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U.S. Jobs Gained and Lost through Trade: A Net Measure

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Recent concerns about the transfer of U.S. services jobs to overseas workers have deepened long-standing fears about the effects of trade on the domestic labor market. But a balanced view of the impact of trade requires that we consider jobs created through the production of U.S. exports as well as jobs lost to imports. A new measure of the jobs gained and lost in international trade flows suggests that the net number of U.S. jobs lost is relatively small—2.4 percent of total U.S. employment as of 2003.

In the aftermath of the 2001 recession, the perception has grown that vast numbers of U.S. services jobs are being relocated to India, China, and other developing countries. Anecdotes abound of companies using overseas call centers, computer programmers, help desk workers, and accountants while closing down whole departments here. The alleged surge in relocations after 2001 coincided for some years with a sluggish job recovery, prompting many to conclude that the "offshoring" of jobs accounted for much of the persistent weakness in the U.S. labor market. While concerns about job relocations were fueled by the slow job growth during the recovery, the belief that U.S. workers are losing jobs to foreign competition has a much longer history: Indeed, the current concerns echo those voiced in many earlier periods about the impact of international trade on domestic workers.

In this edition of *Current Issues*, we explore the relationship between trade and job creation in the United States. In doing so, we adopt two premises. First, the offshoring of jobs is best seen as another form of import activity rather than an altogether new phenomenon. Second, a careful analysis of the

effect of recent trade patterns on the U.S. labor market requires that we measure not only the jobs lost to imports but also the jobs created through the production of U.S. exports. Our strategy is to obtain a measure of the *net* effect of trade on the nation's employment—a measure we term "U.S. jobs embodied in net imports"—and to examine the behavior of this measure over the last two decades. Because we consider both the U.S. jobs embodied in the goods and services imported to the United States and the U.S. jobs embodied in the production of the country's exports, our estimate of jobs lost to trade is more balanced and complete than the estimates presented in earlier studies.

We have two main findings. First, we determine that the offshoring of jobs has been a limited phenomenon: Our comprehensive estimate of the number of jobs embodied in U.S. net imports is small relative to total employment in the United States[1]—2.4 percent of the total, at the most— both historically and in recent years. Moreover, this estimate is sometimes positive and sometimes negative, suggesting that international trade does not necessarily mean a loss of jobs for the United States.

Second, we find no evidence to support the claims that a surge in offshoring played a large role in the jobless recovery. Jobs embodied in net imports did not grow at an accelerated pace after the 2001 recession. In fact, the increase in U.S. jobs sent abroad has averaged about 30,000 per month since 2001—a *deceleration* from the monthly average increase of 45,000 jobs during the period from 1997 to 2001.

More broadly, our results show no clear or necessary relationship between a pickup in jobs lost to trade and weakness in the U.S. labor market. A case in point is the 1997-2001 acceleration in offshoring, which occurred when U.S. payrolls were expanding steadily.

Common Assumptions about the Outsourcing of Jobs

We begin by scrutinizing three common assumptions that are explicit or implicit in the argument that jobs lost to trade account for a large part of the weak performance of the U.S. labor market during the recovery—a period we define here as beginning in 2001 and lasting through the end of 2003.

Imports and trade imbalances more generally surged in the 2001-03 period.

The first assumption is that imports made unprecedented new inroads in many industries during and after the 2001 recession. If this were the case, we would expect to see a sharp acceleration in imports and the trade deficit in recent years.

Observed trade volumes, however, suggest a different scenario. Net imports in the three sectors that make up the private economy—services, durable manufacturing, and nondurable manufacturing—all rose during the 2001 recession and the years following, but the increase in each case continued

a trend that had existed at least since 1997 (Chart 1). Thus, there is no evidence—at this high level of aggregation—of any sudden upturn in imports or trade deficits in these sectors in 2001-03. Instead, it appears that faster growth in certain industries was balanced by slower growth in others, so that overall growth rates were consistent with previous trends.

The outsourcing of jobs to foreign workers has caused a sharp increase in layoffs.

