MITSUBISHI ELECTRIC RESEARCH LABORATORIES
Cambridge, Massachusetts

The Globalization of IT Research

Richard C. Waters
Chairman subcommittee on the globalization of research
ACM job migration task force

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MELCO & MERL

- ## What is Mitsubishi Electric (MELCO)?
  - A Japanese $32B/year diversified electrical manufacturer

- ## What is Mitsubishi Electric Research Labs (MERL)?
  - The North American arm of Melco Corporate R&D
    - IT research and advanced development
    - 82 people in Cambridge MA

- ## MERL is an example of
 - The United States' positive balance of trade in IT research!

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Overview

- ## The current situation in IT research
  - The US is very dominant
  - The G7 is extremely dominant

- ## How things are changing
  - Research is becoming more global
    - Things are changing slowly and the dominance remains, but the direction of change is clear and almost certainly unstoppable

- ## What needs to be done
  - Every place and everyone needs to take globalization seriously
  - Those that dominate cannot continue to dominate as they have
    - (At least not in a percentage sense)
  - They will have to work hard if they want to stay strong

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The Current Distribution of IT Research
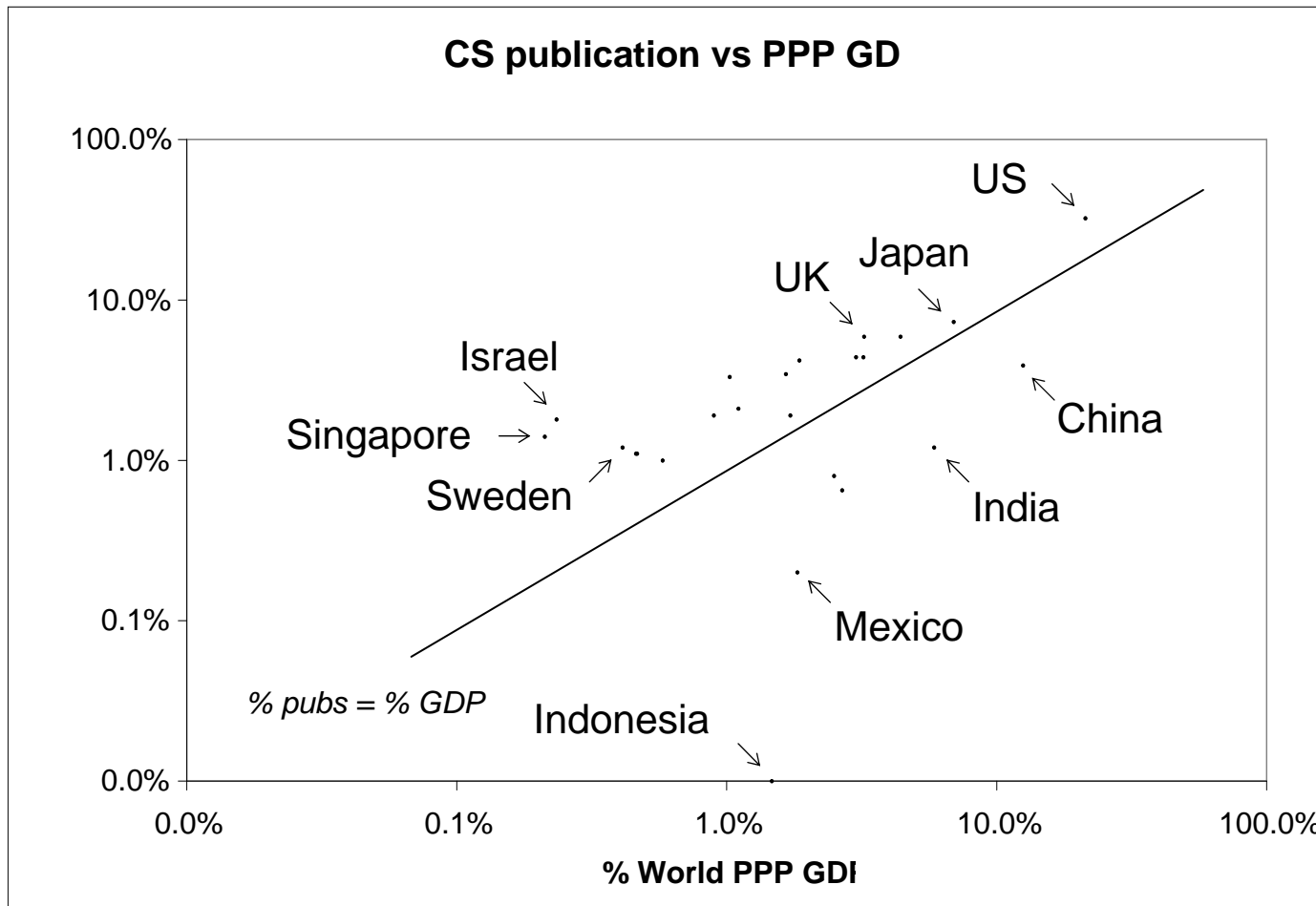
1999-2003 average publication data (from Thomson ISI) vs 2004 PPP GDP

