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- In *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*, edited by B. Eichengreen and R. Hausmann. Chicago: University of Chicago Press, 3–12. Offers an excellent exposition on the issues pertaining to original sin. The introductory chapter summarizes the main contributions of the papers included in the book.
- Eichengreen, B., R. Hausmann, and U. Panizza. 2005. “The Pain of Original Sin.” In *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*, edited by B. Eichengreen and R. Hausmann. Chicago: University of Chicago Press, 13–47. Presents empirical evidence showing that financial and macroeconomic instability in emerging market economies tends to increase with original sin problems.
- Flandreau, M., and N. Sussman. 2005. “Old Sins: Exchange Clauses and European Foreign Lending in the Nineteenth Century.” In *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*, edited by B. Eichengreen and R. Hausmann. Chicago: University of Chicago Press, 154–89. Argues that the main cause of original sin is not the lack of credibility and discipline of governments, as others have argued, but rather it is the result of historical path dependence and market liquidity.
- Jeanne, O. 2005. “Why Do Emerging Economies Borrow in Foreign Currency?” In *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*, edited by B. Eichengreen and R. Hausmann. Chicago: University of Chicago Press, 190–217. Explores the causes of original sin and argues that original sin in private debt markets is mainly the result of monetary policy.
- Jeanne, O., and J. Zettelmeyer. 2005. “Original Sin, Balance-Sheet Crises, and the Roles of International Lending.” In *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*, edited by B. Eichengreen and R. Hausmann. Chicago: University of Chicago Press, 95–121. Explores two classes of models and finds that in both of them crises can be self-fulfilling prophecies. The paper also investigates the role of international lending in ameliorating the effect of financial crises stemming from original sin problems.
- Kaminsky, G., and C. Reinhart. 1999. “The Twin Crises: The Causes of Banking and Balance-of-Payments Problems.” *American Economic Review* 89 (3): 473–500. Investigates the links between banking crises and currency crises. Its main finding is that banking problems typically precede currency crises, and once a currency crisis is triggered, it amplifies banking problems, culminating in a banking crisis.
- Rajan, R. S. 2006. “Managing New Style Currency Crisis: The Swan Diagram Approach Revisited.” *Journal of International Development* 18: 1–24. Presents a model useful for understanding how countries can manage economic disruptions stemming from crises driven by original sin problems.
- Reinhart, C., K. Rogoff, and M. Savastano. 2003. “Debt Intolerance.” *Brookings Papers on Economic Activity* 1: 1–74. Quantifies a country's vulnerability to a debt crisis as it accumulates external debt. Its main finding is that having experienced debt problems in the past makes a country more susceptible to external debt crises in the future.

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### ■ outsourcing/offshoring

The terms *foreign outsourcing* or *offshoring* apply when the components of a good or service are produced in several countries. The term *offshoring* often refers to a company moving some of its operations overseas, but retaining ownership of those operations. Intel, for example, produces microchips in China and Costa Rica using subsidiaries that it owns, so these production activities have moved offshore. In contrast, *outsourcing* refers to moving activities outside of a firm (which could be to another firm in the same country, as with *domestic* outsourcing, or to another firm in another country, as with *foreign* outsourcing). Mattel, for example, arranges for the production of the Barbie doll in several different countries, so it is engaged in foreign outsourcing. Unlike Intel, however, Mattel does not actually own the firms in those countries. In this entry we will not be concerned with the distinction between foreign outsourcing or offshoring, and use either term to refer to shifting activities to another country.

While there are historical examples of companies doing some of their production in another country, outsourcing is generally thought to be a feature of the modern world economy made possible by improvements in international trade, transportation, and communication. Indeed, the earliest known use of the word *outsourcing* in a published source is from an American auto executive in the *Journal of the Royal Society of Arts*, 1979, who wrote: “We are so short of professional engineers in the motor industry that we are having to outsource design work to Germany” (Safire 2004). This example shows that outsourcing may involve the shifting of service activities (like design work) overseas, in addition to the shifting of production activities (like making the Barbie doll) overseas. In this entry we first concentrate on the shifting of *production activities* to other countries and then discuss *service outsourcing*.

