

Doubling the Global Work Force: The Challenge of Integrating China, India, and the Former Soviet Bloc into the World Economy

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One Big Fact

In 1985, the global economic world (N. America, S. America, Western Europe, Japan, Asian Tigers, Africa) consisted of 2.5 billion people.

In 2000 as a result of the collapse of communism, India's turn from autarky, China's shift to market capitalism, global economy encompassed 6 billion people.

Had China, India, and the former Soviet empire stayed outside, global economy would have had 3.3 billion.

The Change Doubled Global Labor Force

Millions of Economically Active Persons

	Global	Advanced	LDC	New
1980	960	370	590	---
2000 Before	1,460	460	1,000	---
2000 After	2,930	460	1,000	1,470*

- China, 760; India, 440; Ex-Soviet, 260

Source: tabulated from ILO, laborsta.ilo.org/

Another Source: Penn World Tables

	Millions of Employed			
	Global	Advanced	LDC	New
1990 Before	1,080	403	680	---
1990 After	2,315	403	680	1,232*
2000 Before	1,389	438	851	---
2000 After	2,930	438	851	1,383**

- * China, 687; India, 332; Ex-Soviet, 213
- ** China, 764; India, 405; Ex-Soviet, 214

Source: tabulated from Penn World Tables, using data on GDP per capita, GDP per employee and population. Ex-Soviet data are sparse; most 1990 based on population extrapolations.

Rough Estimates of Effect of Doubling of Labor Force on Global K/L Ratio*

		Before	After	Ratio
		(1996 US\$, PPP basis)		
1990	5% rate	\$53,500	\$29,800	0.56
1990	10% rate	\$36,200	\$20,300	0.56
2000	5% rate	\$61,300	\$37,600	0.61
2000	10% rate	\$39,400	\$25,100	0.64

Source: calculated from Penn World Tables (PWT), with perpetual inventory method based on investment (no distinction among types of investment). China investment rate in current currency, not PPP, and ex-Soviet area based on K/L ratio of 15% US.

* Please note that these estimates are NOT final and are crude *orders of magnitude*. PWT has not yet produced “official” capital stock” figures.

New Low Wage, L, + Fall in K/L Creates Major Adjustment Problem in Global Labor Market

Downward wage pressure/job loss in “old” developing countries: invalidates pre-doubling growth strategy?

Downward job loss/wage pressure on skilled workers in advanced countries; invalidates “upgraded jobs structure” strategy?

Increased demand for labor in new globalizers; low-paid/low-skilled gain; and opportunities for high-skilled because of immigration/offshoring.

Big Winners from Doubling: Workers in New Entrants and Capital

Living standards in China/India rise with growth, reducing world inequality despite rising inequality *within* countries.

World inequality depends on inequality among and within developing countries; among and within advanced countries; and on Advanced/Developing Gap.

Decline in Advanced/Developing gap due to China and India growth dominates calculation.

World Inequality Trends Using Variance Decomposition of Ln Income Per Capita

Ln variance fits with wage regressions, log-normal distribution.

Nice adding up formula. Take rich with mean ln income r and poor with mean ln income p ; α share of world in rich; b share of each country in world. Then σ^2 of global :

$$\sigma^2 = \alpha \sigma_r^2 + (1 - \alpha) \sigma_p^2 + (1 - \alpha) \alpha (r - p)^2 + \sum b_c \sigma_c^2$$

where σ^2 = variance in ln income,

σ_r^2 (σ_p^2) = variance in ln income in rich (poor),
 σ_c^2 variance in ln income within each country.

World Inequality Trends: Weighted Country Inequality in GDP Per Capita Declined

	σ^2			Mean	
	World	Adv	Dev	LnGap	α (Dev share)
1960	1.04	0.16	0.32	2.09	0.22
1980	1.24	0.04	0.50	2.33	0.18
2000	0.92	0.04	0.44	2.05	0.15

1960-1980: World inequality rises despite convergence among advanced (Adv) countries.

1980-2000: DROP in world inequality of 0.32 points because China, India reduce gap between Adv and developing countries (Dev).

But this does not account for inequality WITHIN countries.

What Happened to W/in Country Inequality?

It rose but by < 0.32 drop in σ^2

Using all available Ginis, inequality within developing countries rose substantially from 1980-2000; it did not rise in advanced countries.

Change in Ginis is 0.004 per year over the period.

