Global Sourcing and Factor Markets: The Information Technology Example

Dr. Catherine L. Mann
Senior Fellow, Institute for International Economics
CLMann@IIE.com

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Why Focus on Information Technology?

Globalization in a petri dish

- Already a globalized industry and marketplace
- Fast pace of change—in technology, in geography of production and demand
- Strong synergies between technological change & global sourcing
- IT hardware as model for IT services and software

US IT Firms in the Global Market

Hardware more globalized than services/software but services/software becoming more important

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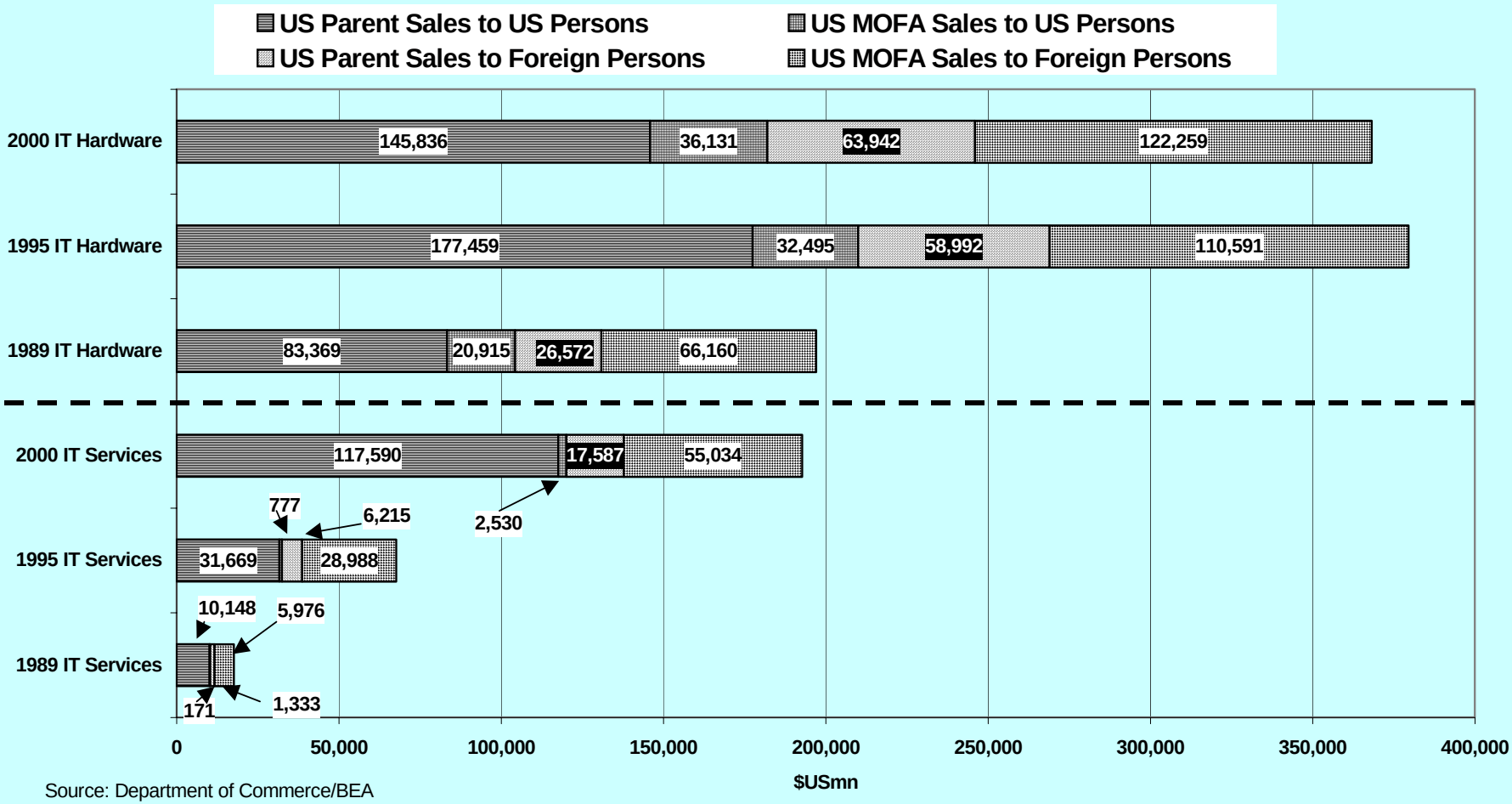
Figure 1.4:
US Multinational Companies' Sales in the US and Global Markets



