Summary of the Papers

THE SIXTH meeting of the Brookings Panel on Microeconomics was held in Washington in December 1992. Paul Joskow, Andrea Shepard, and Nancy Rose looked at the compensation of top executives in regulated companies and found that on average it is less than compensation in unregulated companies. They explore alternative explanations for this compensation gap. Henry Farber examined layoffs in the 1990–91 recession and how they compared with the layoffs in the early 1980s. He found that in the recent recession, older and more educated workers faced greater risk of job loss than was the case in the prior recession. Jack Calfee and Cliff Winston use the results of a survey to make inferences about the value to consumers of pain and suffering awards. These are often added to liability settlements. They find that when consumers buy goods and services they may be paying, implicitly, for insurance that they do not want. Boyan Jovanovic argues that R&D in one product area can provide spillover benefits to R&D in another area within the same company. He develops a theoretical model that uses this assumption to explain why companies diversify, and he finds that his model fits pretty well to observed industry trends. Ken Flamm provides a short history of U.S.-Japan semiconductor trade and discusses the various trade problems that have emerged and policies that have been used. He then develops a model that simulates the possible costs to the United States of a foreign cartel in memory chips. He finds that a successful foreign cartel could be costly for U.S. consumers, but he notes that past U.S. policies may have actually facilitated such a cartel, not discouraged it.

Joskow, Rose, and Shepard on Executive Compensation

Top executives in large U.S. corporations often earn very high levels of compensation, high enough to generate complaints by large stock-

holders, such as pension managers. Consumer advocacy groups have called for restrictions on executive pay, and the Clinton administration has discussed the idea of limiting the tax deductibility of large executive-compensation packages.

The debate about executive pay is a longstanding one in the context of regulated industries. State and federal agencies responsible for overseeing private, regulated companies can influence the size of the executive compensation packages that are offered. In this paper Paul Joskow, Nancy Rose, and Andrea Shepard hypothesize that executive pay in regulated industries is lower than the pay in the unregulated sector and that these discounts are the result of political pressures to constrain compensation. When there is a regulatory body with access to detailed financial information, this raises the visibility of executive pay. Regulatory boards are unwilling to approve rate increases if they decide that the revenue is being used to finance what they see as "excessive" executive pay. Regulators do not have the same interests as shareholders and do respond to public sentiment. Regulators may discourage compensation contracts that reward an executive for achieving superior financial performance for his or her company in the same way that shareholders' representatives would.

The authors have developed a framework to examine this issue and to measure the size of the compensation differential. Prior work in this area has pointed to a compensation differential between the regulated and unregulated sectors, but this study offers a more complete analysis and investigates specific causes of the differential. Their database consists of a sample of over 2,000 CEOs employed by over 1,000 companies during the period 1970 to 1990. The compensation discount faced by executives in the regulated companies emerges clearly from this data, even after controlling for company size, the financial performance of the company, and the characteristics of the CEOs.

The regulated industry best represented in the data is the electric utility industry. Executives in this industry earn 30 to 50 percent less than do executives in the unregulated sector, holding other things constant. For other regulated industries the compensation discount is smaller, particularly for industries like railroads, trucking, and airlines, where rates are set on an industry-wide basis rather than controlled by state officials. Nevertheless, compensation is still lower than in the unregulated sector.

The authors realize that there is another possible explanation for the compensation discount. The economic environment of regulated companies is different from the environment of unregulated companies. A regulated company may not need the executive talents that an unregulated company needs. It may be able to operate perfectly well with a competent manager who would never have become a CEO in an unregulated company.

The authors admit that it is difficult to separate these two explanations, but they argue that the pattern of evidence they uncover suggests the importance of the political constraints in regulated industries. First, executives in regulated industries receive less relative to those in unregulated industries when the regulatory body has more direct control or influence over the companies. Within electricity generation, the CEO compensation discount is greatest where there is a single-state regulatory agency supervising the whole company and is least for multistate holding companies subject to regulation by several different bodies. The compensation discount is also smaller for regulated companies that have unregulated businesses in addition to the regulated business. This holds even when the nonutility business is very small.

