The Impact of Globalization on the United States

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CHAPTER 3

Globalization, Offshoring, and Economic Convergence: A Survey

Dwight M. Jaffee

The impact that globalization has, and will have, on the U.S. economy continues to be one of the most debated economic issues of our time. *Globalization*, of course, is a very broad term; I use it here to refer to changes leading to the freer flow of goods, services, and factors of production between countries. Economists, generally speaking, view such globalization as highly beneficial, based on the international benefits of free trade. At the opposite extreme, globalization is commonly opposed by workers whose jobs are being transferred to foreign locations.[1] Neither is disinterested: workers have an interest in keeping their jobs, and economists (as a group) may have a vested interest in concluding that basic economic forces are benevolent. In the middle, policy makers, journalists, and other neutral observers, seeing both sides of the issue, are often perplexed and unsure what to conclude.

The primary goal of this chapter is to help this middle group to understand the key policy issues that globalization and offshoring raise. In good part, this means asking the right questions and focusing on the right issues. For example, many recent press discussions have focused on the number of jobs lost to offshoring (here interpreted as the form of globalization in which existing U.S. jobs are transferred abroad). However, the evidence is strong, as provided in the first section of this chapter, that such job losses are generally transitory. Thus, lost jobs cannot be a fundamental argument against offshoring, although a strong case can still be made to support policy initiatives for unemployment benefits and worker retraining.

Wage rates and income levels are the proper issues of public concern, focusing on questions such as whether the replacement jobs have significantly lower wage rates. This concern has expanded as offshoring activity

moves beyond manufacturing, now reaching high-paying jobs in high-tech services such as computer programmers. International trade theory has always considered the impact that free trade could have on wage rates and national incomes. Recently, attention has been focused even more on trade theory, due to the publication of *Global Trade and Conflicting National Interests* by Ralph Gomory and William Baumol, "Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization" by Paul Samuelson, and "The Muddles over Outsourcing" by Jagdish Bhagwati, Arvind Panagariya, and T. N. Srinivasan.[2] As these titles all suggest, trade theory is highly relevant to the questions at hand. However, the models are all "delicate" in the sense that subtle changes in the question posed can lead to a major change in the answer provided. In the section titled "Labor Income Effects of Globalization and Offshoring," I apply trade theory to answer the questions raised by the offshoring phenomena for U.S. income levels.

The above trade theory papers all raise the possibility that—they identify conditions under which—rising productivity and technological innovations among U.S. trading partners could seriously challenge our world leadership in high-tech industries, even creating an absolute decline in our income levels. The discussion in the section "Long-Term Options for U.S. Comparative Advantage" takes up the issue, confirming that the conditions required for falling income levels could well occur over, say, the next twenty-five to fifty years. Fortunately, U.S. policy actions can also influence the likely outcome, and the chapter concludes with a discussion of these options.

JOB LOSSES ARE TRANSITORY

Job losses have become the primary metric for the costs of offshoring in press and public discussions. Economists, in contrast, generally believe that labor markets equilibrate rapidly, and that most workers who lose jobs to offshoring are soon reemployed. One explanation for the divergent views is that the *job losses necessarily come first and often are part of a large layoff*, while the reemployment of workers occurs later and usually one job at a time. It is not surprising therefore that the job loss, but not the subsequent rehiring, captures press attention.

A second factor creating divergent views is that the job replacement process is not readily observable. It seems, as Adam Smith noted, to be the work of an Invisible Hand, which may be no more convincing than is the Tooth Fairy to real-world observers who plainly see the job losses. But even if economists cannot display the process, we should be able to document the resulting job renewal. With this goal, several alternative data sets are now discussed.

Macroeconomic Evidence of Jobs Recovered from Technological Change

The increase in average worker productivity—here meaning gross domestic product (GDP) per worker—is among the most dramatic U.S.

macroeconomic phenomena of the post–World War II era. This is illustrated in figure 3.1, which shows U.S. real GDP and employment as index numbers starting at 1.0 in 1948. Over the ensuing fifty-nine-year period, real GDP rose 712 percent cumulatively, while employment grew 251 percent cumulatively, so that real GDP per worker grew 284 percent. The annual compound growth rate of GDP per worker was 1.78 percent. This remarkable record is attributable to many factors, including the growth in other inputs (both physical and human capital) and technological and management advances. The results do not directly depend on offshoring, because imported goods are a debit against GDP. However, offshoring may contribute indirectly by allowing the existing factors of production to be efficiently reallocated.

The productivity increases reflected in figure 3.1 were not necessarily considered positive developments when they actually occurred. In fact, by the early 1960s, there was widespread public concern that a new wave of automated factories doomed U.S. manufacturing workers to a jobless future, in a fashion parallel to the current concerns over offshoring.[3] A pessimistic view, for example, would have interpreted the 1.78 percent annual growth rate in GDP per worker as rendering 1.78 percent of workers unemployed each year. Had this continued unabated for the fifty-nine years of our sample, most of the U.S. labor force would have been unemployed by 2006.

While the anticipated automation of U.S. manufacturing did occur, the feared unemployment effects did not.[4] Figure 3.2 shows that there has

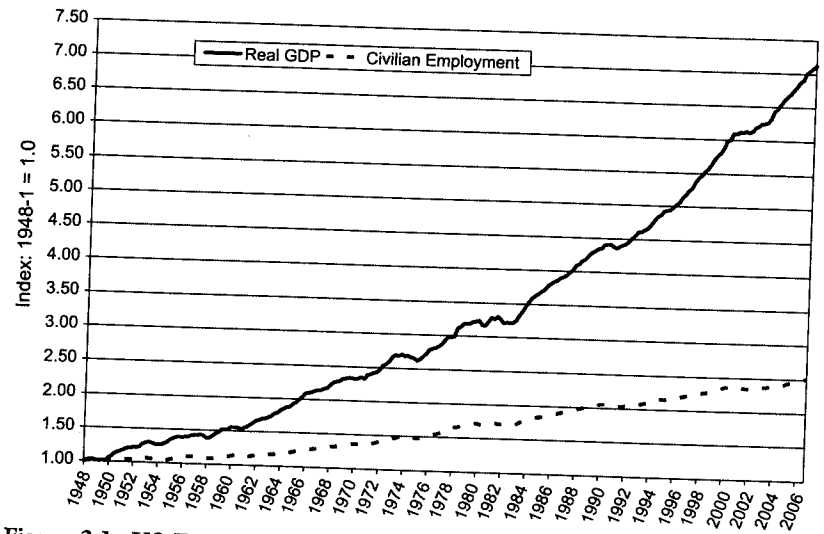

Figure 3.1. US Employment and Real GDP, Index 1.0 = Quarter 1, 1948, 1948 to 2006

Source: Current Population Survey for Civilian Employment, Bureau of Economic Analysis for Real GDP