Source: Department of Commerce/BEA

Implications of IT Globalization:

IT hardware price declines yield macro gains

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Sources of price declines

1. US innovation is key:
   Technology accts for 70-90 % of price declines
2. Also global sourcing:
   regression estimate that 10-30 % more price decline from global production & global markets

How important is 10-30% More price decline?

Sources of macro gains

.... IT price declines overall
Diffused IT investment through US
Price elasticity of demand > 1.0

.... IT investment =>transformation
new workplace practices, new products

.... Transformation => productivity
IT accounts for *more than ½ of increased productivity growth '90s;*

... 10-30% more price decline?
GDP growth 0.3 /yr higher (95-2000)
..adds up to more than ¼ $ trillion

Macroeconomic Gains of the 1990s

Masks Uneven IT Diffusion and Productivity Performance; yields observations on globalization of software/services

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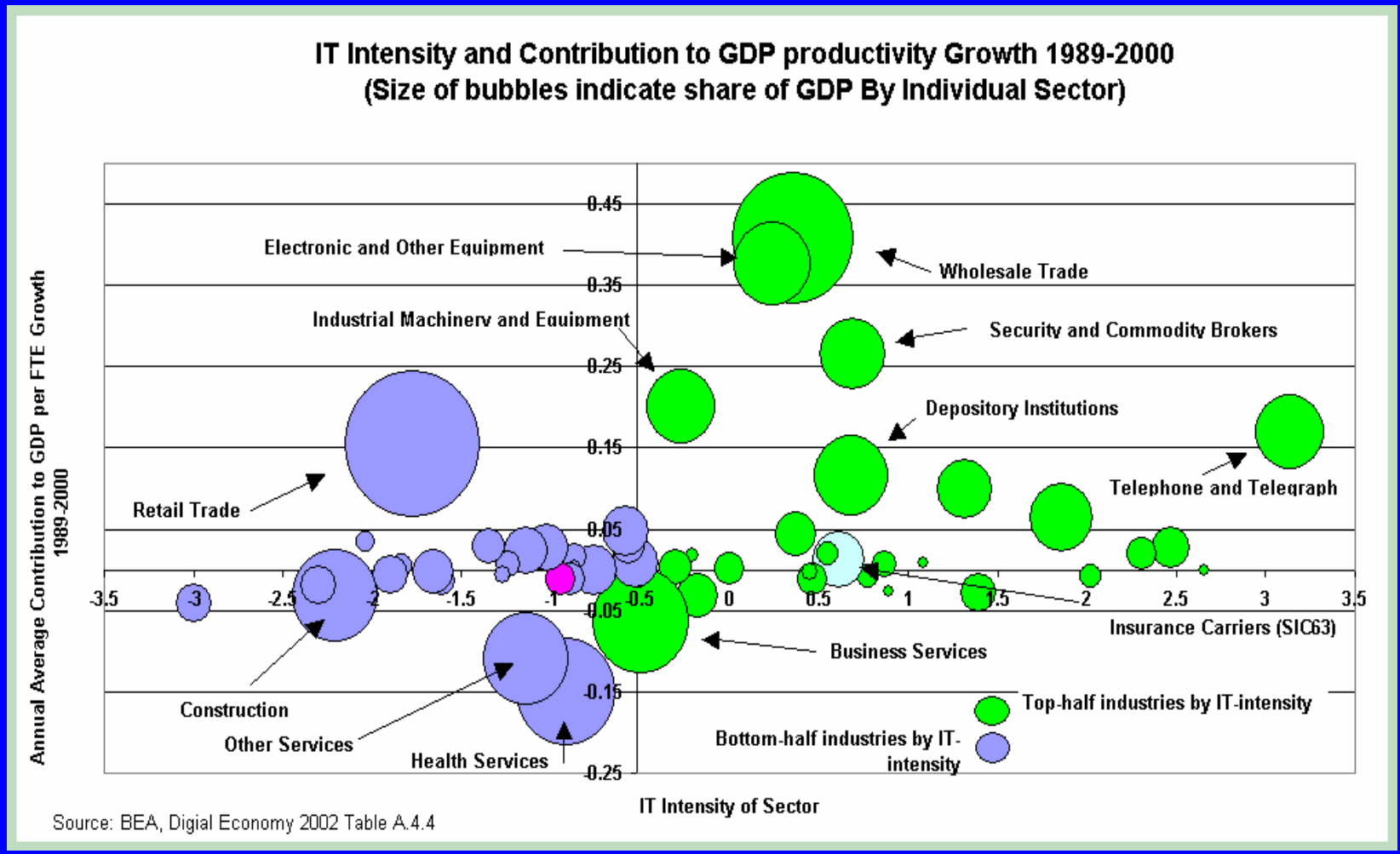