Joskow, Rose, and Shepard also find that the time pattern of the compensation discount supports the political constraints view. The 1975–84 period was one when the industry was heavily affected by the gyrations of energy prices. At this time the quality of its CEO was very important to the success of any utility company. Shareholders should have been motivated to go out and hire skilled CEOs even if that meant offering a costly compensation package. This also was a period when electricity rates were rising rapidly, and consumer discontent was likely to increase the political constraints on CEO salaries. The compensation discount in electric utilities was largest over the 1975–84 period—that is, pay was most severely compressed. This indicates that political constraints were driving the results.

Finally, the authors found that the compensation of CEOs in regulated industries is less responsive to their measures of company financial performance than was the case for unregulated industries. Compensation in the regulated sector has a smaller component tied to stock performance or company earnings. This is consistent, they argue, with compensation packages that give weight to political considerations rather than being geared purely to company profitability.

Since their hypothesis is that political constraints imposed by the regulatory process at least partially account for the lower compensation in regulated industries, the authors expect to see a closing of the compensation gap as industries are deregulated or are regulated less severely. In general, the authors do find this, with the exception of the airline industry.

Do their findings mean that CEOs in regulated industries are underpaid relative to optimal salary levels, or are CEOs in unregulated industries overpaid? The authors say that they do not have the empirical evidence to answer this question. But they note that executive pay can be substantially affected by outside intervention. The public discussion of executive pay that is now taking place may end up affecting how much CEOs are paid in U.S. companies.

In their comments on the study, John Meyer and Sam Peltzman both note the difficulties facing the authors in determining the relative importance of inherent productivity differences and regulation in causing the observed compensation gap. In their judgment the directness of the regulatory oversight does not serve to identify the two causes. Meyer also wonders whether CEOs in regulated industries necessarily earn less over their whole careers.

Farber on the Incidence and Costs of Job Loss from 1982 to 1991

The recession of 1990–92 was not a terribly severe one when measured by the peak unemployment that was reached. Unemployment rose slowly from just over 5 percent in 1990 to a peak of 7.6 percent in mid-1992. By contrast, in the 1982 recession, unemployment rose quickly and peaked at more than 10 percent. Despite this, the recent recession has been perceived as very serious. Dissatisfaction with the economy was the main cause of President Bush's defeat. One reason the recession has looked so bad is the slowness of the recovery. Another important reason is the change in the pattern of layoffs. Job insecurity in this recession has been high for people who did not feel insecure in recessions in the early 1980s.

In this paper Henry Farber examines the pattern of job loss from 1982 to 1991 using the Displaced Workers' Surveys that are collected

by the Department of Labor as supplements to the January Current Population Survey. The surveys ask workers about job loss over the prior five years as a result of plant closings or layoffs without recall. This excludes quits or separations because of poor work performance. Farber concentrates on the job loss in the two years prior to the interview, and he uses these data to see whether the employment vulnerability of higher skilled workers has increased. He also looks at the costs of job loss and at how these costs may have changed. One important limitation is that the data report only one job loss, from the longest job lost.

The first results report a pattern that is to be expected. Young male workers are found to have higher rates of job loss in all periods, with particularly high rates of loss during years of economic slack. Strikingly, however, the rate of job loss among older workers was higher in 1990–91 than it was during 1982–83. Males 45 to 60 years of age, for example, were more likely to lose their jobs in 1990–91 than in the prior recession. The results for females show that women have lower rates of job loss than do men and that the 1990–91 recession did not cause a significantly different loss rate than did the earlier one.

Looking at educational levels, Farber again reports an expected result: higher levels of education are associated with lower rates of job loss. Moreover, the job loss rate declines most with age for educated workers. He finds once again, however, that the recent recession was different. Educated workers suffered higher rates of job loss than they had suffered in the 1982–83 recession.

Farber notes that despite the changing pattern of job loss, the bulk of job loss in downturns is still faced by young and less educated workers. Young nonwhites are hit particularly hard.

The source of data he is using limits the extent to which Farber can determine the industry mix of job losses. By using Bayes's rule, however, he is able to get around the problem to a degree. He finds that manufacturing jobs throughout the period are more insecure than the average of other industries. Manufacturing job loss, however, was substantially less in the recent recession than in the early 1980s, while finance, insurance, and real estate, and professional services had much greater job loss in 1990–91.

