both were hurt relatively hard in the dot.com bust and recent recession (2000-2005).
- Both are highly dependent on the in-migration of skilled professionals.

A. The MA Innovation Economy

- MA leads the Leading Technology States (LTS) in:
  - Total federal R&D expenditures per capita.
  - Patents per capita
  - % of the adult population with a bachelor's degree (36.5%)

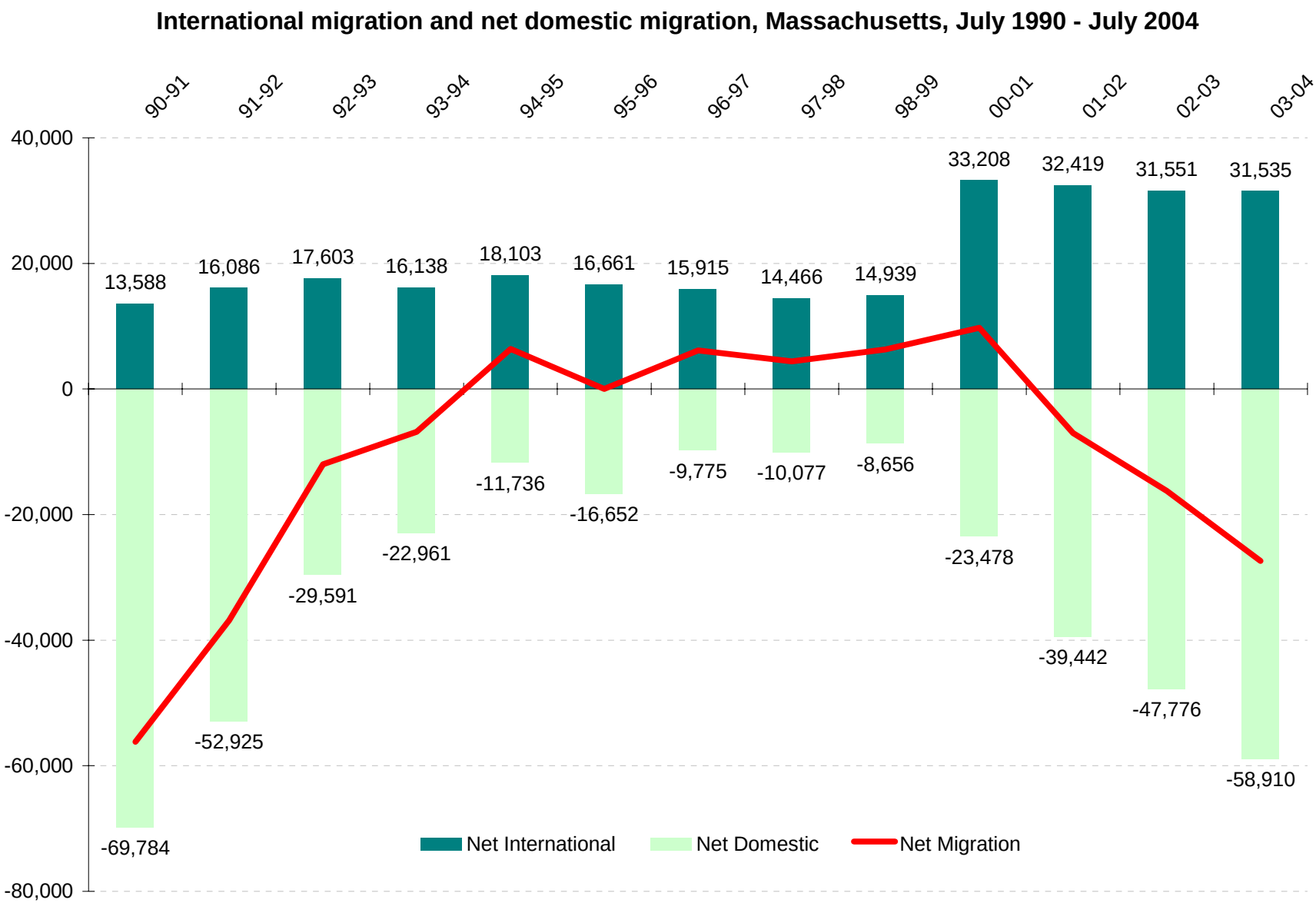
- MA continues to be second, only to CA, in the amount of venture capital funds available.

- The state has a strong rate of new business incorporation.

- MA 4th and 8th graders score well relative to US and LTS on math and science exams.

- MA has experienced an 11% increase in the # of engineering degrees awarded 2000-2004.

…..*however*


International migration and net domestic migration, Massachusetts, July 1990 - July 2004
90-91
91-92
92-93
93-94
94-95
95-96
96-97
97-98
98-99
00-01
01-02
02-03
03-04
40,000
20,000
0
-20,000
-40,000
-60,000
-80,000
13,588
16,086
17,603
16,138
18,103
16,661
15,915
14,466
14,939
33,208
32,419
31,551
31,535
-69,784
-52,925
-29,591
-22,961
-11,736
-16,652
-9,775
-10,077
-8,656
-23,478
-39,442
-47,776
-58,910
Net International
Net Domestic
Net Migration

Weak Link in the MA Innovation Infrastructure

- The MA Innovation Economy is threatened by worker and skills shortfalls.
  - Migration
    - In 2004, almost 60,000 people moved out of MA, compared to about 9,000 in 1999. Many who leave the state are 25-44 years old and college-educated.
  - Housing Costs
    - Median house price of a single family home in MA in 2004 was $340,000 (vs. $211,700 in the U.S.) CA leads at $399,900).

B. Silicon Valley --- in Transition

- Silicon Valley continues to have the core assets of an innovation-driven economy:
  - Strong talent base, with scientific, technical and business professionals coming from all over the world.
  - 'Venture capital' capital of the world
  - Strong entrepreneurial culture
  - Strength in patents and business creation

- Region lost 200,000 jobs 2000-2005… while thousands of new businesses were created.
  - Ongoing disruptions and dislocations
  - Of 432 occupations represented in the region, 55% lost jobs, while 42% added jobs. (3% had no change.)

Silicon Valley: Becoming the World Center for Creativity

- The number of top-level engineering, scientific and management professionals has risen since 2000. [53% of engineers and scientists are foreign born.]

- Traditional culture focusing on engineering and entrepreneurship is changing to focus more on consumers. This shift requires more creative teams, valuing 'right brain' creative skills such as marketing, branding, design and customer service.

- "Creative occupations" are broadly defined to include: designers, computer scientists, physical scientists, life scientists, social scientists, business strategists, & visual artists.

III. Concluding Thoughts on U.S. Future Skills Needs

- YES, U.S. needs more Engineering, Scientific and Math skills/graduates.

- It also needs:
  - MANAGERS and LEADERS:
    - with GLOBAL management and leadership skills, able to promote and implement cross-country partnerships & collaborations
    - with ability and interest in generating greater adoption of ideas and technologies, regardless of country of origin.

Concluding Thoughts (cont.)

- ENTREPRENEURS and ‘CREATIVE’ individuals across a range of fields.
- A K-12 SCHOOL SYSTEM able to provide the education necessary for all students to compete in the 21st century.
- On-going WORKFORCE RE-TRAINING especially given increased workforce ‘churn’ in innovation-driven economies.
- IMMIGRATION POLICIES that encourage the ‘best and the brightest’ to study and work in the U.S.