Source: BEA, Digial Economy 2002 Table A.4.4

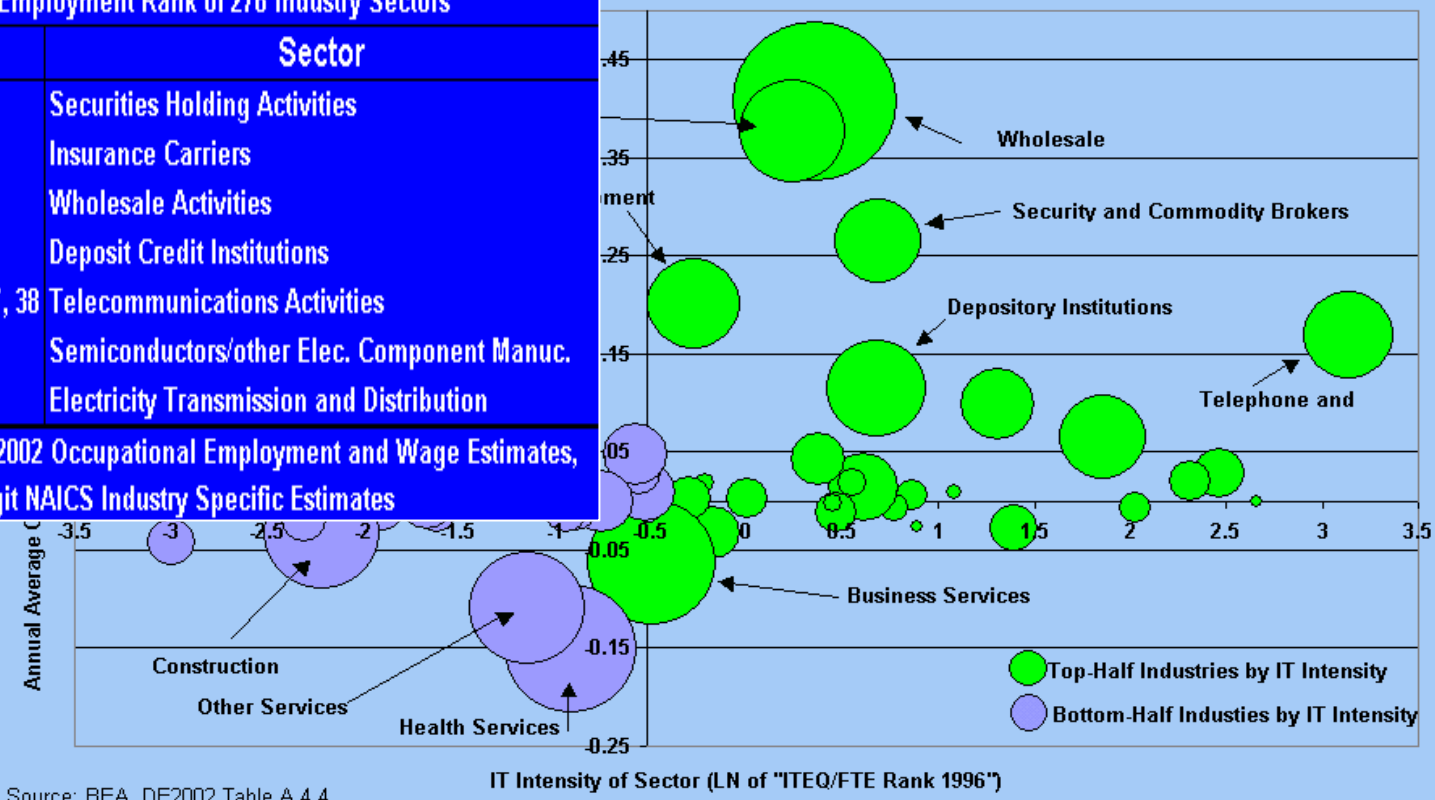
Leading Sectors: More IT investment, higher productivity growth