Farber then turns to the effects of job tenure on the probability of job loss. He is again hampered by the limitations of his data, but he is

able to confirm the expected result that length of tenure on a job is associated with a significant reduction in job insecurity. In fact, he finds that after controlling for job tenure there is little association between age and chances of losing a job for the period as a whole. It remains true, however, that older workers were much more at risk in the recent recession, whereas this pattern does not apply to workers with longer tenure.

How costly are these job losses? The author finds that male and female workers who have been displaced have much lower chances of being employed and much higher chances of being unemployed in the two years subsequent to the job loss than males who were not displaced. This result may suffer from a bias, Farber notes, because displaced workers must have been employed at some point in the period prior to the survey. But the bias will strengthen the conclusion: the drop in employment prospects following displacement is likely to be understated.

For those workers who are displaced but find new jobs, there is still a penalty: they are much more likely to be employed part-time than workers who were not displaced. And even for workers who find full-time employment, there is a fall in weekly earnings.

Farber notes that some common perceptions about the recent recession are correct. It was more concentrated among service industry workers, older workers, and more educated workers than was the case in 1982–83. And job loss is costly. For workers who have been displaced, the chances of having a job are lower, and the earnings if employed are lower, than for workers who have not been displaced.

In his comments on the paper, Robert Hall commended the author for his adroit handling of the estimates of the probabilities of job loss, but he felt that the paper was less successful in determining the effects of job loss because Farber's results underestimate the adverse effects of job loss. Hall also argues that recessions are normally defined as periods of *declining* economic activity rather than periods of high unemployment, a distinction that is important for studying job loss. John Pencavel noted that some workers who lose jobs are able to replace most of their lost earnings with unemployment insurance and other financial assistance, but some workers do very badly. The average effect of job loss does not capture this diversity of experience.

Calfee and Winston on Effects of Pain and Suffering Awards

There is concern among policymakers that excessive litigation, encouraged by very large jury awards in certain cases, has resulted in high costs for U.S. companies without providing any commensurate benefit for consumers. Some products or services carry a price premium that covers the producer's risk of lawsuit. And some products or services may never be provided in the market because the insurance costs make them uneconomic. Some observers estimate the "tort tax" in the U.S. economy to be hundreds of billions of dollars. In this paper John Calfee and Clifford Winston ask how consumer welfare is affected by the pain and suffering awards that are given in some cases over and above monetary damage awards. Data from 1977 indicate that such awards represent 30 to 57 percent of total personal injury awards.

There is a presumption from economic theory that such awards are inefficient. Parents placing their child in a summer camp probably would not pay a $100 premium for an insurance policy that paid off a large sum if the child were killed or seriously injured. Note that monetary damage awards would already cover any medical or rehabilitation costs arising from an accident; the implicit insurance policy payoff is above this. People are being forced to buy such an insurance policy by the working of the tort liability system. Certainly, parents placing a child in summer camp might be willing to pay a $100 premium to reduce the risk of the accidental death of the child. The authors stress that they are not tackling directly the issue of whether pain and suffering awards encourage the optimal level of effort in making products and services safe. Rather, they use a consumer survey to find out how people value insurance policies that pay off if there is an adverse event.

The authors' exploratory survey focused on consumers' reactions to some products and services that carried a risk of accident or death. Respondents were asked about a mix of potential victims, either themselves or their children. The sources of injury or death were autos, medical treatments or vaccines, and day camps. The persons responding to the survey were asked about alternative scenarios, some of which involved insurance. A few situations provided respondents with explicit probabilities of injury, but mostly these were left unstated. The respondents rated the alternatives on a scale of 1 to 10. The design of

the survey was aided by market research professionals, and the questions were designed to elicit information on the prices the respondents were willing to pay for each of the alternatives offered.

Once the results were in, Calfee and Winston used econometric techniques to figure out the implicit valuation that the respondents placed on insurance. Generally, this valuation was below the actuarially fair value of the insurance. (If some accident has a 1-in-100 chance of occurring, then an actuarially fair insurance policy paying $100,000 would cost $1,000. If respondents valued such a policy for more than $1,000, the value of the policy to them would be greater than its actuarial value. If they valued it for less, say $800, and they were forced to take it at a price of $1,000, there would be a $200 loss of consumer value.)