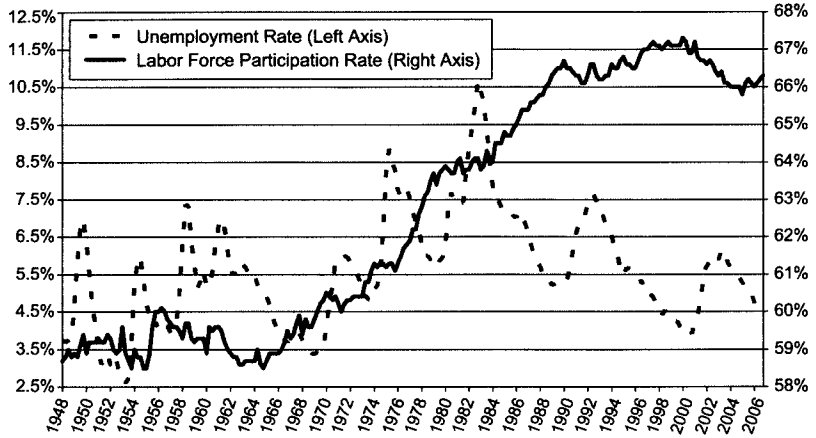

Figure 3.2. US Unemployment and Labor Force Participation Rates (In Percent), 1948 to 2006
Source: Current Population Survey

been no trend in U.S. unemployment rates over the time span; the 4.5 percent unemployment rate in 2006 is well below the 7 percent level reached in 1949 (and is below the full-period average of 5.6 percent). It could be countered that, sooner or later, these workers all left the labor force, either because they become disillusioned or because they just retired. Figure 3.2 also shows, however, that the labor force participation rate has trended steeply upward over the time period, implying that increasing numbers of disillusioned workers are not observable in these data. Similarly, retirement, even early retirement, cannot be masking an unemployment problem: even with retirements, the labor force is steadily expanding, so a significant net loss of job opportunities would have to be reflected in a rising unemployment rate.

To be sure, other macroeconomic factors also influence the unemployment and labor force participation rates, and in principle these could obscure a link between technological change and unemployment. Given the power of a 1.78 percent compound annual growth in GDP per capita, however, labor market effects would surely stand out if technological advances really created lasting unemployment. Thus, I conclude that the workers displaced by technology found new employment such that no macroeconomic trace remains in the unemployment statistics.[5]

Another possible counterargument is that offshoring and technological change are not the same thing, so that the observed benign impact of technological change on total employment need not apply to offshoring. In a moment, I will show that the available offshoring evidence also shows no net employment loss. First, however, I want to note the observational equivalence between technological change and offshoring activity, implying that comparable employment effects should be expected. Paul Krugman has made this point with a parable originally from James Ingram:

> He imagines that an entrepreneur starts a new business that uses a secret technology to convert U.S. wheat, lumber, and so on into cheap high-quality consumer goods. The entrepreneur is hailed as an industrial hero; although some of his competitors are hurt, everyone accepts that occasional dislocations are the price of a free-market economy. But then an investigative reporter discovers that what he is really doing is shipping the wheat and lumber to Asia and using the proceeds to buy manufactured goods—whereupon he is denounced as a fraud who is destroying American jobs. The point of course is that international trade is an economic activity like any other and can indeed usefully be thought as a kind of production process that transforms exports into imports.[6]

Robert Feenstra also concludes from his detailed analysis of technological change and globalization that "globalization has an impact on employment and wages that are *observationally equivalent* to the changes induced by technological innovation."[7]

Jobs Lost to Recent Offshoring of Service Sector Jobs

We now focus on the impact of offshoring on service sector jobs, ranging from call center operators to computer software engineers. One positive factor for service sector workers is that they are likely to exhibit greater flexibility for reemployment after layoffs due to their generally higher and less specific skills. For example, it would seem harder to reemploy a steel production worker than a call center operator or a software engineer. This flexibility of service sector workers is consistent with the results of Mary Amiti and Shang-Jin Wei, who tested for U.S. employment effects from the offshoring of services between 1992 and 2001.[8] They find significant losses of employment when their data are deeply disaggregated (to 450 industries), but these effects disappear when they consider a higher aggregation (100 industries). This suggests that displaced service sector workers are readily moving to similar industries.

Research on the employment effects of offshoring, including that by Amiti and Wei, generally uses industries as the unit of observation. The current wave of service sector offshoring, however, is primarily based on *occupations*, in contrast to the offshoring of manufacturing goods in earlier periods, which was primarily based on industries. As an example, the 1980s and 1990s saw the offshoring of silicon chip manufacturing from the United States to Asia, which caused a large part of the industry, covering a wide range of occupations and tasks, to move abroad. Today, in contrast, the offshoring of service sector jobs is focused on particular occupations, such as call center operations and software engineers, with no suggestion that an entire industry is being moved. Indeed, the evidence suggests that the majority of offshored service sector jobs are actually located within manufacturing enterprises and industries.

Using the concept that occupations, not industries, now move, my colleagues Ashok Bardhan and Cynthia Kroll compiled a list of service occupations "at risk" for offshoring.[9] (Also see Kroll's chapter 4 in this

volume for the latest list of at-risk service occupations.) Their choice of occupations at risk is based on such key factors as:

- No required face-to-face customer or management contact
- Information and data-based services, which are adaptable to foreign workplace cultures
- Communication requirements that are readily adaptable to high-speed broadband links

It is important to stress that the Bardhan and Kroll list only reflects occupations that are at risk. How many jobs actually move abroad, and how rapidly they do so, will also depend on whether the foreign countries maintain a properly skilled labor force; significant wage differentials; sufficient infrastructure, including physical and communications capital structures; and an appropriate business climate, including protection of data and intellectual property.

A summary tabulation of employment in at-risk job categories, from 1999 to 2006, is provided in table 3.1, based on the Occupational Employment Statistics (OES) of the Bureau of Labor Statistics. It starts in 1999 because that was the first year the OES used the new Standard Occupational Classification (SOC) system of the Office of Management and Budget. By focusing on the at-risk share of total employment, I control for business cycle changes in total employment. The main point demonstrated in the table is that the at-risk share of total employment steadily rose over almost the entire 1999 to 2006 time period. Assuming that dislocated workers prefer reemployment in their initial occupation, these data suggest that workers in at-risk occupations had a more favorable reemployment experience than did the dislocated workers in all other occupations. The data also suggest that the number of jobs in at-risk occupations would have been decidedly rising were it not for 2000 to 2002 recession.

Three possible caveats should be noted:

1. In one category, medical/legal/sales, total employment declined slightly from 1999 to 2005. Indeed, a comparable computation carried out at the level of disaggregated individual occupation codes reveals many such examples. This is not surprising, since we know that jobs in these occupations were lost to offshoring over this period. The key question concerns the access these laid-off workers had to new jobs in either their initial or another at-risk occupation. The relative employment growth shown in table 3.1 suggests that, when considering the opportunities of dislocated workers looking for reemployment in their initial occupation, the likelihood of success appears greater for workers initially in the at-risk occupations than in all other occupations.
2. It is possible that the relative growth in at-risk employment reflects only a shift in employment across industries. That is, we could observe the relative growth in at-risk employment for the aggregate, even though the at-risk employment share is falling in each industry, if the fastest-growing industries also had the highest initial at-risk