Sectors that invested a lot in IT capital
also hire a lot of IT workers

Computer and Math Occupations	
Employment Rank of 276 Industry Sectors	
Rank	Sector
#2, 29	Securities Holding Activities
#4	Insurance Carriers
#5, 32, 43	Wholesale Activities
#14	Deposit Credit Institutions
#16, 17, 34, 37, 38	Telecommunications Activities
#25	Semiconductors/other Elec. Component Manuc.
#36	Electricity Transmission and Distribution

Source: BLS 2002 Occupational Employment and Wage Estimates, National 4-digit NAICS Industry Specific Estimates

Figure 1: IT Intensity and Contribution to GDP per FTE Growth 1989-2000[14]
(Duplicate share of GDP By Individual Sector)



Source: BEA, DE2002 Table A.4.4

also are net services exporters

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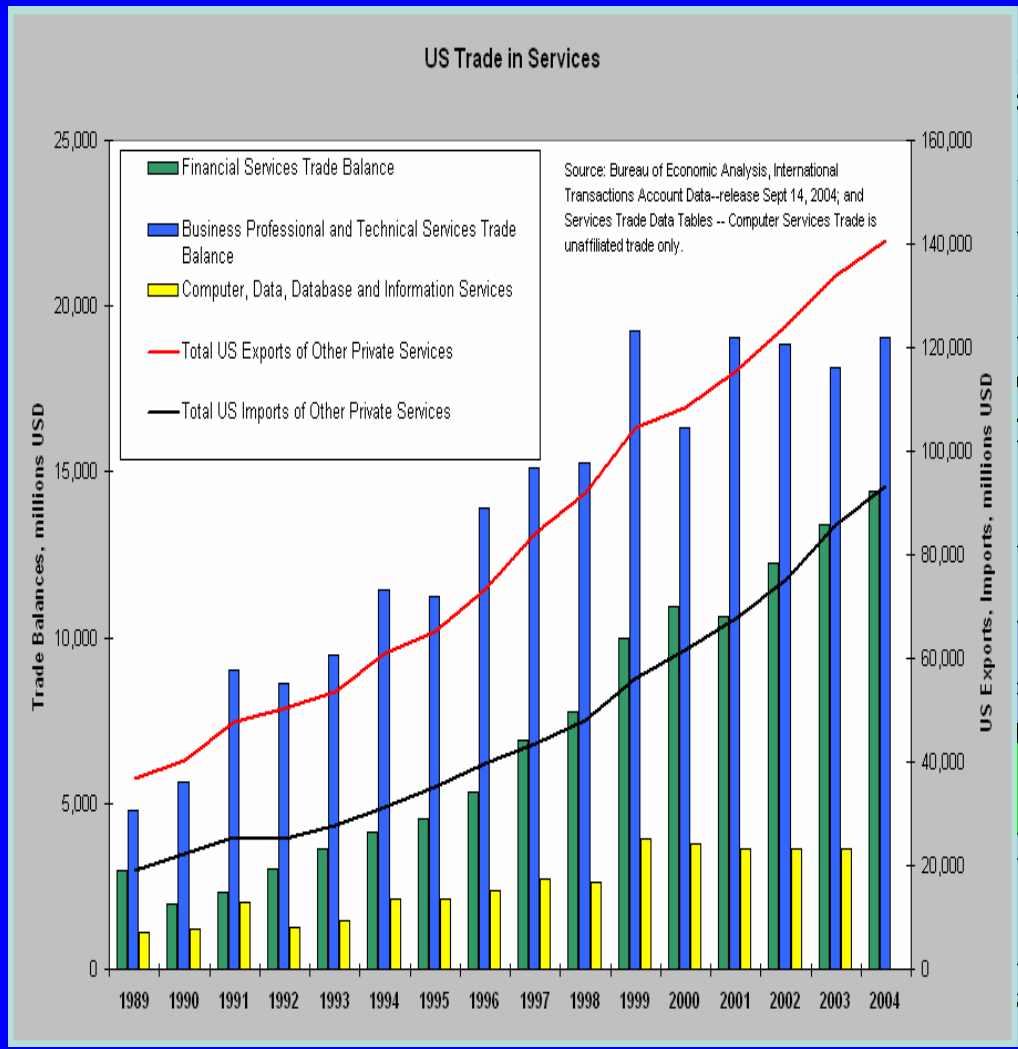