The second assumption is that the loss of jobs to trade has caused the closing of an unprecedented number of plants and offices in the United States and the consequent dismissal of huge numbers of workers. Such a large-scale displacement could pose a serious problem for labor market adjustment. Once again, however, this assumption does not square well with the facts. The Business Employment Dynamics data issued by the Bureau of Labor Statistics (BLS) do show that the rate of job destruction (as a percentage of employment) shot up briefly during the recession, from 7.5 percent in the second quarter of 2000 to 8.3 percent in the third quarter of 2001.[2] Nevertheless, the rate subsequently dropped to 6.7 percent, lower than the job destruction rates seen over the course of the expansion in the 1990s (Chart 2). Additional evidence against the view that offshoring has created a surge in layoffs comes from the Mass Layoff Statistics program. This BLS program, which tracks major job cutbacks among U.S. employers and the reasons for the cutbacks, shows no postrecession elevation in layoffs attributable to foreign competition or other reasons.[3]
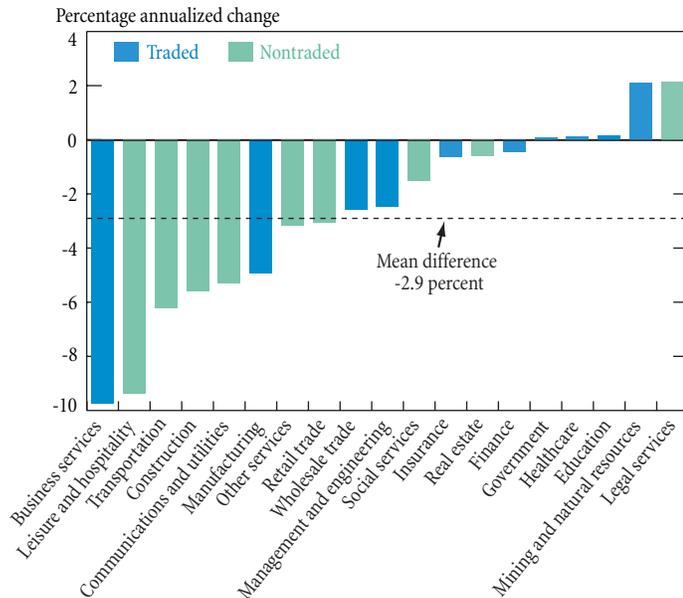
Chart 1
Net Imports by Sector
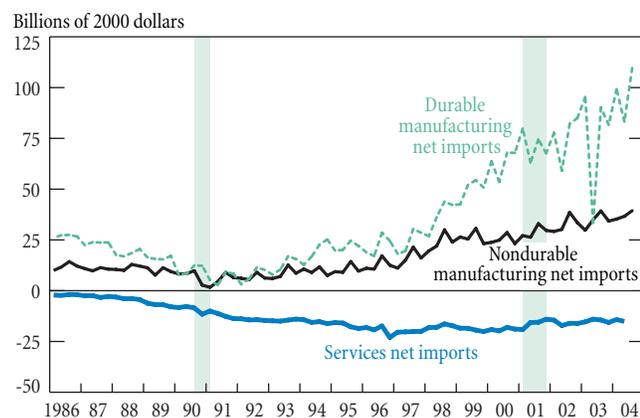
Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Note: The shaded areas indicate periods designated national recessions by the National Bureau of Economic Research.

Chart 2
Job Gains and Losses as a Percentage of Employment, 1992-2003
Quarterly Rate, Seasonally Adjusted
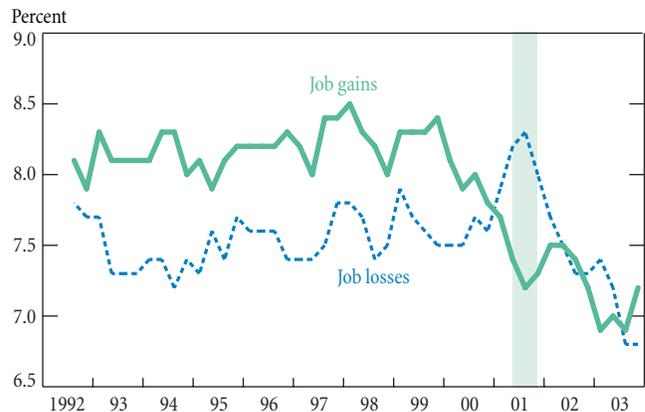
Source: U.S. Department of Labor, Bureau of Labor Statistics.