Table 3.1.
Employment in At-Risk and Total Occupations, 1999 to 2006

		In Thousands of Workers							
At-Risk Occupations[1]	**Code**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Business/Finance Support	13-xxxx	1,997	2,139	2,153	2,199	2,291	2,377	2,482	2,653
Computer and Math	15-xxxx	2,620	2,933	2,826	2,773	2,827	2,915	2,953	3,076
Graphics/Design/ Writing	17-, 27-xxxx	317	335	342	350	359	374	398	419
Office Support	43-xxxx	8,640	8,730	8,638	8,595	8,586	8,713	8,691	8,809
Medical/Legal/Sales	Misc.	937	911	883	886	882	890	894	892
Total At-Risk Employment		14,510	15,047	14,842	14,801	14,944	15,270	15,417	15,850
Total Employment, All Occupations		127,274	129,739	127,980	127,524	127,568	128,127	130,308	132,605
At-Risk Employment as Share of Total		11.40%	11.60%	11.60%	11.61%	11.71%	11.92%	11.83%	11.95%

Notes:
1) At-Risk occupations are based on those identified in Bardhan and Kroll [2003].
2) Through 2002, the OES data are benchmarked to a fourth quarter reference period. Starting with 2003, data are from the May semi-annual survey.
Source: Occupations Employment Survey (OES), Bureau of Labor Statistics

employment ratios. To test for this possibility, I recomputed the at-risk employment assuming that total employment in all industries had grown at the national average. The results showed a positive, albeit negligible, increase in the recomputed at-risk employment, indicating that the actual aggregate results are not driven by industry effects.[10]

3. It is possible that the relative job growth in the at-risk categories would have been still higher were it not for the negative influence of offshoring. This could well be the case, but presumes the goal is to expand employment in the at-risk occupations, not just to maintain the existing employment opportunities. Given that offshoring is a market signal that future growth in these occupations may be limited, it might be considered a good thing to dissuade workers from switching from other occupations to the ones at risk.

Other U.S. Labor Market Data

A 2004 U.S. Government Accountability Office (GAO) report on the effects of services job offshoring on the U.S. economy and employment concluded that very little useful information was available from government agencies.[11] The one partial exception is the Labor Department's Mass Layoff Survey (MLS), which is a federal-state cooperative statistical effort to track extended layoffs at private, nonfarm firms with at least fifty employees and at least fifty initial claims for unemployment insurance filed within a five-week period. As a result of these constraints, Sharon Brown reports that the 2003 survey covered 4.6 percent of all U.S. establishments and 56.7 percent of all U.S. workers.[12]

Since 1996, the survey has included "overseas relocation" as a reason for layoffs. The results from 1996 to 2003 indicate that a very small proportion—generally less than 1 percent of all extended layoffs—were attributed to overseas relocations. There was concern, however, that the low result was due to survey design, so the survey was revised in 2004 with more detailed questions on relocations. Table 3.2 provides the

Table 3.2.
Out of Country Relocations from Extended Mass Layoffs

	Layoff Events			Separations		
	2004	2005	2006	2004	2005	2006
Total	5,010	4,881	4,885	993,909	884,356	935,805
Total with Relocations	382	259	232	55,122	34,194	34,036
Domestic	270	164	148	36,246	21,470	20669
Out of Country	103	91	84	16,197	12,030	13367
Unassigned location	9	4	0	2,679	694	0
Out of country/Total	2.06%	1.86%	1.72%	1.63%	1.36%	1.43%

available data from 2004 to 2006 for total separations due to extended mass layoffs, including those where relocation was indicated as a source of the separation. Even with the redesigned survey, well less than 2 percent of the total separations are attributed to out-of-country relocations. It is quite possible, of course, that there is still substantial underreporting, since independent counts of layoffs due to overseas relocations often provide larger numbers.[13] Also, as discussed in the GAO report, this data problem is only one of many challenges for the measurement of offshoring activity. For example, there are now also serious questions about whether U.S. imports of services, which should be expanding due to offshoring, are being accurately counted.[14]

The Labor Department's Business Employment Dynamics (BED) statistics provide another useful indicator of labor market activity, although without any special reference to offshoring. This source has tracked gross job gains and losses, as well as the net change in employment, since 1993 for about 98 percent of all U.S. employment. A summary is shown in table 3.3. Part A shows, for the total private sector, aggregate job gains and losses and the net change (gains minus losses). The key feature of the table is the large magnitude of the gross gains and losses relative to net changes, implying a very high degree of fluidity in the U.S. labor market. Furthermore, the net loss rate—computed as the net change divided by the gross losses—indicates that even in recession years with a net loss of jobs, the net loss remains a small percentage of the gross losses (peaking at 8.8 percent in 2001).

Part B of the table applies the same format to what the survey defines as the "information sector." This is instructive because here we see a much larger net loss rate, reaching almost 25 percent, no doubt as a result of the dot-com bust and recession. Parts C and D again apply the same format to jobs in the goods and services sectors of the economy, respectively, the sum of which equals the total shown in Part A. It is interesting here that the net loss rates from 2000 to 2003 for goods-sector jobs vastly exceed the comparable rates for service-sector ones, consistent with the view that service-sector workers more readily find new employment.

Job Loss Insurance and Worker Retraining

The data reviewed in the previous sections indicate that job losses, most importantly service-sector job losses, do not lead to measurable and sustainable increases in macroeconomic unemployment rates. At the individual level, of course, there must be dislocations, since the benefits of international trade are obtained exactly by relocating resources. This process is what Joseph Schumpeter called "creative destruction" and what Dani Rodrik refers to in a more modern idiom, "No pain, no gain!"[15]

U.S. policy has long responded to this pain, creating programs for unemployment insurance and worker retraining (starting with President Kennedy's Manpower Training Act of 1962). Since 1974, special assistance has been given to workers displaced by imports under the Trade Adjustment Assistance (TAA) program. This TAA program was significantly extended in 2002, adding the following key features:

Table 3.3.
Gross Job Gains and Losses (Thousands of Jobs)

	A. Total Private Sector Jobs				B. Information Sector Jobs			
	Gross Gains	Gross Losses	Net Change	Net Rate	Gross Gains	Gross Losses	Net Change	Net Rate
1993	29,598	26,984	2,614	9.7%	650	610	40	6.6%
1994	30,809	27,589	3,220	11.7%	739	634	105	16.6%
1995	31,343	29,017	2,326	8.0%	791	716	75	10.5%
1996	32,490	29,895	2,595	8.7%	857	705	152	21.6%
1997	33,714	30,765	2,949	9.6%	892	777	115	14.8%
1998	34,625	31,794	2,831	8.9%	952	847	105	12.4%
1999	35,505	32,903	2,602	7.9%	1,087	881	206	23.4%
2000	35,084	33,243	1,841	5.5%	1,161	941	220	23.4%
2001	32,451	35,574	**-3,123**	**-8.8%**	921	1,217	**-296**	**-24.3%**
2002	31,643	32,110	**-467**	**-1.5%**	748	972	**-224**	**-23.0%**
2003	30,074	30,204	**-130**	**-0.4%**	640	746	**-106**	**-14.2%**
2004	31,472	29,383	2,089	7.1%	658	714	**-56**	**-7.8%**
2005	31,440	29,362	2,078	7.1%	620	627	-7	**-1.1%**
	C. Goods Sector Jobs				D. Service Sector Jobs			
	Gross Gains	Gross Losses	Net Change	Net Rate	Gross Gains	Gross Losses	Net Change	Net Rate
1993	7,828	7,445	383	5.1%	21,770	19,539	2,231	11.4%
1994	8,051	7,313	738	10.1%	22,758	20,276	2,482	12.2%
1995	7,954	7,681	273	3.6%	23,389	21,336	2,053	9.6%
1996	8,003	7,636	367	4.8%	24,487	22,259	2,228	10.0%
1997	8,315	7,735	580	7.5%	25,399	23,030	2,369	10.3%
1998	8,158	7,807	351	4.5%	26,467	23,987	2,480	10.3%
1999	8,205	8,133	72	0.9%	27,300	24,770	2,530	10.2%
2000	8,004	8,062	**-58**	**-0.7%**	27,080	25,181	1,899	7.5%
2001	7,083	8,695	**-1,612**	**-18.5%**	25,368	26,879	**-1,511**	**-5.6%**
2002	6,835	7,774	**-939**	**-12.1%**	24,808	24,336	472	1.9%
2003	6,619	7,281	**-662**	**-9.1%**	23,455	22,923	532	2.3%
2004	6,861	6,645	216	3.3%	24,611	22,738	1,873	8.2%
2005	6,853	6,634	219	3.3%	24,334	22,728	1,606	7.1%