The authors' results support the initial hypothesis that people are being forced to pay for implicit policies that they do not want. The results also showed a wide variation in the value placed on insurance. For auto and medical scenarios, insurance was consistently valued by respondents below its actuarial value, while for drug scenarios the insurance value was close to its actuarial value.

Extrapolating from their results, the authors estimate the likely extent of overinsurance as a result of pain and suffering awards. They find that consumers are being overinsured to the point where at least $7 billion is being wasted. This is the estimate of the "deadweight loss" involved—that is, the amount by which the implicit premium exceeds the value to consumers of the insurance. Calfee and Winston suggest that their figure may underestimate the problem because they were looking at a limited range of products and services and their survey questions concentrated on small insurance policies.

As the authors point out, and as many participants in the conference stressed, the results given here are partial. The effect of tort awards on the behavior of providers of goods and services is not examined. If existing monetary damage awards mean that providers are not taking adequate safety provisions, then pain and suffering awards could help encourage greater safety. Pain and suffering awards would be worthwhile even though they result in overinsurance. Calfee and Winston suggest that this may not be the case, however. Monetary damage awards could be leading to enough caution, or even excessive caution, by providers. If they are correct, pain and suffering awards may impose a significant inefficiency on our economy.

In commenting on the paper, Kip Viscusi noted that the authors were using a contingent valuation approach, in which consumers were asked about a hypothetical market and how they would make their choices in it. Some economists have questioned the validity of inferences drawn from such hypothetical choices. Viscusi also felt that the choices facing consumers in the Calfee-Winston survey were rather complex, and the respondents may have been very unsure of the probabilities of injury. However, Calfee and Winston responded that they had worked with professional survey designers to ensure that the questions being asked were not excessively complex.

Jovanovic on the Diversification of Production

The U.S. economy undergoes continuous restructuring and has experienced two large waves of corporate restructuring in the past twenty-five years. Policymakers are involved in these restructuring decisions because of antitrust considerations, and they must decide whether there are legitimate efficiency reasons for takeovers and mergers. Policymakers can be helped in their task if they understand why companies decide to diversify their activities or combine business units. In this paper Boyan Jovanovic develops a theoretical analysis of the diversification decision and looks at trends in the data to see if his models are reasonably consistent with them. He stresses the role of technology in the diversification decision. Many companies develop a technology for one product and then see the opportunity to apply this same technology or a related technology in other products.

Jovanovic poses two questions that he thinks his models should answer. Why have U.S. companies become more diversified over time, and why are diversified companies more R&D intensive? Jovanovic uses data from Michael Gort and others to show that both size and diversification have increased over the long term among U.S. companies, although this trend has not been a steady one. There has been little change in diversification since the 1980s. F. M. Scherer, Henry Grabowski, and David Teece have independently explored the cross-sectional relation between R&D intensity and diversification and found a positive correlation between the two. Jovanovic tests this idea further,

reporting that the link between R&D and diversification shows up more strongly at the firm level than at the individual establishment level.

Jovanovic quotes Gort on the reason for the link between R&D and diversification. The outcome of an R&D project is unpredictable, so a company with a range of product or process technologies is more likely to be able to take advantage of any innovation that it comes up with than is a company with one product or only a few. Moreover, R&D is not the only input that can be shared across products. The managerial or marketing know-how that is used in one product line may be applicable in related product lines.

If diversification pays, why do companies not become more and more diversified? Jovanovic answers this by arguing that there is an offsetting cost associated with increased diversification. The managers of a diversified company must keep a lot of balls in the air. They must operate in different markets, and they must keep up with technological developments in many areas. This cost of being spread too thin was modeled by Robert Lucas in his "span of control" analysis, and Jovanovic develops his own model from the Lucas framework.

The Lucas span-of-control model provides a limit to the extent to which diversification is efficient. But it also provides an additional reason for increased diversification. A company that has a skilled manager may be too small to utilize fully his or her talents. Such a firm will look to expand into new areas, and diversification may be one way of doing this.

Although Jovanovic stresses technology as a driver of diversification, he recognizes that there can be alternative reasons for diversifying. Companies may diversify to gain market power, to spread and diversify risk, to increase their access to funds, to make products compatible, and to achieve marketing economies. Jovanovic recognizes that managers may wish to follow their own agendas, rather than always following what is best for shareholders. But technology, he argues, is a key element in practice and one that should be explored further.