**Measures of Outsourcing** There are several approaches that can be used to measure the amount of outsourcing. One approach is to look at “processing trade,” which is defined by customs offices as the import of intermediate inputs for processing and subsequent reexport of the final product. This activity has grown enormously in China, for which Hong Kong often serves as an intermediary. For example, between 1988 and 1998, processing exports grew from \$12.4 billion to \$97.2 billion, or from about one-third to over one-half of total Chinese exports (Feenstra and Hanson 2004). This outward processing serves newly industrialized countries in Asia, but also developed countries such as the United States, Japan, and countries in Europe. Between the industrialized countries, too, there has been an increase in processing trade. Görg (2000) reports on the increase in U.S. processing trade with the European Union between 1988 and 1994. He finds that U.S. processing imports into these countries (as a share of their total U.S. imports) increased slightly from 17.7 percent to 19.8 percent, but this same ratio increased more significantly from 13.7 percent to 23.7 percent for U.S. exports into the “periphery” countries of Greece, Ireland, Portugal and Spain.

Another way to measure foreign outsourcing is by the amount of imported intermediate inputs, which

can be estimated by using the purchases of each type of input and multiplying it by the economywide import share for that input. Adding overall inputs used within each industry, we obtain estimated imported inputs, which can then be expressed relative to total intermediate input purchases. Feenstra and Hanson (1999) perform this calculation for U.S. manufacturing industries and find that imported inputs increased from 6.5 percent of total intermediate purchases in 1972 to 8.5 percent in 1979, and 11.6 percent in 1990. Campa and Goldberg (1997) make the same calculation for Canada, Japan, the United Kingdom, and the United States. The United States shows a doubling of the share of imported inputs between 1975 and 1995 for all manufacturing, from 4.1 percent to 8.2 percent, though it is still at a low level compared with other countries. Canada shows an increase in the share of intermediate inputs from 15.9 percent to 20.2 percent from 1974 to 1993, and the United Kingdom shows an especially large increase in this share, rising from 13.4 percent to 21.6 percent over the same years. The exception is Japan, where the share of imported inputs in manufacturing fell. With that single exception, the increased use of imported inputs was a characteristic feature of many industrial countries during the 1980s and 1990s.

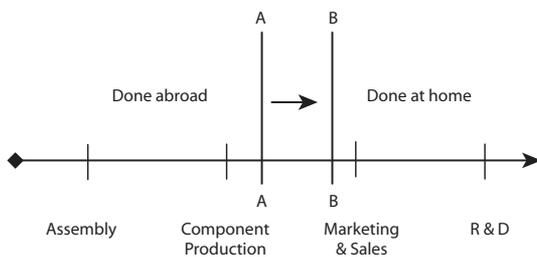
**Effect of Outsourcing on Wages: Evidence from the 1980s** Much of the academic and policy interest in outsourcing is due to its potential effect on wages and employment. During the 1980s there was a surprising movement in wages and employment in the United States and other countries. During that decade, the real wage of less-skilled workers (with high-school education or less) fell in the United States, whereas the real wages of the more highly skilled workers (college graduates) rose. Therefore, the ratio of the skilled wage divided by the unskilled wage—or the relative wage of skilled/unskilled workers—rose. At the same time, the relative employment of skilled/unskilled workers also went up, especially in manufacturing. That pattern is surprising because normally when the relative wage of skilled/unskilled workers rises, we expect that companies will hire fewer skilled employees (since they are more ex-

pensive); instead, the opposite happened and companies hired relatively more skilled workers. The only explanation for this pattern is that the relative *demand* for skilled workers must have increased, especially in the manufacturing sector. What factors can explain this increase in the relative demand for skilled workers?

Two factors that can explain the increase in relative demand for skilled workers are: (1) the increased use of computers and other high-technology equipment, and thus an increase in the skilled workers needed to operate them; and (2) outsourcing. To understand how outsourcing will increase the relative demand for skilled labor, we use the “value chain” of a firm, which includes all the activities involved in the production of a good or service, from research and development (R&D) to assembly to marketing and after-sales service. For the purpose of modeling outsourcing, rather than arranging activities in the order they are actually performed, we instead arrange them in increasing ratio of skilled/unskilled labor used in each activity, as shown in figure 1.

Assembly uses the least amount of skilled labor relative to unskilled labor in figure 1, followed by component production, then marketing and sales, and finally R&D. A firm that is outsourcing to another country with lower relative wages for unskilled labor will want to send those activities using the most unskilled labor. So in figure 1, activities to the left of the line AA will be sent offshore to the foreign country, while activities to the right of the line AA will be performed at home.