Net Rate = Net Change/Gross Losses (**bold** for years with negative net change)
Source: Business Employment Dynamics statistics, Bureau of Labor Statistics

- A comparable North American Free Trade Agreement (NAFTA) assistance program was integrated into the program.
- Income support was extended to seventy-eight weeks, but requires enrollment in a training program.
- Secondary workers who supply parts to a firm directly affected by trade became eligible.
- Workers affected by a shift of production to foreign countries became eligible for the first time.
- Health coverage tax credits were added.
- Wage insurance for older workers was introduced.
- The overall act was extended through 2007.[16]

Nevertheless, serious concerns remain. The existing act is commonly interpreted to apply only to manufacturing workers, although there are now lawsuits and new proposals with the goal of extending coverage to service-sector workers. The current act also does not help local communities and regions that face their own losses when local plants close. Finally, a 2006 GAO report indicates that the data jointly collected by the states and the Department of Labor for measuring trade adjustment assistance programs are highly deficient.[17] On a more positive note, another GAO report from 2006, in a case study of five trade-related plant closures, found that more than three-quarters of the displaced workers received some form of reemployment assistance, particularly personalized job search assistance.[18] Regarding wage insurance, there are now also proposals to provide much wider and deeper coverage.[19]

LABOR INCOME EFFECTS OF GLOBALIZATION AND OFFSHORING

We next turn to the basic issue for globalization and offshoring, namely, the impact on wages and income. Before turning to some new empirical data, this section begins with a review of the international trade literature.

The trade theory literature has created a large inventory of models that vary in the number of goods, factors of production, countries, and technologies considered, among other things. The purpose of the discussion here is to draw out the primary conclusions of this literature with regard to the impact of globalization and offshoring on the income levels of the participating countries. The review starts with Ricardian single-factor and Heckscher-Ohlin multiple-factor models, then considers the special issues of offshoring and imported inputs. "New trade theory" models, based on scale economies, are treated in the last section.

Single-Factor Ricardian Models

Single-factor models are a convenient place to begin, because the recent papers by Ralph Gomory and William Baumol and by Paul Samuelson applying trade theory to globalization both use this model.[20] I start with

the two-goods, two-country model as given by Samuelson, which includes the condition that consumption is split evenly among the goods in each country. Assume initially that international trade is not allowed to occur, so that the national income of each country is determined only by its own productivity in producing the two goods. If we call the two countries U (think United States) and A (think Asia) and assume U initially has higher productivity in both goods, then the national income in U will be correspondingly higher.

Free Trade Dominates No Trade

Now allow free trade to occur. We obtain, of course, the standard result that each country specializes in the good in which it has a comparative advantage—meaning a higher relative productivity—and *the national income in both countries will unambiguously rise.* Intuitively, free trade allows the residents of each country to (1) purchase the goods that are now imported at a lower (real) price and (2) export produced goods at a higher price, creating an unambiguous increase in real income. This result, moreover, generalizes to cases with many goods, many factors, and many countries.[21] Two caveats, however, should be noted:

1. The comparison is sharply made between no trade and free trade. This leaves open the question of how income changes when free trade already exists but there is a further change, such as an improvement in the available technology in one or the other of the countries.
2. The result assumes one production factor, so that the national income and the factor's income are one and the same. This leaves open the question, with multiple factors of production, of whether the introduction of trade might cause income to fall for one or more of the production factors.

Productivity Changes Have Diverse Impacts on National Income

The next question is how the free trade equilibrium changes when the technological productivities available to individual countries change. A positive, and perhaps intuitive, conclusion would be that rising productivity, in any good and in any country, has the unambiguous effect of raising income in all countries. This unfortunately is not the case, and clarifying the negative cases is one of the main messages of the Gomory and Baumol and Samuelson contributions.[22] The cases most relevant to the current issues of offshoring and globalization consider the effects on income *when productivity rises in the developing country A.* These cases are germane because the newly created incentives for offshoring, created by globalization, have the effect that labor in the developing economies has become more productive. The key conclusions are the following:

1. The developing country (A) generally benefits from increases in its own productivity, but there is a special case in which raising its productivity can lead to an actual decline in A's income. This case is termed "self-immiserizing growth" in the work of Jagdish Bhagwati and his colleagues.[23] It can arise if the productivity improvement creates such a large decline in A's terms of trade—that is, a decline in the price of exports relative to the price of imports—that its real income actually falls. While a theoretical possibility and one that cannot be ruled out in the future, this problem has not been evident in the countries that are the current recipients of offshored jobs.
2. When the productivity increase in developing country A occurs in the production of a good initially *imported* by developed country U, then U will also generally benefit from the technological advance in A. It is intuitively sensible that a decline in the production costs, and hence the price, of the good that U is already importing will raise the real income of U.
3. When the productivity increase in developing country A occurs in the production of a good initially *exported* by developed country U, then U may suffer a loss of real income.[24] The applicability of this result, however, is tempered by two points: first, if there is no change in the location of production, then there is no effect; and second, the result may not apply to offshoring activities in which only one component of the overall production process for the good is transferred from U to A. We return below to these issues raised by the offshoring of inputs.
4. Finally, I consider the case where the productivity increase in developing country A occurs in the production of a good *initially nontraded.* Bhagwati, Panagariya, and Srinivasan emphasize this case as the relevant one for the recent wave of offshoring.[25] Their point is that recent technological changes have allowed services ranging from call center operators to computer programmers to enter into international trade for the first time. This is an explicit case of occupations being transformed into service industries and becoming available for trade. Bhagwati and colleagues conclude that "there is a strong presumption that outsourcing that turns previously nontraded services into ... tradable services is beneficial to the United States." The qualifier is that any terms-of-trade effects not be too adverse, a condition they expect to hold in the present context.[26]

Multifactor Heckscher-Ohlin Models

Multifactor models add capital and/or distinguish between skilled and unskilled labor inputs. These models raise the possibility that trade, while it will still raise the national income measured in a suitable way, may cause the real income to decline for one or the other of the factors of production. This possibility has long been analyzed as part of factor price equalization, starting with Wolfgang Stolper and Paul Samuelson, with the latter providing conditions under which international trade can equalize factor income across countries, even though the factors themselves cannot cross international borders.[27] The well-known intuition is that trade in goods can sometimes substitute for actual movements of the factors of production.

