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# Profit Sharing and Productivity

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RECENTLY there has been a strong growth of interest in profit sharing and related forms of pay for group performance.<sup>1</sup> Many reasons undoubtedly exist for this heightened attention. The primary motive probably has to do with the perception that by giving workers a partial stake in their company's performance, profit sharing may, under certain circumstances, lead to desirable outcomes that ultimately increase productivity. If this perception contains an element of truth, widespread profit sharing might conceivably improve national "competitiveness," with consequent policy implications. In such a context, but also for more general reasons, it becomes important to sort out and evaluate as systematically as possible the evidence on a possible link between profit sharing and productivity.

The purpose of this paper is to bring together the partial strands of eclectic evidence from a wide variety of fields and perspectives, including considerations of economic theory, observations from comparative economic systems, industrial relations case studies and surveys of attitudes, and formal econometric investigations. Although we try to be reasonably comprehensive, detached, and objective in this survey, the possible link between profit sharing and productivity is ultimately not the sort of proposition that lends itself to crisp proof or disproof. We cannot honestly give decisive answers and must end up instead with the traditional plea for more research. And more research is genuinely needed in this area. Yet, without denying all that, we think it also fair to conclude that total agnosticism is not warranted. Profit sharing is not as likely to impair as to improve productivity. The weight of the evidence

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1. Throughout most of this paper the term *profit sharing* is used as the generic indicator of group performance, thereby obscuring the distinction with the more narrowly defined *gain sharing* and other such related forms of pay for group performance. The reasons for this uniform treatment is discussed in the section on case studies.

leans toward a positive link. From many different sources there emerges a moderately consistent pattern of *weak support* for the proposition that profit sharing improves productivity. Any one piece of evidence can legitimately be challenged because no single piece is conclusive. But taken as a whole, the many different parts add up to a fairly coherent picture of a weak positive link between profit sharing and productivity.

The paper is organized as follows. In the first section we attempt to use contemporary economic theory to shed light on the possible connections between profit sharing and productivity. Next we try to pull together the admittedly loose evidence that emerges from observing comparative economic systems. We then summarize the relevant findings of the literature, which is also somewhat loose, on case studies, surveys of attitudes, and simple statistical studies. In the following section we survey the existing formal econometric studies. Afterwards, we try to integrate all the disparate pieces, concluding, as already mentioned, that there is consistent, if weak, support for the proposition that profit sharing can improve productivity. Finally, in the last section we speculate on the possible policy implications of that link.

### Economic Theory

In general, economic theory can provide a powerful organizing framework for thinking consistently about certain economic issues. And it often suggests the outlines of an answer to some specific question. But pure theory rarely provides a definitive answer. Every model has a counter-model, and judgments about which models apply to which situations are ultimately empirical. The particular issue under examination here—the relation between profit sharing and productivity—is no exception to this generalization. The subject involves a particularly complicated interplay of economic and other motivations that rubs awkwardly against the confines of conventional theorizing. Nevertheless, we think that economic theory can be used here both to frame the main theoretical issues and to offer some explanatory power. We begin with the simplest conventional model and work our way up to more complicated contemporary models that incorporate increasingly sophisticated considerations. Throughout, the emphasis is on talking through a particular application—what the models might say about the real world connection between profit sharing and productivity—not on modeling *per se*.

### *The Prototype*

The simple one-person case is what most people have in mind as the prototype of the advantages of profit sharing. It illustrates nicely many of the principal issues and can serve as a point of departure for more sophisticated models.

Suppose that a person produces a single output from a single input according to some well-defined production function. The input is most easily thought of as a generic combination of hours of work and effort. The hours part of labor input can be measured, but the effort part largely cannot be. Effort might stand for all sorts of unobservable things like working harder, working smarter, taking initiative, and taking advantage of unforeseen opportunities of time and place. Individual small-scale farming might be a good example of this kind of paradigm, but there are many others.

A “wage system” in the present context would pay the hired farmer-worker a fixed wage in return for a fixed number of hours of labor. The fixed hours, in conjunction with a certain verifiable level of effort set by implicit or explicit standards, would yield some level of output. Unfortunately, there is no guarantee that this output level is efficient. In particular, with effort both unpleasurable and difficult or otherwise costly to monitor (at least beyond a certain point), the wage system would result in too little output being produced relative to what is socially optimal. In other words, a wage system tends to result in low productivity equilibria, where the marginal value of an extra unit of effort exceeds its marginal cost.

The obvious solution is to pay the hired farmer the value of his output over some fixed amount accounting for economic rent. This kind of profit sharing will automatically guarantee an efficient outcome, where the marginal value of an extra unit of output is equal to the marginal effort-cost of producing it. When the farmer-worker is paid for what he produces, he will automatically adjust his effort to the optimal degree. Here, then, a switch from a wage system to a profit-sharing system would increase productivity.

Such a simple example of a farmer-worker is what most people have in mind when they assume that a profit-sharing system can be expected to increase productivity relative to a wage system. Common sense tells them that a worker will work harder and produce more output under profit sharing than under a rigid wage system because he or she has some stake in the outcome. Even though the basic message of this example

can be diluted by more sophisticated formulations, a germ of truth remains. The key insight is that under profit sharing high productivity is rewarded with more pay, so there tends to be *some* pressure to move toward modes of behavior that increase output.

As applied to an individual farmer-worker, the proposition that profit sharing increases productivity is one of the more spectacular examples of simple theory giving an essentially correct insight that is confirmed by experience. One may fairly generalize that throughout the world, other things being equal, agriculture run on a decentralized "responsibility system" with rewards directly linked to output is more efficient than agriculture run on a centralized, labor-for-hire type system with rewards far removed from performance.<sup>2</sup>

This simple model, however, omits certain aspects of reality. In the next three subsections we treat what we consider to be the three most important deviations from the basic model. These are: the free rider problem of individual incentives that become diluted in a group setting where rewards are linked to group effort; risk-bearing issues associated with profit sharing that expose workers to an unacceptable degree of pay variation; and the possible weakening of capitalist property rights under profit sharing through some form of codetermination.

### *The Free Rider Problem*

Some difficult issues are connected with understanding what extension, if any, of the single farmer-worker model applies to a multiworker setting, where profit sharing is naturally tied to group performance. A dilution or free rider problem seems to arise whenever it is hard to monitor a single person's contribution, as is presumably frequently the case. An externality is present because any one person's reward depends on everyone else's effort. With  $n$  members of the group, the extra profit-sharing reward associated with marginal effort on any single worker's part is diluted by a factor of  $1/n$ . The result is an inefficiently low level of effort, which is lower as  $n$  is larger. Following the logic of the static Nash equilibrium framework, profit sharing might not have very much effect on a large organization, since every member would hold back effort while trying to free ride off the others.

Such a free rider scenario is often used to argue that group incentives will be ineffective for any reasonably large value of  $n$ , and therefore, by

2. Of course there are exceptions that prove the rule, such as, perhaps, some aspects of California agribusiness.

default, relatively greater emphasis should be placed on individual incentives. This argument doubtless has some truth. Yet there is an important caveat. In a repeated game setting the conclusions may be quite different.

The profit-sharing "game" is a form of prisoner's dilemma. All members of the collective are potentially better off if everyone works harder. Yet there is always a temptation for any single individual to shirk, because per capita output and the reward of any member of the group will not be much affected when one person's effort is reduced. (Hence the conclusion in a static context that one-shot profit sharing will not have much effect on effort and output.) But when the game is repeated, which corresponds to a long-term relationship among the workers, a much richer set of strategies emerges in the resulting non-cooperative "supergame." Depending on the specifics of how the technology of observation and production is modeled, workers may punish shirking workers by withholding their own effort or, if feasible, ostracizing the offending antisocial shirkers. In such a setting an enormous number of dynamic equilibrium strategies can exist. Among the equilibria, if the participants' discount rate is sufficiently small, is the cooperative strategy in which all participants choose to work at the socially optimal level. (This is a particular application of the so-called folk theorem of noncooperative game theory.)<sup>3</sup> Thus there is a rigorous sense in which profit sharing *may* defeat the prisoner's dilemma free rider problem and induce greater productivity in a multiperson setting. By contrast, a rigid wage system does not have a chance to improve productivity, because rewards are independent of effort. With profit sharing, as opposed to a rigid wage system, there are modes of behavior that can make everyone better off, and it may be individually rational to pursue such modes for the long-term benefits they yield.

The theory we have outlined—that repetition allows for the possibility of self-enforcing socially desirable outcomes when rewards are linked to group performance—is not without its problems. Profit sharing *may* induce greater productivity, so that the single farmer-worker model can be extended to groups, but other outcomes like narrowly self-interested shirking are possible as well.

Equilibrium is a state of rest from which no agent has an incentive to

3. See Drew Fudenberg and Eric Maskin, "The Folk Theorem in Repeated Games with Discounting or with Incomplete Information," *Econometrica*, vol. 54 (May 1986), pp. 533–54. For a readable account of a broad series of related issues, see Robert M. Axelrod, *The Evolution of Cooperation* (Basic Books, 1984).

deviate, given that all other agents are at equilibrium in the same state of rest. When there are multiple equilibria (in this case an uncountable infinity of them), the relevant equilibrium depends on a complex, typically unspecified interaction between the underlying dynamic process and initial conditions. At present, theory does not offer much guidance on which equilibria are more likely to emerge under what conditions. In a way the theory can be interpreted as highlighting considerations of history, chance, culture, exhortation, institutional detail, and the like.<sup>4</sup>

In the end, repeated game theory delivers a complicated message about the likely effects of profit sharing on productivity in a multiperson organization. It is possible that profit sharing will lead to increased productivity. But it is possible that it will not. The outcome would seem to depend on whether an organization can convince its members that everyone pulling together is essentially a better idea than everyone pulling separately. In some equilibria it may be in my long-term self-interest to pull together because everyone else is pulling together, and if I do not I risk the danger of unraveling the social compact. In some other self-fulfilling equilibria it may not be in my long-term interest to pull together because no one else is pulling together, and I do not think my good behavior is going to influence anyone else.

An attempt to sum up the implications of this particular application of theoretical research to the effect of profit sharing on productivity might go as follows. To some extent the door is open for believing that, by comparison with an unresponsive wage system, a group-based reward system can improve productivity. But it appears to be not enough for management just to install a profit-sharing system and walk out the door. To get the productivity-enhancing effects, something more may be needed—something akin to developing a corporate culture that emphasizes company spirit, promotes group cooperation, encourages social enforcement mechanisms, and so forth.

### *Risk Issues*

Another problem with our original farmer-worker model is that it abstracts away from risk. In a deterministic context, linking a worker's pay to his or her output makes good sense, because it will encourage the

4. For related interpretations, see David M. Kreps, "Corporate Culture and Economic Theory," Stanford University, 1984; and Roy Radner, "The Internal Economy of Large Firms," *Economic Journal*, vol. 96 (Supplement, 1986), pp. 1-22.

socially optimal degree of effort. But what happens in the presence of uncertainty? Then the correct contract is not so clear. A higher degree of profit sharing relative to the base wage will elicit more effort from the worker but will also expose him to greater risk. Sometimes this risk-exposure argument is put forth as if it were a compelling reason that workers should be paid only base wages without any profit shares. But on closer examination, the argument is not decisive.

This set of issues has been extensively examined in the theoretical literature under the heading of the so-called principal-agent problem.<sup>5</sup> In the present setting the agent is the farmer-worker, while the principal is the hiring party who is ultimately interested in output. On the one hand, an efficient contract should link the agent's reward closely to output because that will elicit greater, or more attentive, work effort. On the other hand, in a world of uncertainty the agent's pay should be made relatively stable, because the agent is typically more averse to risk than the principal. (A company can diversify risks more easily than a worker, whose pay constitutes the main component of his income portfolio.) The optimal contract balances these two opposing considerations of effort and exposure to risk.

