



# Pratt School of Engineering

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## Globalization, Elephants and Dragons

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# Summary of 8 Research Projects – Duke, UC Berkeley, NYU, Harvard

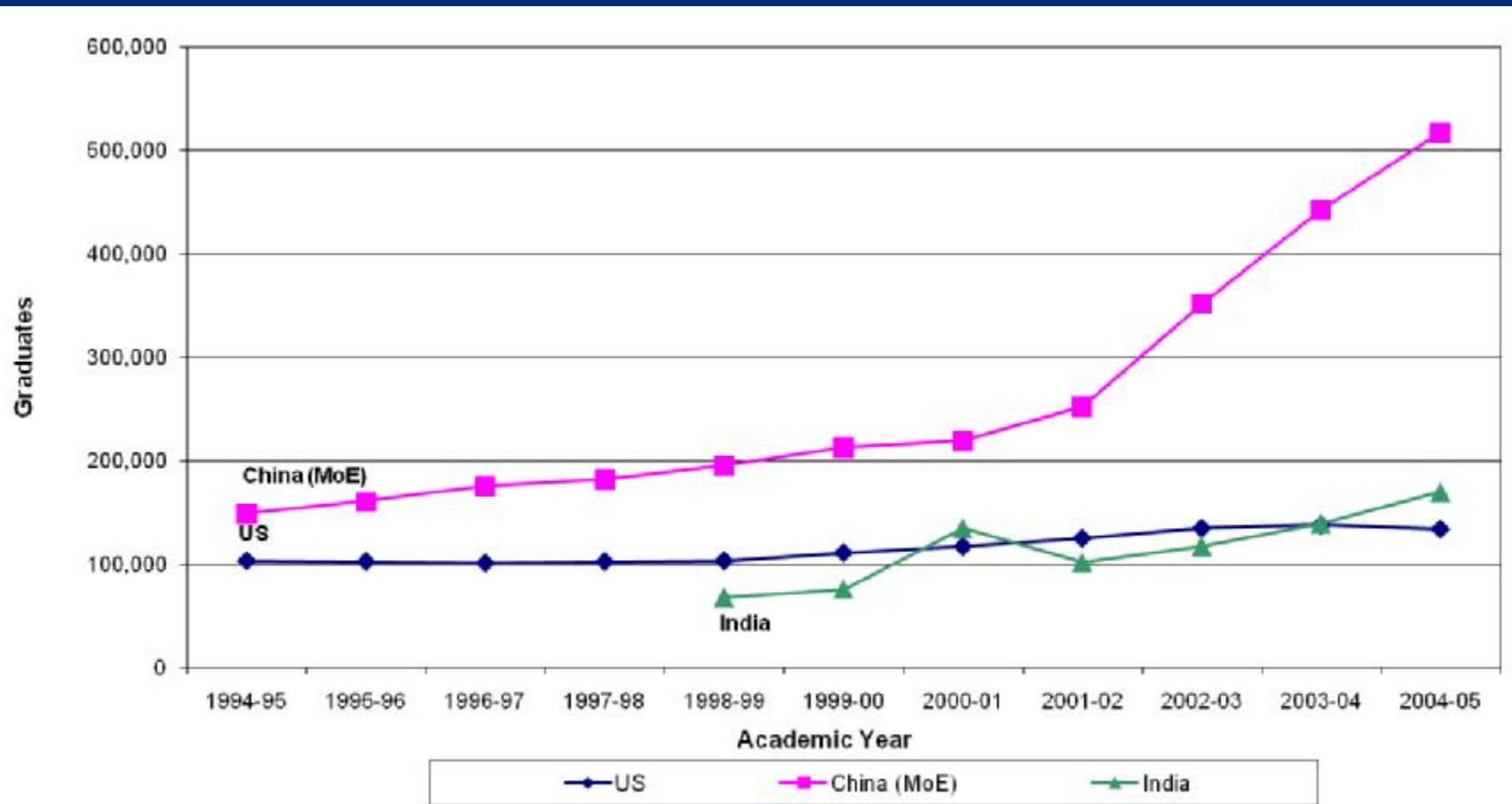
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- § Graduation rates of engineers in India/China
- § Where are the shortages?
- § Skills/productivity of Indians/Chinese vs. Americans
- § Reasons for companies going offshore
- § Do bachelors degrees even matter?
- § Accomplishments of Indians and Chinese immigrants
- § Reverse brain-drain
- § The next wave