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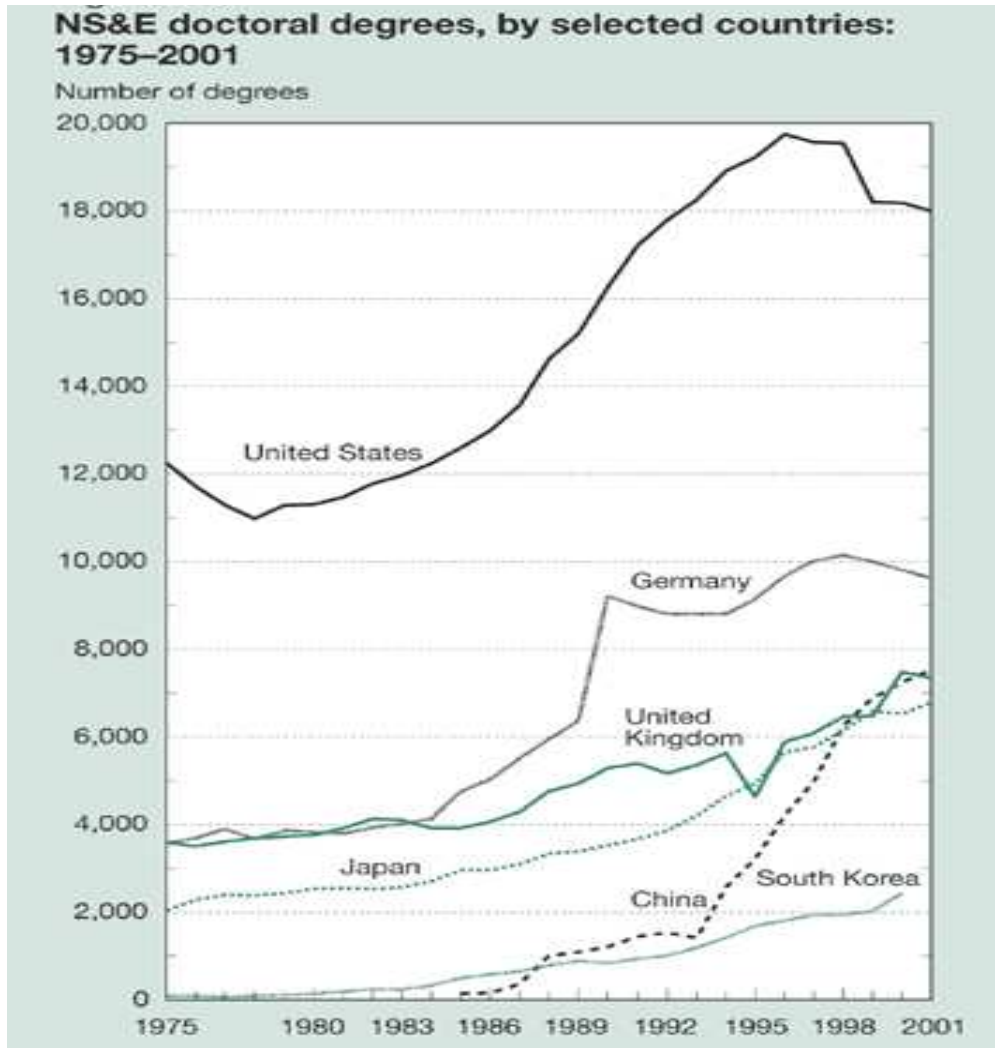**MITSUBISHI ELECTRIC**
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The Current Balance of US R&D Trade

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

The IT research balance is almost surely a lot more in favor of the US

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Changes in PhD Production

NS&E doctoral degrees, by selected countries: 1975–2001

The IT PhD balance is probably a lot more in favor of the US,

But the changes may well be the same

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Changes in Technical Immigration To the US