The theory can be used to derive a formula for the optimal mix of base wage and profit share.<sup>6</sup> The formula for the optimal profit share is typically a complicated function inversely related to the degree of risk aversion or the amount of uncertainty and directly related to the elasticity response of output to increased effort. Explicit modeling of risk considerations does not per se eliminate the argument for profit sharing, though it probably lowers the degree of profit sharing in the optimal pay formula (from 100 percent) to soften the exposure to risk. More important, the theory shows that under standard assumptions it is quite difficult to derive a corner solution where the efficient pay contract involves only straight wages and no profit sharing.

An additional consideration in any analysis of the risk aspect of a profit-sharing contract is the effect on employment. Standard principal-agent theory evades this issue. The theory is, in essence, about the individual high-seniority worker who already has job tenure, not about the aggregate of all would-be workers. In a world of sticky pay parame-

5. For a survey see Oliver Hart and Bengt Holmstrom, "The Theory of Contracts," in Truman F. Bewley, ed., *Advances in Economic Theory—Fifth World Congress* (Cambridge University Press, 1987), pp. 71-155, and the references cited there.

6. See, for example, Martin L. Weitzman, "Efficient Incentive Contracts," *Quarterly Journal of Economics*, vol. 94 (June 1980), pp. 719-30.

ters, profit sharing may help to reduce employment fluctuations. If that is so—and this interpretation is controversial—the argument for profit sharing might be somewhat stronger than what is suggested by standard principal-agent theory.<sup>7</sup>

The risk of unemployment is probably the largest income risk faced by labor as a whole, as opposed to the median tenured worker, and it is concentrated on the marginal or outsider worker. If more variable pay for the individual helps to preserve full employment for the group, whereas fixed pay for the individual tends to contribute to unemployment, overall welfare might be improved by having more profit sharing, because of the difference between first-order Okun-gap-type unemployment losses and second-order Harberger-triangle-type random redistribution losses. Of course the insiders, whose pay is made more variable by profit sharing, may resent the sacrifice being extracted on behalf of the outsiders, whose employment is possibly made more secure, and may react adversely. Any attempt to balance this out by side payments from insiders to outsiders could in practice create a serious labor relations problem. (Although there is some overlap, by and large this set of employment-related issues is outside the main scope of our paper.)

### *Codetermination Issues*

The repeated prisoner's dilemma argument previously outlined shows that, other things being equal, profit sharing may improve effort and productivity despite a dilution or free rider problem. In effect, it may be in the self-interest of each member of the work collective to act over time like one artificially aggregated worker, and therefore to work harder under profit sharing. However, this argument neglects one potentially significant element.

If workers share more profits, then capitalists of necessity share less. One must therefore worry about whether diluting the capitalists' incentives might not weaken or fatally compromise their motivation, discretion, power, or authority. For example, increased worker profit sharing may lead to increased worker demands for codetermination in enterprise decisionmaking.

7. For an advocate's argument of this case, see Martin L. Weitzman, *The Share Economy: Conquering Stagflation* (Harvard University Press, 1984); and Weitzman, *The Case for Profit Sharing* (London: Employment Institute, 1986). See Douglas L. Kruse, "Essays on Profit-sharing and Unemployment," Ph.D. dissertation, Harvard University, 1988, for some empirical evidence in favor of this interpretation.

The theoretical arguments, pro and con, on this set of issues are complex because the applicable models are usually concerned only with partial aspects, and in any event they are not fully developed. A complete model would be very messy technically, including as it should considerations of information, monitoring, supervision, dynamic gaming, risk sharing, insider versus outsider workers, and many other issues. At present economists do not fully understand on a theoretical level the possible connection between increased worker profit sharing and increased codetermination in enterprise decisionmaking.

At a practical level, the connection between profit sharing and codetermination is also poorly understood. There are many examples of profit sharing without codetermination. Indeed, that would appear to be the typical pattern in the United States. It seems possible to believe that some profit sharing is basically productive, whereas the more extreme forms of European-style legislated codetermination are essentially counterproductive. Thus we are admittedly on uncomfortable ground in this paper when we try to concentrate on profit sharing per se while blurring the already murky boundary with issues of worker control.<sup>8</sup> The critiques and defenses that have arisen are really of worker management rather than of profit sharing per se. No one, so far as we can tell, has attempted to disentangle the two issues carefully.

In the extreme case of perfectly costless monitoring and supervision, an efficient outcome requires that management be given all the residual claims on profits and all decisionmaking power. This basic insight underlies the claims of some members of the "property rights" school that profit sharing, insofar as it involves worker management, is likely to be inefficient because it diverts vesting of property rights from the capitalist central monitors to individualistically oriented workers whose motivation is diluted by the free rider problem.<sup>9</sup> In this view, profit sharing would be associated with lower productivity because of more shirking, increased enjoyment of on-the-job leisure, slowed or incorrect managerial decisions, a too-short time horizon, an excessively risk-averse attitude due to a nondiversified pay portfolio, and the like. Although there are many variations, the basic theme of the critique of

8. For more on the latter, see the paper by Laura D'Andrea Tyson and David Levine in this volume.

9. See Armen A. Alchian and Harold Demsetz, "Production, Information Costs, and Economic Organization," *American Economic Review*, vol. 62 (December 1972), pp. 777-95; and Michael C. Jensen and William H. Meckling, "Rights and Production Functions: An Application to Labor-Managed Firms and Codetermination," *Journal of Business*, vol. 52 (October 1979), pp. 469-506.

codetermination by the property rights school revolves around the idea that (1) the essence of the firm concerns monitoring because otherwise labor does not work well, (2) capital can effectively monitor labor, and, therefore, (3) efficiency requires that capital be given all residual claims on profits and all decisionmaking power.

The defense of profit sharing and worker participation largely involves challenging the basic assumptions of the property rights school.<sup>10</sup> In less extreme settings than perfectly costless monitoring and supervision, finding the optimal degree of profit sharing becomes an extraordinarily complicated problem in the theory of the second or third best. Some profit sharing may be desirable in a world where workers can sometimes monitor, supervise, and motivate each other more effectively than management can, or where workers are able to provide technical information to management that would otherwise be costly or time consuming to obtain. For what it is worth, the popular literature is full of talk about the importance of corporate culture, cooperative work environments, team spirit, peer pressure, and the like.<sup>11</sup> Proponents of profit sharing and worker participation stress the potential for improved channels of information processing, better conflict resolution, greater possibilities for acquiring on-the-job human capital from other workers, a more positive attitude toward the introduction of new technology, and other good things.

This survey of the worker control issue is a necessarily brief review of some subtle and complicated arguments, whose connection with profit sharing is poorly understood.<sup>12</sup> The main element of the debate seems to center on the appropriate model of monitoring, supervision, and incentives to shirk. Explicit consideration of property rights does not per se eliminate the argument for profit sharing, though it may well affect one's view of the optimal degree of profit sharing. We think the appropriate application of the theory of property rights indicates that quite extreme assumptions are needed to derive a corner solution in which the efficient

10. For well-developed arguments see, for example, Louis Putterman, "On Some Recent Explanations of Why Capital Hires Labor," *Economic Inquiry*, vol. 22 (January 1984), pp. 171-87; and Haig R. Nalbantian, "Incentive Compensation in Perspective," in Haig R. Nalbantian, ed., *Incentives, Cooperation, and Risk Sharing: Economic and Psychological Perspectives on Employment Contracts* (Totowa, N.J.: Rowman and Littlefield, 1987), pp. 3-43.

11. See, for example, Carla O'Dell and Jerry McAdams, *People, Performance, and Pay* (Austin, Tex.: American Productivity Center, 1987); and Rosabeth Moss Kanter, "The Attack on Pay," *Harvard Business Review*, vol. 65 (March-April 1987), pp. 60-67.

12. For more detail see the works cited in notes 9 and 10.

pay contract would consist entirely of base wages, with zero profit sharing. In that sense our conclusions are analogous to those we drew from the principal-agency theory.

### Summary

One could go further in applying modern economic theory to analyze the likely effect of profit sharing on productivity, but we believe the main themes have been covered.

If we take all considerations into account, what does contemporary economic theory say about the relation between profit sharing and productivity? The message is complicated and incomplete. Certainly theory does not rule out the possibility that, even in a multiperson context, profit sharing may increase productivity. Whether this happens may depend largely on historical and institutional factors in the workplace. On balance, the theoretical considerations point more toward a positive than a negative effect of profit sharing on productivity. When all relevant considerations are factored in, it seems unlikely that a corner solution consisting of all base wages and zero profit sharing can be an efficient contract. Such an extreme outcome would have a probability measure close to zero, given reasonable probability distributions on underlying model parameters. Although we are far from being able to give an operational formula for the optimal degree of profit sharing, on theoretical grounds alone a value of exactly zero seems implausible. We think that, taken as a whole, economic theory is suggesting the plausible existence of a positive relation between some modest degree of profit sharing and some modest degree of productivity enhancement. But, as usual, theory gives us few hints about quantitative magnitudes.

### Comparative Systems

The evidence of a link between profit sharing and productivity gained from studying comparative economic systems is of necessity very loose. The evidence is loose because economic societies have so many differences that it is extremely hard to isolate the pure effects of one particular institution, such as profit sharing, while holding everything else constant. One is forced to fall back on soft, impure arguments by extension and other suspect reasoning that are easy targets for criticism.

It seems fair to say that capitalism, the system that relies primarily on the profit motive, is more productive than socialism, the system that

promises full employment to everyone at fixed pay. This sweeping generalization is naturally subject to qualifications, exceptions, and caveats. Nevertheless, we think that the evidence—from specific studies of public enterprises, through observations about bureaucracies and private enterprises, to comparisons of socialist and capitalist experiences—yields as powerful a general message as can be found in economics.<sup>13</sup> Capitalism may not be very good at ensuring economic security or income equality. But it is *relatively* good at delivering efficiency and productivity. Exceptions abound, of course, but this powerful general message remains a broad truth in a world that allows few economic certainties of comparable scope.

Why is a system based on individualistic, decentralized pursuit of the profit motive more productive than a system based on job security at fixed pay? Probably because capitalism embeds in the sociopolitical system a strong local constituency for profitability. Throughout the economy profit-sensitive or profit-directed agents are effectively installed in focal decisionmaking positions. At some point in the capitalist economic hierarchy, an agent who is rewarded by enterprise profitability will put pressure on subordinates to take measures, frequently politically or socially unpopular, to increase profits. This constituency of profit-sensitive agents with decisionmaking power, then, has the authority to make seemingly antisocial decisions in pursuit of its own goals. The essential argument for capitalism is that such a seemingly paradoxical power arrangement works fairly well in practice—compared with the alternatives. The capitalist system automatically delivers efficiency and productivity because that helps the key decisionmaking agents who benefit from the profits. Socialism, in contrast, has a less distinguished record for efficiency and productivity because rewards are not tied closely to performance, and there is no comparable local constituency for profitability to resist more immediately humanitarian aspirations, various “higher goals,” bureaucratic inertia, and other features of the system.

From this line of reasoning, one is tempted to conclude, as a kind of heuristic argument by continuous extension, that, other things being equal and within a reasonable range, the broader and deeper the constituency for profitability, the greater the pressure on the system to

13. See, for example, Abram Bergson, “Comparative Productivity: The USSR, Eastern Europe, and the West,” *American Economic Review*, vol. 77 (June 1987), pp. 342–57; and Raymond Vernon, *The Promise of Privatization: A Challenge for U.S. Policy* (New York: Council on Foreign Relations, 1988).

increase productivity. The thought goes: “If the profit motive is good for productivity, so is profit sharing.” This argument by continuous extension from comparative systems to profit sharing is not rigorous, but it is not implausible either. If the pay of managers as well as owners is linked to profitability, managers have a more direct incentive to be alert to productivity-enhancing measures. If workers, as well as managers and owners, have bonuses linked to profits, they are probably, other things being equal, going to work harder and be more sympathetic to the introduction of new machinery or flexible work rules that increase productivity.