Now suppose that the home firm wishes to offshore more activities. The reason for this could be a trade agreement with the foreign country, leading to



**Figure 1**  
Outsourcing on the value chain

reduced tariffs; or improvement in the infrastructure in the foreign country, leading to reduced costs there; or an increase in costs at home. When deciding what extra activities to offshore, the firm will look to those activities that were just on the borderline of being outsourced before, that is, those activities just to the right of the line AA, which used to be profitably performed at home but now are shifted abroad. The borderline between the activities performed at home and abroad therefore shifts from the line AA to the line BB.

What is the impact of this increase in outsourcing on the relative demand for skilled labor at home and abroad? Notice that the activities no longer performed at home (i.e., those in between AA and BB) are *less* skill-intensive than the activities still done there (those to the right of BB). This means that the range of activities now done at home is more skilled-labor intensive, on average, than the set of activities formerly done at home. For this reason, the relative demand for skilled labor at home increases, as occurred in the United States during the 1980s. That increase in demand will also increase the relative wage for skilled labor.

What about in the foreign country? The activities that are newly sent offshore (those in between AA and BB) are *more* skill-intensive than the activities that were initially outsourced to the foreign country (those to the left of AA). That means that the range of activities now done abroad is more skilled-labor intensive, on average, than the set of activities formerly done there. For this reason, the relative demand for skilled labor in the foreign country also increases. With this increase in the relative demand for skilled labor, the relative wage of skilled labor also increases in the foreign country. That outcome occurred in Mexico, for example, during the 1980s, as well as in Hong Kong.

**Outsourcing versus Technological Change** By shifting activities from one country to the other, outsourcing can increase the relative demand for skilled labor in *both* countries, as has actually occurred in a number of industrial and developing countries. However, the same result can occur from skill-biased technological change, such as the

increased use of computers, which can increase the relative demand for skilled labor across countries. Given that outsourcing and skill-biased technological change both predict an increase in the relative wage of skilled labor, it becomes an empirical issue as to which is more important.

A study for the United States (Feenstra and Hanson 1999) seeks to explain the increase in the share of total wage payments going to nonproduction (skilled) versus production (unskilled) labor in U.S. manufacturing industries over the period 1979–90 and analyzes the increase in the relative wage of nonproduction labor over the same period. The study considers two possible explanations for the change in wages: outsourcing and the use of high-tech equipment such as computers. High-technology equipment can itself be measured in two ways: either as a fraction of the total capital equipment installed in each industry or as a fraction of new investment in capital that is devoted to computers and other high-tech devices.

Using the first measure of high-tech equipment (i.e., fraction of the capital stock), 20–23 percent of the increase in the share of wage payments going to nonproduction workers was explained by outsourcing, and 8–12 percent of the increase was explained by the growing use of high-tech capital. Thus, using the first measure of high-tech equipment, it appears that outsourcing was more important than high-tech capital in explaining the change in relative demand for skilled workers. The story is different, however, when the second measure of high-tech equipment (i.e., fraction of new investment) is used. In that case, outsourcing explains only 13 percent of the increase in the nonproduction share of wages, whereas high-tech investment explains 37 percent of that increase. So we see from these results that both outsourcing and high-tech equipment are important explanations for the increase in the relative wage of skilled labor in the United States, but which one is more important depends on how we measure the high-tech equipment.

Moving on to the increase in the relative wage of nonproduction workers, using the first measure of high-tech equipment (fraction of the capital stock),

21–27 percent of the increase in the relative wage of nonproduction workers was explained by outsourcing, and 29–32 percent of the increase was explained by the growing use of high-tech capital. Using the other measure of high-tech equipment (fraction of new investment), the large spending on high-tech equipment in new investment can explain *nearly all* (99 percent) of the increase in the relative wage for nonproduction workers, leaving little room for outsourcing to play much of a role (it explains only 12 percent of the increase in the relative wage). These results are lopsided enough that we might be skeptical of using new investment to measure high-tech equipment and therefore prefer the results using the capital stocks. Summing up, both outsourcing and high-tech equipment are important explanations for the increase in the relative wage of nonproduction/production labor in U.S. manufacturing, but the relative contributions of the two measures are very sensitive to how we measure the high-tech equipment.