Note: The shaded area indicates a period designated a national recession by the National Bureau of Economic Research.

Percentage annualized change

How, then, can we account for the dearth of jobs during the recovery? The answer is that job *creation* rates fell dramatically, from 8.4 percent in the fourth quarter of 1999 to a low of 6.9 percent in the first quarter of 2003. In other words, employment growth was slow because firms were hiring many fewer workers than they were during the preceding expansion, not because they were laying them off more rapidly. If trade was in fact driving the sluggish job recovery, it must have been working to suppress the creation of new jobs rather than to generate more layoffs.

Sectors with high or growing trade lagged more than other sectors in job creation.

The third assumption is that sectors that are heavily or increasingly exposed to trade suffered disproportionate job losses during the recession and recovery. To test this assumption, we examine job growth rates in this period relative to growth rates during the 1990s expansion for both trade-sensitive and trade-insensitive industries (Chart 3). Starting with goods-producing industries, we find that manufacturing—one of the sectors most exposed to trade—did indeed lose a disproportionate share of jobs during the downturn and subsequent recovery. However, mining and natural resources,

another heavily traded industry, performed better in this period than in the preceding expansion, while the nontraded construction industry experienced disproportionate job losses.

Turning to services, we find that the results are even more mixed. Business services—an industry in which outsourcing is believed to have taken a large toll on domestic jobs—saw above-average job losses during the recession and recovery. However, finance, insurance, wholesale trade, and management and engineering jobs did relatively well, despite often-voiced concerns about outsourcing. Moreover, a number of services industries that are *not* exposed to trade incurred above-average employment losses; the leisure and hospitality trades, for example, do not transfer jobs to overseas workers but still experienced heavy payroll shortfalls relative to the preceding period.

The absence of any consistent pattern in the fortunes of individual industries suggests that while trade-related competition may have driven job losses in some sectors, layoffs in many other sectors occurred for reasons unrelated to trade. Indeed, in a number of industries, forces such as technological change, investment overhangs, and changing consumption behavior are much more likely to have caused job losses.

In sum, all three assumptions we have examined appear to be flawed or exaggerated. To be sure, jobs have been lost through trade flows, but there is no evidence that offshoring has produced rampant job destruction or that industries heavily exposed to trade have, as a group, lost a disproportionate number of jobs.

Measuring U.S. Equivalent Jobs Embodied in Trade

To get a more accurate picture of the employment changes brought about by trade, we propose a new formulation of the effects of trade on U.S. jobs. Currently, the discussion is framed in terms of the question "How many jobs is the United States losing to foreign workers?" However, looking at the issue in this way overlooks two important considerations. First, the use of foreign labor to produce a good or service is analogous to importing intermediate goods—inputs used to make other, final goods—when those inputs might instead have been produced domestically. Thus, using foreign labor is just another form of international trade rather than a new and disquieting development.

Second, given that trade flows in both directions, exports as well as imports must be considered in any assessment of the effect of trade on U.S. jobs. After all, while some jobs are lost to imports, others are created through the production of exports. Thinking about trade's employment effects as a two-way phenomenon leads us to ask the more essential question, "What have been the job implications of recent flows of goods and services to *and* from the United States?"

The importance of looking at exports as well as imports is best understood by examining how the experiences of individual workers are "counted" in trade flows. What we find is that U.S. job losses, like U.S. job gains, are sometimes counted in import flows and sometimes in export flows. Consider first the hypothetical case of Dan, a U.S. software programmer. His company has fired him and hired programmers in India to replace him. If the company sells the software in the United States, the firing of Dan will mean the loss of a U.S. job and an increase in U.S. software imports from India. Alternatively, if the company sells the software abroad, then Dan's job loss will be reflected in lower U.S. software exports. Thus, in assessing the effects of trade, one cannot readily isolate imports from exports because the loss of a U.S. job might produce either a drop in exports or a rise in imports.