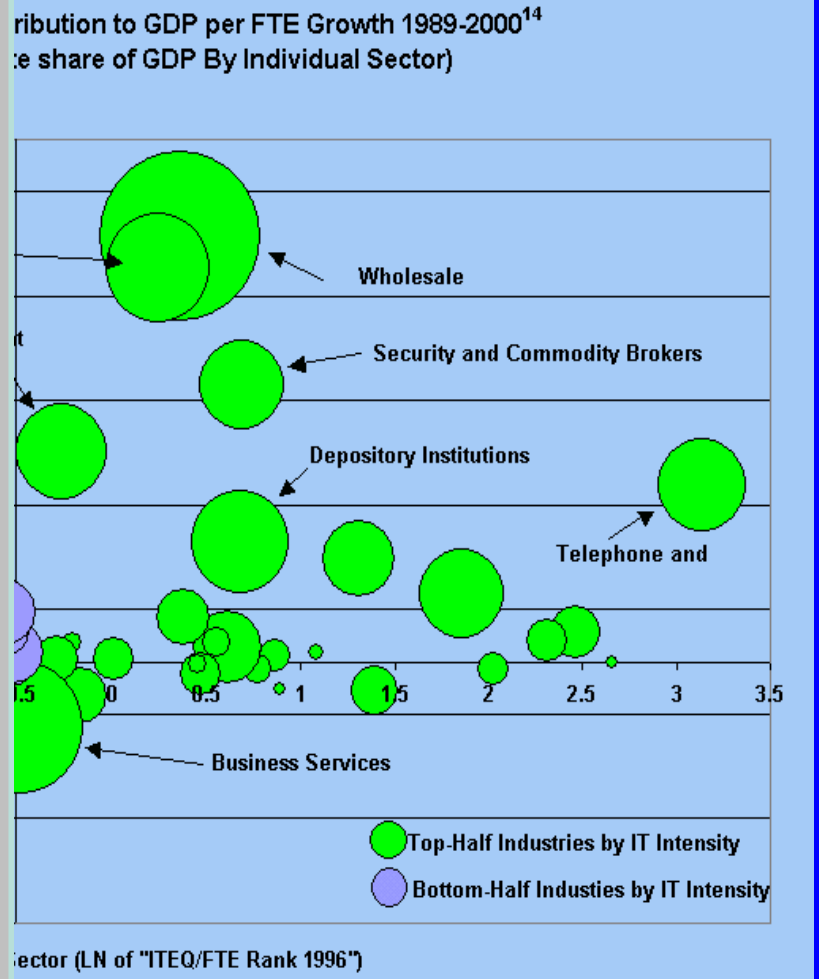

What about the 'lagging' sectors?

