

Federal Reserve Bank of Cleveland

This Is Bangalore Calling: Hang Up or Speed Dial?

What Technology-Enabled International Trade in Services Means for the U.S. Economy and Workforce

by Catherine L. Mann

Globalization, always a contentious issue, has become even more so with media reports of U.S. service-sector jobs being outsourced to emerging-market economies, such as call center operations to Ireland or programming jobs to India. Traditionally, these jobs have been considered “nontradable” and therefore safe from the competitive forces of international trade and investment. But increasingly, technological advances are making it easier to buy services from other companies, even those in developing countries, where savings in the cost of labor or the opportunity to use the 24-hour clock to speed product development can be irresistible.

Both technological advances and globalization cause dislocations of domestic labor. They also generate great gains to the U.S. economy. But technology and trade have become so interdependent and mutually reinforcing that it is increasingly difficult, and in some sense meaningless, to try to separate out which is the cause of any given gain or loss. Because technology and trade reinforce each other, deeper global integration and increased worldwide sourcing of products and services have the potential to generate greater gains, and greater adjustment challenges, than either technology or international trade alone have before.

Existing research, mostly on the manufacturing sector, shows well the two sides of globalization. The positive side is well-touted—lower prices and greater variety of consumer goods and business inputs; innovation and efficiency from the discipline of foreign competition; technology transfer and new ideas from global markets. Ultimately, the productivity growth that results creates higher-

value products, supports higher wages, and raises employment. These gains from trade result when firms change what they produce and the way they produce it in response to competition, technology, and opportunities at home and abroad. But these gains do not come without dislocations: Firms go out of business, workers lose their jobs, and communities are hard hit.

The Internet and information technology more completely integrate the United States with the rest of the world and extend the competition for markets, investment, and jobs from the manufacturing economy into the service sector. As the U.S. and global economies become more integrated, the gains from trade in services will most likely be greater, but the adjustment costs will probably be more widespread. Moreover, our deeper integration is taking place at a time when large players—China, India, countries of the former Soviet Union—are breaking onto the international scene. Putting the two sides of the new globalization together to make a positive equation for U.S. workers and firms is the critical challenge facing policymakers today.

Gaining from globalization and technological change requires that businesses and workers change what they do. Stopping global integration does not stop technological change. Policies to promote adaptation to a changing environment are critical even without any further international integration. But because technology and trade are more likely to go hand in hand these days, an integrated policy approach is needed, with businesses, workers, educators, and the government working together to

The U.S. service sector is in the midst of a transformation similar to the one undergone by the manufacturing sector. Some jobs are moving to other countries, some are disappearing, some are being born. But the service-sector transformation is likely to be different. Technological advances and globalization are making it possible, but these factors reinforce each other in such a way that the gains to the U.S. economy are likely to be greater than with manufacturing, and the transition costs more widespread. Thus, superior and better coordinated domestic and international policies are needed to address the challenges and opportunities.

maximize the gains and best ameliorate the costs of the changes brought about by technology and trade.

■ The Two Sides of Global Sourcing from a Manufacturing Perspective

Because the globalization of services is just beginning, we don't yet know for sure how much we stand to gain from it, but we can expect to gain plenty if the gains from the globalization of manufacturing are any guide. Research using very detailed plant-level data, summarized in a short book by Howard Lewis and J. David Richardson, shows that global engagement through trade and investment has been very advantageous for U.S. workers and firms.¹ First, workers and companies that export have 0.6–1.3 percent faster sales growth and 2–4 percent faster employment growth,

and offer dramatically better pay and benefits. Exporting is the slam-dunk of global engagement.

But even if a firm only imports, it is more likely to receive foreign direct investment, which pays for advanced manufacturing technologies, which yield higher wages for the workers. For each 10 percent of imported input, worker salaries are higher by \$1,000.

This research also finds that multinational groups are more robust than domestic-only companies. Plants that are part of a U.S.-parent multinational company have 11 percent higher labor productivity than those that are only domestic, and this higher productivity supports a 7–15 percent wage premium (blue- and white-collar, respectively). It is also the case that U.S. plants that are owned by a foreign parent are more likely to grow faster, employ more people, use advanced manufacturing technologies, and have 13–19 percent higher wages compared to domestic-only plants.