This is .08 for 20 years.

Translates into $\Delta \sigma$ of ~ 0.16 (assuming a log-normal distribution).

If initial σ of 0.30, raise it by 0.16 to 0.46. This increases σ^2 by 0.12 ($= 0.46^2 - 0.30^2$) compared to fall of 0.32.

No conceivable rise in within-country inequality could overcome 0.32 drop.

Now Look at One Transition Problem – the United States

- **Huge increase in less-educated work force puts pressure on low-skilled, but ... major problem for educated as well.**
- **Huge increase in educated work force: In 2000, ~ 100 million enrolled in college globally – 15% in US; 38% in new globalizers and they do science and engineering (SE).**
- **2003 China graduated 700,000 BS engineers compared to 60,000 in US !!**
- **US Share of World PhDs in SE fell from nearly 50% in 1975 to 22% in early 2000s to ~15% 2010.**

Ratio of #S&E PhDs from Foreign Universities to # from US Universities

Ratio of PhDs in each year	1975	1989	2001	2003 ^a	2010 ^a
Asia major nations	0.22	0.48	0.96		
China	na	0.05	0.32	0.49	1.26
Japan	0.11	0.16	0.29		
EU major (Fr, Germ, UK)	0.64	0.84	1.07		
All EU	0.93	1.22	1.54	1.62^c	1.92^c
Chinese 'diaspora' vs. US 'natives' (estimate)			0.72^b		

^a For 2003 & 2010, ratios calculated using US doctorates at 2001 production level.

^b 'Diaspora' includes estimates of Chinese doctoral graduates from UK, Japan, and US (with temporary visas). US 'natives' = citizens and permanent residents.

^c EU data extrapolated from earlier years.

Sources: Science & Engineering Indicators – 2004 (NSF), and primary sources referenced therein; Weigo & Zhaohui National Research Center for S&T Development (China) – private communication.

Trade Models to Analyze Doubling

New trade/Ricardian model: countries can lose if new entrants take key industries. Gain comparative advantage through education.

Standard N/S model: North has SE workers who produce technological change. North exports new goods; South gets low-wage sectors that produce old goods.

Scale N/S model: Large numbers educated in South + digitalization of knowledge work → squeeze model? N (US) caught between low-wage and high-tech in S (China).

Four Mechanisms of Globalization

Trade -- Developing countries dominate low-wage, low K/L sectors but could gain in high-tech areas because of numbers of educated.

Immigration – US has bifurcated flows.

Capital – offshoring and FDI shifts demand to large developing countries.

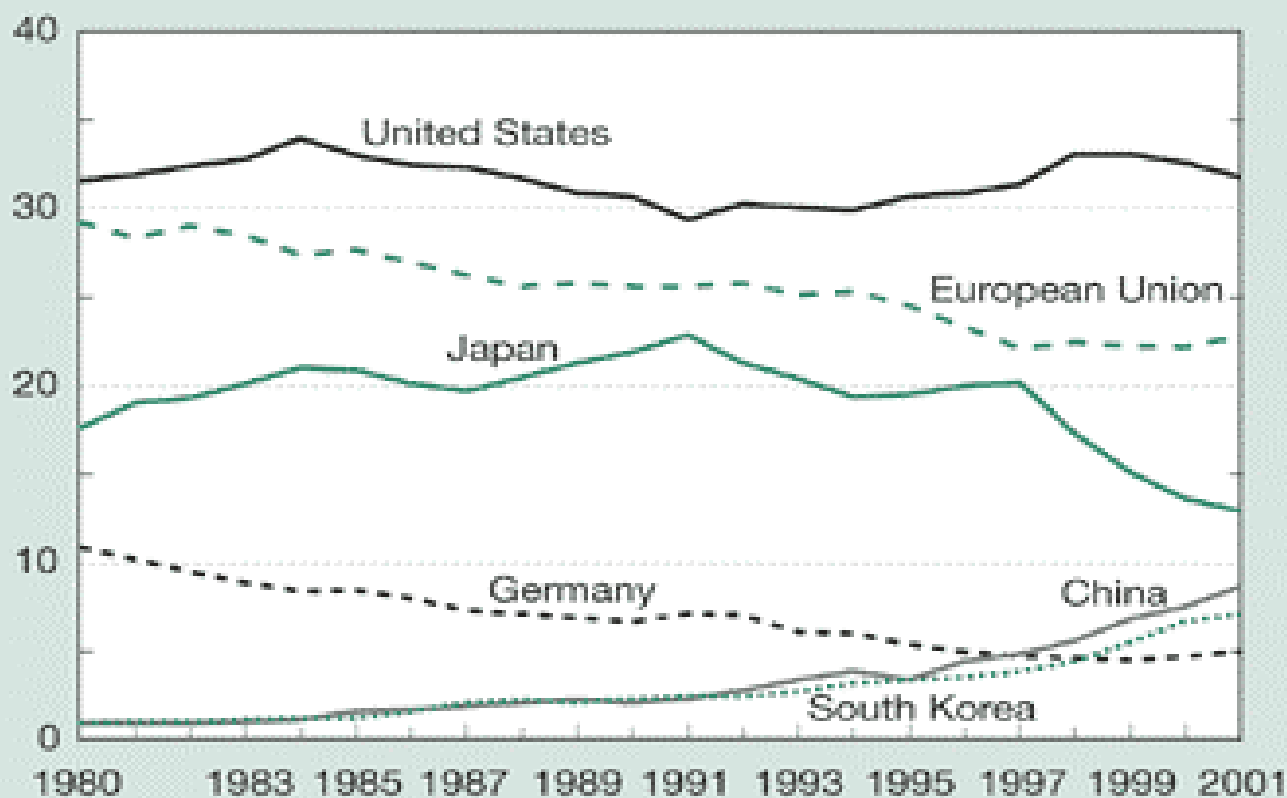
Technology – spread of technology reduces advanced country edge; productivity advance in one country can reduce income in trading partner.