Potential gains from globalization of IT services & software

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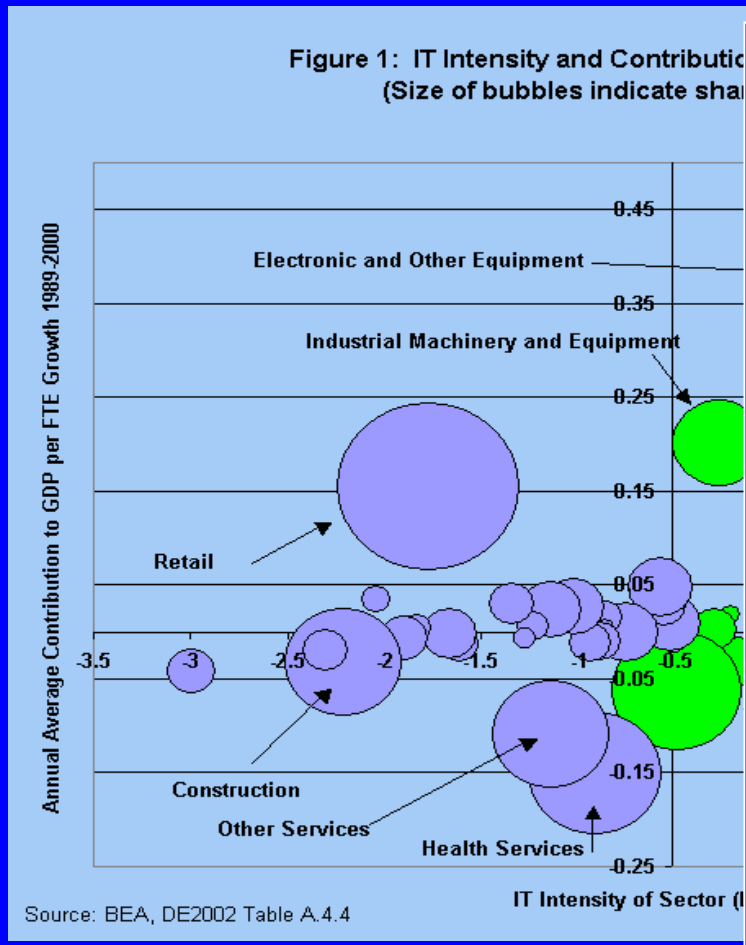

Why do some sectors lag?

- Rising relative spending on services & software vs hardware; $1.4 per $1 (1993) vs. $2.2 per $1 (2000)
- Software/ services for lagging sectors is harder to do & costs more. Why?

=> Regulation & complexity of relationships (health)