These economywide, plant-specific, and individual-worker gains are not without cost. Lori Kletzer analyzed a sample of dislocated workers, spanning a period of 21 years, and found that 17 million workers were displaced from manufacturing overall and 6.4 million were displaced from sectors facing particularly high import competition, such as electrical machinery, apparel, motor vehicles, non-electrical machinery, and blast furnaces.² About 21 percent of workers displaced from manufacturing sectors were high school dropouts. Although about 70 percent of displaced manufacturing workers did get a new job (about half in their same industry), weekly earnings were, on average, 13 percent lower. This average masks important differences in wage outcomes: Some workers did quite well in their new jobs—36 percent reported the same or higher earnings. Others fared poorly—25 percent reported earnings losses of 30 percent or more. Those reporting the worst replacement earnings were the older, less-educated and lower-skilled production workers with the longest tenure at their old job. An important finding of Kletzer's work is that among all re-employed workers, the re-employment experience was similar whether the job was lost on account of imports or for some other reason—except for the specific case of women losing jobs in the apparel industry. So, international trade was not the unique factor dominating the job loss or re-employment outcome.

A key lesson from the research on globalization is that the gains are large. Equally instructive is the observation that the adjustment costs for those who lose their jobs are similar regardless of whether they lose them because trade affected their industry or for some other reason. That this should be the case emphasizes the need for policy to address the adjustment cost of technological change, particularly in the context of upgrading of skills in the workplace, not just the forces of international trade. Most specifically, policy needs to address the fact that those with a lower level of educational attainment fare worst when it comes to adapting to change.

■ International Trade in Services: Why Now and How Important for the United States?

What changed to make services internationally tradable, and how important might that trend be for the U.S. economy? What changed, in short, are the attributes of services that made them heretofore nontradable: Services used to involve high transactions costs and require functional business integration. For example, financial, legal, or administrative services have required handshakes, physical presence to sign papers, or professional licensing exams unique to a jurisdiction. These attributes have been eroded over time by global technological change, local policy change, and changes in customer and business attitudes.

Key technological changes include the Internet in conjunction with international telecommunications networks, information technology (IT) hardware (such as personal computers), and the digitization of activities. These technologies have created the potential for linkages between countries and businesses that simply did not exist before.

A second key technological innovation has been the codification of information, which reduces the specific knowledge needed to perform skill- and information-intensive tasks. For example, the on-screen menu system in a customer service center replicates aspects of the step-by-step decisionmaking process taken by an expert, so that people with less experience can perform these tasks effectively. Spreadsheet software with embedded equations, combined with the ability to download data, means that people with modest financial training can prepare financial reports.

All told, communications infrastructure and codification of information make it easier to separate many tasks from the

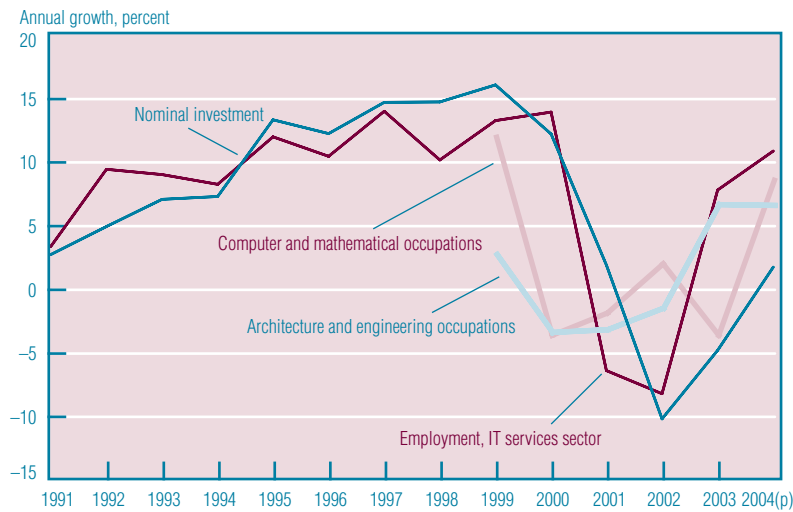
internal functions of a firm. Once separable from the core activity of the firm, these activities can be outsourced. Once outsourced, they can be offshored, that is, done abroad *if* the foreign location has the appropriate infrastructure, business environment, and worker and firm characteristics. Although technology is the driving force behind the potential globalization of these activities, the extent of actual globalization is limited by the characteristics of the trading countries and the degree of fragmentation of the activity.