1. Production of High Tech Globally

Figure 6-5

Country share of global high-technology market in selected countries: 1980–2001

Percent



SOURCE: Global Insight, Inc., World Industry Service database, 2003. See appendix table 6-1.

High-tech Trade, US Share of World X Falls, Share of World M Rises

	1980	2001
US share of high-tech exports	30%	17%
US share of high-tech imports	13%	18%

**This is US trade balance problem in sector
with comparative advantage.**

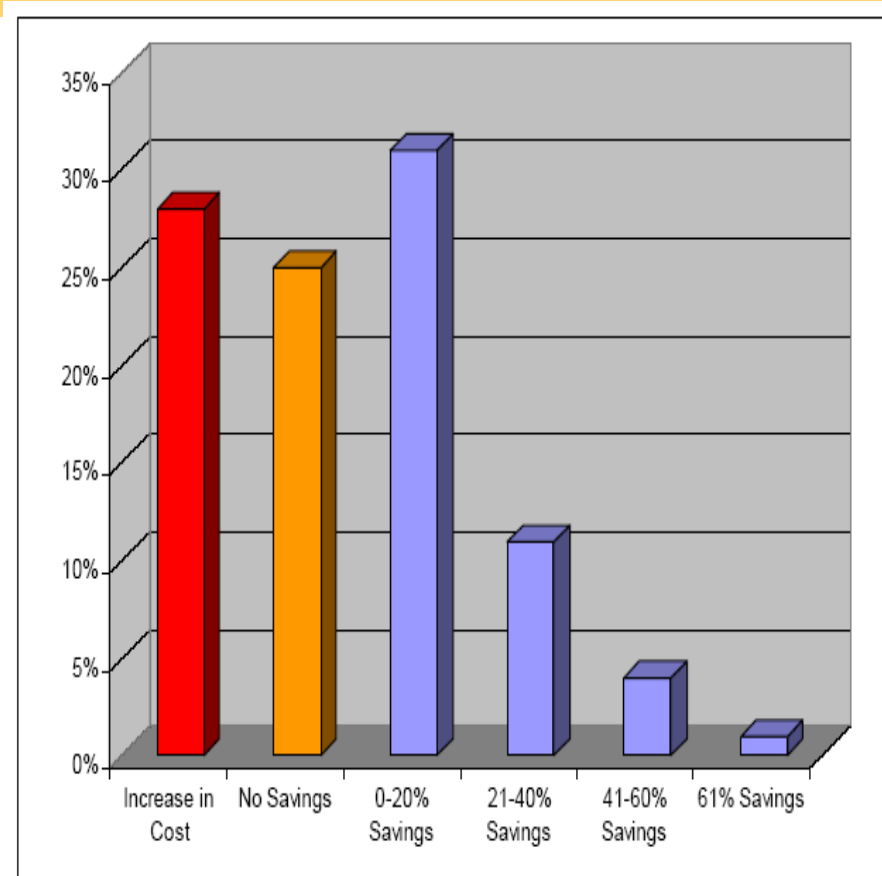
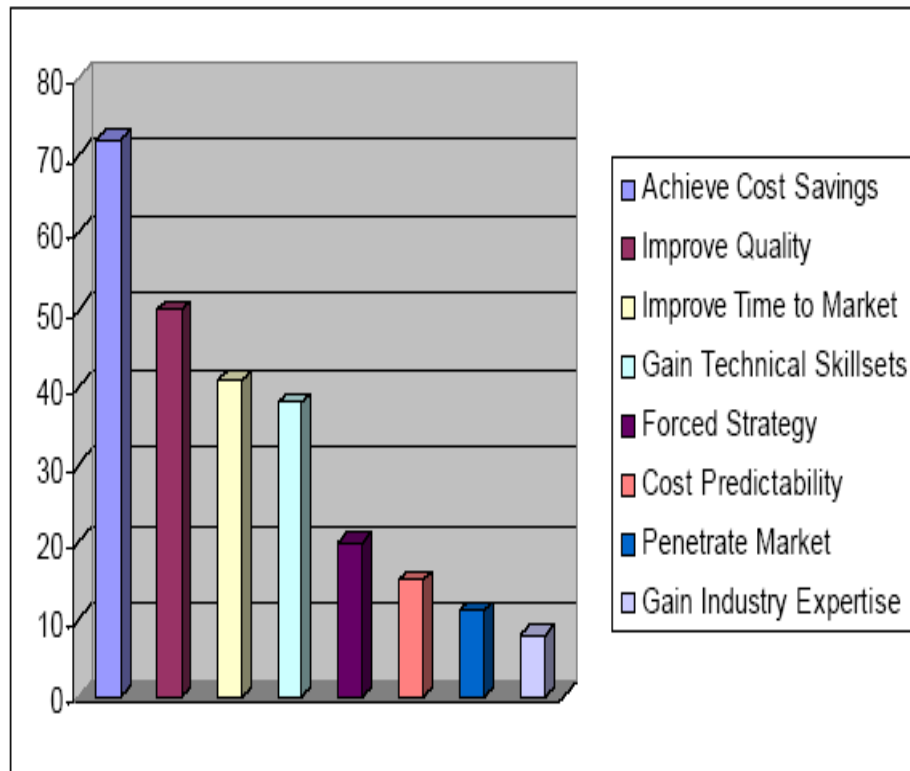
2. Immigration: Foreign-born Share of S&E Employment Rises in US

	1990	2000
Bachelor's	11%	17%
Master's	19%	29%
All PhDs	24%	38%
PhDs < 45	27%	52%
Post-Doc	51%	60%

Source: All but post-docs from Census of Population; post-docs from NSF. Note: FB % post-doc in 1987 was 45%.