Student, exchange visitor, and other high-skill-related temporary visas issued: FY 1998–2003
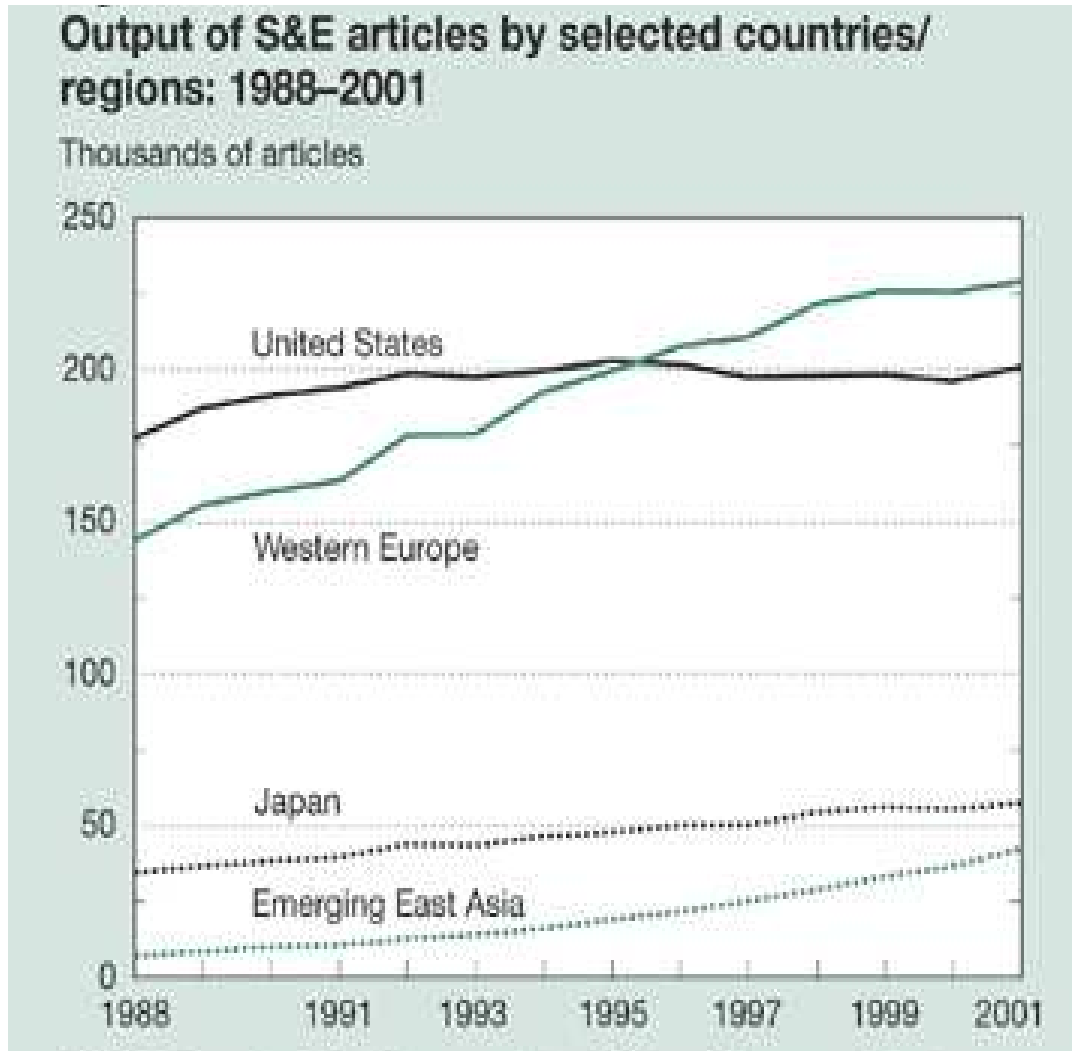
Number of visas
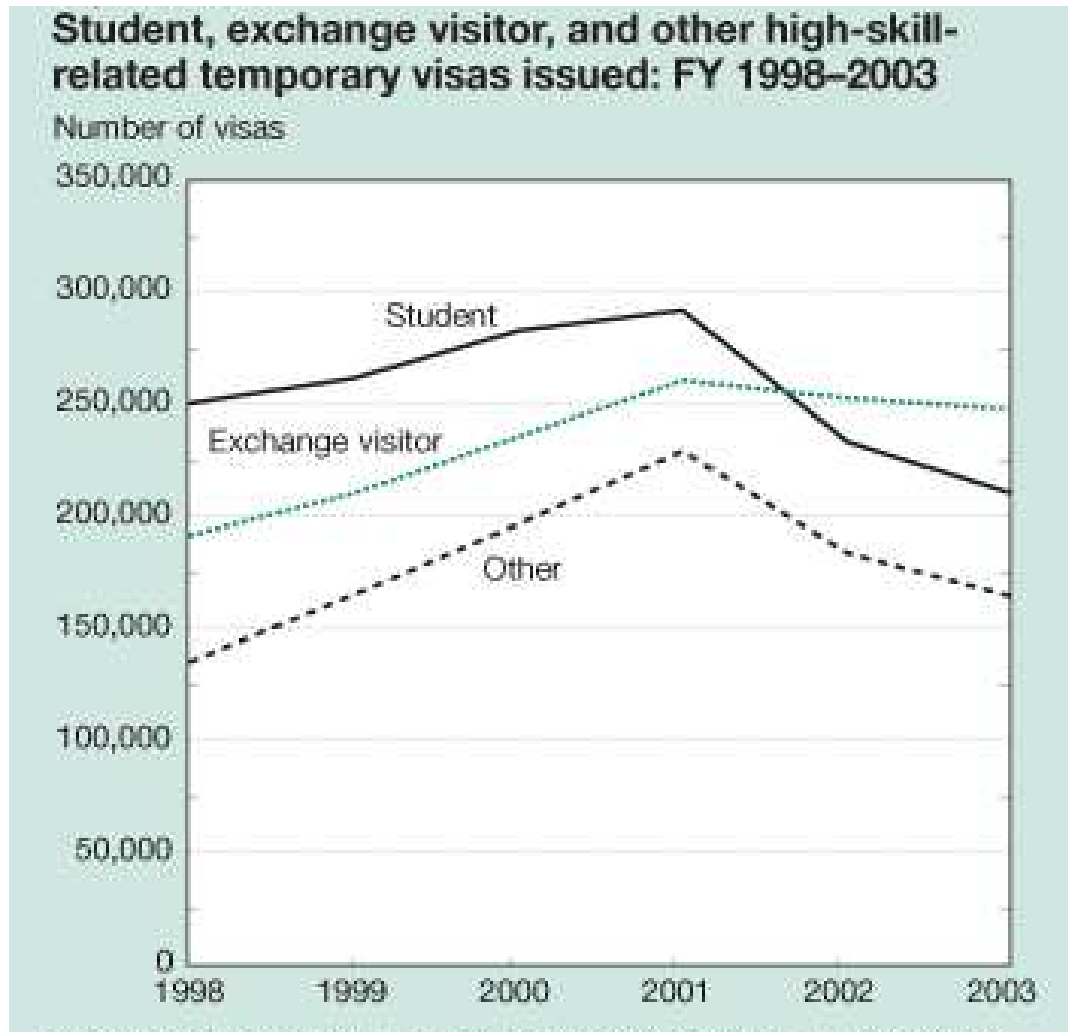
In 2001, 63% or IT PhDs were awarded to foreign students,