# Bachelors Degrees in Engineering, CS and IT

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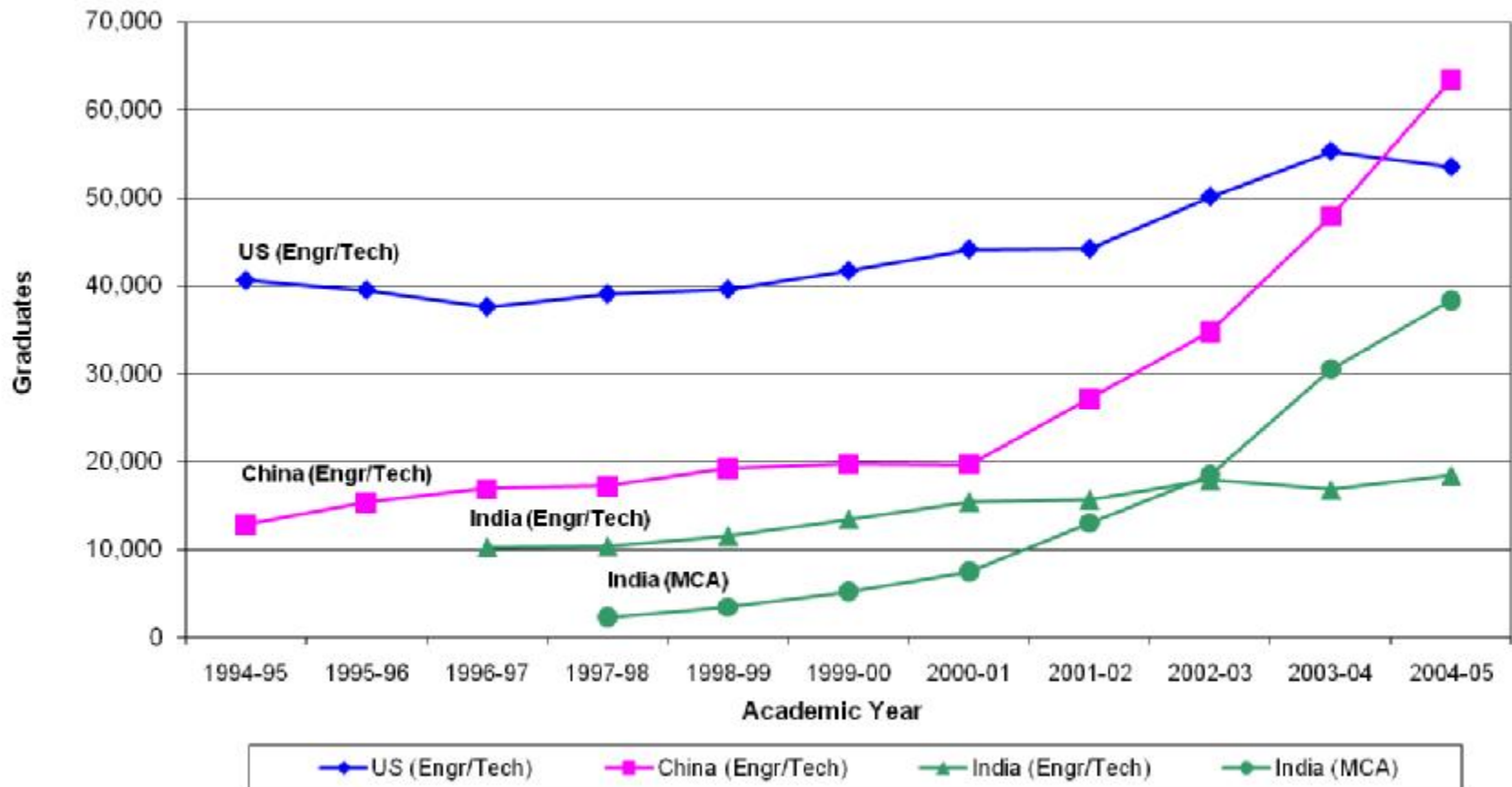