**Trade Costs and Outsourcing across Firms** The effects of outsourcing described in figure 1 can be thought of as occurring along the value chain of a firm. One natural way to examine these changes is by examining the impact of falling trade costs on manufacturing establishments with different characteristics. It is likely that as firms move production activities offshore, they will outsource the least skilled activities (as depicted in figure 1), or close the plants focusing on these activities.

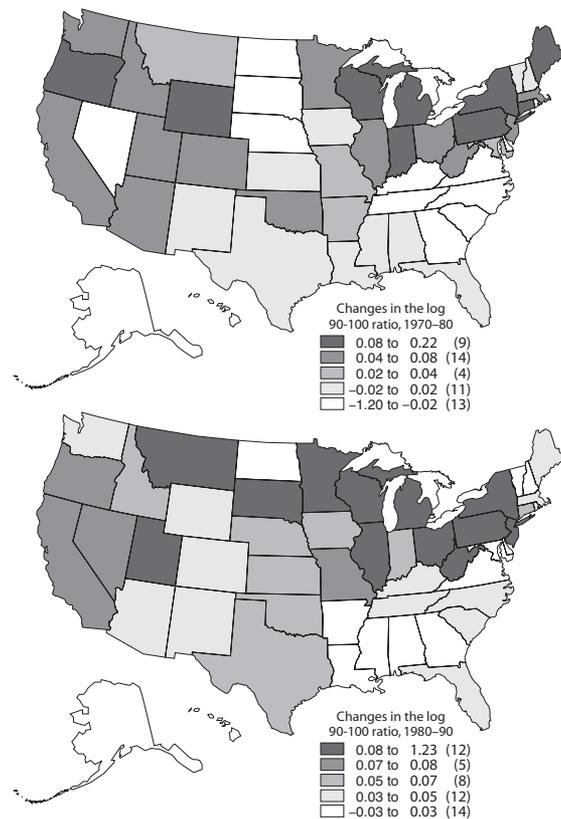
Bernard, Jensen, and Schott (2006) examine the implications of falling trade costs on U.S. manufacturers, and specifically examine the channels by which trade affects the distribution of economic activity. They find when trade costs in an industry fall, plants are more likely to close. They also find that low productivity, nonexporting plants are more likely to die. This is one channel by which outsourcing can affect the distribution of economic activity. Falling trade costs tend to reduce the amount of economic activity at the low end of the productivity distribution. Because low-productivity plants also tend to be production-worker intensive, this change is likely to reduce the relative demand for unskilled workers.

Bernard, Jensen, and Schott (2006) also find that relatively high-productivity nonexporters in industries with falling trade costs are more likely to start exporting. The magnitude of the effect of falling trade costs on becoming an exporter is substantial. Because higher-productivity plants are more skilled-worker intensive, as these plants expand they will increase the relative demand for skilled workers. They also find that existing exporters increase their shipments abroad as trade costs fall. Because exporters have relatively high-productivity plants, the expansion of the high end of the productivity distribution will tend to raise aggregate productivity (even if no plants changes its productivity). Because exporters are skill- and capital-intensive, this will also tend to increase relative demand for these factor inputs. Finally, these authors find that plants in industries with falling trade costs have faster productivity growth, possibly due to increased outsourcing.

It should be noted that the productivity increase associated with outsourcing means that the real wage of workers (even the less-skilled workers) need not fall due to outsourcing. That result is shown in the model of Feenstra and Hanson (1996), from which figure 1 is drawn. The same result occurs more strongly in the recent model of Grossman and Rossi-Hansberg (2006), where the real wage of less-skilled worker are guaranteed to rise due to the productivity-enhancing effect of outsourcing.

**Regional Variation in Wage Inequality in the United States** The increase in wage inequality due to outsourcing has not been uniform across the United States. Bernard and Jensen (2000) find that the changing composition of employment in regional economies is strongly correlated with changes in wage inequality in the United States. Somewhat surprisingly, they find that while many regions in the United States experienced increasing wage inequality, some regions experienced *decreasing* wage inequality over the 1970–90 period.

Figure 2 shows the variation across states in changes in residual wage inequality for 1970–80 (upper map) and 1980–90 (lower map). States with large increases in wage inequality are in the traditional “Rust Belt,” and states with decreases in wage



**Figure 2**  
Changes in inequality by state. Source: Bernard and Jensen (2000).

inequality are in the Southeast. Bernard and Jensen find that decreases (increases) in the share of manufacturing sector employment in the durable goods sector is strongly correlated with increasing (decreasing) wage inequality.