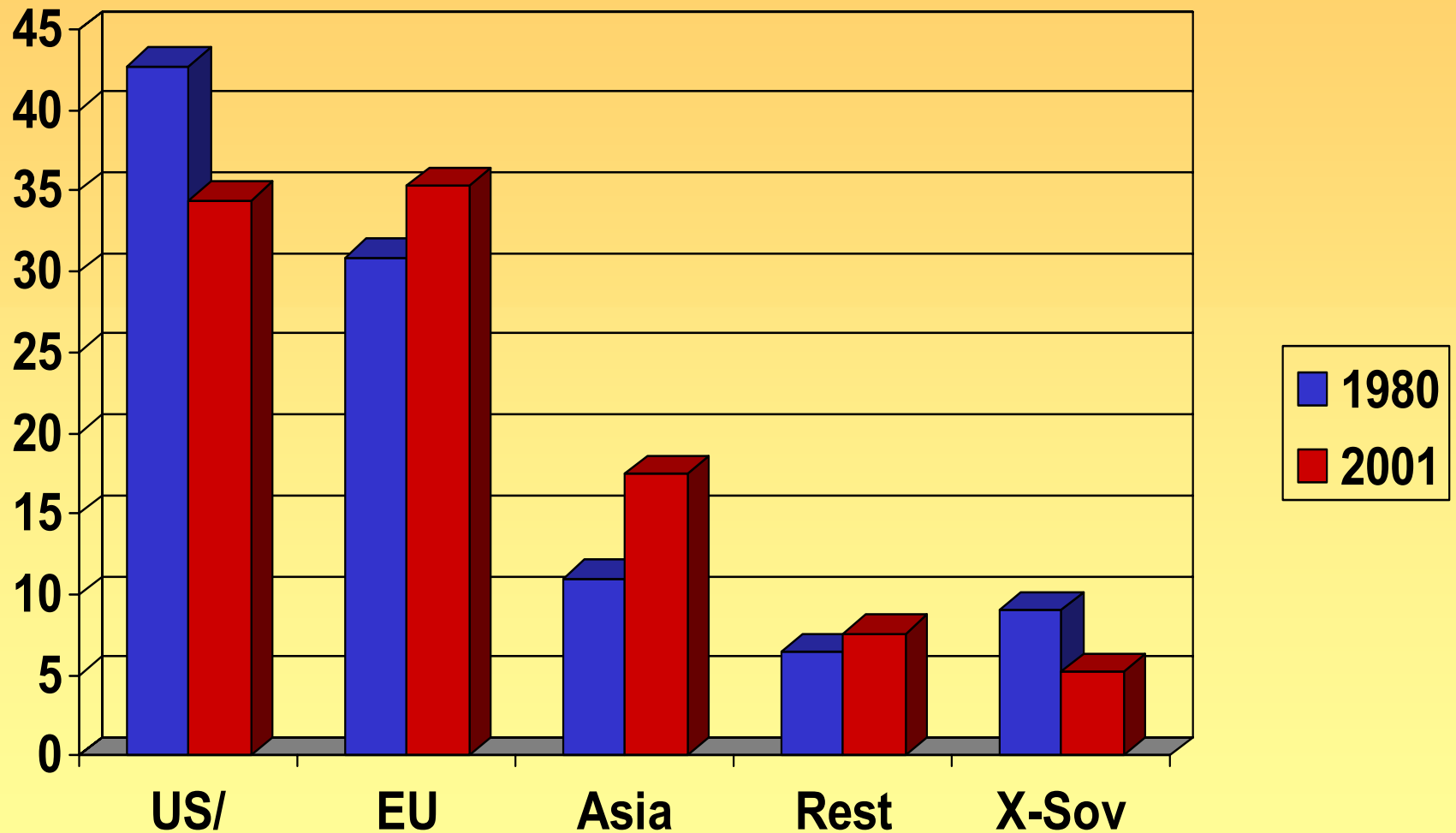
3. Capital Flows: FDI to US dropped to 0.3% in 2003. No good #s on offshoring but ...

Why Move Offshore?