**China numbers are suspect – inconsistent data collection, unrelated degrees, independent verification is not possible.**



# Masters Degrees in Engineering, CS and IT

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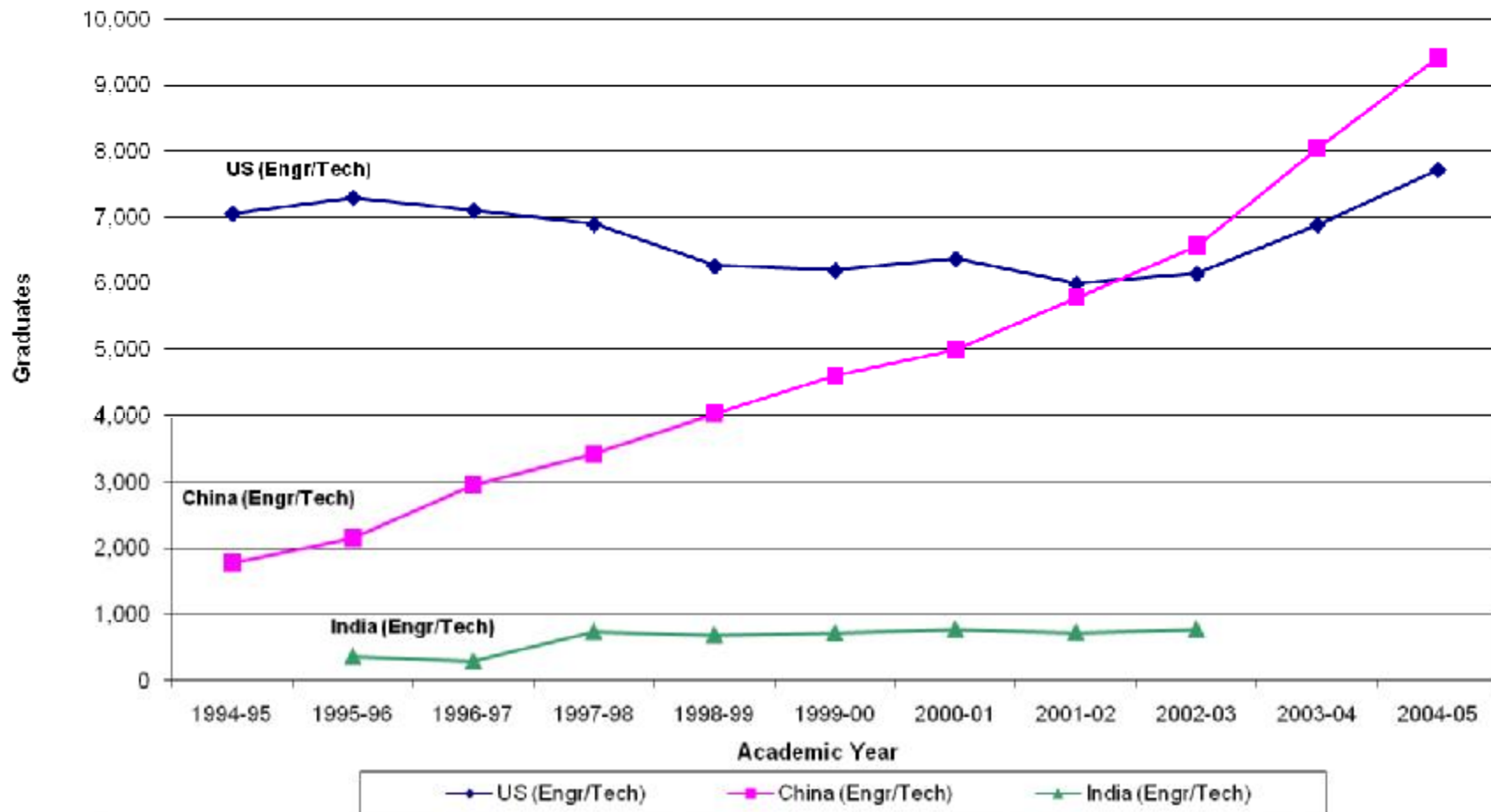


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# PhD's in Engineering, CS and IT

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# Where are the shortages?