This possibility has recently received significant attention in view of the widening gap in the United States between the wages of skilled and unskilled workers. The literature has focused on two alternative explanations for the change in the wage structure: technological change, which could raise the demand for skilled relative to unskilled labor; and international trade, which may drive down the relative wages of unskilled labor as an application of international factor price equalization. Initially, studies found technological change to be the primary source of the changing wage structure in the United States.[28] The results followed from the insight that demand for skilled labor was increasing rather equally across industries, suggesting a technological basis. An international trade explanation, in contrast, requires the shifts in the amount and pattern of labor demand to vary across industries depending on their initial reliance on unskilled labor. This distinction between trade and technology explanations, however, is less clear when imported inputs are considered, to which we now turn.

The Special Role of Imported Intermediate Inputs

Trade in intermediate inputs (hereafter, simply "inputs") creates a resource allocation that varies from the pattern established when trade occurs only in final goods (as assumed in the models just described). Specifically, when trade is restricted to final goods, the location of production is determined by the overall comparative advantage for each good, even though the comparative advantage for certain *stages* of the production process may actually reside elsewhere. The opening of trade in inputs, as would arise from a reduction in trading costs, then allows a reallocation of resources to occur. Of course, trade in these inputs still follows the precepts of the traditional models.[29] Comparative advantage, which is based on *industries* when trade occurs only in final goods, becomes focused on *occupations* when trade occurs in service inputs.

To take a realistic example, consider a high-tech product in which the United States has a comparative advantage due to its abundance of capital and skilled labor (hardware engineers), even though certain steps in the process could be better carried out abroad by unskilled labor (call center operators). As long as the costs of disassembling production remain high, the entire process, including call center operators, remains in the United States. However, as the costs of disassembly decline, there reaches the point when call centers are offshored. This reflects a fundamental change in the nature of trade, since *comparative advantage now determines the location of an occupation, not an industry.*

The importance of imported inputs for the United States can be illustrated at the aggregate level and particularly so in specific industries. Table 3.4 shows the percentage of U.S. imports that are inputs for all imports and some of the most intensive industries.[30] For all U.S. imports, about 38 percent were inputs in 1997. For specific industries, the percentage is still higher, including autos (NAICS [North American Industry Classification System] 336), chemicals (NAICS 325), and the more anonymous NAICS 333 (nonelectronic machinery).[31]

Table 3.4.
U.S. Imported Inputs as % of Total Imports, 1997

Industry	Imported Inputs(%)	Industry	Imported Inputs(%)
Total US Imports	38%	NAICS 325 Chemicals	51%
NAICS 336 Transportation Equipment	48%	NAICS 333 Machinery Not Electronic	54%

Source: Bardhan and Jaffee [2005], from Bureau of Economic Analysis data.

The interaction of imported inputs and U.S. employment is well illustrated by the U.S. computer industry's experience over the last twenty years. Figure 3.3 shows the steady growth in computer hardware shipments and computer services revenue, at least until the recession starting in 2000. Figure 3.4 shows that the computer industry's production employment was generally declining, even though U.S. hardware shipments were generally rising. Figure 3.4 also shows that over this period the U.S. computer industry gained almost four service sector jobs for each

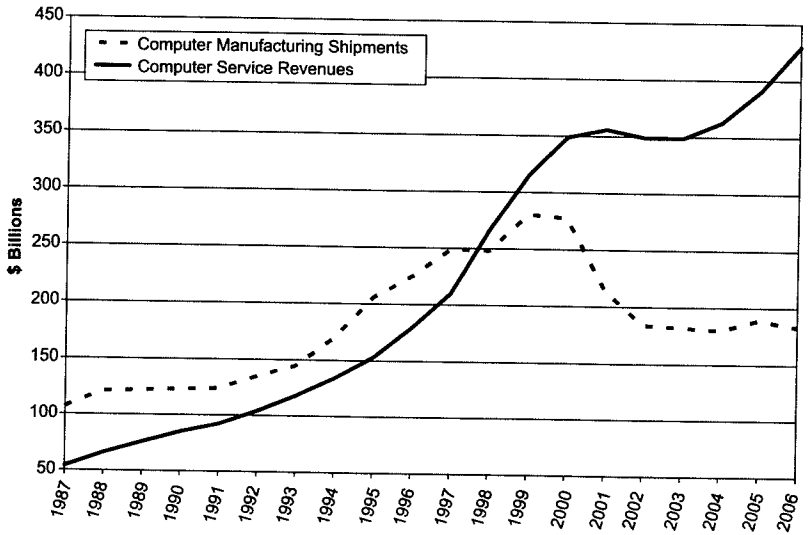

Figure 3.3. Computer Industry Hardware Shipments and Services Revenue, 1987 to 2006

Computer manufacturing = computers (NAICS 3341) and semiconductors (NAICS 3344).

Computer services = computer design (NAICS 5412), programming (NAICS 5112), and internet services (NAICS 518).

See Bardhan, Jaffee, and Kroll [2004] for details.

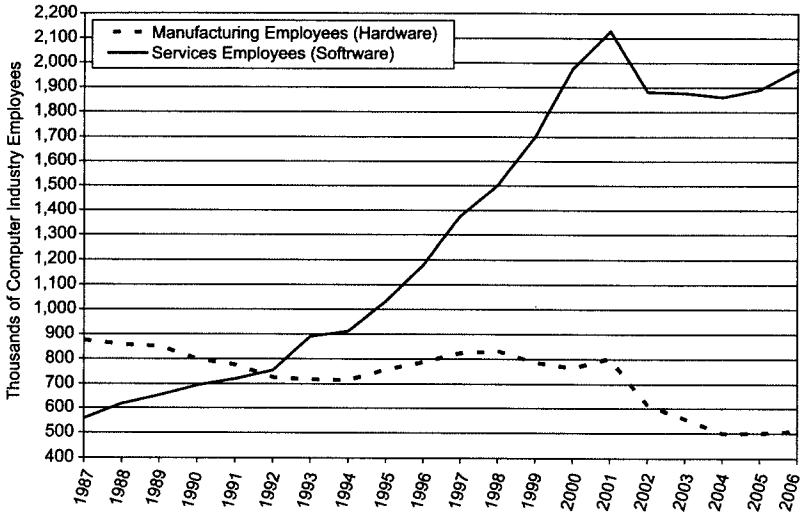

Figure 3.4. U.S. Employment in Computer Industry, 1987 to 2006
Computer industry defined as computers (NAICS 3341) and semiconductors (NAICS 3344).
Computer services = computer design, programming, and information system tasks.
See Bardhan, Jaffee, and Kroll [2004] for details.

manufacturing job it lost, and that, by 2006, service jobs exceed manufacturing jobs in the computer industry by a ratio of almost four to one. The implication is that the reduction in the costs of computer hardware, created in good part by the offshoring of computer manufacturing, has allowed the industry to grow and prosper, creating the dramatic growth in computer services employment.