Similarly, U.S. job gains may be counted on either side of U.S.-foreign trade flows. Denise, a consultant employed in the United States, has two current assignments. For the first assignment, she advises an American company on how to penetrate the Asian marketplace. Company managers had initially hired an Asian consultant but soon realized that they preferred Denise, with her U.S. business school education, for the job. Hence, Denise's first assignment reduces consultancy services imports to the United States. Denise's second assignment involves advising a European company that is considering launching a product in the United States. This assignment contributes to consultancy services exports. Thus, U.S. jobs created through U.S. trade can either decrease imports or raise exports.

To determine the job implications of bilateral trade flows, we first calculate how many U.S. workers, at current wages, prices, and productivity levels, would be needed to produce the goods and services imported by the United States. We then calculate how many U.S. jobs are needed to produce the goods and services exported by the United States. By subtracting the second number from the first, we obtain a *net* measure of the employment effects of trade. Since U.S. imports exceed U.S. exports, this is essentially a measure of the number of jobs needed to produce U.S. net imports domestically. Thus, we call this measure U.S. jobs embodied in net imports.[4]

The methodology we use to estimate the net measure is described in detail in the box. In essence, however, we compute this measure by multiplying the change in U.S. output

More on Methodology

Our calculation of U.S. jobs embodied in net imports is based on the following equation:

$$\begin{bmatrix} \text{U.S. jobs} \\ \text{embodied in} \\ \text{net imports} \end{bmatrix} = \begin{bmatrix} \text{change in U.S. output} \\ \text{needed to replace} \\ \text{U.S. net imports} \end{bmatrix} \times \begin{bmatrix} \dfrac{\text{U.S. employment}}{\text{U.S. output}} \end{bmatrix}.$$

To compute the amount of nominal output required to replace U.S. net imports for each key sector, we use the sequence of U.S. input-output tables for 1983-2000 developed by Chentrens and Andreassen (2003) for the Bureau of Labor Statistics (BLS). We begin by calculating an industry-by-commodity requirement matrix, as explained in Chentrens and Andreassen. This matrix provides us with an estimate of the amount of industry output required per dollar of each good or service supplied to final users.

We then multiply this requirement matrix by the amounts of net imports of goods and services. That is, we assume that the net imports, initially assumed to flow to U.S. final users, are now produced in the United States. The result of this calculation provides us with an estimate of the amount of output required from each sector, at current factor prices, to replace net imports. This is essentially the first ratio in the right-hand side of the equation and is measured in current dollars.

Next, we calculate the number of jobs embodied in these output levels by multiplying the levels by the number of workers per dollar of output for each sector, which is the second ratio in the right-hand side of the equation. The employ-

ment data are taken from Current Employment Statistics, a BLS series.

Because we do not have any input-output tables for the years after 2000, we use the 2000 requirement matrix to calculate the jobs embodied in trade for 2001 through 2003. Using requirement matrices for years other than 2000 for this calculation yields very similar results. Note that our results are conditional on the assumption that there are no drastic changes in the requirement matrix after 2000.

Like other analyses based on input-output tables, ours is limited by the assumptions that underlie these tables. Thus, our analysis assumes constant-factor input shares to calculate the input requirements for each industry. In addition, the data do not allow us to account for differences in quality between traded and nontraded goods.

Our results are all based on the Standard Industrial Classification (SIC) system, because this system is used to define the sectors in the input-output tables that we employ. Results for 2003 are based on employment figures for April of that year, the last month for which SIC-based employment data were published. The import and export data that we use are based on the North American Industry Classification System (NAICS), because no SIC-based trade data are available after 1999. Before 1999, the difference between SIC- and NAICS-based trade data does not imply important quantitative and qualitative differences in our results.