And 56% of the foreign students who got IT PhDs in 1996 were still in the US in 2001

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Changes in Publication Rates

Output of S&E articles by selected countries/regions: 1988–2001

The IT publication balance is a lot more in favor of the US,

But the changes may well be the same

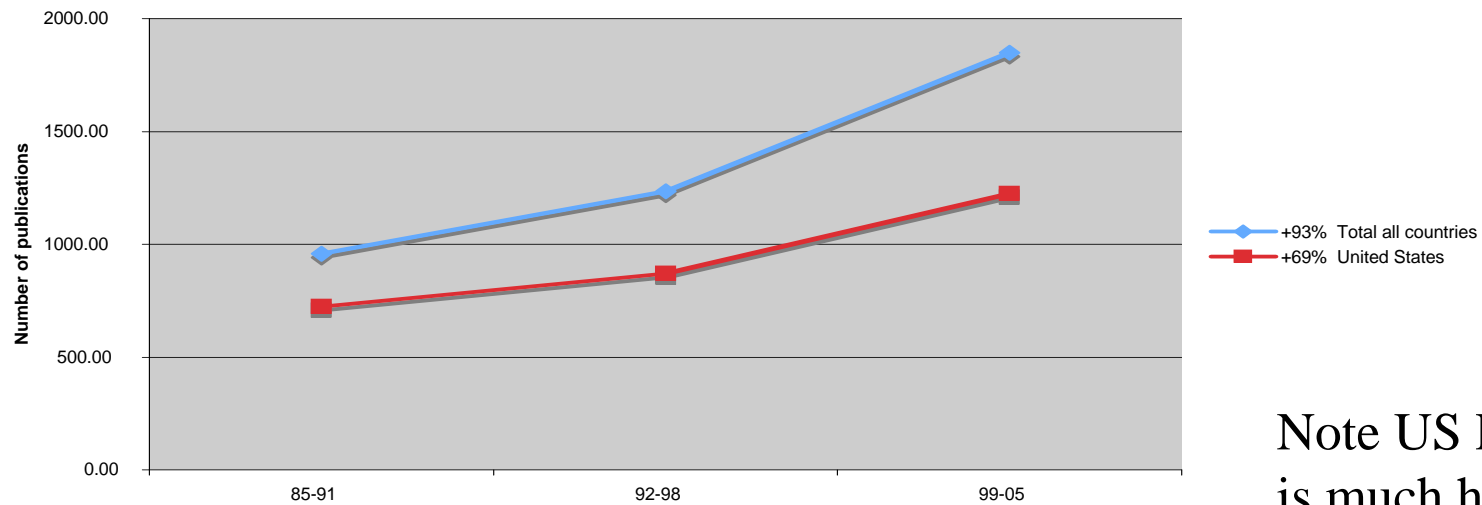**MITSUBISHI ELECTRIC**
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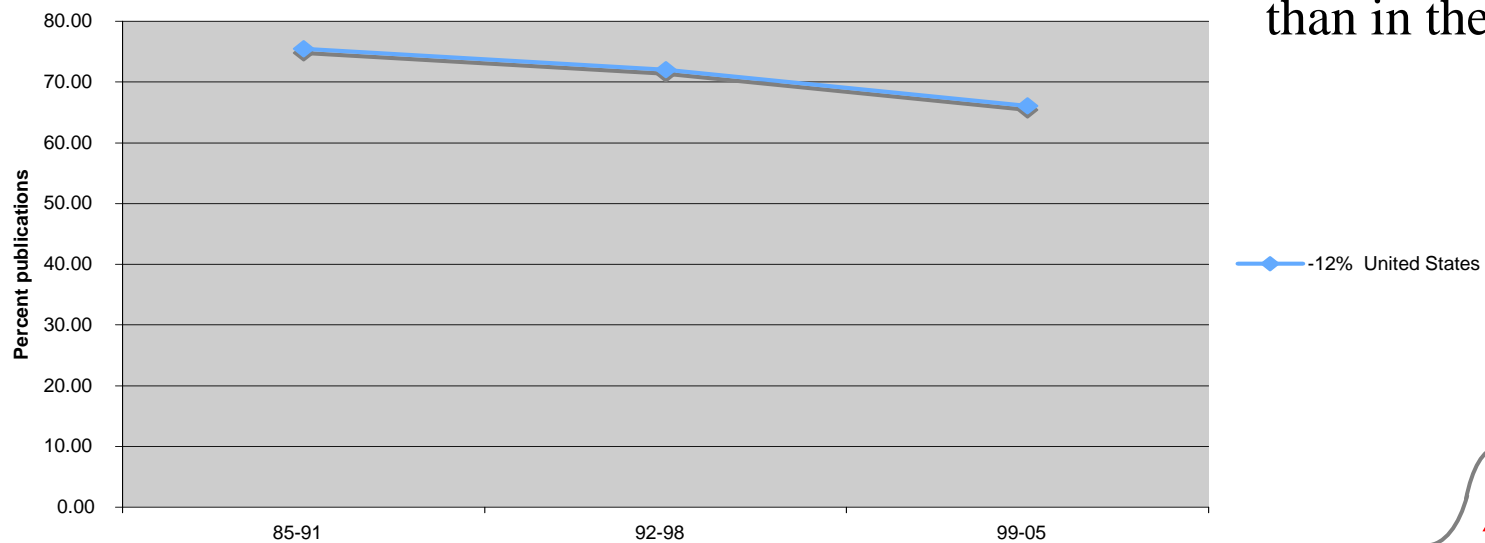
Suggestive Data On IT Publication Trends