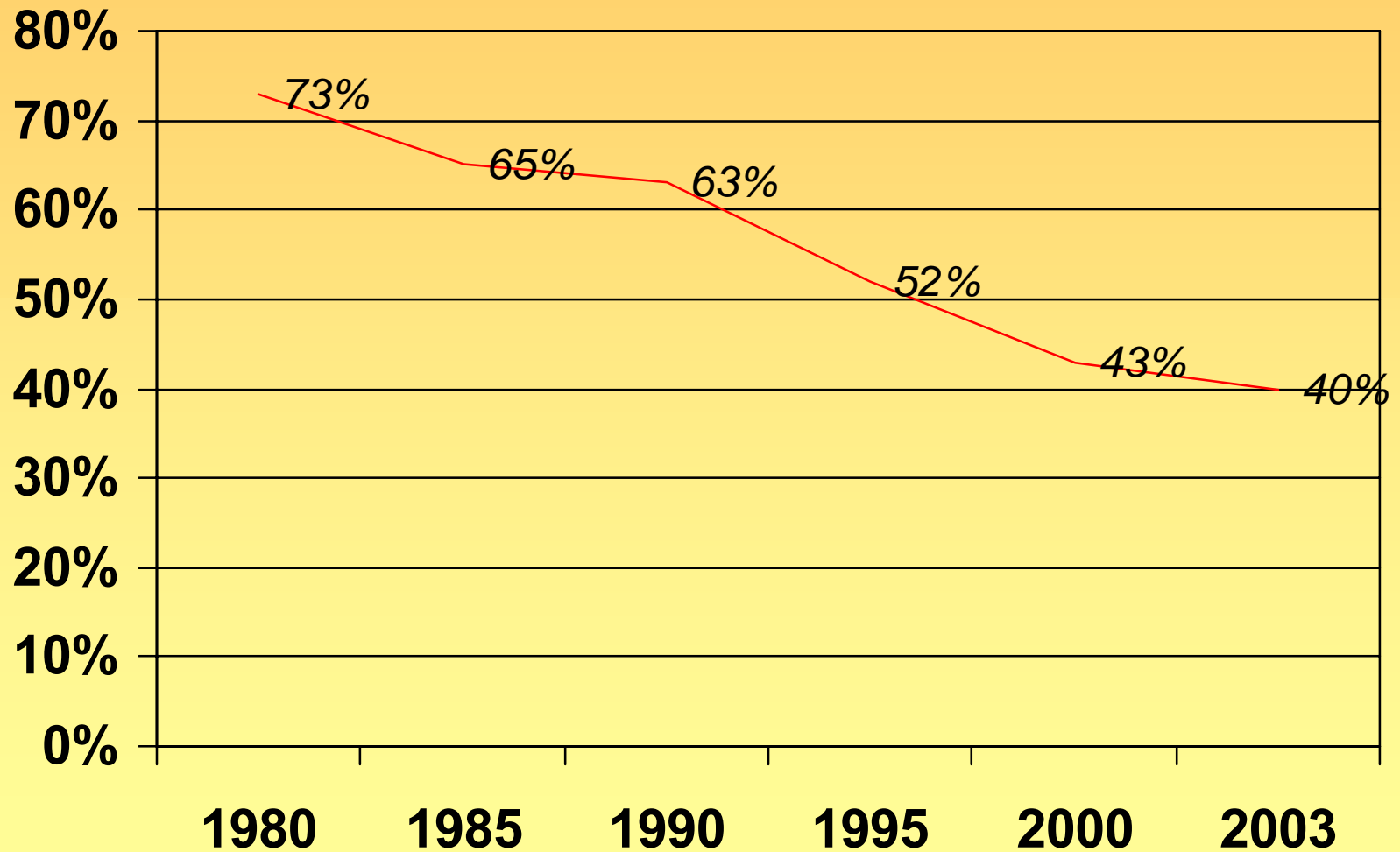


Source: WWW.ventoro.com