How important to the United States is the trend toward expanding trade in services? Without a doubt, services are increasingly important in the U.S. economy, and increasingly important in international engagement. Their contribution to national production, international trade, and foreign investment continues to grow, and the proportion of U.S. workers engaged in this sector now far exceeds all others combined. Services account for 60 percent of real personal consumption expenditures,³ 84 percent of private industry products, about 30 percent of exports, and about 15 percent of imports. Service occupations account for about 90 percent of employment. No wonder globalization of services has generated concern.

Not only are services already important for the domestic economy, the global integration of U.S. services is proceeding quite rapidly. Data on cross-border services trade show that trade transactions in “other private services” is growing faster than cross-border trade in goods and is increasingly in surplus.⁴ Other private services exports are growing more than twice as fast as goods exports, and other private services imports are growing about 50 percent faster. The net positive trade balance in other private services has increased over the last dozen years, and stands in contrast to the large and increasingly negative balance of trade for goods. Technology may well be increasing two-way trade in these services, but the concern that trade of technology-enabled services will disproportionately favor service imports over exports is not corroborated by these data—in fact, the robustness of these exports even in the face of slow growth in major industrial markets abroad suggests that U.S. providers of technology-enabled services are globally competitive.⁵

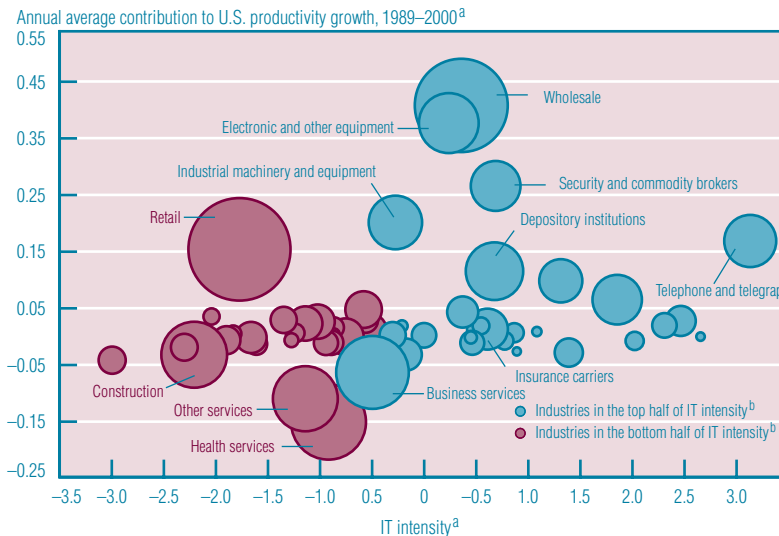
Meanwhile, U.S. direct investment abroad and direct investment into the United States are increasingly in the service sector. Services that are *enabled* by information technology, such as finance,

FIGURE 1 IT INVESTMENT AND IT-RELATED EMPLOYMENT



NOTE: IT services consists of software publishing (NAICS category 5112), ISPs, search portals and data processing (NAICS 518), and computer systems design and related services (NAICS 5415). It does not include IT employment outside these sectors. Investment data for 2004 are the average of Q1, Q2, and Q3 final data, and 2004 employment data are the 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 refer 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.

FIGURE 2 UNEVEN DIFFUSION OF IT AND UNEVEN PRODUCTIVITY GROWTH BY SECTOR IN THE UNITED STATES



a. See Economics and Statistics Administration, Department of Commerce, *Digital Economy 2002*, p. 34, available at <https://www.esa.doc.gov/reports/DE2002_CH4.pdf>, for an explanation of how this measure was calculated.

b. The size of the bubbles indicates the individual sector's share of GDP.

SOURCE: Economics and Statistics Administration, Department of Commerce, *Digital Economy 2002*, Table A4.4.

insurance, information, and business and professional services, accounted for about one-third of the cross-border flows of direct investment between 1999 and 2003.

Direct investment in information-technology-enabled services is somewhat more important coming into the United

States as compared to U.S. investment abroad, which may be due to a more liberal environment for foreign investment in the United States. All told, if the model of manufacturing is repeated for information-technology-enabled services, the potential gain to the U.S. economy could be quite great.

However, the adjustment challenges could be greater than experienced with manufacturing, not just in the United States, but in other countries around the world. First, the proportion of the U.S. economy in the services sector is larger than that in manufacturing—and this is true for most industrial nations. Second, the pace of change for the globalization of services is more rapid than for the globalization of goods. Moreover, because the share of services in consumption rises as a country gets richer, the pace of globalization of trade and investment in services is likely to accelerate with faster GDP growth here and greater economic development abroad. Fourth, with both trade and direct investment in services increasing around the world, the share of labor—both in industrial and in developing countries—exposed to international market forces is rising, in contrast to manufacturing and agriculture, where productivity growth is reducing the ratio of labor input to production.