- Data from the ACM on-line publication database

  – Showing changes in publication rates from different countries

  – The results are only suggestive due to several issues

    - It is only ACM journals

      – Not representative of world-wide publications (it's only English publications, only journals and only a, possibly biased, subset of that)

      – Significant numbers of authors have no affiliations

        There might be bias in this by region or over time

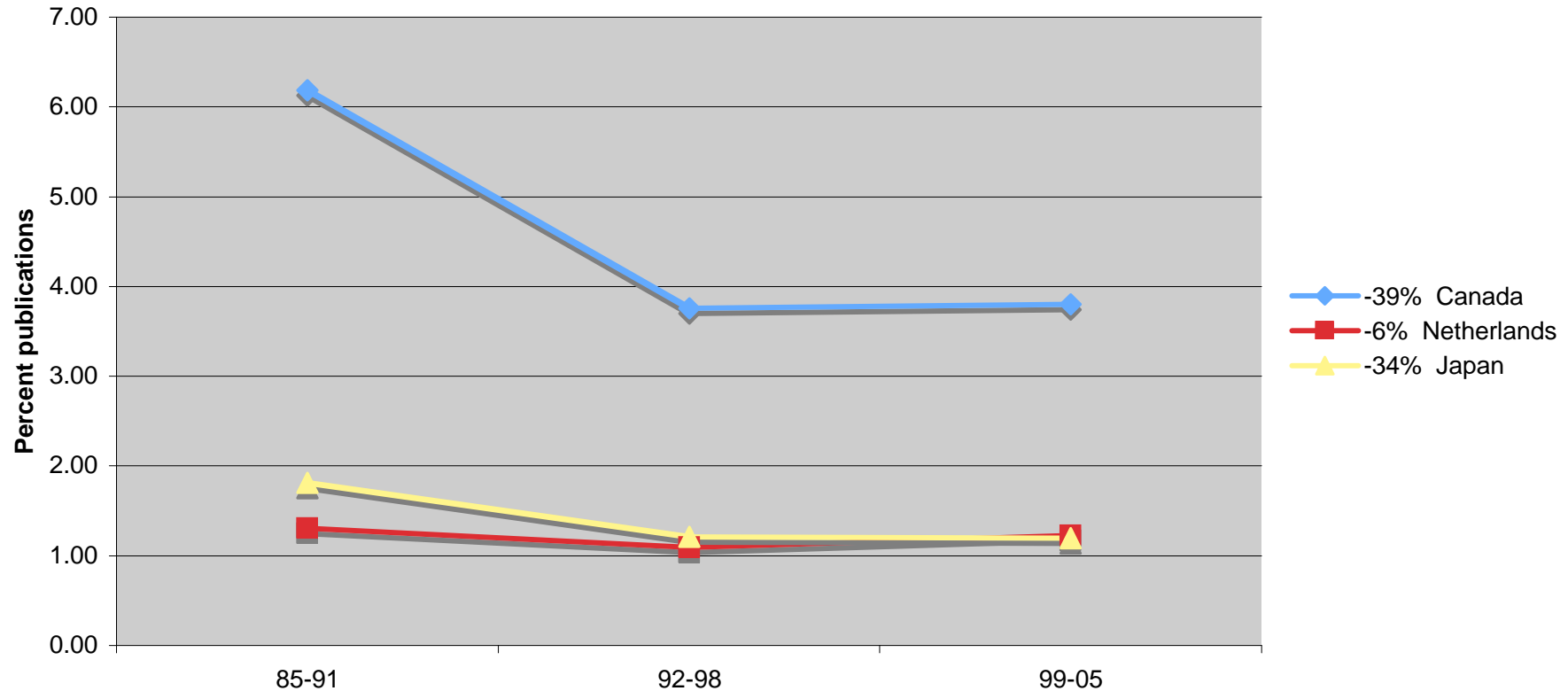 – Nevertheless, it shows trends that are very plausible