This general line of argument—that to enhance productivity, local agents who care about local profitability must be installed throughout the system—has wide recognition in socialist countries today. Current debate about economic reforms in the Soviet Union, China, and other socialist countries is largely, though not entirely, about linking rewards more closely to performance.<sup>14</sup> Socialist economies often promote meaningful profit sharing in one form or another as a socially acceptable way of creating a broad-based local constituency for profitability that can help to resist the inertia of bureaucratic control. While none of these changes “proves” that profit sharing increases productivity, the beliefs and experiences of socialist reformers seem at least to aim in that direction. Without overdoing the point, it does not seem totally unfair to use a basic empirical generalization from studying comparative economic systems to permit some modest part of the productivity luster of the for-profit system to rub off on profit sharing.

Other suggestive but slightly “cleaner” evidence comes from comparing capitalist countries. Japan, Korea, and Taiwan all have widespread bonus payment systems with strong profit-sharing overtones. (Singapore is now also strongly encouraging the introduction of profit sharing.) In Japan bonuses paid twice a year constitute about 25 percent

14. This includes letting unprofitable enterprises fail, which is just one way in which traditional Yugoslav worker-managed cooperatives have differed from genuine profit-sharing institutions. On economic reform in the Soviet Union, see Ed A. Hewett, *Reforming the Soviet Economy* (Brookings, 1988); Joseph S. Berliner, “Statement,” in *Economic Reforms in the U.S.S.R.*, Hearings before the Subcommittee on National Security Economics of the Joint Economic Committee, S. Hrg. 100-749, 100 Cong. 1 sess. (GPO, 1988), pp. 269–85; and Abel G. Aganbegan, *The Economic Challenge of Perestroika* (University of Indiana Press, 1988). On China, see Dwight H. Perkins, “Reforming China’s Economic System,” *Journal of Economic Literature*, vol. 26 (June 1988), pp. 601–45. For an overview of the socialist reform process in Hungary, see Janos Kornai, “The Hungarian Reform Process,” *Journal of Economic Literature*, vol. 24 (December 1986), pp. 1687–1737.

of an average worker's total pay. The ratio of bonus to base wage is statistically significantly correlated with profitability, though the elasticity is much less than one.<sup>15</sup> In Korea and Taiwan the quarterly bonuses constitute about 15 percent of an average worker's total pay and, at least in Korea, there is a statistically significant correlation between the ratio of bonus to base wage and profitability.<sup>16</sup>

An important question is what role, if any, these bonus payment systems play in the remarkable productivity and employment records of the Japanese, Korean, and Taiwanese economies. The question is difficult to answer. Serious research is just beginning. It will probably be hard to reach firm conclusions for all the usual reasons, including the extreme difficulty of disentangling the role of one particular factor in the very complicated set of institutional arrangements we call an industrial relations system.

At the minimum, however, the experiences of Japan, Korea, and Taiwan strongly suggest that bonus payment systems with profit-sharing overtones are not inherently counterproductive. Of course we are not able to say exactly what role the profit-sharing bonus per se plays, since it is so intertwined with other factors. Nevertheless, these three economies are otherwise distinct enough to make the common strand of a meaningful bonus system intriguing. On-the-scene participants and observers in the three countries tend to believe that the bonus system is not just a form of disguised wage, but that it is there for a reason. The reason most often cited follows a familiar story line: a group performance payment mechanism helps to unite the interests of workers and management by giving everyone a stake in the outcome and encouraging positive, flexible, productivity-enhancing workplace behavior.

What emerges from these broad observations of comparative systems is admittedly loose and subject to multiple interpretations. Taken by itself, the evidence is not compelling. Nevertheless, though far from being conclusive, the "big picture" from comparative economic systems at least suggests there is a positive relation between profit sharing and productivity.

15. For a description of the Japanese bonus system (and an attempt at assessing its economic effect), see Richard B. Freeman and Martin L. Weitzman, "Bonuses and Employment in Japan," *Journal of the Japanese and International Economies*, vol. 1 (June 1987), pp. 168-94, and the references cited there.

16. Joon Woo Kim, "Bonuses and Employment in Korea," senior thesis, Harvard University, 1988.

### Case Studies

It is hard to summarize accurately the literature on group performance-related pay, in part because of its great diversity. In the next three sections we review several kinds of noneconometric yet systematic attempts to assess the relationship between profit sharing or gain sharing and productivity or other performance measures, in ascending order of methodological rigor. We begin here with the relatively subjective domain of case studies, which are often testimonial and anecdotal.

The industrial relations literature sometimes makes a distinction between gain sharing, defined narrowly, and profit sharing. Gain sharing in that context typically means a group incentive pay system geared to productivity, cost reduction, or something else that may be perceived as less arbitrary and less comprehensive than profitability, which is the basis for profit sharing. Gain-sharing plans come in many forms, including the Scanlon plan, the Rucker plan, and Improshare.<sup>17</sup> Plans are tailored to the individual needs of each particular site, usually consisting of an involvement system and a formula linking pay to performance. The size of the relevant group is designed by the planners, but for very large enterprises it is normally smaller than the entire firm. Each gain-sharing subspecies is enthusiastically promoted by its commercial sponsor, but each seems to differ from the others more in specific details (such as compensation formula, degree of employee involvement, number of participants, and other features that may actually be quite important in practice) than in the general philosophy of why, how, and when it works. From an economic point of view, these various group performance-related pay plans, whether designated as gain sharing or profit sharing, seem generically more similar than different, and we will henceforth blur the distinctions among the varieties of gain sharing and profit sharing.

Two other conceptual issues concern the relationship of profit sharing to employee stock ownership plans (ESOPs) and to unions. A full consideration of these issues is beyond the scope of this paper, but a few brief comments are in order.<sup>18</sup>

The public often thinks of profit sharing and employee ownership as essentially similar, but they are conceptually different. ESOPs have a

17. Bureau of National Affairs, *Labor Relations Week*, vol. 2: BNA Special Report, *Changing Pay Practices: New Developments in Employee Compensation* (Washington, D.C., 1988), pp. 68-74; and Nalbantian, "Incentive Compensation in Perspective."

18. For more about ESOPs, see the paper by Svejnar and Conte in this volume.



profit-sharing component, in that participants (along with outside stockholders) receive dividends (or share price increases) on stock allocated to their accounts; however, the primary company contributions to ESOPs are not profit based. Profit-sharing plans and ESOPs are sometimes used in tandem to motivate and compensate employees, though evidence on U.S. publicly held companies shows that the overlap between profit sharing and ESOPs is not very different from what would be expected by random assignment.<sup>19</sup> The institutional differences between plans are likely to be important, and we do not propose to explore those here. There is a growing empirical literature on ESOPs;<sup>20</sup> a fair generalization is that ESOPs are often associated with better firm performance, but the link is by no means automatic, and it is often weak or nonexistent when adequate controls are applied. In this sense ESOPs differ somewhat from profit sharing. An overview of the empirical literature suggests that the case for a positive link between employee ownership and productivity is weaker (maybe we should say "even weaker") than the case for a positive link between profit sharing and productivity, though probably not to the point of nonexistence.<sup>21</sup>

The relation between unions and profit sharing has attracted little empirical research. Historically, unions have usually resisted profit-sharing plans, and firms have tended to drop profit sharing after becoming unionized.<sup>22</sup> But some unions accepted profit sharing in the 1980s, most notably the United Automobile Workers in their recent contracts with General Motors and Ford. The dynamics of profit sharing under union-

19. Kruse, "Essays on Profit-sharing and Unemployment."

20. This literature is summarized in Joseph R. Blasi, *Employee Ownership: Revolution or Ripoff?* (Ballinger Books, 1988).

21. This conclusion comes out fairly clearly from the econometric studies of cooperatives described later in our paper, which typically show that profit sharing has a more significant effect on productivity than workers' capital ownership or participation. (Coefficients on the latter two variables are often negative or insignificant, or both.) See also Kruse, "Essays on Profit-sharing and Unemployment"; Steven M. Bloom, "Employee Ownership and Firm Performance," Ph.D. dissertation, Harvard University, 1985; Paula B. Voos, "Managerial Perceptions of the Economic Impact of Labor Relations Programs," *Industrial and Labor Relations Review*, vol. 40 (January 1987), pp. 195-208; and U.S. General Accounting Office, *Employee Stock Ownership Plans: Little Evidence of Effects on Corporate Performance*, GAO/PEMD-88-1 (October 1987).

22. Richard B. Freeman and Morris Kleiner, "Union Organizing Drive Outcomes from NLRB Elections during a Period of Economic Concessions," *Proceedings of the Thirty-Ninth Annual Meeting* (Madison, Wis.: Industrial Relations Research Association, 1987), pp. 41-47.

ism, and whether unionism interacts positively or negatively with profit sharing in affecting performance, are interesting questions for which there are currently no clear answers.<sup>23</sup>

As for the case studies proper, they tend to be skewed toward the anecdotal and testimonial side of evidence taking. Even so, we feel this approach can yield some useful information. To give a sense of the vast case study literature, we will summarize the results of what we identified as the major systematic attempts from within the industrial relations community to survey individual case studies on group pay-for-performance plans. We found five such surveys. In addition, we read a great many (although not all) individual case studies from the literature.

Case studies of gain sharing are widely diverse. The first survey, of thirty-three cases, characterized these studies as being of "poor to good" quality.<sup>24</sup> Bullock and Lawler, the authors of the survey, noted that all the cases were "post hoc analyses of a single organization"; none "used standard statistical methods."<sup>25</sup> The thirty-three cases were distributed among union and nonunion firms, and among small, medium, and large firms. Gain sharing, it was found, positively influenced organizational effectiveness (productivity, quality, costs, or consumer service) in 73 percent of the cases, and in most of them the quality of work life, innovation, labor-management cooperation, and employee pay improved. Overall, two-thirds of the plans were considered successful. In explaining the successes, the authors observed that "there is surpris-

23. For some attitudinal evidence on unions and profit sharing, see Edwin B. Flippo, *Profit Sharing in American Business: A Study of Methods Used to Maintain and Sustain Profit-Sharing Plans* (Ohio State University, 1955); F. Beatrice Brower, "Sharing Profits with Employees," Conference Board Reports, Studies in Personnel Policy 162 (New York: National Industrial Conference Board, 1957); Opinion Research Corporation, "How Profit Sharing Affects Employee Attitudes," Princeton, N.J., October 1957; I. B. Helburn, "An Analysis of the Industrial Relations Climate in Unionized Profit Sharing Firms," Ph.D. dissertation, University of Wisconsin, 1966; and Laura B. Cardinal and I. B. Helburn, "Union Versus Nonunion Attitudes Toward Share Agreements," *Proceedings of the Thirty-Ninth Annual Meeting*, pp. 167-73. For evidence that profit sharing decreases the probability of union success in representation elections, see Edgar R. Czarnecki, "Effect of Profit Sharing Plans and Union Organizing Efforts," *Personnel Journal*, vol. 49 (September 1970), pp. 763-73. For some interesting reflections on the future of possible "mixed marriages" between unions and profit sharing, see Daniel J. B. Mitchell, "The Share Economy and Industrial Relations," *Industrial Relations*, vol. 26 (Winter 1987), pp. 1-17.

24. R. J. Bullock and Edward E. Lawler, "Gainsharing: A Few Questions, and Fewer Answers," *Human Resources Management*, vol. 23 (Spring 1984), pp. 23-40.

25. Bullock and Lawler, "Gainsharing," pp. 26, 38.

ingly little evidence as to why they work," and speculated that gain-sharing plans "change the culture of the organization" in such a way that employees have a "much broader understanding of and commitment to the total enterprise and its success."<sup>26</sup>

Second, the National Commission on Productivity and Work Quality did a survey of experiences with Scanlon plans.<sup>27</sup> Among forty-four firms with such plans, thirty were considered successful, and fourteen failures. (One suspects that adopted plans may be more likely to be reported as successful than unsuccessful.)

Third, a survey by Katzell and Guzzo of worker productivity experiments covered twenty studies of performance-based compensation; of these, eighteen had found at least one positive effect on an output measure.<sup>28</sup> In addition, seven of nine studies addressing the issue had found that absenteeism or turnover was reduced, and three of four pertinent studies had found improvements in employee attitudes.

Fourth, a 1981 General Accounting Office study investigated thirty-six firms with gain-sharing plans, of which twenty-four provided financial data.<sup>29</sup> In the smaller companies (with annual revenues below \$100 million) the average "savings in work force costs" due to gain sharing were calculated as 17.3 percent; in the larger companies the average savings were estimated as 16.4 percent. Level of performance was found to be positively related to the age of the plan.