Because the United States is on the leading edge of the gains and adjustment challenges presaged by the globalization of services, other countries will be looking to our policy direction for guidance. Policies undertaken here at home—to either embrace trade or to try to slow it down, to develop labor-skills policies or to ignore worker adjustment—could affect the potential markets abroad for U.S. trade and investment.

Is the policy response obvious? Unfortunately, despite the sense of urgency created by these measures of trade and technology, we have no crystal-clear picture of the path that the globalization of U.S. services will take, nor of all its implications. Because the pace of change is so brisk, that fact is not likely to change. Even as additional data are collected, policymakers will have only an imperfect picture to work with.

Globalization on Steroids: The IT sector

Examining the synergies between trade and technology in the IT sector may give insights on both the channels for potential gains and the nature of the policy challenges that may be brought by the globalization of services more generally. IT is a particularly interesting sector in that it manifests a very rapid pace of technological change combined with the speedy global integration of countries that have targeted the sector through investment and skill development.

Hard evidence on the gains from global sourcing of IT comes from looking at patterns of production, investment, and the use of IT. In the United States in the 1990s,

TABLE 1 EVOLUTION OF JOBS AND SKILLS IN SELECTED U.S. TECHNOLOGY OCCUPATIONS, 1999–NOVEMBER 2003

	Employment			Wages
	Absolute change 1/99–11/03	Percent change 1/99–11/03	Level 11/03	11/03
Call-center and low-wage technology workers				
Call-center-type occupations ¹	-126,110	-22	444,500	\$ 25,000
Low-wage technology workers ²	-419,140	-33	856,720	\$ 24,000
Total	-545,260	-30	1,301,220	\$ 25,000
Production workers in the manufacturing sector (for comparison)				
		-20		
High-wage technology workers				
Computer programmers, SOC 15-1021	-125,380	-31	403,220	\$ 65,000
Software engineers and systems analysts ³	263,980	22	1,188,820	\$ 73,000
Database administrators, SOC 15-1061	-3,920	-4	97,540	\$ 62,000
Network and system administrators and analysts ⁴	137,800	21	645,490	\$ 65,000
Computer hardware/electrical engineers ⁵	34,430	10	350,890	\$ 77,000
Total	264,470	11	2,465,120	\$ 70,000
Total CES employment (for comparison)				
		1		

SOURCES: Bureau of Labor Statistics, current employment statistics (CES) data, 1999, 2000, 2001, 2002, May 2003, and November 2003; Bureau of Labor Statistics, national occupational employment and wage estimates.

1. Telemarketers and telephone operators (Standard occupational classification (SOC) 41-9041 and 43-2021).
2. Switchboard operators and answering services; computer operators; data entry keyers; and word processors and typists (SOC 43-2011; 9011; 9021; and 9022).
3. Computer software engineers, applications; computer software engineers, systems software; and computer systems analysts (SOC 15-1031; 1032; and 1051).
4. Network and computer systems administrators; and network systems and data communications analysts (SOC 15-1071; and 1081).
5. Computer hardware engineers; electrical engineers; and electronics engineers (SOC 17-2061; 2071; and 2072).

the globalization of the IT hardware industry resulted in U.S. IT prices some 10 to 30 percent lower than they would have been based on domestic production and domestic technological advances alone.⁶ The lower prices increased investment in IT hardware and spread its use. Because of the general-purpose nature of the IT product, estimates suggest that overall price declines spurred a greater than one-for-one increase in IT investment throughout the economy.⁷ Lower prices also freed up resources for other activities within firms, including the important reorienting and transforming of business activities and workplace practices that were needed to use the information technology more effectively.⁸

Both the increased IT investment and the business transformations spurred by it raised productivity and real GDP growth in the United States. Altogether, IT accounted for well more than half of the acceleration of structural productivity growth of the 1990s, which supported both the higher GDP growth (4 percent) and the lower unemployment rates (3.9 percent) enjoyed by the U.S. economy in the second half of the decade.

The boom in IT capital investment also spurred the hiring of IT professionals. But the structural change in the U.S. economy toward more intensive use of information technology has been bumpy. Figure 1 shows that complementarity between IT capital and IT workers, which worked to increase the demand for IT workers during the technology boom, yielded a wave of firings during the tech bust. Nevertheless, as IT investment has rebounded, so, too, has the demand for workers with IT skills.