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US Publication Changes

Note US Percentage is much higher here than in the ISI data

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Significant Players Who Are Declining

Legend:
- -39% Canada
- -6% Netherlands
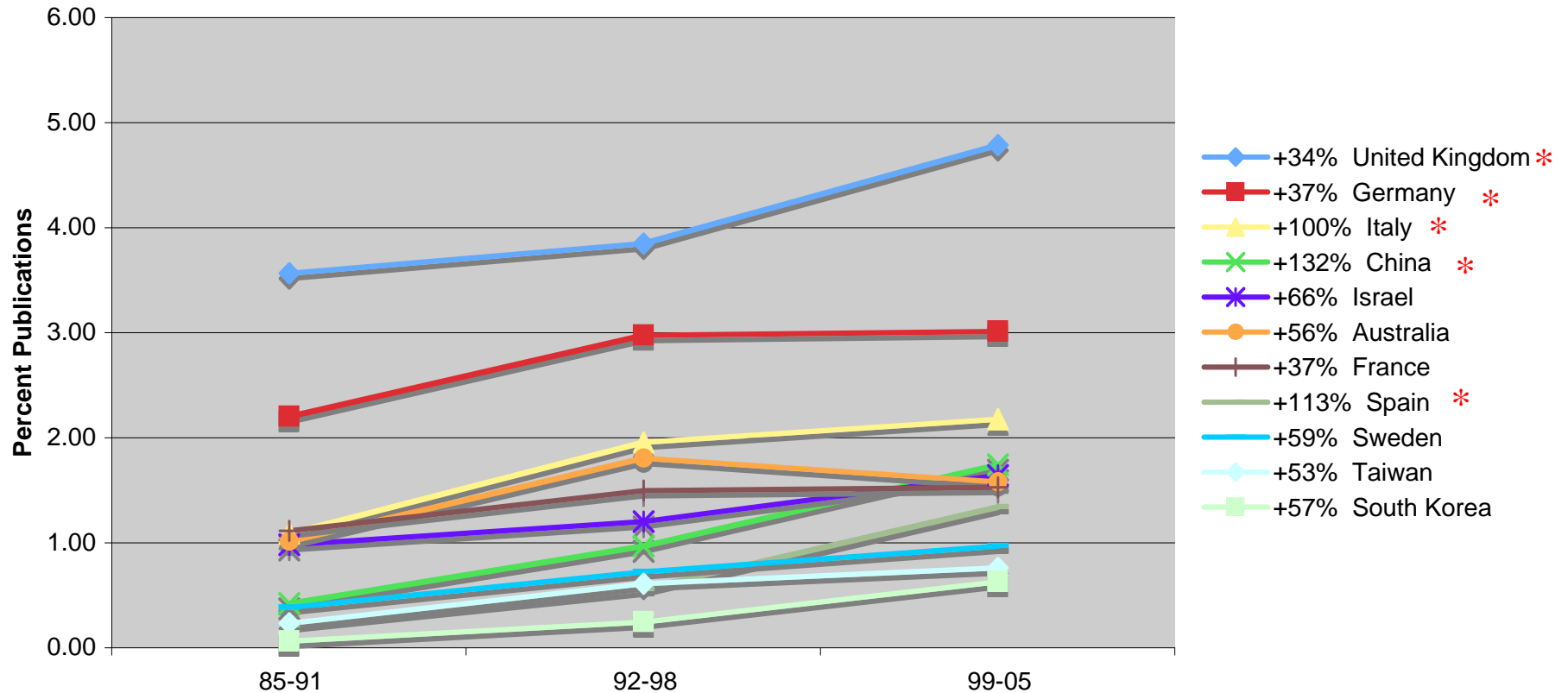- -34% Japan