Another dimension of the importance of imported inputs is emphasized in the recent research of Robert Feenstra, who has focused attention on the critical and perhaps unique role that imported inputs may play in understanding the falling relative wage of unskilled workers in the United States.[32] As noted earlier, the initial studies of this phenomenon determined that international trade was not the primary factor, because the observed shifts in the demand for unskilled labor were not particularly distinguishable by industry. Feenstra noted, however, that when it becomes economically attractive for firms to transfer the production of inputs to foreign locations, we may then observe similar changes in the demand for unskilled labor occurring for many industries. Using these insights, Feenstra and Gordon Hanson argue that international trade, in the form of trade in inputs, may play a substantially larger role in the declining relative wages of unskilled labor in the United States than had been previously appreciated.[33]

With these various possibilities before us, it is worthwhile looking at one other data set that sheds light on the extent to which recent

offshoring developments are affecting relative wages in the United States. For this purpose, I return to the Occupational Employment Statistics of the Bureau of Labor Statistics, already used in table 3.1. It will be recalled that I earlier analyzed the relative employment growth for occupations judged to be at risk to offshoring. Now I look at relative wage growth from 1999 to 2006 for the same at-risk occupations (see also the discussion in chapter 4 in this volume).

Table 3.5 shows that the average annual wage for all at-risk occupations rose relative to the wage for all occupations between 1999 to 2006 (from a relative value of 1.17 in 1999 to 1.16 in 2006). To be sure, the relative wage for graphics/design/writing does fall over the period, and the relative wages of other categories fall in individual years, especially 2002. Overall, however, the wages in at-risk categories rose significantly in absolute amount in all cases, and relative to the United States aggregate wages in all but one case. Combining this observation with the results of table 3.1, where we saw employment growth in the at-risk category for the same period, I conclude that there is no evidence of a reduction in demand for labor in the at-risk occupations.[34] Thus, whatever the gross job losses created by offshoring over the period, on net the economy appears to have replaced them with new positions that provide at least comparable average wages.

LONG-TERM OPTIONS FOR U.S. COMPARATIVE ADVANTAGE

The discussion in the previous section indicates that there are conditions under which technological advances and productivity increases in developing countries that are U.S. trading partners could cause a decline in overall U.S. income. The possible decline in U.S. income may be the result of two alternative mechanisms: comparative advantage in certain industries could shift from the United States to the developing countries,[35] or the offshoring of initially nontraded goods may create adverse terms of trade effects.[36] Whichever the source, the possible income decline is over and above any income reduction that may be faced by individual factors of production.

Likely Developments over the Next Decade

The overall decline in U.S. income is, of course, only a *possibility*, and the evidence reviewed in the previous two sections suggests it is not now occurring. Furthermore, a number of factors suggest that no adverse effects on U.S. income are likely in the near future, say, over the next decade:

- The experience with the offshoring of U.S. high-tech manufacturing during the 1980s and 1990s indicates that the process unfolds slowly over time. For example, as shown in figure 3.4, the reduction of approximately 40 percent in U.S. computer manufacturing employment

Table 3.5.
Average Annual Wage, At-Risk, and Total Occupations

	Code	1999	2000	2001	2002	2003	2004	2005	2006
All Occupations		31,571	32,890	34,020	35,560	36,210	37,020	37,870	39,190
At-Risk Occupations[1]									
Business/Finance Support	13-xxxx	46,934	50,049	52,559	55,517	57,775	57,775	60,283	62,758
Computer and Math	15-xxxx	54,930	58,050	60,350	61,630	63,240	65,510	67,100	69,240
Graphics/Design/Writing	17-, 27-x	38,999	40,742	42,023	43,268	43,419	44,502	45,260	46,868
Office Support	43-xxxx	26,966	28,741	29,791	30,561	30,951	31,775	32,598	33,500
Medical/Legal/Sales	Misc.	27,107	28,319	29,249	30,411	31,211	32,513	33,877	35,647
All At-Risk Wages		35,035	37,724	39,162	40,380	41,486	42,618	44,064	45,808
				At-Risk Wages relative to U.S. All Occupations					
Business/Finance Support	13-xxxx	1.49	1.52	1.54	1.56	1.60	1.56	1.59	1.60
Computer and Math	15-xxxx	1.74	1.76	1.77	1.73	1.75	1.77	1.77	1.77
Graphics/Design/Writing	17-, 27-xxx	1.24	1.24	1.24	1.22	1.20	1.20	1.20	1.20
Office Support	43-xxxx	0.85	0.87	0.88	0.86	0.85	0.86	0.86	0.85
Medical/Legal/Sales	Misc.	0.86	0.86	0.86	0.86	0.86	0.88	0.89	0.91
All At-Risk Wage Relatives		1.11	1.15	1.15	1.14	1.15	1.15	1.16	1.17

Notes:
1) At-Risk occupations are based on those identified in Bardhan and Kroll [2003].
2) Through 2002, the OES data are benchmarked to a fourth quarter reference period. Starring with 2003, data are from the May semi-annual survey.
Source: Occupation Employment Survey (OES), Bureau of Labor Statistics

occurred over a twenty-year period, or around 2 percent a year on average. Applying the 2 percent factor to the 15.85 million at-risk jobs in 2006, as shown in table 3.1, yields an annual estimate of jobs lost to offshoring of approximately 310,000 a year, which is well within the range of other current estimates of possible U.S. job losses from offshoring.[37] Whatever the precise numerical estimate, job losses of this magnitude appear extremely small when compared to the gross job losses and gains that the U.S. economy already successfully deals with each year, as shown in table 3.3.

- The offshoring of high-tech manufactured goods has assuredly been a net positive for the U.S. economy and U.S. income.[38]
- The current offshoring of relatively low-level service tasks, such as call center operators, not only increases the profits of U.S. firms but also likely leads to further growth, including the creation of new jobs in higher-level service occupations, such as computer designers. This is precisely the pattern illustrated in figure 3.4 for service-sector employment in the computer industry. (The question of where this will end is taken up below.)
- The technological developments that have accelerated service imports to the United States have also accelerated U.S. service exports (sometimes called "inshoring").[39]

Risks and Opportunities over Longer Time Spans

Looking further into the future, however, it is no longer possible to be as assuredly optimistic that offshoring and globalization will benefit the United States. The core issue is the possible loss of comparative advantage in key high-tech industries. While such a loss is not plausible over the next decade, it is a relevant concern within the next fifty years. The policy issues raised by possible shifts in the location of major industries require a special analytic framework, for which the "new trade theory" appears particularly suitable.

The New Trade Theory

The new trade theory is a framework developed in the early 1980s that analyzes the location of international trade with a focus on economies of scale (at either the firm or industry level), although traditional comparative advantage is still considered.[40] The assumption of economies of scale also raises further issues of industrial organization, including imperfect competition and differentiated products. An immediate implication of economies of scale is that new businesses may not be able to enter markets against an incumbent, due to the high fixed costs of entry. The incumbent may therefore earn excess returns simply because it arrived first. The new trade theory provides a framework for analyzing possible international trade interventions a government could undertake with the goal of maintaining its own national industries and/or displacing foreign ones.

Paul Krugman, in a highly accessible and penetrating analysis of the new trade theory, describes two alternative motivations for such government intervention.[41] The first, which he terms *strategic trade policy*, is based on the strategic use of such tools as export subsidies and import restrictions to ensure that a domestic firm is the survivor in an industry. The second is based on the *externalities* that a company may provide to other firms in its environment, especially if these benefits can be restricted to the home country. Investments in research and development (R&D) are a particularly important source of such externalities, which leads to a focus on high-tech industries in policy discussions. Overall, the new trade theory offers a consistent framework for evaluating government interventions to facilitate the growth of U.S. industries.