The economywide story masks noteworthy differences in the diffusion of IT across sectors in the U.S. economy, which points to where the future gains of the globalization of IT services and software may come from. “Leading” sectors, such as wholesale trade, electronic products, and financial institutions, invested relatively more in IT, whereas other sectors, such as health services and construction, lagged in the uptake of IT. Productivity performance at the sector level is similarly uneven, with the sectors with the highest investment in IT having the highest productivity growth (see figure 2). The leading sectors also hire the bulk of IT profes-

sionals, and sectors such as finance run international trade surpluses. So, going hand in hand with IT intensity are gains to productivity growth, IT jobs, and trade surpluses.

■ Software and IT Services: The Next Wave of Global Sourcing

Going forward, the United States is poised for (indeed, perhaps is in the midst of) a second wave of IT investment, growth in IT jobs, and faster macroeconomic productivity growth, as components of software and IT services are produced more cheaply abroad as part of an international value chain. A key source of the gains to investment, jobs, and productivity may come from diffusion of IT into the sectors that did not take up IT during the 1990s.

How does globalization of services meet the challenges of the sectors that lagged in the 1990s? Large sectors in the U.S. economy, such as health services and construction (about 5 percent of GDP each), as well as many small and medium-sized enterprises (SMEs) still do not use IT very intensively. Reasons range from cost to culture to regulatory

constraints. For example, the culture and business of SMEs often require more tailored IT applications and on-site assistance. In health services, regulatory issues are quite important for software and services design, as is the complexity of the relationships along the chain of delivery of health services (doctor, hospital, pharmacy). In construction, professional licensing and “stick-built” housing construction have been the norm.

These issues have interacted with the higher relative cost of software and services to put IT further out of reach for these firms. Although the hardware may be generalized to fit many needs, services and software are more situation-specific. So, as hardware prices fell in the 1990s, software and IT services became more important, and spending on them rose relative to hardware. In 1993, for each \$1 spent on hardware, firms in the United States spent \$1.40 on software and services. But by 2000, the ratio was \$2.20 on software and services for every \$1 on hardware.⁹

Offshoring of some components of services and some part of software production should reduce the price of customized software and services. Because the responsiveness of demand to the price of these products is estimated to be even greater than in the case of IT hardware, as these products become less expensive, demand for them will expand more than proportionate to the decline in price. As a result, the lagging sectors should be able to afford more IT, the leading sectors should deepen their use of it, productivity growth should rise throughout the U.S. economy, and the demand for workers with integrative IT skills in all sectors should grow as well.

Already, data point to how technology and globalization are affecting the mix of IT skills being demanded in the United States (see table 1). Between 1999 and November 2003 (the time period for which detailed data are available), the number of “programming” jobs, earning \$64,000 on average, fell by about 125,000. But jobs held by applications- and systems-software engineers, database analysts, and network engineers, earning \$74,000 on average, increased by some 425,000. Thus, global sourcing of software and services, even as it increases the number of IT jobs, changes the mix of IT jobs—with a greater emphasis on integrating imported components, and analyzing, designing, and implementing

IT products to meet the specific needs of U.S. businesses.

The effect of technology and international trade together also can be seen for occupations that use IT but are less highly skilled and pay lower wages—around \$25,000. These occupations—telemarketers, switchboard operators, telephone operators, computer operators, data entry keyers, word processors and typists, and office machine operators—experienced very large job losses (545,000) from 1999 to November 2003—a decline of about one-third of those employed in 1999. These jobs are not likely to return to the United States or indeed anywhere, to the extent that they have been replaced by technology itself.

■ Coordinating Domestic and International Policies

If this is the face of twenty-first-century globalization, what is the twenty-first-century policy response? Both domestic and outward-oriented policies are important.

First, technology and trade put an even higher premium on more education, whether above high school or in the industrial trades. Second, innovative methods will be needed to help move dislocated workers to new careers and up a new wage ladder. Two possibilities are on-the-job training and wage insurance. Wage insurance (see Lori Kletzer and Robert Litan¹⁰) replaces for a period of time a fraction of the difference between the old wage at the lost job and the new wage at the new job. This policy encourages people to take work in a new career, while recognizing that a low rung on a new job ladder probably does not pay as much as a high rung on a career that is now gone.