=> SMEs cost conscious and need tailored applications

Based on IT hardware analysis…

Globalization & fragmentation of production of software & services

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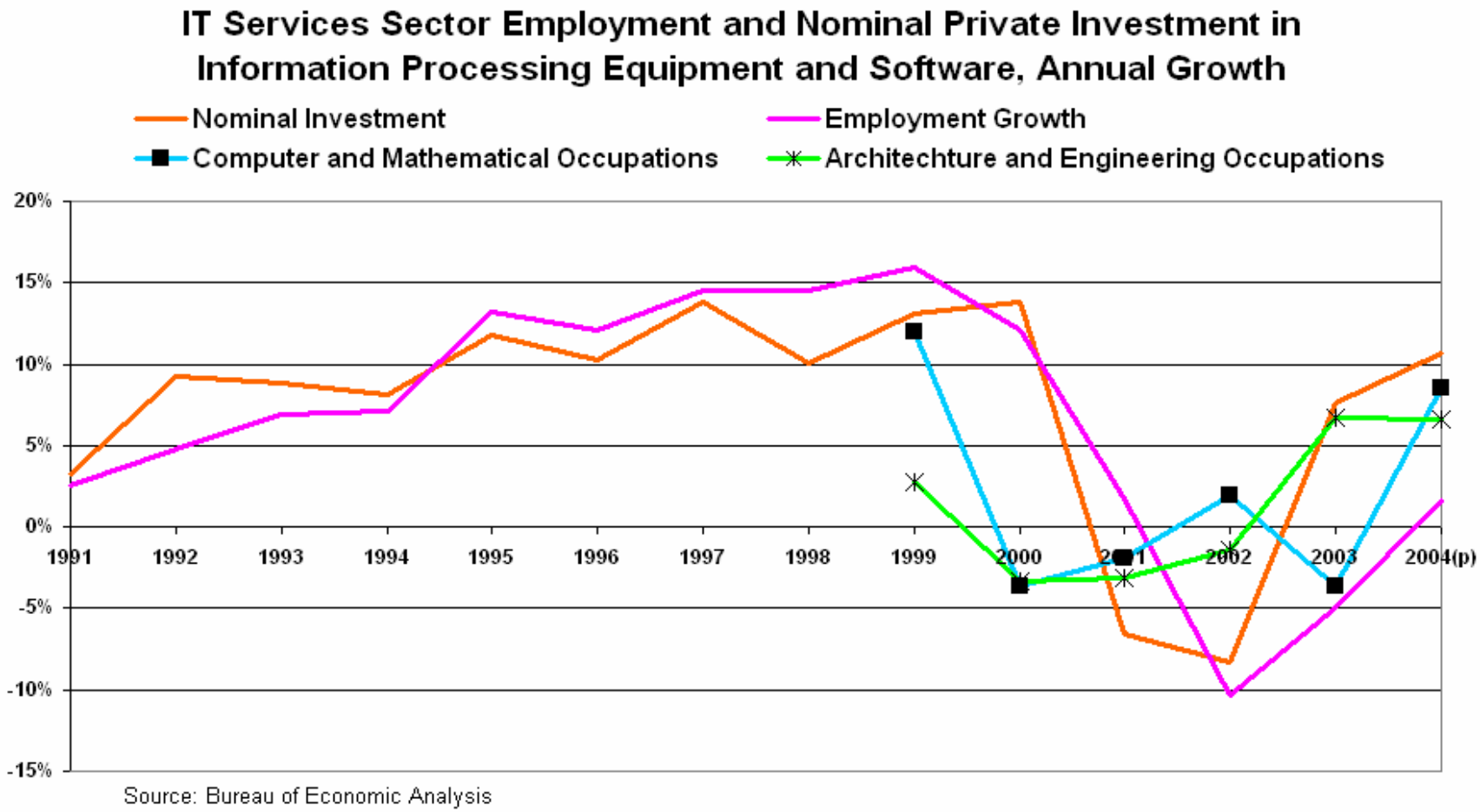
- Will reduce cost of 'inputs' (such as programming modules)
  - Which reduces costs of tailored applications.
- Given estimated investment-price elas. of software/services >> 1.0
- Yields more investment & business transformation overall
  - and particularly in lagging sectors

- What about employment?
- Elasticity estimates imply high job demand
  - BLS projections indicate 10 of top 30 jobs & growth 3X overall job growth
- But fragmentation of production means higher skills demanded.
- US jobs will demand sector-specific knowledge as well as IT skills
  - Particularly true of lagging sectors

Employment Evidence?