This possible role for government intervention under the new trade theory may conflict, however, with the benefits of free trade expected under traditional trade theory. The conflict is real because the new trade theory does not preclude that the traditional factors of comparative advantage are also at work, the full benefits of which require free trade. Krugman in particular, although a primary creator of the new trade theory, has voiced concern that the benefits of government interventional along new trade theory lines might be exaggerated, with the cost being the loss of the more traditional advantages of free tree.

Some Guidelines for Long-Term Policy

Put in the sharpest terms, the issue is how the United States should best go about maintaining its comparative advantage in high-tech industries. When considering how to solve issues far in the future, it is often useful to consider how they were solved far in the past. In other words, how did the United States come to have such a comparative advantage in high-tech industries in the first place? Paul Samuelson briefly addressed this question:

> Historically, U.S. workers used to have kind of a de facto monopoly access to the superlative capitals and know-hows (scientific, engineering, and managerial) of the United States. All of us Yankees, so to speak, were born with silver spoons in our mouths—and that importantly explained the historically high U.S. market-clearing real wage rates for (among others) janitors, house helpers, small business owners, and so forth.[42]

Of course, this begs the question of how we obtained the silver spoon of superlative capital and know-how in the first place. The new trade theory has its own approach, which is to accept the initial position as if given by happenstance, though once these industries are established, economies of scale will make it difficult for other countries to dislodge them.

My own view is that U.S. dominance of these industries is more than happenstance, though I admit that in creating the following list of critical attributes I am aided by (and possibly biased by) the advantages of hindsight:

1. The United States maintains a long cultural tradition of honoring and rewarding invention and entrepreneurship. Even failure is often rewarded with a fresh start. These cultural and societal attributes encourage risk-taking and innovation in both invention and entrepreneurship. The development of the U.S. venture capital industry is a case in point.
2. The United States has allocated substantial resources to R&D, based on both private-sector and government initiatives. The investments in research reflect a fundamental faith in the benefits of science, and the investments in development reflect a similar faith in technology. These allocations are consistent with the first point above, but operate on the institutional rather than at the individual level.
3. The United States has allocated substantial resources to education, based on both private and governmental transfers. At the high school and college levels, this creates a fundamentally sound basis of mass human capital. At the advanced degree and technical degree levels, this offers human capital with special skills in R&D.
4. The United States has maintained a generally benign immigration policy with respect to students and technically skilled individuals (engineers, programmers, etc.). This has allowed the country to augment its human capital base in a very tactical fashion.
5. The U.S. government sets many of the rules under which the economy operates, but directly intervenes as little as possible. The economic rules cover such matters as business law, taxation, and regulatory oversight. I would also include the social safety nets, such as social security, unemployment insurance, and employment retraining programs. While the borderline cases concerning what is or is not an appropriate area of government activity are contentious, I believe there is a well-defined and large area of common agreement. It is ironic, of course, that the very issue of whether the U.S. government should intervene to maintain our comparative advantage in key industries is such a borderline case.
6. In view of the key advantages enumerated in the items above, it is not surprising that the United States has also become a location of choice for the development of innovations and discoveries that first occur abroad. Even now, as the offshoring of jobs to Asia continues, Asian entrepreneurs still indicate that the United States is a highly favored location to develop their newest ideas.

The above is just one list of key attributes for the U.S. comparative advantage in high-tech industries; other observers will no doubt have additions and even subtractions. Whatever the details, it remains noteworthy that the United States is now underperforming in several of these areas, most notably R&D and education, and may be facing a backlash in immigration policy (perhaps inadvertently as the result of 9/11).[43] At the same time, the rest of the world is surely improving, in part by copying our success.

So what should the United States do? The obvious, and I believe correct, answer is "more of the same," since our past formula properly and successfully focused on the economic fundamentals that create a strong

and dynamic economy. This means we must invest in the future as we did in the past, especially in the R&D and education areas, at the same time maintaining the traditions of invention, entrepreneurship, and free markets, to ensure that we continue to set the pace for the world.

NOTES

The author thanks his UC Berkeley colleagues Ashok Bardhan and Cynthia Kroll, and a colleague of years past, William Baumol of NYU, for helpful discussions concerning this chapter. Cynthia Kroll has also kindly shared her data, which underlie tables 3.1 and 3.5 in this chapter. Responsibility for errors and views, of course, remains my own.

1. Globalization is also opposed by those fearing that it creates worse working conditions in developing countries or increases environmental damage. This chapter focuses only on the impact of globalization on employment and wage levels in the United States.

2. Ralph E. Gomory and William J. Baumol, *Global Trade and Conflicting National Interests* (Cambridge, MA: MIT Press, 2000); Paul Samuelson, "Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization," *Journal of Economic Perspectives* 18, no. 3 (2004): 135–46; Jagdish Bhagwati, Arvind Panagariya, and T. N. Srinivasan, "The Muddles over Outsourcing," *Journal of Economic Perspectives* 18, no. 4 (2004): 93–114.

3. For example, John F. Kennedy used jobs lost to automation as a major campaign issue in 1960, which led to legislation creating the Manpower Training Act.

4. Of course, layoffs remain a common event in U.S. labor markets. Lori Kletzer provides a highly useful and detailed analysis of unemployment from 1979 to 1994 in manufacturing industries, with special reference to the reemployment experience of workers displaced from import competing industries. Such layoffs notwithstanding, pools of unemployed workers have not accumulated. See Lori Kletzer, *Job Loss from Imports: Measuring the Costs* (Washington, DC: Institute for International Economics, 2001); this work is summarized in Lori Kletzer, "Trade-Related Job Loss and Wage Insurance: A Synthetic Review," *Review of International Economics* 12, no. 5 (2004): 724–48.

5. I also tested a regression using the change in the unemployment rate as the dependent variable against the growth in GDP/worker (both current and lagged), with the result that higher growth rates in GDP/worker significantly *reduce* unemployment rates. This result, however, may also reflect a spurious element, if firms "hoard" labor in the early stages of a recession, causing measured GDP/worker to fall at the same time that the recession is raising the unemployment rate.

6. Paul Krugman, "What Do Undergrads Need to Know about Trade?" *American Economic Review* 83, no. 2 (1993): 24; James Ingram, *International Economics* (New York: Wiley, 1983).

7. Robert Feenstra, "Integration of Trade and Disintegration of Production in the Global Economy," *Journal of Economic Perspectives* 12, no. 4 (1998): 31–50 (emphasis in original).

8. Mary Amiti and Shang-Jin Wei, "Service Outsourcing, Productivity and Employment: Evidence from the U.S." working paper, International Money Fund, 2005.

9. Ashok Bardhan and Cynthia Kroll, "The New Wave of Outsourcing," Research Report 1103, Fisher Center for Real Estate and Urban Economics, University of California, Berkeley, 2003, available at http://repositories.cdlib.org/iber/fcreue/reports/1103/.

10. It would not necessarily be a problem even if the aggregate results were a function of industry-specific growth patterns. For example, it is possible that industry growth is itself endogenous and positively related to a large share of employment in at-risk occupations, in which case the results would still reflect fundamental economic forces.

11. GAO, "International Trade: Current Government Data Provide Limited Insight into Offshoring of Services," GAO-04-932 (Washington, DC: GAO, 2004).

12. Sharon Brown, "Mass Layoff Statistics Data in the United States and Domestic and Overseas Relocation" (Washington, DC: Bureau of Labor Statistics, 2004).