The first modeling effort in the paper is to understand the secular trend of rising diversification, a trend that has been accompanied by rising average firm size. Jovanovic asks how increases in capital, population, and productivity, as well as changes in product diversity and in technology, could give rise to this trend. And he concludes from his model that the secular rise in the amount of capital per worker in the

economy is the underlying reason for the increase in average firm size and in diversification. This result did depend on the specific functional forms assumed in the model. Managers become spread too thin as output of a given product increases and as the number of products they oversee increases. With some values of the parameters in his model, a rise in capital per worker would lead to a larger output of a single product rather than to the observed increase in diversification. Still, with a reasonable set of parameters, Jovanovic's model tracks the observed trends pretty well.

Jovanovic extends his model by looking at factors, other than the rise in capital intensity, that might have led to a secular rise in diversification and firm size. He finds that technical change, increases in population, and increases in product variety are unlikely to have resulted in these trends.

In his next model Jovanovic takes on the R&D spillovers issue by setting up a framework in which the innovative output of a research team depends upon the number of researchers in the team and on the number of researchers working on other projects *in the same firm*. In other words, there are spillovers within firms, but there are no spillovers from one firm to another. Within this framework Jovanovic carefully works out the conditions under which the model predicts a positive relationship between diversification and R&D intensity. This is the cross-sectional relation that is observed in the data. His model also predicts that R&D-intensive sectors should have larger firms in them, again a prediction that matches the data.

In the final section of his paper, Jovanovic looks at the size of the efficiency gains that may result from diversification when there are R&D spillovers. To do this, he uses empirical estimates made by F. M. Scherer. After controlling for the amount of R&D done in an industry, Scherer found that diversification raises the number of patents taken out. The number of patents provides a measure of the innovative output of R&D. Scherer's results suggest that diversification raises the productivity of a given amount of R&D. Numerically, Jovanovic finds that the R&D in a two-product firm is between 2.5 and 30 percent more productive than R&D in a one-product firm. This finding must be qualified, Jovanovic notes, because Scherer thought that the relation he observed between diversification and patents could partly result from diversified firms' greater propensity to patent. But that seems implau-

sible as the main explanation of the empirical finding, so the Scherer results give general support to the framework of this paper and indicate that the spillovers could be empirically important.

In commenting on the paper, Richard Gilbert applauded the author for developing his model of how the nature of firms is determined, but he noted that it is difficult in practice to determine causality in such a framework. The Jovanovic model suggests that diversification increases the benefits from R&D and hence leads to higher levels of R&D. An alternative perspective is that R&D causes diversification because it leads to new products. Gilbert also wondered whether individual idiosyncracies of managerial talent and technology might be important to diversification in actual companies.

Flamm on Semiconductors and Trade Policy

In 1986 the U.S. government concluded a semiconductor pact with Japan, and in 1991 the Semiconductor Trade Arrangement set out a framework for trade and investment in the industry. The motivation for these agreements, or at least the purported motivation, is U.S. policymakers' concern that the U.S. semiconductor industry might be driven out of business completely, leaving U.S. manufacturers of computers or other users of semiconductors (including the Defense Department) vulnerable to a Japanese semiconductor cartel. In this paper Kenneth Flamm looks at the history of semiconductor trade between the United States and Japan and develops a model to examine how costly a Japanese semiconductor cartel would be to the United States should one arise.

In 1959 U.S. companies complained about Japanese transistor exports and suggested that the U.S. industry needed protection on national security grounds. The Department of Defense argued that there was no significant threat to defense capabilities from the imports, but Japan's Ministry of International Trade and Industry (MITI) decided to go ahead with quotas and price floors on transistor radios exported to the United States. In the next few years the threat from Japan was lessened because of rapid innovation in the U.S. industry, such as the development of integrated circuits.

Over this period the Japanese created their own trade barriers, and U.S. semiconductor companies were prevented from operating in Japan

despite superior technology. Texas Instruments threatened to bring suit to exclude Japanese exports from the United States because Japanese manufacturers were infringing on TI patents, and as a result of this suit TI forced Japan to allow a joint venture with TI in Japan. Quantitative restrictions were gradually removed in Japan, but MITI used other strategies to support its semiconductor industry, including subsidies for the development of memory chips, especially dynamic random access memories (DRAMs).