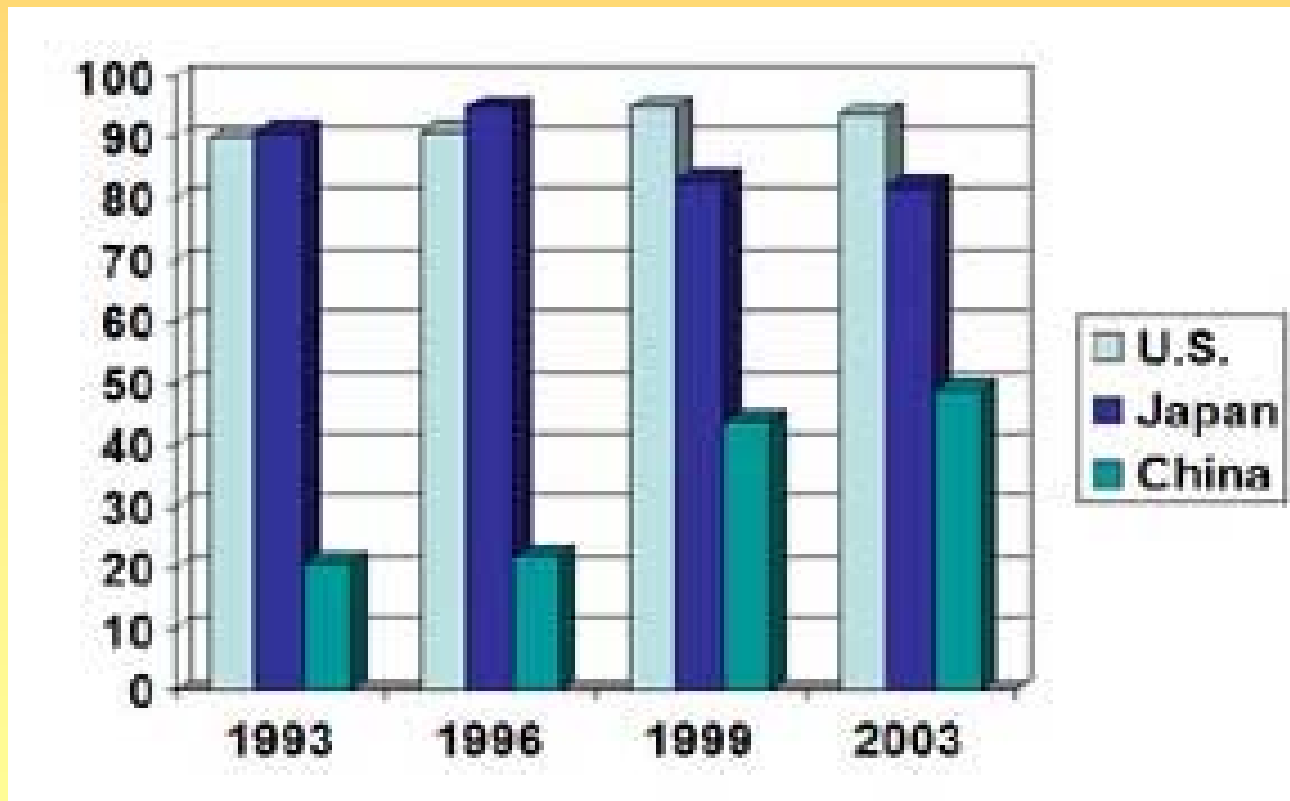
4. Technology: Share of Scientific Papers Published