One specific example of how these heterogeneous responses to trade pressures can affect regions differentially is the case of Appalachian manufacturing. Appalachian manufacturing is concentrated in low-wage, labor-intensive industries, and Appalachian manufacturers within those industries tend to be lower wage and lower productivity than plants in those industries elsewhere in the United States. This combination of industrial mix and plant production technology leaves the region particularly susceptible to import competition from low-wage countries. For

example, low-wage competition shows a more pronounced effect on Appalachian plants in terms of employment growth and plant failure than elsewhere in the United States. Plants in the Appalachian region have higher shutdown probabilities and lower employment growth when facing low-wage imports than do firms in the rest of the United States.

**Service Outsourcing in Manufacturing: Evidence from the 1990s** The patterns of wages and employment in U.S. manufacturing changed in the 1990s, with rising relative wages and employment for skilled workers. The relative wage of nonproduction/production labor in U.S. manufacturing continued to increase from 1989 to 2000, but in addition, the relative employment of production workers *decreased*. A likely explanation for this new pattern of wage and employment is that it reflects service outsourcing from U.S. manufacturing. To the extent that the back-office jobs being outsourced from manufacturing use the lower-paid nonproduction workers, then the offshoring of those jobs could very well *raise the average* wage among nonproduction workers, while lowering their employment. So that pattern would be consistent with what has actually occurred in U.S. manufacturing. In the rest of our entry, then, we focus on service outsourcing.

Examples of service outsourcing from the manufacturing sector include the offshoring of services such as communication, finance, insurance, computer, and information services. Amiti and Wei (2006) report that in the United States, the amount of imported service inputs is small but growing. Measured as a share of total inputs purchased, imported services were 0.2 percent in 1992 (i.e., two-tenths of one percent of total inputs), and grew to 0.3 percent in 2000 (i.e., three-tenths of one percent). The fact that imported services are small does not necessarily prevent them from being important for productivity and employment.

In terms of the impact of service outsourcing and high-technology equipment on manufacturing productivity measured by value added per worker, over the eight years 1992–2000, Amiti and Wei find service outsourcing can explain about 11 percent of the total increase in productivity. Despite the small

amount of service imports, they find it explains a significant portion of productivity growth. It may be some of that productivity growth is actually due to domestic outsourcing of service activities, which is confounded in the data with foreign outsourcing of services. The contribution of service outsourcing can be compared to the offshoring of material inputs, which explains a further 5 percent of the total increase in productivity. Adding together these contributions, we see that these two factors explain about 16 percent of the increase in value added per worker, or as much as one-sixth of productivity growth. Since productivity rose by about 4 percent per year in manufacturing, these results show that outsourcing of services together with material inputs during the 1990s can explain two-thirds of a percentage point in productivity growth per year, which is economically important.

**Offshoring's Impact on the Service Sector** In the previous section we examined the impact of service outsourcing on the manufacturing sector. In this section we consider the potential impact of offshoring on the service sector. While work on trade in services is quite recent and hampered by less detailed information than trade in goods, Jensen and Kletzer (2006) provide evidence on the potential impact that trade in services will have. They use the geographic concentration of service activities within the United States to identify industries and occupations that appear traded across regions within the United States and classify these activities as tradable. They find that a significant share of total employment is in tradable service activities: in fact, more employment is in tradable professional and business services than in manufacturing. They also find that workers in tradable service activities are different than workers in nontradable activities, even in the same sector. Workers in tradable services have more education and significantly higher earnings (after controlling for observable differences). They examine recent trends in employment growth and find little evidence that tradable services have lower employment growth than no-tradable services, though they do find some evidence of higher displacement rates in tradable service activities.

These results suggest that the potential scope for tradable services is large enough to have a significant impact on the U.S. economy. It seems likely that increasing trade in services will have a similar effect as the increased trade in goods. Trade in services is likely to increase productivity through a number of channels, including closure of low-productivity service producers, entry into exporting of relatively high-productivity service providers, and expansion of service firms that already export. Similar to manufacturers, service exporters likely have superior operating characteristics and use a different skill mix than nonexporters. We expect increased trade in services will affect the relative demand for skilled and unskilled labor, though it may affect a different portion of the skill distribution than we witnessed in the manufacturing sector in the 1980s and 1990s.

**See also** fragmentation; internalization theory; trade and wages

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