Y-axis: Percent publications (0.00 to 7.00)
X-axis: 85-91, 92-98, 99-05

Other countries with > 1% of publications and falling shares

(Note no country had an absolute fall in publications)

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Significant Players Growing

Countries with significant shares and strong growth

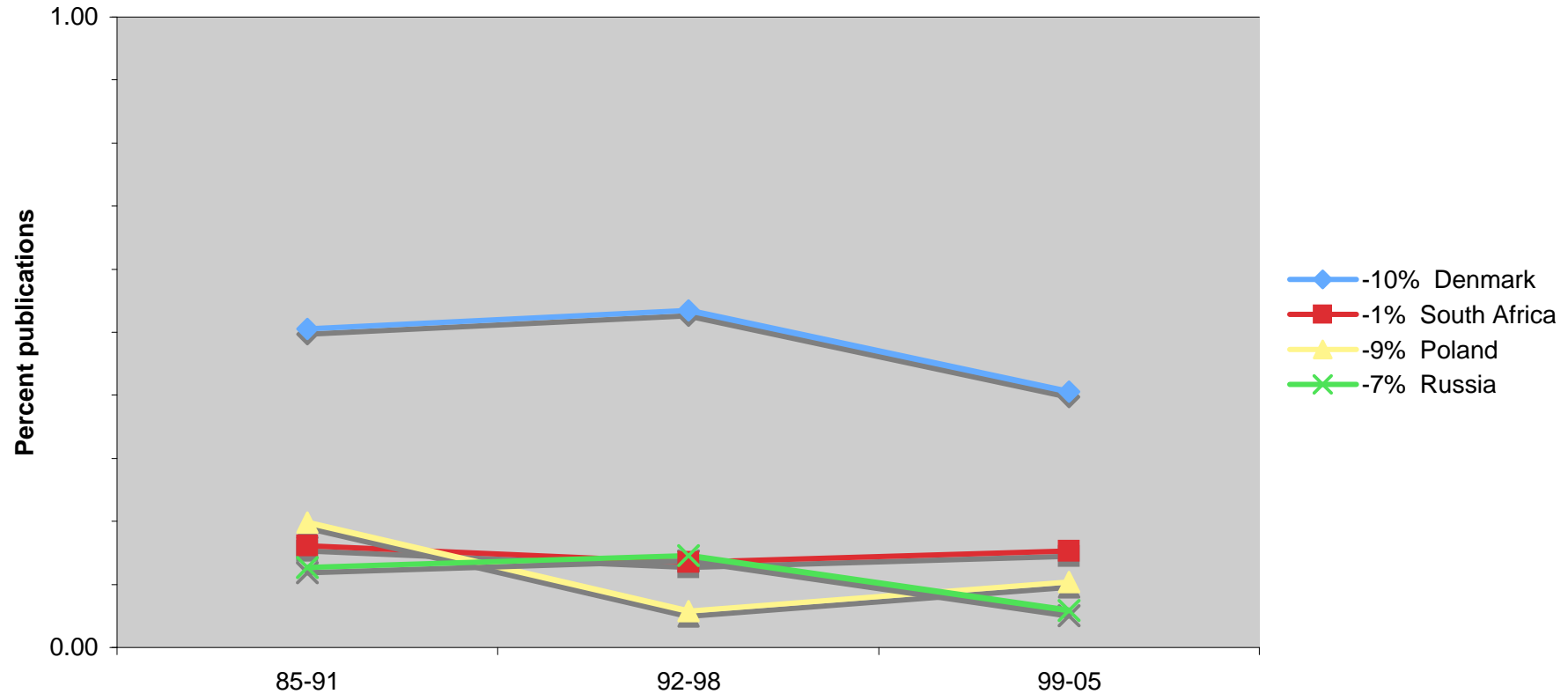**MITSUBISHI ELECTRIC**
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Minor Players On the Way Up
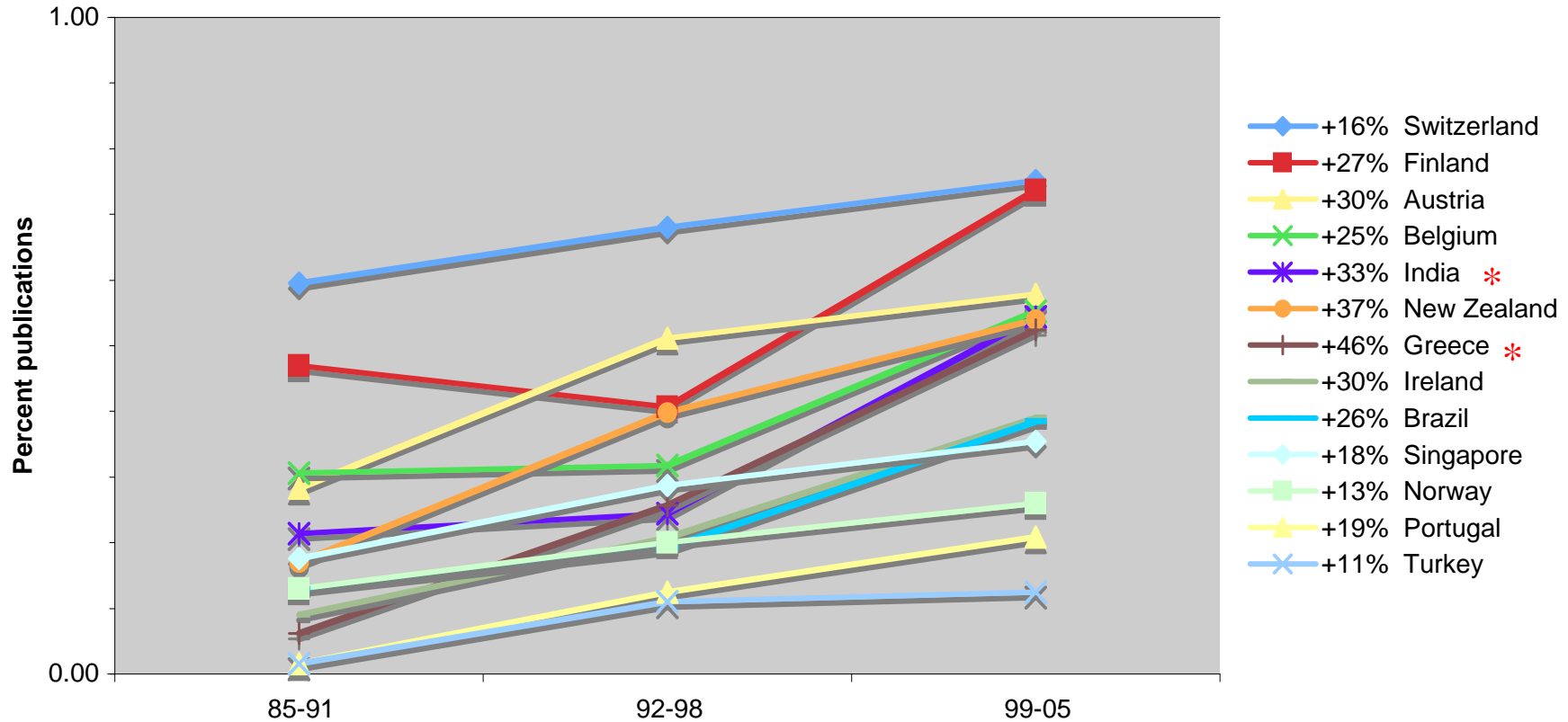
Countries with small shares and modest growth