US Share of Papers Chemical Abstracts Service, 1980-2003



And China Moves up in Georgia Tech Index of Technology Capability



Spread of Technology & Education Can Harm Advanced Country

If it loses “retainable” industries or competitor catches up in productivity in industries with close cost competitiveness (Gomory-Baumol).

Industries with R&D/new products are natural temporary monopolies: “It’s good to be a monopolist.”

Large developing country leapfrogs to tech dominance because of scale effects.

But if spread leads developing country to take over high-tech and produce lots at low price, world output zooms and US benefits from terms of trade (Ruffin-Jones).

What can we learn from history?

**Europe after WW2 – Marshall Plan
massive increase in K/L**

Japan after WW2 – 30 years to recover

US South after Civil War – 80 years ??

The Importance of Job Structure in Contested Sectors

Situation 1: Contested have many “good jobs” and growth potential, so loss → big drop in wages for workers (eg: high-tech mfg; electrical machinery, motor vehicles, chemicals; information services, education).

**Situation 2: Contested have few or “bad” jobs.
(eg: astronomy, trip to Mars; apparel, keypunching data)**

→ GOVERNMENT, INDUSTRY MUST CHOOSE SECTORS WISELY; GOVT R&D AND EDUCATION MONEY CRITICAL

Paradox of Globalization

Victory of Capitalism and spread of modern technology is epochal achievement for humanity (think of all those former peasants advancing science ... literature ... sports).

But Cold War winners at risk during transition.

Race between improved wages in developing countries and technical change in advanced vs. worsening terms of trade.

Spread of capitalism → need for safety net and controlled distribution in global leaders.

Scenarios for the Era of Great Doubling

BAD TRANSITION

China, India develop enclave economies that use low-paid “surplus labor” from agriculture, wages grow slowly; US continues to import capital.

Global capital stock increases slowly → wages in advanced drop/stagnate until parity established.

Transition is long: China – 6% growth of wages → 50 yrs to reach US level; at 7% 30 years.

Globalization → new protectionism, rules for global economy; huge within-country inequality.

Scenarios for the Era of Great Doubling

GOOD TRANSITION

Technological advance increases because additional SE R&D from developing countries.

TC → reduced cost of goods, which dominates declining terms of trade.

Advanced countries retain some leading sectors.

Social services and infrastructure substitute for stagnant, slow-growing wages.

Large increase in K/L → higher wages in LDCs; fall in world poverty/inequality.

Policies for adjustment and for development

United States

- 1. Targeted R&D – Nanotech initiative?**
- 2. Specialize in developing innovations**
- 3. Strengthen knowledge networks**
- 4. Partner with large developing countries**
- 5. HIGHER SAVINGS RATE**
- 6. Safety net/social wage**

GLOBAL FINANCIAL INSTITUTIONS

- 1. Take global perspective when providing advice**
- 2. Support local “heresies”/allow policy autonomy**
- 3. Greater regulation of capital flows**
- 4. Higher world savings – go after US!**
- 5. FOCUS ON TRANSITION FOR LABOR,
not on protecting capital**