Fifth, a study of Improshare plans (a form of gain sharing that does not emphasize worker participation in decisions) by Fein found that, among seventy-two firms, the median productivity increase after one year was 19–20 percent.<sup>30</sup>

In addition to (and behind some of) these general surveys are many

26. Bullock and Lawler, "Gainsharing," pp. 36–37.

27. National Commission on Productivity and Work Quality, *A Plant-Wide Productivity Plan in Action: Three Years of Experience with the Scanlon Plan* (Washington, D.C., May 1975).

28. Raymond A. Katzell and Richard A. Guzzo, "Psychological Approaches to Productivity Improvement," *American Psychologist*, vol. 38 (April 1983), pp. 468–72. The authors report that "in some experiments more than one type of program and more than one type of outcome measure were studied" (p. 469), but do not report the number of outcome measures in each study. In interpreting these results, one should remember that a larger number of outcome measures increases the chance of at least one being positive, which is an important caveat for these results.

29. U.S. General Accounting Office, *Productivity Sharing Programs: Can They Contribute to Productivity Improvement?* AFMD-81-22 (March 1981).

30. Mitchell Fein, *Improshare: An Alternative to Traditional Managing* (Norcross, Ga.: American Institute of Industrial Engineers, 1981).

analyses of individual cases.<sup>31</sup> Profit-sharing and gain-sharing plans were found to be basically successful in most of the cases discussed (though it is unlikely that these are representative of all experiments). The tone of the case studies is usually, but not always, favorable to gain sharing. In two cases of failure, Alban and Gray found that profit shares or bonuses were apparently too small.<sup>32</sup> The sharing of monetary gains, it should be pointed out, does not get all the credit in the successful cases; in particular, several authors found that worker participation is an essential component in a successful gain-sharing plan (and may be more important than the monetary incentive taken alone).<sup>33</sup>

The mechanisms translating group incentives into increased productivity are poorly understood. The literature emphasizes such factors as increased worker involvement, more labor-management cooperation, heightened monitoring of fellow workers, more information sharing, working smarter, greater awareness of and interest in the company's profitability, and improved corporate culture.<sup>34</sup> Most observers agree

31. John J. Jehring, "A Contrast between Two Approaches to Total System Incentives," *California Management Review*, vol. 10 (Winter 1967), pp. 7–14; Fred G. Lesieur and Elbridge S. Puckett, "The Scanlon Plan Has Proved Itself," *Harvard Business Review*, vol. 47 (September–October 1969), pp. 109–18; R. B. Gray, "The Scanlon Plan: A Case Study," *British Journal of Industrial Relations*, vol. 9 (November 1971), pp. 291–313; Carl F. Frost, John H. Wakeley, and Robert A. Ruh, *The Scanlon Plan for Organization Development: Identity, Participation, and Equity* (Michigan State University Press, 1974); Ronald Carl Alban, "An Analysis of Companywide Cash Profit Sharing Plans," Master's thesis, Massachusetts Institute of Technology, 1980; Richard D. Rosenberg and Eliezer Rosenstein, "Participation and Productivity: An Empirical Study," *Industrial and Labor Relations Review*, vol. 33 (April 1980), pp. 355–67; R. J. Bullock and Patti F. Bullock, "Gainsharing and Rubik's Cube: Solving System Puzzles," *National Productivity Review*, vol. 1 (Autumn 1982), pp. 396–407; Carl F. Frost, "The Scanlon Plan at Herman Miller, Inc.: Managing an Organization by Innovation," in Robert Zager and Michael P. Rosow, eds., *The Innovative Organization: Productivity Programs in Action* (Pergamon Press, 1982), pp. 63–87; Brian E. Graham-Moore and Timothy L. Ross, eds., *Productivity Gainsharing: How Employee Incentive Programs Can Improve Business Performance* (Prentice Hall, 1983); Linda S. Tyler and Bob Fisher, "The Scanlon Concept: A Philosophy As Much As a System," *Personnel Administrator*, vol. 29 (July 1983), pp. 33–37; and Felix R. FitzRoy and Kornelius Kraft, "Participation and Division of Labor: A West German Case Study," *Industrial Relations Journal*, vol. 16 (Winter 1985), pp. 68–74.

32. Alban, "Analysis of Companywide Cash Profit Sharing Plans"; and Gray, "Scanlon Plan."

33. Frost and others, *Scanlon Plan for Organization Development*; Rosenberg and Rosenstein, "Participation and Productivity"; and Frost, "Scanlon Plan at Herman Miller, Inc."

34. Nalbantian, "Incentive Compensation in Perspective," p. 21; Bureau of National Affairs, *Changing Pay Practices*, pp. 67–94; and General Accounting Office, *Productivity Sharing Programs*, pp. 24–30.

that group performance-related pay plans are more likely to lead to improved productivity than pay plans that are not tied to appropriate performance measures. But it is also a common observation that background organization conditions can significantly influence the pay-performance link.<sup>35</sup>

It is interesting to note how closely the case study observations dovetail with the general conclusions from repeated game theory cited earlier. The usual gain-sharing plan emphasizes employee involvement as well as the group reward structure. Worker participation is generally seen as an essential component in successful Scanlon plans.<sup>36</sup> Practitioners tend to indicate that otherwise well-designed gain-sharing-like plans can fail if trust and cooperation are not generated during the implementation phase.<sup>37</sup> FitzRoy and Kraft, in their West German case study, argue that the traditional division of labor inhibits the worker interaction and collective response that are necessary to produce a positive profit-sharing effect on productivity.<sup>38</sup> Case studies usually conclude that profit sharing can help to improve productivity—in an environment with the appropriate corporate culture.

A current piece of conventional wisdom is that group incentives like profit sharing are productive, whereas individual incentives like piece-work are counterproductive. Consistent with this, there has recently been a pronounced growth of group incentive systems.<sup>39</sup> Many observers report that in the rapidly changing work world a great need exists for a highly flexible, cooperative labor force, adaptable to new contingencies and not hampered by rigid work rules. Some assert as an empirical generalization that—especially in the fast-growing service and information sectors—the main potential sources of improved productivity now come from interactive team and collective efforts at the workplace, which are difficult to isolate and encourage with individual incentives. According to this scenario, then, profit sharing, by promoting group values positively related to group productivity, may be becoming an important part of the new work scene.

35. Bureau of National Affairs, *Changing Pay Practices*, pp. 72–75.

36. Frost, "Scanlon Plan at Herman Miller, Inc.," and Frost and others, *Scanlon Plan for Organization Development*.

37. Rosabeth Moss Kanter, "The Attack on Pay," *Harvard Business Review*, vol. 65 (March–April 1987), pp. 60–67.

38. FitzRoy and Kraft, "Participation and Division of Labor."

39. O'Dell and McAdams, *People, Performance, and Pay*, p. 8.

## Attitude Surveys

Two broad types of attitude surveys can be distinguished: of employees and of employers. The conclusions based on these surveys are naturally subject to several caveats. First, the initial sample may have an overrepresentation of firms with group incentive systems. Second, there are self-selection biases associated with response to a voluntary survey. Third, organizations or individuals that have adopted a particular plan will normally tend to think well of the plan and to rationalize its existence. Fourth, answers to opinion questions are influenced by the questionnaire design—for this and other reasons the expressed opinions are an imperfect guide to actual behavior or performance. These caveats suggest potential threats to both internal validity (whether the findings represent true performance differences within the sample) and external validity (whether the results can be generalized to larger groups). Nevertheless, it seems plausible that one can obtain useful information from those who have first-hand experience with profit-sharing and gain-sharing plans. Some overall bias probably exists in the survey literature toward finding positive effects for profit sharing. The exact extent of the bias is unknown, but it would most likely not overturn the consistently strong positive findings that emerge.

In this review we have tried to locate all published results of attitude surveys in which employees or employers were asked: (1) questions about performance or motivation, for which the answers could be compared across profit-sharing and non-profit-sharing groups or firms; or (2) direct questions about whether profit sharing has improved performance or motivation.

## Employee Surveys

We found six published employee surveys, which are briefly summarized in table 1. As can be seen, employees usually feel that profit sharing and gain sharing are good for personal effort, company growth and productivity, and workplace atmosphere. In the one study that compared answers across profit-sharing and non-profit-sharing employees (Opinion Research Corporation 1957), the former were more likely than the latter to say that they benefit from company growth and that workers get credit for company progress. Also, a majority of profit-sharing employees stated that their interests are not substantially different from those of management (61 percent) and owners (71 percent).

Table 1. Surveys of Employee Attitudes

<i>Authors of the studies<sup>a</sup></i>	<i>Source of data</i>	<i>Main content of questions asked employees (PS = profit sharing)</i>	<i>Percent of positive answers</i>
Bell and Hanson 1987	2,703 employees of 12 profit-sharing companies (67 percent response rate)	How do you view PS in general? How do you view PS in your firm? Does PS improve employee attitudes? Do you agree or strongly agree that PS: <sup>b</sup> makes people work more effectively? strengthens loyalty to the firm? creates a better atmosphere in the firm? is good for company and employees? is popular because people like bonuses? should not be substitute for adequate wage? can cause disappointment or bitterness because profits can go down?	91 88 73 51 47 65 86 93 96 42
Bureau of National Affairs 1988	1,000 telephone interviews from Omnitel weekly national survey (Bruskin and Assoc.)	Which of the following pay systems do you prefer? company-wide incentive basis? individual incentive basis? straight wage salary?	12 22 63
Colletti 1969	76 employees at Motorola (36 percent response rate)	Agree that employees gain by cost cutting Agree that employees share in firm's growth Is PS an incentive in daily job? Has PS made you want to do a better job?	80 89 67 72
Jehring 1956	Employees in 202 U.S. companies	Has PS been successful or very successful?	81
National Commission on Productivity and Work Quality 1975	Comparison between 66 blue-collar answers before and after the introduction of a Scanlon plan in one U.S. company	Before the introduction of the plan: would cooperation be better with the plan? might communication improve? might participation increase? After the introduction of the plan: is cooperation better now? has communication improved? has participation increased?	53 65 44 82 72 71
Opinion Research Corporation 1957	Comparison between two samples of profit-sharing and non-profit-sharing employees	Agree that: employees get their share of company growth? employees get credit for company progress? employees gain from cost cutting? PS cuts down labor-management friction? employees take it hard if profits go down?	79 (47) <sup>c</sup> 79 (43) 60 (40) 32 35

a. D. Wallace Bell and Charles G. Hanson, *Profit Sharing and Profitability: How Profit Sharing Promotes Business Success* (London: Kogan Page, 1987); Bureau of National Affairs, *Changing Pay Practices: New Developments in Employee Compensation* (Washington, D.C., 1988); Jerome Colletti, *Profit Sharing and Employee Attitudes: A Case Study of the Deferred Profit-Sharing Program at Motorola, Inc.* (University of Wisconsin, Center for the Study of Productivity Motivation, 1969); John J. Jehring, *Succeeding with Profit Sharing: The Experiences of Profit Sharing Companies in Communicating Their Plans to Their Employees*

(Evanston, Ill.: Profit Sharing Research Foundation, 1956); National Commission on Productivity and Work Quality, *A Plant-Wide Productivity Plan in Action: Three Years of Experience with the Scanlon Plan* (Washington, D.C., May 1975); and Opinion Research Corporation, "How Profit Sharing Affects Employee Attitudes," Princeton, N.J., October 1957.

b. These are the answers to a series of five-option questions, ranging from strongly agree to strongly disagree.

c. The numbers in parentheses are percentages for non-profit-sharing employees.

Employees in this sample rated profit sharing as the second most important advantage of working for their companies (second to steady employment and higher than good pay rates and other benefits).