As their technology developed, the Japanese started to export DRAMs in volume to the United States, and U.S. producers argued that Japanese producers were using the protected Japanese market as a profitable base and then selling overseas at close-to-marginal production costs. The Semiconductor Industry Association in the United States commented during an International Trade Commission investigation in 1978–79 that foreign chips were like foreign oil, cheap at first but then subject to cartelization.

There were signs of two-tier pricing in the late 1970s, but evidence on this issue, Flamm says, is quite mixed and hard to interpret. The reason that it is so hard to decide if Japanese chip makers were dumping or two-tier pricing is that memory chips are mostly sold under long-term contracts. Seventy to 80 percent of the market operates this way. When spot prices of chips rise, the contract prices look low. When spot prices fall, the contract prices look high. Flamm says that chip prices rose after 1979, and the charge of a two-tier pricing strategy has been hard to sustain since then.

Japanese manufacturers pushed rapidly into the 64-kilobit (K) generation of memory chips after 1979, and by 1982 U.S. producers were complaining about low-priced Japanese imports. Again there were voluntary export controls instituted under the guidance of MITI, and these actually pushed DRAM prices in the United States well above Japanese levels. Some in the United States argued that the Japanese had formed a cartel and were reaping the rewards of predatory pricing.

Chip demand was weak in 1985–86 relative to capacity, and U.S. chip prices fell dramatically. The Commerce Department announced a preliminary finding of dumping of 64K DRAMs in response to a suit brought by Micron, a U.S. manufacturer, and this was followed by a determination of dumping for 256K DRAMs. (Other products were also being considered for similar action.) Against this backdrop, the Semi-

conductor Trade Arrangement was concluded in 1986. The dumping cases were suspended in return for an agreement by the Japanese chip manufacturers to abide by price floors. There was also a "secret" side agreement that the United States would be given a 20 percent share in the Japanese market.

The Japanese government held down chip production and pressured Japanese companies to reduce capacity investment. By 1988 there was a shortage of DRAMs and prices soared, leading U.S. semiconductor users to complain about the trade arrangement. In a repeat of their earlier argument, U.S. chip producers claimed that prices were rising because of a Japanese cartel that was exploiting its earlier success in predation. Flamm argues that both sides of this debate were making flawed arguments. During the peak demand period, market prices were well above the price floors of the Semiconductor Trade Arrangement, so the floors were not causing the high prices. Yet it was strong demand for chips facing industry capacity limitations (capacity limitations that were partly the result of U.S. pressure), not Japanese collusion, that led to the price increases.

The boom and bust cycle of chip prices took another downturn in 1989. Demand weakened, and Japanese companies appear to have made coordinated cuts in output to sustain prices. The 1989–90 period is the most interesting one to look at in terms of collusion, says Flamm. He interviewed Japanese semiconductor executives in 1989, and they were frank about their plans to cut production in order to sustain prices. Prices stayed above the floor levels of the trade arrangement despite the weakness of demand. And one semiconductor executive told a U.S. official that the Japanese industry had moved from competition to market sharing. Flamm notes the possibility that the Semiconductor Trade Arrangement facilitated a Japanese cartel rather than protected the United States from a Japanese cartel.

Turning to his formal model, Flamm focuses on the 1-megabit DRAM, the most recent generation. He notes that the Japanese share of the DRAM market has been rising with each generation, from 67 percent for the 64K to 99 percent in 1986 for the 1M. Key features of the production technology for DRAMs are that costs decrease with volume and that there is "lumpy investment" in the form of large costly plants that must be built soon after a new generation is introduced in order to achieve a reasonable payback.

One of the early models of this industry was introduced by Michael Spence. He pointed out that since costs decrease with volume, it makes sense for companies to encourage sales by keeping initial prices low and bringing down production costs. This model, however, failed to match observed behavior since it fails to predict the rapid declines in chip prices that occur over time with each new generation. Richard Baldwin and Paul Krugman argued that the Spence model ignores capacity constraints. In their model, firms always operate with full capacity, and this leads to a predicted path for prices that fits better with observation. Flamm finds problems with the Baldwin-Krugman model, however. He says that they underestimated the extent to which costs fall with volume. And they do not allow for firms to vary capacity utilization.