13. See, for example, Kate Bronfenbrenner and Stephanie Luce, "The Changing Nature of Corporate Global Restructuring: The Impact of Production Shifts on Jobs in the U.S., China, and around the Globe," working paper, Cornell University, 2004, available at http://www.news.cornell.edu/releases/Oct04/jobs.outsourcing.rpt.04.pdf.

14. GAO, "International Trade." The Brookings Institution sponsored a conference on this issue in April 2004; see http://www.brookings.edu/pge/offshoring.htm for the agenda and conference materials.

15. Joseph Schumpeter, *Capitalism, Socialism and Democracy* (New York: Harper, 1942); Dani Rodrik, "Symposium on Globalization in Perspective: An Introduction," *Journal of Economic Perspectives* 12, no. 4 (1998): 3–8.

16. See GAO, "Trade Adjustment Assistance: Reforms Have Accelerated Training Enrollment, but Implementation Challenges Remain," GAO-04-1012 (Washington, DC: GAO, 2004).

17. GAO, "Most Workers in Five Layoffs Received Services, but Better Outreach Needed on New Benefits," GAO-06-43 (Washington, DC: GAO, 2006).

18. GAO, "Trade Adjustment Assistance: Labor Should Take Action to Ensure Performance Data Are Complete, Accurate, and Accessible," GAO-06-496 (Washington, DC: GAO, 2006).

19. See Lori Kletzer and Robert Litan, "A Prescription to Relieve Worker Anxiety," Policy Brief 01-2 (Washington, DC: Institute for International Economics, 2001); Lael Brainard and Robert Litan, "Offshoring Service Jobs: Bane or Boon—and What to Do?" Policy Brief 132 (Washington, DC: Brookings Institution, 2004).

20. Gomory and Baumol, *Global Trade and Conflicting National Interests*; Samuelson, "Where Ricardo and Mill Rebut."

21. Samuelson, "Where Ricardo and Mill Rebut," 143.

22. Gomory and Baumol, in *Global Trade and Conflicting National Interests*, provide a useful history of the development of the trade theory that analyzes the impact that an improvement in a country's productivity has on the national income of the trading countries.

23. See, among others, Bhagwati, Panagariya, and Srinivasan, "Muddles over Outsourcing."

24. Samuelson, "Where Ricardo and Mill Rebut," illustrates this possibility with an intuitively understandable special case in which the productivity improvement in A is such that no trading opportunities exist between the two countries after the switch. U may still have an absolute productivity advantage, but there is simply no comparative advantage one way or the other. In this case, the national income in U reverts to the no-trade value, which is to say all of the gains from trade are now lost. A is better off in this no-trade position than it was in the initial no-trade situation, though, since it now has the benefit of its higher productivity.

25. Bhagwati, Panagariya, and Srinivasan, "Muddles over Outsourcing." Productivity changes in nontraded goods are not treated by Gomory and Baumol or Samuelson.

26. All the trade models analyzed by Bhagwati, Panagariya, and Srinivasan in "Muddles over Outsourcing" include multiple factors of production, which I take up in the next section. I include their case of technological change in the nontraded good here because it is completes the taxonomy of cases. Their quoted conclusion should hold equally well in a single-factor model.

27. Wolfgang Stolper and Paul Samuelson, "Protection and Real Wages," *Review of Economic Studies* 9 (1941): 58–73; Paul Samuelson, "International Factor Price Equalization Once Again," *Economic Journal* 59 (1949): 181–97.

28. For a literature review, see Eli Berman, John Bound, and Zvi Griliches, "Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufactures," *Quarterly Journal of Economics* 109 (1994): 367–98, and Matthew Slaughter, "What Are the Results of Product-Price Studies and What Can We Learn from Their Differences?" in *The Impact of International Trade on Wages*, edited by Robert C. Feenstra, 129–70 (Chicago: University of Chicago Press, 2000).

29. This point was emphasized recently in Bhagwati, Panagariya, and Srinivasan, "Muddles over Outsourcing," and Paul Samuelson, "A Ricardo-Sraffa Paradigm Comparing Gains from Trade in Inputs and Finished Goods," *Journal of Economic Literature* 39 (2001): 1204–14. As noted above, Bhagwati and colleagues also argue that recent offshoring has often covered goods previously not traded.

30. Table 3.4 data are drawn from Ashok Bardhan and Dwight Jaffee, "On intra-firm trade and imported intermediate inputs." In *Multinationals and foreign Investment in Economic Development*, edited by Edward Graham. London: Macmillan, 2005.

31. Imported inputs are computed using the U.S. input/output matrix for inputs and U.S. trade data to determine the extent to which these inputs are imported. Also see Bardhan and Jaffee 2005.

32. Feenstra, "Integration of Trade."

33. Robert Feenstra and Gordon Hanson, "Global Production Sharing and Rising Inequality: A Survey of Trade and Wages," in *Handbook of International Trade*, edited by E. Kawn Choi and James Harrigan, 146–87 (Oxford, UK: Blackwell, 2003). For further discussion of the impact of input trade on labor demand, see also Ashok Bardhan and David Howe, "Globalization and Restructuring during Downturns: A Case Study of California," *Growth and Change* 32, no. 2 (2001): 217–35, and Matthew Slaughter, "International Trade and Labor-Demand Elasticities," *Journal of International Economics* 54, no. 1 (2001): 27–56.

34. It could be useful as well to focus on the wage bill, the product of wage rates and employment. The OES data also provide detailed distributions of wage rates within each occupation, which would provide more detailed evidence of how the wage structure is evolving.

35. Gomory and Baumol, *Global Trade and Conflicting National Interests*; Samuelson, "Where Ricardo and Mill Rebut."

36. Bhagwati, Panagariya, and Srinivasan, "Muddles over Outsourcing."

37. Alan Garner, "Offshoring in the Service Sector: Economic Impact and Policy Issues," *Federal Reserve Bank of Kansas City Economic Review* (3rd Qtr 2004), discusses the available estimates of the likely impact of offshoring on U.S. employment.

38. See Ashok Bardhan, Dwight Jaffee, and Cynthia Kroll, *The Impact of Globalization in a High-Tech Economy* (Boston: Kluwer, 2004); Catherine Mann, "Globalization of IT Services and White Collar Jobs: The Next Wave of Productivity Growth," Policy Brief 03-11 (Washington, DC: Institute of International Economics, 2003); and Brainard and Litan, "Offshoring Service Jobs."

39. Bhagwati, Panagariya, and Srinivasan, "Muddles over Outsourcing," emphasizes this point and provides a number of examples.

40. For many of the theoretical underpinnings of the new trade theory, see Elhanan Helpman and Paul Krugman, *Market Structure and Foreign Trade* (Cambridge, MA: MIT Press, 1985). For an accessible overall summary, see Paul Krugman, "Is Free Trade Passé?" *Journal of Economic Perspectives* 1, no. 2 (1987): 131–44.

41. Krugman, "Is Free Trade Passé?"

42. Samuelson, "Where Ricardo and Mill Rebut," 144.

43. Alan Blinder, "Offshoring: The Next Industrial Revolution?" *Foreign Affairs* 85, no. 2 (2006): 113–28, presents a similar view of the need to develop highly skilled human capital if U.S. income levels are to be maintained in the long run.