In contrast to the perceived positive effects of profit sharing on effort, growth, and workplace atmosphere, employees apparently dislike the income variability caused by profit sharing. In the Bell and Hanson sample, even though 91 percent of employees supported profit sharing "in general," 42 percent agreed that profit sharing "can cause bitterness or disappointment, because profits can go down as well as up." This is probably the main reason that in the Bureau of National Affairs sample 63 percent of employees stated their preference for a straight wage salary. Consistent with the theory of decreasing relative risk-aversion, low-income workers were more likely than high-income workers to prefer a straight wage salary.

An unpublished employee survey sheds some light on the factors that make employees respond positively to profit sharing. Florkowski surveyed 154 employees in three profit-sharing companies and used several indexes to predict positive responses toward profit sharing.<sup>40</sup> Perceptions of greater pay equity, performance-reward contingencies, organizational commitment, and job satisfaction were correlated with positive attitudes about profit sharing, whereas perceived influence on decisionmaking did not have a strong relationship.

### *Employer Surveys*

We found fifteen published attitude surveys of employers; the thirteen amenable to compression are summarized in table 2. As with employee surveys, the overall result is that employers view profit sharing positively. Between 73 percent and 100 percent agreed with the designation of profit sharing as "successful" or "very successful" in four samples. A majority believed that profit sharing improved employee satisfaction and loyalty.

Mitchell and Broderick's was one of the few samples that included employers without profit-sharing plans. Comparing several types of plans (including ESOPs, gain sharing, and simple incentives), this survey found that 28 percent of all managers viewed profit sharing as the best alternative for raising productivity (second to simple incentives, men-

40. Gary W. Florkowski, "The Organizational Impact of Profit Sharing," Ph.D. dissertation, Syracuse University, 1988.

tioned by 42 percent), and that 48 percent of managers viewed it as the best for increasing loyalty. The survey also shed some light on the question of the relation between profit sharing and participation: 39 percent of managers in cash-profit-sharing companies (and 33 percent in deferred profit-sharing companies) agreed that it creates demands for participation in management.

The American Productivity Center survey (O'Dell and McAdams 1987) found that there has been a striking growth in the number of firms adopting group-based pay for performance systems (more were adopted in the last five years than in the previous twenty years), and that adoption of such plans was higher among firms reporting increased competition. Profit-sharing plans existed in 32 percent of the companies, with "gain sharing" (that is, Scanlon, Rucker, Improshare, or custom plans) in 13 percent and "small group incentives" in 14 percent. Frequent information sharing with employees was found to be more prevalent in gain-sharing and profit-sharing companies (65 percent) than in other companies (37 percent), which suggests that sharing of information may be perceived as an important complement to profit sharing.

The two studies of employer attitudes not summarized in table 2 used attitude measures as dependent variables in formal statistical regressions. Paula Voos analyzed 343 unionized firms in Wisconsin in 1984.<sup>41</sup> Managers were surveyed about their companies' experience with gain sharing, profit sharing, ESOPs, employee participation, and joint union-management committees. Managers were asked to evaluate the effectiveness of the various programs along the dimensions of product quality, productivity, unit labor cost, and profits. The responses were used as dependent variables, with the types of programs used as predictors. The coefficient on gain sharing or profit sharing was always positive and statistically significant at the 5 percent level, with the largest perceived effects on product quality and productivity. The size of the estimates was comparable only to that for employee participation programs (and well above ESOPs), leading Voos to conclude that managers view participation, profit sharing, and gain sharing as the programs most likely to have positive effects on firm performance.

The final employer attitude study analyzed data from the Workplace Industrial Relations Survey, covering 1,266 British establishments in 1984, of which 42.7 percent reported some form of profit-sharing or share

41. Paula B. Voos, "Managerial Perceptions of the Economic Impact of Labor Relations Programs," *Industrial and Labor Relations Review*, vol. 40 (January 1987), pp. 195-208.

Table 2. Surveys of Employer Attitudes

<i>Authors of the studies<sup>a</sup></i>	<i>Source of data</i>	<i>Main content of questions asked employers (PS = profit sharing)</i>	<i>Percent positive answers</i>
Brower 1957	204 executives of U.S. manufacturing firms	Did the plan improve employee attitudes? Did the plan reduce turnover?	90 77
General Accounting Office 1981	36 companies with gain-sharing plans in action	Did the plan improve labor-management relations? Did the plan reduce grievances? Did the plan reduce absenteeism? Did the plan reduce turnover?	80 47 36 36
Knowlton 1954	300 managers in profit-sharing companies	Was the PS plan very successful? Was the PS plan successful? Was the PS plan disappointing?	32 45 2
Metzger 1966	130 U.S. companies with less than 500 employees, mostly but not necessarily with profit-sharing plans	Was the PS plan very successful? Was the PS plan successful? Did the PS plan improve morale and cooperation? Was the PS plan effective in cutting costs?	26 56 93 64
Metzger 1975	38 U.S. companies with more than \$50 million of profit-sharing trust assets in 1971	Was the PS plan very successful? Was the PS plan successful? Was the PS plan disappointing?	53 47 0
Mitchell and Broderick 1987	545 managers out of 6,988 questionnaires sent out (sample heavily biased toward managers knowledgeable about flexible plans)	PS best alternative for: raising productivity increasing loyalty linking labor costs to firm's conditions Agrees that cash PS: raises productivity increases loyalty creates demand for participation is difficult to administer	28 (30) <sup>c</sup> 48 (49) 53 (56)  43 (45) 51 (51) 44 (39)* 50 (57)*
Mitchell and Broderick 1987 ( <i>cont.</i> )		Agrees that deferred PS: raises productivity increases loyalty creates demand for participation is difficult to administer Agrees that PS in general: links labor costs to firm's conditions	32 (32) 50 (52) 39 (33)* 43 (54)*  63 (64)
National Commission on Productivity and Work Quality 1975	Comparison between 28 managers' answers before and after the introduction of a Scanlon plan in one U.S. company	Before the introduction of the plan: would cooperation be better with the plan? might communication improve? might participation increase? After the introduction of the plan: is cooperation better now? has communication improved? has participation increased?	90 79 74  100 93 77
New York Stock Exchange 1982	1,158 respondents out of 7,000 U.S. corporations with 500 or more employees	Are PS plans successful?	73
Nightingale 1980	86 executives of small Canadian profit-sharing companies	Did the plan increase employee satisfaction? Did the plan reduce turnover? Did the plan improve morale and cooperation?	84 65 72
O'Dell and McAdams 1987	1,598 companies, members of the American Productivity Association	PS has a positive or very positive effect on: performance productivity quality turnover	74 65 70 56
Wider Share Ownership Council 1985	Cited by Estrin 1986; and Wadhvani and Wall 1988 <sup>d</sup>	Did the plan increase productivity? Did the plan increase loyalty? Did the plan reduce turnover?	45 77 39

Table 2 (continued)

Authors of the studies <sup>a</sup>	Source of the data	Main content of questions asked employers	Average rating
Metzger 1975	38 U.S. profit-sharing companies with more than \$50 million of trust assets	Employers were asked to rate their plan on a 1 to 3 scale on 9 measures of success; lowest and the highest average ratings were	1.74-2.88
Ruh, Wallace, and Frost 1973	205 managers from 18 U.S. companies that are continuing or have discontinued Scanlon plan	Continuing Scanlon plan companies: Average rate on a 1 to 5 scale Discontinuing Scanlon plan companies: average rate on a 1 to 5 scale	4.1 3.7
Smith 1986	303 U.K. profit-sharing companies	Average plan rating on 9 measures of success: scale of 1 to 5	4

a. F. Beatrice Brower, "Sharing Profits with Employees," Studies in Personnel Policies 162 (New York: National Industrial Conference Board, 1957); U.S. General Accounting Office, *Productivity Sharing Programs: Can They Contribute to Productivity Improvement?* AFMD-81-22(1981); Philip A. Knowlton, *Profit Sharing Patterns* (Evanston, Ill.: Profit Sharing Research Foundation, 1954); Bertram L. Metzger, *Profit Sharing in Perspective* (Evanston, Ill.: Profit Sharing Research Foundation, 1966); Bertram L. Metzger, *Profit Sharing in 38 Large Companies: Piece of the Action for 1,000,000 Participants*, vol. 1 (Evanston, Ill.: Profit Sharing Research Foundation, 1975); Daniel J. B. Mitchell and Renae F. Broderick, "Flexible Pay Systems in the American Context: History, Policy, Research, and Implications," paper prepared for the Pacific Rim Comparative Labor Policy Conference, Vancouver, Canada, June 1987; National Commission on Productivity and Work Quality, *A Plant-Wide Productivity Plan in Action: Three Years of Experience with the Scanlon Plan* (Washington, D.C., May 1975); New York Stock Exchange, *People and Productivity: A Challenge to Corporate America* (1982); Donald V. Nighingale, *Does Profit Sharing Really Make a Difference?* (Ottawa: Conference Board in Canada, 1980); Carla O'Dell and Jerry McAdams, *People, Performance, and Pay* (Austin, Tex.: American Productivity Center, 1987); and

Wider Share Ownership Council 1985 (see note d).  
b. This study compares managers' attitudes toward the following alternative flexible compensation plans: profit sharing, ESOP, tax credit ESOP, gain sharing, simple incentives.

c. The numbers in parentheses refer to respondents whose firm had a profit-sharing plan in action. A \* indicates that the responses of firms with profit sharing are significantly different (5 percent, Chi-square test) from the responses of other firms.

d. Saul Estrin, "Profit Sharing, Motivation, and Company Performance: A Survey," paper prepared for the Employment Institute, June 1986; and Sushil Wadhvani and Martin Wall, "The Effects of Profit-Sharing on Employment, Wages, Stock Returns, and Productivity: Evidence from UK Micro-Data," Working Paper 1030 (London School of Economics, Centre for Labour Economics, 1988).

e. Metzger 1975 (see note a); Robert A. Ruh, Roger L. Wallace, and Carl F. Frost, "Management Attitudes and the Scanlon Plan," *Industrial Relations*, vol. 12 (October 1973), pp. 282-88; and Gillian R. Smith, "Profit Sharing and Employee Share Ownership in Britain," *Employment Gazette*, vol. 94 (September 1986), pp. 380-84.

## Profit Sharing and Productivity

ownership scheme.<sup>42</sup> Unlike the previously described surveys, this one did not ask managers to evaluate the schemes. Rather, personnel managers were asked whether the company's financial performance was "better than average" compared with the rest of the industry, and this response was coded as a dummy dependent variable for probit regressions. Controlling for size, industry demand, percent labor costs, and unionism, the profit-sharing coefficients in two specifications were positive, with *t*-statistics of 1.4 and 1.6. Managers in profit-sharing companies were somewhat more likely to report above-average company performance, but the statistical significance was weak.

Unlike the other surveys in our group, which were limited to either employers or employees, a multinational survey conducted by Louis Harris included samples of business executives, trade union leaders, employees, legislators, and members of the public.<sup>43</sup> Of the U.S. employed public, 43 percent felt that "employees getting financial rewards for productivity gains" would increase productivity a great deal; this was the most popular method of raising productivity for the public, business leaders, and congressional members, but not for union leaders. Asked if they were willing to have their salaries linked to productivity if "their sacrifices would provide money needed for investment," 63 percent of U.S. employees answered yes.

To summarize the attitude surveys, while it is clear that potential biases exist, the overall results consistently show that employees and employers view profit sharing and gain sharing as positive influences on productivity and company performance. These positive influences are tempered on the employee side by the risk of fluctuating income.

## Simple Statistical Studies

Other evidence on profit sharing can be found in studies that compare profit-sharing and non-profit-sharing companies on measures of financial performance. Almost without exception the six studies summarized in table 3 found that profit-sharing companies have higher mean or median values for performance indexes than non-profit-sharing companies do.

42. D. G. Blanchflower and A. J. Oswald, "Profit Related Pay: Prose Discovered?" London School of Economics, 1987.

43. Sentry Insurance, *A Sentry Study: Perspectives on Productivity: A Global View*, study conducted by Louis Harris and Associates (New York, 1981). The total number of respondents across all samples was 5,098.