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## Survey of 78 divisions of 58 U.S. based companies involved in engineering outsourcing

### Acceptance Rates in the U.S.:

- § 47% reported acceptance rates greater than 60%
- § 80% said acceptance rates had increased or stayed constant

### § Signup Bonuses offered in the U.S.:

- § 88% offered no bonuses or to less than 20% of hires

### § Time to Fill an Open position in the U.S.:

- § 80% said engineering jobs were filled within 4 months

***In other words – no shortages of engineers in the U.S.***



# Where are the shortages?

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§ Adequate to Large Supply of Well-Qualified Entry Level Workers:

§ India – 75%

§ U.S. - 59%

§ China - 54%

***No shortages in India, and greater supply in the U.S. than China??***



# Skills of Indians/Chinese vs. Americans

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- § Productivity -- 87% said U.S. workers more productive or equal
- § Quality -- 98% said U.S. locations produced higher or equal quality
- § Relative Advantages:
  - § U.S. -- communication skills, understanding of U.S. industry, business acumen, education/training, proximity to work centers
  - § China -- cost, willingness to work long hours
  - § India -- cost, technical knowledge, English, strong work ethic

***Americans are ahead in productivity, quality, market knowledge  
but Indians and Chinese workers cost less and work harder***





# Do bachelors degrees even matter?

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## Degree Requirements:

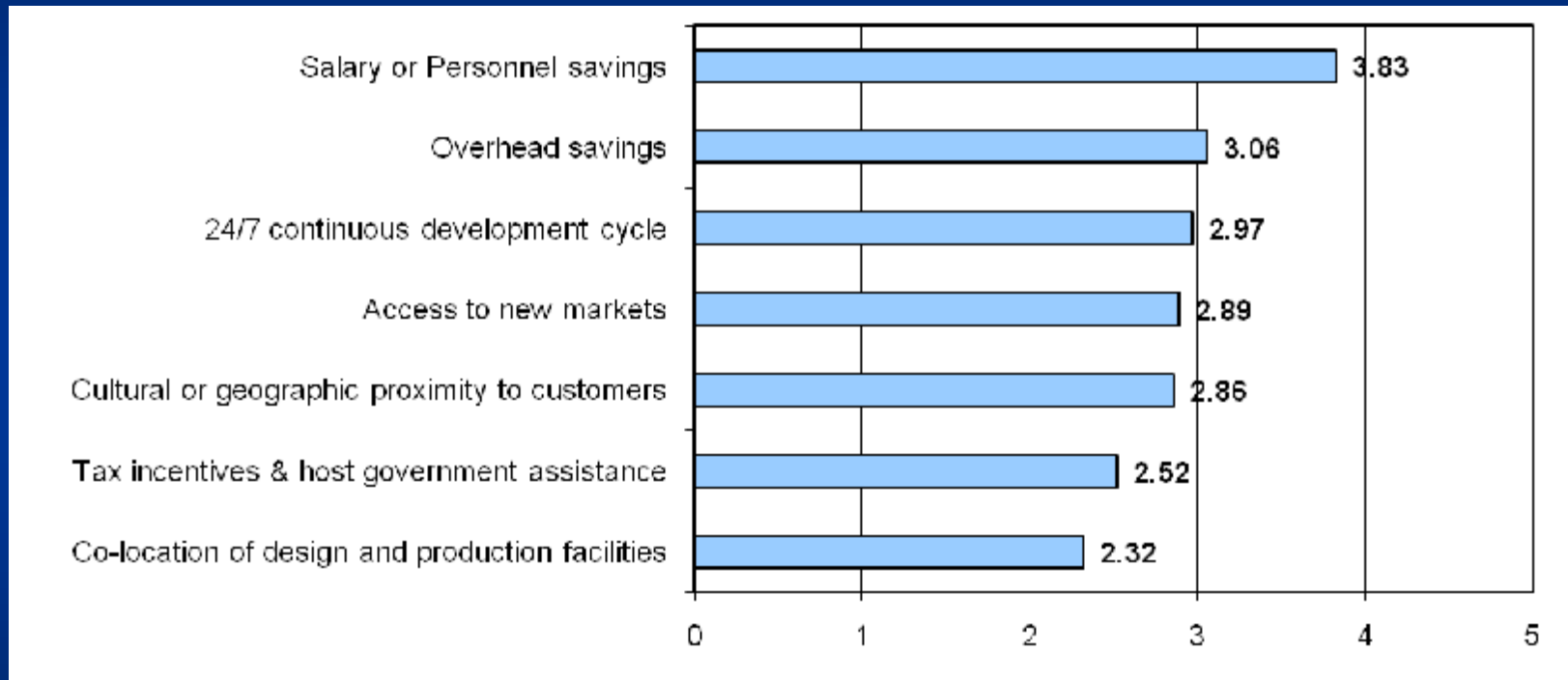
§ 44% hired engineers with 2- & 3-year degrees. Additional 17% would hire such applicants if they had additional training or experience