Flamm's model allows firms to choose their initial capacity and the rate at which they utilize this capacity over the lifetime of a plant. He solves the model numerically and finds that it provides a reasonable approximation to key features of the actual industry—namely, the number of companies operating and the pattern of prices that is followed over the life of a chip generation.

Having set his model up, Flamm investigates the impact of a cartel and determines how costly a cartel might be to consumers. He finds that if the Japanese industry were to form a cartel, it could increase its profits. In fact, the switch from competition to collusion could add $4.5 billion to producers' profits over five years. During the same period, however, the costs to consumers from the cartel could be $30 billion, an amount that dwarfs the extra return to producers. A very substantial loss of efficiency—a deadweight loss—would be caused by a cartel in this industry. This is always true for a cartel, but the loss in semiconductors would be especially large because cutting back production means that companies do not achieve the same cost reductions that would be achieved with competitive levels of prices and output.

In conclusion, Flamm suggests that it is clearly important for the welfare of U.S. semiconductor users that a cartel be avoided. Thus, the results of his model support one argument that has been made by U.S. policymakers. On the other hand, if U.S. semiconductor trade policy actually has encouraged a Japanese cartel, while purporting to sustain U.S. competition, a serious and costly mistake may have been made.

In commenting on the history of the industry given in Flamm's paper, Peter Reiss noted that the U.S. semiconductor industry is now very diverse and has changed radically since 1980. Reiss was concerned about the simulation model in Flamm's paper in that it does not explain how a foreign cartel might develop. Also it does not explain how cost differences emerge and are carried over from one generation of chip to the next.

Bishop on the Role of the U.S. Employment Service

There are many reasons to be concerned about the performance of the U.S. labor market. Productivity growth has been slow over the past twenty-five years, and many people think that declining skill levels are a partial cause of this. In addition, there has been a widening in the dispersion of wages in the 1980s with the less skilled and less educated workers suffering wage declines relative to the more skilled and educated. One possible reason for labor market problems is that workers may end up in the wrong jobs, ones that are not well suited to their skills. If workers and jobs could be matched more effectively, this could increase overall productivity and perhaps increase the amount of on-the-job training and reduce turnover and unemployment.

In this paper John Bishop examines the issue of job matches and the role of the U.S. Employment Service in facilitating job placement. The Employment Service has changed since the 1960s. In 1960, 20 percent of new hires resulted from placements made by the service compared with 7 percent in 1990. At present, only 18 percent of Employment Service registrants find a job through the referrals they receive. Bishop examines the job matching process and asks whether government can facilitate better matches and, if so, how.

The first step in the empirical analysis in the paper is to ask how effective the matching of young workers to jobs has been for a sample of companies. A 1987 survey on this issue was sent to 11,000 companies. About 2,600 of these responded. The owners or managers who responded to the survey were asked about hiring for a job category for which they hire regularly. The employer was then asked to select the two individuals who had been most recently hired for this type of job

and to respond to specific questions about the performance of these two workers.

Information about starting and current wage rates was requested, and the employer was asked to rate the two workers' productivities on a scale of 0 to 100 at three points in time: after about one week's work, after six months of work, and currently (or shortly before the person left the firm). The employer also was asked what had been expected about the person's productivity at the time he or she was hired. How did the actual productivity after six months of experience compare with the level of productivity that the employer had expected to obtain after this much experience? This last question allowed the calculation of a "productivity surprise," the amount, on average, by which employers were pleasantly or unpleasantly surprised by the productivity of the people that they hired. It was found that actual productivity after six months was less (by about 12 percent) than the employer had expected. Employers were often disappointed with the results of their hires.

Another striking finding from the survey is that there were very large differences among individuals in their productivities. *Ex post*, employers find some hires to be much more productive than others. Moreover, these differences were not well predicted when the people were hired. Employers are engaged in a crapshoot when they hire. They are too optimistic on average, and they cannot anticipate very accurately which employees are going to do well.