**Table 3. Simple Statistical Comparisons**

<i>Authors of the studies<sup>a</sup></i>	<i>Source of data</i>	<i>Statistical technique</i>	<i>Principal findings</i>
Bell and Hanson 1987	414 U.K. companies, 113 profit-sharing, 301 non-profit-sharing, 1977-85	Comparisons of 9 measures of performance	Each index had eight years of comparisons. Across 72 points of comparison, profit-sharing firms were superior in 90 percent of the cases. Before and after comparison showed relative improvement in 7 of 9 measures
Howard and Dietz 1969	175 U.S. profit-sharing and non-profit-sharing companies in 9 industries	Comparisons of the median values of 16 indexes of performance in each industry	16 comparisons were made for each industry. Over the 144 points of comparisons profit-sharing firms were superior in 58 percent of the cases and inferior only in 19 percent. In each index considered separately over all industries profit-sharing companies outperformed the others
Howard 1979	202 U.S. profit-sharing and non-profit-sharing companies in 6 industries	Comparisons of the median values of 16 indexes of performance in each industry	16 comparisons were made for each of 6 industries. Over the 96 points of comparisons, profit-sharing companies were superior in 47 percent of the cases and inferior in only 27 percent
Jehring and Metzger 1960	8 U.S. profit-sharing companies and 6 U.S. non-profit-sharing companies	Comparisons with respect to various measures of performance	Profit-sharing companies do better than the others

Metzger and Colletti 1971	8 U.S. profit-sharing companies and 6 U.S. non-profit-sharing companies	Comparisons with respect to 9 measures of performance	With respect to all 9 measures, profit-sharing companies do better than the others, and the superiority gap widens considerably between 1958 and 1969
Metzger 1978	33 U.S. profit-sharing companies, Fortune 500 industrials, and Fortune 50 retailers	Comparisons of median values for 2 indexes of performance	Comparisons were made on return on sales and equities for each year in 1973-76, for both industrials and retailers. Over 16 points of comparisons profit-sharing firms were always superior

a. D. Wallace Bell and Charles G. Hanson, *Profit Sharing and Profitability: How Profit Sharing Promotes Business Success* (London: Kogan Page, 1987); Bion B. Howard and Peter O. Dietz, *A Study of the Financial Significance of Profit Sharing* (Chicago: Profit Sharing Council of America, 1969); Bion B. Howard, *A Study of the Financial Significance of Profit Sharing, 1958-1977* (Chicago: Profit Sharing Council of America, 1979); John J. Jehring and Bertram L. Metzger, *The Stockholder and Employee Profit Sharing* (Evanston, Ill.: Profit Sharing Research Foundation, 1960); Bertram L. Metzger and Jerome A. Colletti, *Does Profit Sharing Pay? A Comparative Study of the Financial Performance of Retailers with and without Profit Sharing Programs* (Evanston, Ill.: Profit Sharing Research Foundation, 1971); and Bertram L. Metzger, *Profit Sharing in 38 Large Companies: Piece of the Action for 1,000,000 Participants*, vol. 2 (Evanston, Ill.: Profit Sharing Research Foundation, 1978).



The five U.S. studies used a variety of financial measures on American firms and found that profit-sharing companies are usually superior.<sup>44</sup> Consistent with these five studies, a British study by Bell and Hanson (1989) found higher growth, profitability, and investor returns among 113 profit-sharing companies than among 301 non-profit-sharing companies. Over the 1977–85 period the cumulative difference in sales growth was 20.3 percent, and the difference in profit growth was 52.8 percent.

An obvious limitation of these studies is the lack of controls for anything other than industry membership. A further limitation is that they used cross-sectional comparisons and did not address the question of causality: it is possible that profit sharing is more likely to be adopted by successful companies. (The one exception to this limitation was Bell and Hanson, who found in a simple longitudinal comparison that mean values increased in seven of nine performance measures after the adoption of profit sharing.) As with the attitude studies, though, the evidence is clearly consistent with the hypothesis of a positive effect of profit sharing on productivity and company performance.

### Econometric Literature

After an exhaustive search of the literature we found sixteen formal econometric studies on the relation between profit sharing and productivity, which used forty-two different samples of firms (with several samples analyzed in more than one study). Here we define a formal econometric study as one that uses regression analysis with an objectively measured productivity-like dependent variable, and some type of profit-sharing-like measure as an independent variable. Within this definition the studies vary greatly in data sources, methodologies, and attempts to control for biases. Six of the studies concern cooperatives, in which the authors try to separate the profit-sharing component of the cooperatives from the membership, ownership, and participation components. Two studies cover firms with Scanlon and Rucker plans, and

44. These studies are summarized in Gary W. Florkowski, "The Organizational Impact of Profit Sharing," *Academy of Management Review*, vol. 12 (October 1987), pp. 622–36. The measures include operating income margin, net income margin, return on operating assets, return on total capital, return on common equity, operating earnings per employee, net income to net worth, net income to sales, net worth, company earnings per employee, return on sales, return on equity, sales trend, earnings per share trend, dividends per share trend, and market price per share trend.

one covers firms that voluntarily allow for worker participation. The remaining seven studies cover private or publicly held capitalistic firms. It should be noted that the relation of profit sharing to productivity was not the primary focus of several of these studies.

Salient problems in the estimation of the effect of profit sharing on productivity include all the standard econometric problems of production function estimation, the potential endogeneity of profit sharing, and omitted variable biases due to the unobservable character of managerial quality and other firm-specific variables. Attempts to address these problems will be described briefly.

Generally speaking, the studies use either value added or sales per employee (in logarithm form) as dependent variables; profit sharing is measured as a dummy variable, profit share per employee, profit share as a percentage of compensation, and/or percent of employees covered by profit sharing. The specification is most often based on a Cobb-Douglas production function, though several studies also use the more general constant elasticity of substitution (CES) and translog functions. In the studies that try to control for endogeneity, the most common approach is instrumental variables. (As will be seen, the use of instrumental variables does not change the results greatly relative to the ordinary least squares, OLS, specifications.) Since each econometric study normally includes a number of specifications, it is convenient to have some summary measure of the estimated profit-sharing effect and the significance levels. In this review we present the mean *t*-statistic on profit-sharing variables, as well as the proportion of profit-sharing *t*-statistics that indicate statistical significance at the 5 percent level.

The general picture that emerges from the econometric studies is that profit sharing and productivity are positively related. The studies are listed in table 4, with mean *t*-ratios given and brief notations made on data sources, productivity, and profit-sharing measures. As can be seen, the mean *t*-ratio is positive in all studies, and greater than two in twelve of the sixteen studies. Of the 226 total profit-sharing coefficients reported (in 216 regressions), 94 percent are positive, and 60 percent have positive *t*-ratios greater than two. The "grand mean" of all 226 reported *t*-statistics is 2.46. Only 6 percent of coefficients are negative, and no study reported a *t*-ratio on a profit-sharing variable that was less than minus two. It is fair to say that no one study yielded convincing evidence on the relation between profit sharing and productivity. However, the similar conclusions that emerge from all sixteen studies taken together provide fairly strong evidence of a consistent pattern.

Table 4. Econometrics Results

<i>Authors of the studies<sup>a</sup></i>	<i>Source of data</i>	<i>Productivity measure<sup>b</sup></i>	<i>Profit-sharing measure</i>	<i>Number of regressions reported</i>	<i>Average t-statistic</i>
Cable and FitzRoy 1980	42 West German firms members of the AGB from 1974 to 1976	Value added	Total profits distributed to workers	3	2.45
Conte and Svejnar 1988	40 U.S. firms (period not reported)	Value added	Dummy for firms with profit sharing	6	1.98
Defourney, Estrin, and Jones 1985	440 French cooperatives in 1978; 550 French cooperatives in 1979	Value added	Profits distributed to workers per head	14	2.21
Estrin, Jones, and Svejnar 1987	550 French cooperatives in 1978 and 1979; 150 Italian cooperatives from 1976 to 1980; 50 British cooperatives, 5 year intervals, 1948-68	Value added	Profits distributed to workers per head	11	4.44
FitzRoy and Kraft 1986	61 West German firms in 1977; 62 West German firms in 1979	Profits defined as cash flow divided by assets	Profits distributed to workers per head	2	3.03
FitzRoy and Kraft 1987	61 West German firms in 1977; 62 West German firms in 1979	Total factor productivity (residual of a Cobb-Douglas estimation)	Profits distributed to workers per head	2	3.51
Florowski 1988	3 U.S. profit-sharing companies (monthly data)	Value added per worker	Intercept and slope effects before and after the plan introduction or modification	6	1.69
Jones 1982	From 46 to 30 British cooperatives over the period 1948-68	Value added	Individual bonus to labor	52	2.01
Jones 1987	50 British cooperatives in the retail sector in 1978	Gross margin	Surplus distributed to workers as dividend	2	1.25
Jones and Svejnar 1985	316 Italian cooperatives from 1975 to 1978; 315 Italian cooperatives from 1975 to 1980	Value added	Profits distributed to workers per head	6	6.58
Kruse 1988	2,976 U.S. Compustat firms from 1971 to 1985	Sales per employee	Dummy for firms with profit sharing; percent of employees covered by profit sharing	76	2.41
Mitchell, Lewin, and Lawler 1989	495 U.S. business units, 1983-86	Sales per employee; return on investment; return on assets	Dummy for firms with profit sharing	12	2.09
Shepard 1986	20 U.S. chemical firms from 1975 to 1982	Value added	Dummy for firms with profit sharing; profits distributed to workers per head; ratio of profit sharing to fixed compensation	16	3.41

## Studies of Cooperatives

Cooperatives were the focus of analysis in five studies.<sup>45</sup> Specifications based on Cobb-Douglas production functions were used in each study, and translog and CES specifications were also tested in four of the studies. The dependent variable was always value added; the profit-sharing variable was either total shared profits or shared profits per worker. To examine the influence of other features of cooperatives, the studies included the following independent variables: capital ownership by members (all five studies); loan capital and reserves per member (all except Jones 1982); proportion of employees who are members (all except Jones 1987); and worker membership on the board of directors (in Jones 1982 and Jones 1987).

Recognizing the potential endogeneity of the profit-sharing variable, three of these studies (all except Jones 1982 and Jones 1987) used an instrumental variables approach. In addition, the presence of longitudinal variation allowed for the testing of fixed-effects specifications in two studies (Estrin and others 1987; and Jones and Svejnar 1985).

In each of these five studies the large majority of the coefficients showed positive effects of profit sharing on productivity. As seen in table 4, the average *t*-statistic was always positive and greater than two in three of the studies.<sup>46</sup>

The positive effects of the OLS regressions and of the instrumental variables regressions do not differ much. When using instrumental variables, Defourney and others found positive profit-share coefficients in two regressions, with one significant at the 5 percent level. Estrin and others reported eleven OLS regressions in which the profit-share coefficient was always positive, and nine in which it was statistically significant at the 5 percent level. They found that the instrumental variables estimates were "very similar" to the OLS estimates for the U.K. and Italian samples. The short panel in France, however, allowed for "limited predictive power" of the instrumental variables: five of the six French equations still had positive coefficients but only one was significant at the 5 percent level. Finally, Jones and Svejnar reported

45. Defourney, Estrin, and Jones 1985; Estrin, Jones, and Svejnar 1987; Jones 1982; Jones 1987; and Jones and Svejnar 1985.

46. It should be noted that the sample in Jones 1988 comprised consumer cooperatives in which employees could participate as members and on boards of directors; the sharing of profits with consumers could reasonably be expected to attenuate the productivity effects of profit sharing, which may partially explain the low *t*-ratios.