(Note there are no countries with small shares and strong growth)

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Minor Players Waning

Countries with small shares and shrinking shares

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What Research Globalization Means for the World

- A freer world-wide market for IT research means:
  - More opportunities for those with the best research skills
    - Particularly in regions where there was little or no opportunity before
    - And thus
      - A bigger pool of IT researchers
      - More of the very best IT researchers
  - More progress for each dollar spent
    - And thus
      - A better world for everybody

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What Research Globalization Means for Localities

- Localities fight to be centers of IT research
  - Because this is a basis of high-value economic activity

- Aspiring new centers of research
  - Have a golden opportunity to rise to prominence due to
    - Burgeoning local and global demand
    - Competitive cost structures
  - But they must apply funds and appropriate policies for decades

- Existing centers of research
  - Must not be complacent
  - They have a huge competitive advantage
    - Because good research(ers) attract good research(ers)
  - But if they think they can rest on their laurels, they will wane

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What Research Globalization Means for Researchers

- Researchers outside the traditional centers of research
  - Will have much better opportunities
  - With less need to migrate

- The best researchers everywhere in the world
  - Will have increased opportunities
  - Research is an area where talent (and thus productivity) differs by so much between people that the best can survive any competition

- The weaker researchers
  - Will face major challenges
  - And some my have to change jobs

- Anyone who thinks they can rest on their laurels is wrong

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What Will The Future Supply/Demand Balance Be?

- ## The demand for IT research is rising quickly
  - This is good news at least for the best researchers

- ## The supply of IT researchers is rising quickly
  - This is bad news at least for the weakest researchers

- ## What is the balance between these two forces?
  - This will have a big effect on the average researcher

- ## Unfortunately, the balance is probably impossible to forecast

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Conclusion

- ## IT Research is becoming more global
  - Many places are fighting very hard for a seat at the table
  - Eventually research should end up distributed according to GDP
    - This means percentage (but not necessarily absolute) drops in the US

- ## This will have a big effect on all of us
  - Those that ignore it do so at their peril
  - Those that 'ride the wave' can prosper greatly

- ## The biggest determiner of our individual prosperity
  - Will be the future net world-wide balance of supply and demand
  - Which is almost impossible to predict
    - However, the relentless growth of the knowledge economy bodes well!

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