Third, for some skills, particularly in science and technology, several “classic” market imperfections warrant more incentives for on-the-job training to try to forestall any job loss. Such a “human-capital” investment tax credit recognizes that technology skills take a long time to develop, yet depreciate quickly, and, moreover, that the first job in a technical career ladder may no longer exist in the United States, once technology enables international trade.

What market imperfections support the human-capital investment tax credit? “Free-riding” by some firms on training costs and benefits tends to limit how much all firms spend on training their

own workers. “Spillover” benefits for the economy as a whole are generated from innovative science and technology workers, and workers able to adjust to new ways of working with technology. “Incomplete information” about what skills might be demanded in the future hinders workers from retooling before their skills depreciate and their jobs are lost. These rather familiar market imperfections are the rationale for the R&D tax credit and the investment tax credit for IT capital. In twenty-first-century competition, a human-capital investment tax credit offered to individuals, through firms, and implemented by educational institutions has even greater salience, given the importance of innovation and human skills in today’s international environment.

With respect to outward-looking policies, both macroeconomic growth abroad and trade liberalization in services are needed. Advocating macroeconomic policies abroad that promote growth and development may well play a particularly important role in raising exports of information-technology-enabled services because estimates indicate that exports of U.S. services rise more than one for one with growth abroad and also rise with the importing countries’ level of development, as compared with goods exports.¹¹ Second, more explicit and urgent attention to services negotiations in the Doha round of multilateral trade negotiations is needed. Research suggests that global gains from liberalizing services exceed those for agriculture and manufacturing. For some countries, including the United States, GDP gains come through more exports. For other countries, including many developing countries, GDP increases as all sectors of the economy gain from more efficient provision of services.¹²

Bangalore is calling, and international trade in information-technology-enabled services offers the prospect of deeper global integration, faster productivity growth, higher wages, and more job creation both in the United States and abroad. Global integration is on “speed dial” and, because services are a greater and rising share of the economy and employment, far superior policy responses are crucial. To avoid having the U.S. economy “hang up” on the gains from trade, policymakers must do more to aid in the adjustment of those on the front lines of globalization.

■ Footnotes

1. Howard Lewis and J. David Richardson, 2001. *Why Global Commitment Really Matters*. Washington, D.C.: Institute for International Economics.
2. Lori Kletzer, 2001. *Job Loss from Imports: Measuring the Costs*. Washington, D.C.: Institute for International Economics.
3. Because of the chain indexes, calculations of shares and ratios of components are illustrative of order of magnitude, not exact.
4. Cross-border trade in the category of transportation, travel, and government services has gone into deficit, but these services are distinct from those considered within the rubric of "information-technology-enabled services."
5. Catherine L. Mann, 2004. "The U.S. Current Account, New Economy Services, and Implications for Sustainability," *Review of International Economics*, 12(2).
6. See Catherine L. Mann, 2003. "Globalization of IT Services and White-Collar Jobs: The Next Wave of Productivity Growth," Institute for International Economics Policy Brief, December.
7. See Tamim Bayoumi and Markus Haacker, 2002. "It's Not What You Make, It's How You Use IT: Measuring the Welfare Benefits of the IT Revolution across Countries," IMF Working Paper WP/02/117. Washington, D.C.: International Monetary Fund.
8. See Sandra Black and Lisa Lynch, 2004. "Workplace Practices and the New Economy," Federal Reserve Bank of San Francisco, *Economic Letter* no. 2004-10 (April 16); Timothy Bresnahan, Erik Brynjolfsson, and Lorin Hitt, 2002. "Information Technology, Workplace Organization, and the Demand for Skilled Labor: Firm-Level Evidence," *Quarterly Journal of Economics* (February), pp. 339-76.
9. See World Information Technology and Software Alliance (WITSA), 2002. Digital Planet.
10. Lori Kletzer and Robert Litan, 2001. "A Prescription to Relieve Worker Anxiety," Institute for International Economics Policy Brief 01-2 (February).
11. Mann, 2004. op.cit.
12. Drusilla K. Brown, Alan V. Deardorf, and Robert M. Stern, 2003. "Impacts on NAFTA Members of Multilateral and Regional Trading Arrangements and Initiatives and Harmonization of NAFTA's External Tariffs," in *North-American Linkages*, edited by Richard G. Harris, Ottawa: Industry Canada. See also Phillipa Dee and Kevin Hanslow, 2001. "Multilateral Liberalization of Services Trade," in *Services in the International Economy*, edited by Robert M. Stern. Ann Arbor: University of Michigan Press, pp. 118-39.

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