Table 4 (continued)

Authors of the studies <sup>a</sup>	Source of data	Productivity measure <sup>b</sup>	Profit-sharing measure	Number of regressions reported	Average <i>t</i> -statistic
Schuster 1983	7 U.S. sites with a gain-sharing plan (Scanlon, Rucker)	Employee output per hour	Intercept and slope effects before and after the plan introduction	7	2.97
Schuster 1984	1 U.S. firm with Scanlon plan	Employee output per hour	Intercept and slope effects before and after the plan introduction	2	2.48
Wadhvani and Wall 1988	96 U.K. firms from 1972 to 1982	Real sales	Dummy for firms with profit sharing	1	1.84
Total	...	...	...	216 <sup>c</sup>	2.46

a. John R. Cable and Felix R. FitzRoy, "Cooperation and Productivity: Some Evidence from West German Experience," *Economic Analysis and Workers' Management*, vol. 14, no. 2 (1980), pp. 163-80; "Productive Efficiency, Incentives and Employee Participation: Some Preliminary Results for West Germany," *Kyklos*, vol. 33, no. 1 (1980), pp. 100-21; Michael A. Conte and Jan Svejnar, "Productivity Effects of Worker Participation in Management, Profit-Sharing, Worker Ownership of Assets and Unionization in U.S. Firms," *International Journal of Industrial Organization*, vol. 6 (March 1988), pp. 139-51; Jacques Defourney, Saul Estrin, and Derek C. Jones, "The Effects of Worker Participation on Enterprise Performance: Empirical Evidence from French Cooperatives," *International Journal of Industrial Organization*, vol. 3 (June 1985), pp. 197-217; Saul Estrin, Derek C. Jones, and Jan Svejnar, "The Productivity Effects of Worker Participation: Producer Cooperatives in Western Economies," *Journal of Comparative Economics*, vol. 11 (March 1987), pp. 40-61; Felix FitzRoy and Kornelius Kraft, "Profitability and Profit-Sharing," *Journal of Industrial Economics*, vol. 35 (December 1986), pp. 113-30; Felix FitzRoy and Kornelius Kraft, "Cooperation, Productivity, and Profit Sharing," *Quarterly Journal of Economics*, vol. 102 (February 1987), pp. 23-35; Gary W. Florkowski, "The Organizational Impact of Profit Sharing," Ph.D. dissertation, Syracuse University, 1988; Derek C. Jones, "British Producer Cooperatives 1948-68: Productivity and Organizational Structure," in Derek C. Jones and Jan Svejnar, eds., *Participatory and Self-Managed Firms: Evaluating Economic Performance* (Lexington Books, 1982), pp. 175-98; Derek C. Jones, "The

Productivity Effects of Worker Directors and Financial Participation in the Firm: The Case of British Retail Cooperatives," *Industrial and Labor Relations Review*, vol. 41 (October 1987), pp. 79-92; Derek C. Jones and Jan Svejnar, "Participation, Profit Sharing, Worker Ownership and Efficiency in Italian Producer Cooperatives," *Economica*, vol. 52 (November 1985), pp. 449-65; Douglas L. Kruse, "Essays on Profit Sharing and Unemployment," Ph.D. dissertation, Harvard University, 1988;

Daniel J. B. Mitchell, David Lewin, and Edward F. Lawler III, "Alternative Pay Systems, Firm Performance, and Productivity" (in this volume); Edward M. Shepard, "The Effect of Profit Sharing on Productivity," Ph.D. dissertation, Boston College, 1986; Michael Schuster, "The Impact of Union-Management Cooperation on Productivity and Employment," *Industrial and Labor Relations Review*, vol. 36 (April 1983), pp. 415-30; Michael Schuster, "The Scanlon Plan: A Longitudinal Analysis," *Journal of Applied Behavioral Science*, vol. 20, no. 1 (1984), pp. 23-38; and Sushil Wadhvani and Martin Wall, "The Effects of Profit-Sharing on Employment, Wages, Stock Returns, and Productivity: Evidence from UK Micro-Data," Working Paper 1030 (London School of Economics, Centre for Labour Economics, February 1988).

b. Measures of productivity used as a dependent variable in the regression.

c. Arbeitsgemeinschaft zur Förderung der Partnerschaft in der Wirtschaft e. V.

This is a group of firms that have voluntarily introduced some form of workers' participation in decisionmaking or profit sharing, or both.

d. Does not double-count two regressions that appear in two studies.

that the effect of profit sharing is increased in magnitude by instrumental variables estimates (with *t*-statistics greater than two in both regressions).

A sixth study (Conte and Svejnar 1988) used a sample of forty U.S. firms combining cooperatives with profit-sharing and ESOP firms. Using both OLS and instrumental variables techniques, the authors looked at the effect of participation and profit-sharing variables on productivity. Profit sharing was measured as a dummy variable, and productivity was measured as value added. The profit-sharing coefficients were always positive and were statistically significant at the 5 percent level in two of the six reported regressions (with an average *t*-statistic of 1.98).<sup>47</sup> The magnitude of the coefficients indicates a range of 19–32 percent higher productivity in profit-sharing firms.

### *Gain-Sharing Plans*

Michael Schuster studied Scanlon and Rucker plans, which combine limited forms of employee participation with sharing by employees in the gains from productivity improvement. In his 1983 study he reported results of a longitudinal analysis of four Scanlon plans (one covering two sites) and two Rucker plans. The level of productivity (defined as physical or financial output per worker) increased in six of the seven sites after the implementation of the plans, with statistically significant increases in four of the sites. By contrast, the trend in productivity increased in five of the sites, but only one had a statistically significant trend increase, and one had a significant trend decrease (following a significant level increase).

In the most extensive study by Schuster (1984), which analyzed monthly data over an eleven-year period with a Scanlon plan introduced in the fifth year, he found statistically significant increases in productivity in the manufacturing and repair divisions associated with the adoption of the plan. Also, the growth rate of repair productivity increased by a statistically significant amount, and the growth rate of manufacturing productivity showed an insignificant increase. He also found that no management, organizational, or technological changes occurred at the time of plan adoption, and that employee suggestions apparently played

47. The two significant profit-sharing coefficients occur in equations that include one dummy variable for an employee participation plan; when two dummy variables for participation are included (one for wage decisions and one for production decisions) the profit-sharing coefficients remain positive but are significant only at the 10 percent level.

a role in increasing productivity. Based on his research, Schuster concluded in a 1986 article, "Most firms that introduce gainsharing experience productivity improvements of 5 percent to 15 percent in the first year." He emphasized, consistent with the theory about preconditions for overcoming the free rider problem, that employees "develop positive beliefs about the Scanlon plan when there is organizational trust, group attitudes supportive of the concept, and supervisory acceptance."<sup>48</sup>

### *Studies of Capitalist Firms*

Seven econometric studies have been done on profit-sharing firms other than cooperatives. Three of them analyze West German data. The first, by Cable and FitzRoy (1980), used questionnaire data collected from forty-two firms in 1974–76. These firms were members of a West German association of firms that practice profit sharing or employee shareholding, or both. Using a Cobb-Douglas production function, the authors tested the effects on value added of worker involvement in decisionmaking, individual incentives, worker capital holdings, and total profits distributed to workers. In the sample taken as a whole, the profit-sharing measure is positive but statistically insignificant, but splitting the sample into high-participation and low-participation firms (using an index of worker involvement in decisions) produces a positive and significant coefficient on profit sharing for high-participation firms and a negative but insignificant coefficient for low-participation firms. This result provides some support for the view, discussed in the industrial relations section, that the effect of profit sharing may be conditional on other industrial relations policies.

FitzRoy and Kraft (1986, 1987) used data from sixty-five German metalworking firms from 1977 and 1979 to examine the influence of profit sharing on productivity and profitability. In their 1987 paper the authors regressed total factor productivity (the residual from a Cobb-Douglas estimation) on the profit-share income per employee, with a large number of control variables. In both single-equation and simultaneous-equation estimates, profit-share income coefficients were highly significant (*t*-values of 3.76 and 3.26, respectively). The coefficient sizes indicate that the mean value of profit-share income per employee is associated with a 3 percent higher productivity relative to no profit sharing. Interestingly,

48. Michael Schuster, "Gainsharing: The State of the Art," *Compensation and Benefits Management*, vol. 2 (Summer 1986), pp. 285–90.

the age of the profit-sharing plan was a strong predictor of profit-share income, which "suggests that a significant learning process is indeed involved in encouraging cooperative behavior through group incentives" (p. 31). The authors noted that the results were very robust but that there was an unavoidable lack of information on managerial quality as a possible omitted variable.

In their 1986 paper FitzRoy and Kraft analyzed the effect of profit sharing on profitability (measured as the ratio of cash revenues to assets), with simultaneous estimation of an equation for the amount of profit sharing. They found strong positive effects of profit sharing on their measure of profitability, but no feedback from profitability to profit sharing (though the cross-sectional sample limited their efforts to untangle the problem of causality). Both of the coefficients on profit sharing were positive and statistically significant at the 5 percent level.

British publicly traded companies were the subject of a study by Wadhvani and Wall (1988). Their sample included ninety-six firms over the 1972-82 period, of which eighteen had a profit-sharing plan at some point in the period. Using sales as the dependent variable, with firm-specific dummies and measures of employment and capital stock (both instrumented to help control for endogeneity), the authors estimated the effect of a profit-sharing dummy and a profit-sharing dummy interacted with the capital stock. Both profit-sharing variables have positive coefficients, with *t*-statistics of 1.53 and 2.16, respectively. The coefficient on the profit-sharing dummy indicates an increase of 2 percent in real sales associated with profit sharing (not counting the effect through the interaction term, which could not be calculated from the reported results).

Four econometric studies have been done on U.S. firms other than cooperatives. Since the Mitchell, Lewin, and Lawler study appears in this volume, it will not be described here. A study by Shepard (1987) examined twenty chemical firms with publicly traded stock during 1975-82, of which nine had profit-sharing plans. Using a production function framework with value added as the dependent variable, he concluded that the profit-sharing firms had 9-10 percent higher value added than the others, and that the elasticity of value added with respect to the profit-sharing to compensation ratio was 0.3 (using two-stage least squares to control for endogeneity). Of the fourteen regressions reported, thirteen had positive profit-sharing coefficients significant at the 5 percent level, with an average *t*-statistic of 3.41. Interestingly, by using an approximated CES production function to estimate whether profit shar-

ing was labor augmenting or capital augmenting, Shepard found that profit sharing influences productivity "principally through the effect upon labor effort" (p. 100). Since no firms switched profit-sharing status over the time period studied, fixed unobservable characteristics could not be controlled.

Florkowski (1988) conducted detailed case studies of four U.S. profit-sharing firms, with productivity data available from three. He measured productivity as value added and used an ARIMA interrupted time-series design to examine changes in levels or trends after changes in profit-sharing status. In the two companies that adopted profit sharing within the sample period, productivity trends increased in both cases, whereas productivity levels increased in one case and decreased in the other (none significant at the 5 percent level). But Florkowski noted that a comparison with three-digit (standard industrial classification) industry data suggests that profit sharing did spur productivity improvement in one company. In a third company, which changed the profit-sharing formula in the sample period by funding a pension plan out of the profit shares (thereby forcing employees to defer the benefits), there was a large and statistically significant decrease in the trend of productivity (with a small insignificant increase in the level). This evidence is consistent with the idea that cash plans are better motivators than deferred plans; however, for this third case Florkowski noted that the formula change coincided with a competitor's product breakthrough that strongly affected sales and value added. He concluded that the introduction of profit sharing coincided with productivity improvement in one firm but had no effect in another; in a third firm a shift in the profit-sharing formula toward deferred payments coincided with decreased productivity.<sup>49</sup>

Finally, Kruse (1988) analyzed a large sample of U.S. publicly traded firms. The sample was drawn from the CompuStat files and matched to the federal government's private pension data base, which provides information on whether a firm had a deferred profit-sharing plan and indicates the year in which the plan was begun. Out of 2,976 firms, 1,198 (40.3 percent) were found to have a profit-sharing plan in 1984, and about half had been adopted since the beginning of the sample period (1971). Kruse used three types of estimation: cross-sectional by year, first-

49. In the firm that apparently experienced increased productivity, measured quality decreased and absenteeism increased after the introduction of profit sharing, suggesting that these were not the mechanisms of productivity improvement (although industry comparison data were not available).

difference over long periods (ten or fourteen years), and panel regressions using both first-difference and firm-intercept specifications. Here we focus on the panel regressions, since they use the most information. (The cross-sectional and long-period regressions yielded similar results.) The dependent variable was revenues per worker, and profit sharing was alternatively measured as a dummy variable and as the proportion of a firm's employees who participate in profit sharing. Controls were included in all regressions for capital stock, employment, and industry effects. It should be borne in mind, however, that the profit-sharing plans examined in this study were all deferred-payment plans (as opposed to immediate cash-payment plans), since these are the only plans that must be reported to the federal government (where they are collected in the data base). That is a potential weakness of the study, since we are not exactly sure to what extent it picks up genuine profit sharing.