Cyclical factors: IT jobs & IT investment are complements



Source: Bureau of Economic Analysis

Note: IT Services consists of Software publishing (NAICS category 5112, ISPs, search portals and data processing (NAICS 518) and computer systems desing and related services (NAICS 5415). DOES NOT INCLUDE IT EMPLOYMENT OUTSIDE THESE SECTORS. 2004 data for investment is the average of Q1, Q2 and Q3 final data, and 2004 employment data is last available data for September 2004 (p). Computer and Mathematical Occupations, and Architecture and Engineering Occupations are annual OES data benchmarked to the last quarter of 1999, 2000, 2001 and 2002. 2003 data refers to May 2003, whereas 2004 data have been created by growing the May 2003 OES data point by the rate of change from the CPS monthly data from May 2003 to September 2004

Structural Factors and Jobs

low-wage in real trouble; standardized high wage also at risk but increasing high-wage jobs demanding 'integrative' skills

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Selected US Technology Occupations, 1999-November 2003

	Absolute Change in Employment Period 1999-November 2003	1999-November 2003 Percentage Change	November 2003 Employment	November 2003 Wages
Call-Center Type Occupations (1)	-126,110	-22%	444,500	$~25000
Low-wage Technology Workers (2)	-419,140	-33%	856,720	$~24000
Total Call-Center and Low-Wage Tech. Workers	-545,250	-30%	1,301,220	$ 25,191
Comparable; Production Workers in the Manufacturing Sector		-20%		
High-wage Technology Workers				
Computer and information scientists, research, SOC 15-1011	-2,510	-11%	23,770	$ 85,240
Computer programmers, SOC 15-1021	*-125,380*	*-31%*	*403,220*	*$ 65,170*
Computer software eng., applications, systems software; analysts (3)	263,980	22%	1,188,820	$~73,000
Database administrators, SOC 15-1061	-3,920	-4%	97,540	$ 62,100
Network & systems admin, & data com engineers& analysts (4)	137,800	21%	645,490	$~65000
Computer hardware & electrical engineers (5)	34,430		350,890	$~77000
Total High-wage Tech. Workers	264,470	11%	2,465,120	$ 69,992
Comparable; Total CES Employment		1%		

Source: Bureau of Labor Statistics CES Data, 1999, 2000, 2001, 2002, May 2003 and November 2003 National Occupational Employment and Wage Estimates

1. Call-Center Type Occupations (telemarketers, telephone operators): Soc 41-9041;43-2021
2. Low-wage Technology Workers:switchboard, answering services, computer operator, data entry, word processors: soc 43-2011,9011, 9021,9022
3. Computer software engineers, applications, systems software; analysts; soc 15-1031,1032,1051
4. Network & systems admin, & data com engineers& analysts: soc 15-1071,1081,
5. Computer hardware & electrical engineers:soc 17-2061,2071,2072

Two Pronged Policy Implication

Domestic policy

- Transition policies for permanently displaced workers
  - Wage insurance and training credits
- Entry and up-skilling policies within a career-ladder
  - Human capital investment tax credit through firms & community colleges
- Movement/flexibility policies mitigate costs of adjustment
  - Affordable health portability; pension portability
- Business climate to promote investment in IT and R&D

External policy

- Foreign macro demand & exchange rate policies
  - Collapse in exports is a key problem today
- Trade negotiations
  - Negotiate reduced tariffs on capital goods exports
  - Negotiate for two-way trade and investment in services

The Human-Capital Investment Tax Credit

Invest in people for a competitive economy

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- The ITC instrument fits a 'classical' economics case of market failure
- Free-riders, spillovers, incomplete information
  - Free-riders: firms worry about trained people leaving so do not train enough
  - Spillovers: National benefit accrues to training but not enough done
  - Incomplete information: Individuals do not know what jobs to do (and schools by themselves don't either)
- Is the rationale for the R&D tax credit & accelerated depreciation / investment tax credit.
- H-ITC for incumbent workers to move up career ladder
  - An H-ITC mitigates the firm's disincentive to train workers for fear of losing them to a rival firm that does not train
- H-ITC for entry level workers
  - A internship credit mitigates students' concern about technical careers and recognizes that the 'first job' may no longer be US