Chart 4
U.S. Jobs Embodied in Net Imports
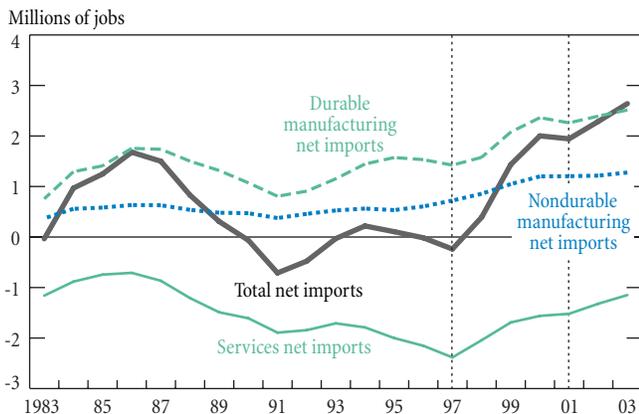
Millions of jobs

Sources: U.S. Department of Labor, Bureau of Labor Statistics; U.S. Department of Commerce, Bureau of Economic Analysis; authors' calculations.

needed to replace U.S. net imports by the ratio of U.S. employment to U.S. output. To calculate the first term, we use the U.S. input-output tables constructed by the Bureau of Labor Statistics (Chentrens and Andreassen 2003). These tables allow us to account for both the direct jobs and the support jobs needed to produce U.S. net imports. Including support jobs takes into account the "multiplier effect" of job losses—that is, the tendency of job losses to spread to supporting or related positions.[5]

We estimate the U.S. jobs embodied in net imports for the entire private economy and its three constituent sectors over the 1983-2003 period. Our results, plotted in Chart 4, indicate that 2.6 million jobs would have been needed to produce total U.S. net imports in 2003. Roughly 2.5 million jobs would have been needed to produce net imports in durable manufactured goods in 2003, and about 1.3 million jobs to produce net imports of nondurable manufactured goods in the same year. By contrast, services trade ran a surplus, so the United States exported output equivalent to 1.2 million jobs. (Since the chart shows net imports, the 1.2 million net export figure appears as a negative number.)

The trends in the three sectors also merit attention. Beginning in 1997, all three show a rise in the jobs embodied in net imports—meaning that, relative to the preceding years, the sectors were losing more jobs to trade (on net) and contributing fewer jobs to U.S. payrolls. In the case of the services sector, this rise reversed an earlier pattern: the U.S. jobs needed to produce the country's surplus of services exports had been growing steadily since 1986, reaching a peak of 2.4 million jobs in 1997. From 1997 to 2003, however, the number of payroll jobs embodied in services net exports dropped by 1.2 million jobs. This decline was almost as great as the decline of 1.6 million

jobs in the jobs contributed to U.S. payrolls by the two manufacturing sectors over the 1997-2003 period.

Interpreting Our Findings

Our results challenge the view that offshoring accounts for much of the persistent weakness in U.S. employment during the recovery. First, we have seen that the services and durable and nondurable manufacturing sectors all show a rise in the jobs embodied in net imports—or, equivalently, a decline in contributions to U.S. payrolls—beginning in 1997. Significantly, this pickup in jobs lost to net trade flows took place at a time when the U.S. labor market as a whole was still expanding. Indeed, it was not until 2000 that job losses overtook job gains and U.S. payrolls began to decline (see Chart 2). The fact that the rise in offshoring coexisted with a strong U.S. labor market during the late 1990s undermines the popular notion that jobs lost to trade played a large role in the sluggish growth of overall employment after the 2001 recession.

Further evidence against such an association comes from the behavior of jobs embodied in total net imports (Chart 4, black line). Between 1997 and 2003, the number of jobs embodied in total net imports rose by 2.9 million, which amounts to about 40,000 jobs a month on average. The flow from 1997 to 2001 averaged about 45,000 jobs a month; it fell to about 30,000 jobs from 2001 to 2003. Thus, the growth of jobs lost to trade actually slowed during the post-recession period of weak job gains.