***Companies will make do with the best talent they can find and train employees as needed***



# Reasons for companies going offshore

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In your offshoring endeavors, how much of an advantage, if any, has your company gained from the following? (1: No Advantage; 2: Slight Advantage; 3: Moderate Advantage; 4: Strong Advantage; 5: Significant Advantage)

***It's its all about cost savings and access to markets***



# Americas New Immigrant Entrepreneurs

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Tech and Engineering companies founded from 1995-2005 (2054 Surveyed):

- § 25.3% nationwide had an immigrant as a key founder
- § 52.4% of Silicon Valley startups founded by immigrants
- § 2005 revenue -- \$52 billion. Employed 450,000
- § Indians founded 26% of these -- more than the next 4 groups (from U.K, China, Taiwan and Japan) combined

## WIPO Patents:

- § 25.6% had foreign national authors in 2006. This increased from 7.6% in 1998
- § 16.8% had a Chinese-name and 13.7% had an Indian-name authors in 2006. This increased from 11.2% and 9.5% in 1998



# Background of Americas New Immigrant Entrepreneurs

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- § 96% of immigrant company founders have bachelors degrees
- § 74%+ have a Masters or PhD
- § 75%+ have degrees in engineering, math or science related fields
- § 52% obtained degrees in the U.S. and stayed after graduation
- § Plus anecdotal evidence indicates that immigrants who come to the U.S. are risk takers and highly entrepreneurial



# U.S. Immigration Backlog

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Legal, Educated, skilled workers currently waiting for green cards:

- § 500,040 in main employment-based visa categories plus 555,044 family members
- § 259,717 international graduate students plus 38,096 in practical training (includes postdoctoral scholars)

Permanent resident visas available yearly:

- § 120,120 in the 3 main employment visa categories (EB-1, EB-2, and EB-3).
- § Largest numbers in queue from India and China
- § Max. number of visas per country – 8,400 (7% of pool)

***Over 1 million skilled immigrants waiting for yearly quota of 120,000 visas – with 8,400 max/country***

***We're headed for a massive reverse brain-drain***



# Next Wave of Globalization

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## India as a center of research, design and innovation:

### § Pharmaceutical

§ Drug discovery, specialty pharmaceuticals, biologics, high value, bulk manufacturing, advanced intermediate manufacturing

### § Aerospace

§ In-flight entertainment, airline seat design, collision control systems, navigation control systems, fuel inverting controls, first-class cabin design

### § Consumer Appliances/Semiconductors, etc.

§ Design of next generation washing machines, dryers, refrigerators, digital TV, cell phones – base stations, automobiles, tractors, locomotive motors



# Effect of Educated, Skilled Returnees

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Anecdotal data/observations:

Intrapreneurship:

- § In pharmaceutical industry, most of PhD's involved in drug discovery in Ranbaxy, Aurigene, and Dr. Reddy's labs received their PhD's in the U.S.
- § GE India -- one third of R&D staff are returnees from the U.S.
- § IBM India -- half of the PhD researchers returned from the U.S.

Entrepreneurship:

- § Founders/CEO's, CTO's of an increasing number of startups in India and China are experienced executives who returned from the U.S. and Europe

***Returnees appear to be fueling R&D and innovation and company formation in India and China***