Surprises in performance are likely to lead to high turnover, and the data confirmed that this is the case. In the United States almost 40 percent of all workers have been in their current job less than two years, a much higher percentage than for other countries. And for workers with less than one year of tenure, there is a 59 percent probability that they will have left that job before twelve months have passed. It is very common in the United States for people to job shop, and one likely reason for this is that job matches are not very good. Bishop says that German and Japanese employers appear to be much more careful in their selection of blue-collar workers and clerical workers. He points out that if the initial job matches are poor, this is costly: efficiency is lowered, turnover is high, and training may be wasted. Then, as a response, employers become reluctant to provide training.

Bishop goes on to examine factors that might help explain the productivity surprises. Given the characteristics of the individuals, could

employers have done better in their hiring decisions? To tackle this question, Bishop estimates an equation in which the productivity surprise is related to information on the individuals that was available to the employer at the time of the hire. Bishop finds that none of these variables provides significant information about the productivity surprise. In other words, employers are not using the information available to them in an irrational way—except for the fact that they are too optimistic.

One feature of these results was important. Employers, at the time of hire, had information on total prior work experience. Bishop's regressions find that this variable does not predict the productivity surprise. On the other hand, workers whose prior job experience was in a similar position did do better on the job, whereas workers with experience on an unrelated prior job did worse than expected. Employers typically had information about the extent of prior employment, but they did not have information about the relevance of the prior work experience to this particular job.

The survey data allowed Bishop to examine the areas in which employers felt able to predict performance well and areas in which they could not predict performance. And he looked at how these findings related to the overall productivity surprises. More information about basic academic skills would not greatly improve the efficiency of job matches, whereas better information about work habits and other occupational skills would be helpful. Bishop notes, however, that testing basic academic skills is very cheap and easy to do, so even if the gain was small there might be a case for more testing of this type.

Bishop next asks whether more careful screening of new hires could improve job matches. He reports that only 40 percent of the employers obtained references before hiring someone. For those who did, the information paid off in a better match. This conclusion applies to references from previous supervisors and to workers recommended by friends or relatives but not to references from personnel offices. Workers who were given performance tests prior to hiring performed significantly worse than average, although such workers were paid less than average. There appeared to be little difference among sources of recruitment, informal or formal, but workers found through advertising performed poorly. Referrals made by a high school vocational teacher or by a

major professor in college did well on the job, but other school referrals did not do so well.

The bad news in these results is that referrals made by public agencies—the Employment Service or other public agencies—performed significantly worse than did others. They were less willing to stay late and had low productivity relative to their wages. Within six months, employers had dismissed those referrals who did not perform well; the ones who remained after six months did as well as hires from other sources. Private employment agencies also make job referrals, and one might have expected that the private sector would do better in placement. But this was not the case. Private agency referrals performed as poorly as did public agency referrals.

Bishop concludes with a review of the dilemmas faced by the Employment Service. In the 1950s and early 1960s, the Employment Service served employers by trying to find the best applicants that it had on its lists, and this encouraged employers to list vacancies with the service. Then the nature of the Employment Service changed, and its funds were structured to emphasize targeted groups. For example, in 1978, 40 percent of its budget came from programs catering to disadvantaged groups. By 1983 most employers did not want to receive Employment Service referrals. Its reputation was weak, and its budget was cut.

Those workers who did find jobs through the Employment Service did not find good jobs. In 1984–85 the wages of workers finding positions through the Employment Service were only slightly above the minimum wage.

Bishop points out that the U.S. Employment Service has fewer resources per capita than such services in Europe, and he feels that the failings of the service reflect the situation in which it has been placed. Required to try and solve affirmative action problems and given little financial support, it is clearly failing. He feels that if it gave more tests to applicants and was willing to ensure that referrals were qualified for the jobs to which they were sent, it could function much more effectively.

In her comments on the Bishop paper, Katharine Abraham notes that if a given firm is able to select more productive workers to hire, this does not necessarily mean that overall productivity rises. She also notes

that the data used in the study may not be representative of all workers. In one data source the sample was weighted toward low-wage job hires, and in the other the response rate of employers was not all that high. In interpreting the results, she points out that in a tight labor market, employers who are unable to find attractive job candidates from other sources may end up using the Employment Service even though the resulting hires are then below average in quality.