As a measure of magnitude, our estimates of the jobs embodied in net trade flows suggest that offshoring has been a limited phenomenon. Although 40,000 jobs a month may seem to be a large number, we can put such statistics in perspective by dividing the number of jobs embodied in net imports by total U.S. payrolls (Chart 5). What we find is that relative to total employment, the number of jobs embodied in recent net trade is small—never more than 2.4 percent and sometimes negative.

While offshoring thus emerges as a comparatively small part of the total employment picture in Chart 5, the overall trend depicted in the chart suggests why concerns about jobs lost to trade might have grown in recent years. As a share of total employment, the number of jobs embodied in net imports has continued to climb; in 2003, this measure was 2.4 percent, its maximum value for the period observed. The increase in this measure might at first appear to conflict with our finding that jobs embodied in net imports have grown at a slower pace since 2001. Yet the conflict is easily resolved: From 1997 to early 2001, the labor market was tightening and domestic job creation was high; although jobs embodied in net imports were growing at a relatively fast pace, they

Chart 5
U.S. Jobs Embodied in Net Imports as a Share of Payroll Employment
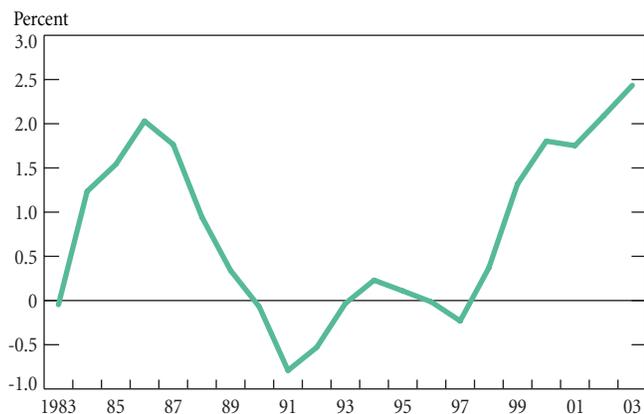
Source: Authors' calculations.

attracted less attention as a share of total employment. Then, as job creation rates dropped dramatically from 2001 to 2003, jobs embodied in net imports, though growing more slowly, claimed a larger share of total employment. Thus, the loss of jobs to overseas workers became much more conspicuous in the later period.

One further exercise that can help us reach a more realistic assessment of offshoring is to compare the jobs embodied in total gross imports with the jobs embodied in net imports (Chart 6). The contrast is striking—the number of jobs lost through gross imports is nearly five times as large as the number we find for net imports. Thus, omitting the benefits of jobs created through export production—a common

Chart 6
U.S. Jobs Embodied in Gross and Net Imports
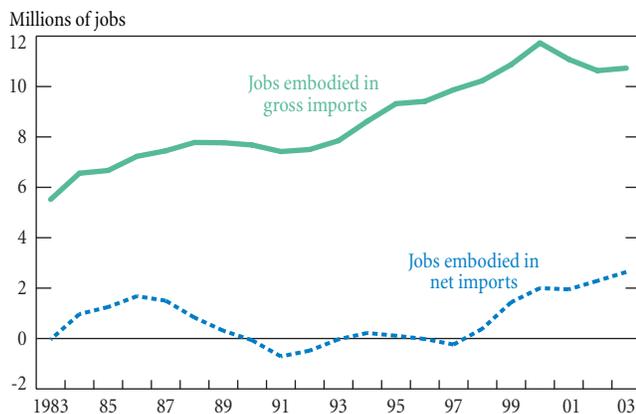
Sources: U.S. Department of Labor, Bureau of Labor Statistics; U.S. Department of Commerce, Bureau of Economic Analysis; authors' calculations.

practice in discussions of offshoring—will substantially overstate the costs of trade for the U.S. labor market.

Uncounted Benefits of Trade

Although our estimates of the number of jobs lost to trade improve upon earlier estimates,[6] they capture only the effects of trade now, holding many considerations fixed. The full impact of trade is, however, more complex and difficult to quantify. Our estimates recognize that jobs are created through the production of U.S. exports, but they do not address the broader benefits of trade in raising wealth.