The firm-intercept and first-difference panel regressions showed consistently positive and statistically significant increases in productivity associated with the adoption of profit-sharing plans, with a range of 2.8–3.6 percent for manufacturing firms and 2.5–4.2 percent for nonmanufacturing firms. The *t*-ratios ranged from 2.25 to 3.5. The estimated effect was stronger when profit sharing was measured as the proportion of employees covered: a plan covering all workers was estimated to have an 8.0–8.9 percent effect on productivity in manufacturing, and a 10.3–11.0 percent effect in nonmanufacturing (again, with high significance levels). When trend terms were included to capture the effect of profit sharing over time, these were close to zero and insignificant, showing there was no tendency for productivity either to increase or to decrease with the age of the profit-sharing plan.

Kruse used several methods to try to control for the potential endogeneity of profit sharing: (1) addition of a prior productivity growth variable, to control for the possibility that growing firms may establish profit sharing to attract new employees; (2) restriction of the sample to consistent taxpayer firms, to control for the possibility that only consistent taxpayers adopt profit sharing to reduce tax liabilities; (3) restriction of the sample to firms with pension plans, to control for the possibility that the existence of pension plans, rather than profit sharing per se, increases productivity; and (4) restriction of the sample to firms that adopted profit sharing within the sample period, again to control for the possibility that these were quickly growing firms that had large productivity increases throughout the period. The results were unchanged by

restrictions 1 and 2 and only slightly weakened in size and significance by restrictions 3 and 4.

As mentioned, omitted variables bias is a potentially important issue. An attempt was made to control for fixed unobservable characteristics of firms through the use of firm-specific intercepts and first-difference specifications, but the adoption of profit sharing could also be associated with changes in management or other personnel policies. The study reported on a special survey of manufacturing firms that gained additional information on their personnel policies and management changes. Of the fifty-eight profit-sharing managers who were asked whether profit sharing had been adopted following a change in management, only two responded affirmatively. As for the adoption of other personnel policies (quality circles, individual bonus systems, job rotation plans, other group bonus systems, and regular employee surveys), very few managers reported that these were adopted within two years before or after the start of profit sharing. The inclusion of these personnel policies in productivity regressions did not change the profit-sharing adoption coefficients. It therefore seems unlikely that the strong positive coefficients on profit-sharing adoption are due to simultaneous new management teams of higher quality or to the concurrent adoption of other personnel policies.

### *Summary*

The consistently positive results from the econometric evidence are striking. Across all studies, with a total of 226 reported profit-sharing coefficients (in 216 regressions), only 6 percent of the coefficients on profit-sharing variables are negative, and not one of the negative coefficients is statistically significant at conventional levels ( $t < -2$ ). Positive coefficients appear in 94 percent of the regressions, and 60 percent of all the regressions have positive coefficients statistically significant at the 5 percent level ( $t > +2$ ). Twelve of the sixteen studies have average *t*-statistics greater than two, and the lowest average *t*-statistic reported by any study is 1.25. The grand mean of all 226 reported *t*-statistics is 2.46. In the studies that tried to account for the possible endogeneity of profit sharing, the results were not greatly changed by adding endogeneity controls.

If all studies used identical methods and data, the results would be more suspect (since they could all share common defects). The variety

of specifications employed, as well as the diversity of data sources, lends greater credibility to the findings. We have performed several standard statistical tests developed under the name meta-analysis, a set of techniques used to analyze combined results from secondary sources.<sup>50</sup> Not surprisingly, because the present survey covers forty-two presumed independent samples in sixteen studies, the probability derived from meta-analysis is essentially infinitesimal that the null hypothesis of an underlying profit-sharing coefficient of zero or less is true. Although any one study has definite limitations, the evidence from all the studies taken together provides a quite strong indication that profit sharing and productivity are positively related.

A further question is the magnitude of the relation between profit sharing and productivity—if profit sharing does have an effect, is this effect large or small? The size of the effect almost certainly varies with the circumstances in which profit sharing is implemented. Point estimates of the size of the profit-sharing effect must be viewed with caution, since the estimates come from varying industries, time periods, sizes of firms, and so forth. To gain a rough idea of the size of the profit-sharing effect on productivity, we derived estimates from the regression coefficients of the various studies where sufficient information was provided. The mean estimated effect of profit sharing on productivity for “average” amounts of profit sharing (as measured by the mean values of profit-sharing variables within profit-sharing firms) is 7.4 percent, with a median estimate of 4.4 percent (and lower and upper quartiles of 2.5 percent and 11.0 percent).<sup>51</sup> Such estimates strike us as reasonable—they are neither

50. We used eight methods for analyzing significance levels across studies: the Fisher combined test, the method of adding  $t$ 's (Winer test), adding probabilities, adding  $z$ 's (Stouffer test), adding weighted  $z$ 's, mean  $p$ , mean  $z$ , and the binomial sign test. All results overwhelmingly reject, at the highest levels of significance, the null hypothesis of a true underlying profit-sharing coefficient of zero or less. The methodology of meta-analysis, which has so far been used primarily in the psychometrics literature, is described in Robert L. Bangert-Drowns, “Review of Developments in Meta-Analytic Method,” *Psychological Bulletin*, vol. 99 (May 1986), pp. 388–99; Frederic M. Wolf, *Meta-Analysis: Quantitative Methods for Research Synthesis* (Sage Publications, 1986); and Robert Rosenthal, “Combining Results of Independent Studies,” *Psychological Bulletin*, vol. 85 (January 1978), pp. 185–93.

51. These estimates are based on 101 coefficients from twelve of the sixteen studies; excluded are 12 coefficients representing trend effects, 55 coefficients with insufficient information to calculate effects, and the 58 coefficients that were not based on panel data in Kruse 1988. (The 18 panel coefficients were judged to be better estimates of the “true” effect of profit sharing; when Kruse’s nonpanel coefficients are included, the overall mean effect is 8.2 percent and the median 6.4 percent.)

Where profit sharing was measured as a dummy variable, the percentage effect size

so small as to be negligible, nor so large as to be implausible when adjustment costs are included.

A limitation of the econometric studies is that they shed little light on the mechanisms through which profit sharing may affect productivity. As discussed in the theory and industrial relations sections, productivity gains may come from many different sources, including more effort, greater quality, freer information flow, and increased acceptance of technological change. An important item on the research agenda is to gather data on these mechanisms and examine their relative contributions, since this knowledge is potentially important for managerial and public policy.

### Conclusions and Implications

The available evidence on the connection between profit sharing and productivity is not definitive. Yet it is also not neutral—many sources point toward a positive link; the only quarrel seems to be over magnitudes. The firm-level econometric studies can perhaps be considered the most rigorous tests, and these studies taken together provide the strongest evidence that profit sharing and productivity are positively related. From the industrial relations literature, most case studies show improved performance when there is profit sharing or gain sharing (though a strong theme of that literature is that the success of these plans often depends on the conditions under which they are implemented). Attitude surveys indicate that employers and employees usually feel that profit sharing helps improve company performance. Considerations of economic theory and observations from comparative economic systems, though at best suggestive, are generally supportive of a positive link between profit sharing and productivity.

If one were tentatively to accept this evidence as showing that profit sharing has positive effects on productivity, what would be the policy

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was estimated as  $[\exp(\text{coefficient}) - 1] \times 100$ . Where profit sharing was measured as a continuous variable, the percentage effect size was estimated as  $[\exp(\text{coefficient} \times \text{mean}) - 1] \times 100$ , where *mean* is the mean of the profit-sharing variable. In Jones 1982 profit sharing was measured in logarithmic form in the majority of the specifications, so that the coefficient represents an elasticity; there the rough estimate of the percentage profit-sharing effect is simply the coefficient times 100. When the dependent variable was not in logarithmic form, the percentage effect was estimated as  $[(\text{coefficient}) \times (\text{profit-sharing variable mean})] \div (\text{dependent variable mean})$ . In Schuster 1983 the percentage effect was estimated as the immediate change in the level of productivity, divided by the current level (ignoring the productivity trend change, which was positive in four of the six cases).

implications? Because productivity gains from profit sharing would seem to accrue largely to the firm, in principle there should be a firm-level incentive to adopt such plans and no public policy as such is needed. This observation may well contain a large measure of truth, but in practice, we feel, the issue is not settled. There could be many reasons why profit sharing is not more widespread even though it may basically be a good idea. The gains are probably modest, and perhaps it is a difficult change to engineer. A society's labor payment system seems to be one of the more likely candidates for historical inertia, institutional rigidities, and imitation effects. The profit sharing-productivity link is obviously complicated and depends on different environmental factors, some of a public-goods nature. Possibly, information gathering, exhortation, financial incentives, or other forms of social encouragement may be warranted. At this stage, it seems premature to speculate much further in such directions. More basic, empirical, data-oriented research is needed so that we can better understand the productivity effects of profit sharing and other group incentives.

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## Comment by David Card

Weitzman and Kruse's paper is remarkable for the breadth of evidence brought to bear on the question of profit sharing and productivity and for the exhaustive survey of previous empirical studies. Their reading of the evidence is that profit-sharing plans are associated with higher productivity. I have no quibble with this important conclusion. Nevertheless, as I read the paper several points occurred to me that deserve further consideration.

First, one should keep in mind that the productivity effects of a profit-sharing plan are likely to be once-for-all effects associated with the adoption of the plan. There is little presumption that profit sharing can lead to long-run changes in productivity *growth*.<sup>1</sup> Yet it is the growth

1. It is sometimes asserted that profit-sharing plans increase the incentives of employees to devise and suggest productivity-improving innovations. See, for example, Sumner H. Slichter, James J. Healy, and E. Robert Livernash, *The Impact of Collective Bargaining on Management* (Brookings, 1960), esp. pp. 851-75. If this assertion is correct, it implies that a correct empirical specification relates the level of productivity to the number of years of operation of the plan.

rate of productivity, rather than its level, that is the focus of many policy discussions.

Second, I find the dismal calculus of  $1/n$ , associated with the free rider problem in group incentive schemes, rather more compelling than Weitzman and Kruse do. They argue that  $1/n$  is overcome in a repeated game setting. In the absence of a clearer mapping between the game theory and the plans themselves, however, I remain skeptical that simple economic models of individual self-interest can usually explain the effects of profit sharing. It is true that cooperative behavior can be induced in multiperiod games by dynamic punishment schemes and the like. But what role is played in these games by profit-sharing plans that link current compensation to current profits? I would underscore the authors' conclusion that more research is needed on the mechanism by which profit-sharing plans elicit individual effort. Empirical work on this question would be aided by a clear statement of the theoretical linkages suggested by the more complicated multiperiod models.

A third comment pertains to the "meta-analysis" underlying table 4. The authors note that of 216 regressions reported, only 6 percent of the estimated profit-sharing coefficients are negative, and none are significantly negative at conventional levels. If these were unfiltered reports of 216 independent trials, that would be an impressive record. Unfortunately, there are important biases that can lead to a preponderance of positive coefficients even if the true coefficient is zero. The biases (or prior beliefs) of the authors of these studies are likely to lead to stopping rules for their specification searches that make positive coefficients more likely to turn up.<sup>2</sup> These biases are accentuated by the publication process, which makes it more likely for significantly positive results to appear in the literature.<sup>3</sup> In spite of these biases, however, several of the individual studies are carefully done, and taken with the rest, lead to a presumption of a positive effect.

2. See Edward E. Leamer, *Specification Searches, Ad Hoc Inference with Nonexperimental Data* (Wiley and Sons, 1978).

3. This publication bias is highlighted in a recent meta-analysis of cancer treatments. See Jesse A. Berlin, Colin B. Begg, and Thomas A. Louis, "An Assessment of Publication Bias Using a Sample of Published Clinical Trials," *Journal of the American Statistical Association*, vol. 84 (June 1989), pp. 381-92.