In discussing the gains from trade, economists emphasize that trade allows countries to specialize in the production of particular goods or services. Specialization makes trading partners richer because each exchanges goods it produces efficiently for goods that its partners can produce at lower cost.

In one form of specialization, countries concentrate on a particular phase of a product cycle. Some countries may specialize in the beginning phase of the cycle, when innovation is needed to conceive a product and experiment with its design. Other countries are better adapted to take on the later phases of the cycle, when the product evolves into a commodity and its design and manufacture become routine.

Since the United States has the highest rate of international patenting per capita in the world,[7] it can be thought of as specializing in product innovation, the first phase of the cycle. Once a product matures, however, the United States loses some of its comparative advantage in producing that good. The country's highly skilled workers may be too expensive to be internationally competitive in the routine production of many commodities. Thus, when a product or service becomes a commodity, the most routine jobs involved in its production may be sent overseas.

Subsequently, competition among producers lowers the price of the commodity, raising the purchasing power (or wealth) of consumers and thus their demand not only for that good but for others. This process is the source of new jobs for the U.S. workers displaced when jobs go overseas. As wealth increases and demand grows, these workers can find employment elsewhere in the economy and perhaps move on to the design and creation of the next new product. Seen in this way, the country's ability to continue sending jobs overseas may be, at least in part, a sign of its ongoing success in innovation.[8]

The process we have described also creates wealth in the developing countries that take over the production phase. Since wealthier countries are better customers for U.S. products, the United States benefits from this effect as well.

Conclusion

Our analysis suggests that offshoring has been a limited phenomenon—and one that has contributed only marginally to the labor market's weak performance in recent years. Through year-end 2003, the number of jobs embodied in net imports did not exceed 2.4 percent of the country's total employment. Moreover, the jobs lost to net trade flows grew at a slower pace after the recession than they did before—dropping from 45,000 jobs per month in 1997-2001 to 30,000 in 2001-03. These findings provide little support for claims that the transfer of U.S. jobs to overseas workers is largely to blame for the jobless recovery.

Our conclusion that trade has only modestly affected aggregate U.S. employment does not imply, however, that trade has had no serious consequences for individual workers. Our approach explicitly recognizes that jobs created through trade may, to a greater or lesser extent, offset jobs lost to trade. But even if these job gains and losses roughly balance for the U.S. economy as a whole, they may not do so for individual workers—that is, some workers who lose a job to imports may not immediately find an equivalent position. Quantifying the effects of trade on the well-being of workers is beyond the scope of our analysis. Rather, our study offers a new, net measure of the overall number of jobs embodied in recent trade flows.

Notes

1. Throughout this article, the term "total employment" refers to nonfarm business employment. This measure, which excludes government and farming jobs, is commonly used by economists to represent the number of jobs in the private sector.

2. More information about the relatively new Business Employment Dynamics data series is available at <http://www.bls.gov/bdm/home.htm>.

3. See U.S. Department of Labor, Bureau of Labor Statistics, *News*, June 10, 2004, <http://www.bls.gov/news.release/pdf/reloc.pdf>.

4. We caution that this exercise does not yield the number of jobs that would actually be added to payroll employment if all net imports were produced in the United States. To determine this number, we would have to take into account any reallocations of labor that arise from the wage, price, and productivity effects of trade. We hold all these factors fixed in our analysis.

5. For example, if a firm loses production jobs to overseas workers, it may cut back its payroll services staff accordingly.

6. For example, two often-cited estimates of services jobs lost to offshoring—Goldman Sachs and Company (2003) and McCarthy (2002)—measure only the gross flows of U.S. jobs to other countries.

7. Porter and Stern (2001) provide evidence on patenting per capita. The authors also rank the United States first in a "National Innovative Capacity Index."

8. Maintaining this success over time, however, may become more difficult. The country's current specialization in innovation depends on the strength of its science and engineering workforce. Current trends—in particular, the declining numbers of U.S. science and engineering graduates and the diminished job market rewards for these graduates—may erode this dominance in the future (see Freeman [2005]).

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