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ALTERNATIVE PAY SYSTEMS, FIRM PERFORMANCE
AND
PRODUCTIVITY

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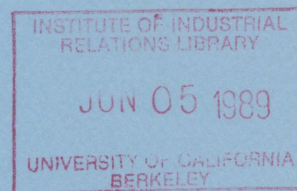
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The 1970s and 1980s are perceived, with hindsight, as periods of economic change and adjustment. Dramatic shifts occurred in exchange rates, in energy prices, in the rate of inflation and unemployment, and in the extent of government regulation of the product market. It is not surprising, therefore, that words such as "productivity" and "competitiveness" came into vogue during this period. Employers and employees, in their separate ways, became concerned about their survival and welfare. Given that environment, a willingness to experiment in human resource (HR) practices developed, including practices relating to compensation systems.¹

In this paper, we focus on the possible contribution of alternative pay systems - incentive plans, profit sharing, and gain sharing - to microeconomic performance. We begin with an analysis of some recent trends in the use and analysis of pay practices. Then, we turn to the historical development of these practices. We find that the ebbs and flows in the use of particular pay systems reflect a complex web of social movements, movements in managerial thinking, trends in academic thinking, major economic events (especially the world wars and the Great Depression), and public policies including tax preferences. The ebbs and flows occurred without hard evidence of the productivity effects of alternative pay systems.

Data sets with detailed information on pay and other human resource practices have been scarce. However, we follow the historical analysis with evidence from various data sources. Highlights of the findings are 1) that incentive workers are consistently paid more than time workers, a fact suggesting greater productivity of the former or some cost saving associated with their employment, 2) that profit sharing does not seem to substitute for other forms of pay, a fact relevant to the proposed employment-expansion effect of such plans, and 3) that use of profit sharing was associated with both higher productivity and improved firm performance in the 1980s.

Productivity, Pay Systems, and Human Resource Practices.

Economists have long put forward the truism that productivity trends and real wage trends have tended to coincide over long periods.² In other words, improvements in living standards depend ultimately on rising productivity. Early investigations of the sources of productivity growth led to the surprising conclusion that much of it could not be explained by such prime candidates as rising capital/labor ratios.³ Yet until measured productivity growth stagnated in the early 1970s, policy makers were generally content to assume that something like a 3% productivity increase could be expected annually. Such assumptions were built into the incomes policy experiments of the period.⁴

Although many suggestions have been made to explain the deterioration in productivity performance, there has been a growing interest in exploring the impact of micro-level human resource policies in determining the effective use of employees.⁵ Economists have traditionally viewed the price system as a key input into efficient allocation of resources, on the assumption that people react to incentives. Thus, there is a potential harmony between the view of the human resource professional that incentives can "matter" and economic orthodoxy. However, until recently, economists have not sought to explore the effects of alternative pay systems or other human resource practices.⁶

Even before the recent spate of literature in the "new economics of personnel" (see below), there had been a recognition that the employment contract was a complex exchange. Employers want more of their employees than simply time spent at the job. They want loyalty, cooperation, teamwork, or just output (as opposed to input). Yet the conventional time-based wage system pays explicitly only for time on the job. It is not a radical step to suppose that if the pay system explicitly rewarded desirable behaviors, more such behaviors might be induced; indeed, both economists and psychologists would readily accept this supposition.

New Trends in Human Resources and Industrial Relations.

One factor which may have limited the interest of economists in alternative pay systems is the assumption that if such practices were profitable, they would already be in use.⁷ However, as will be discussed below, pay and other human resources practices have changed over time. Particularly in the compensation area, there is evidence of a new interest among HR professionals in systems other than time-based wages.

In the shrinking union sector, the 1980s saw such the development of such practices as lump-sum bonuses, two-tier wages, and pay based on product prices or firm profitability. These arrangements were often associated with "concession bargaining" and "givebacks." Precedents for these concession-related features had long existed, but their proliferation was noteworthy. In the nonunion sector, "pay for performance" (rather than time) became a catch phrase.

Some authors and studies suggested that in both sectors, human resource managers were being forced to become more "bottom line" oriented in implementing HR policies.⁸ Such pressures could be expected to induce consideration of alternative approaches. In addition, there is casual evidence that new entrants to the workforce are increasingly interested in monetary rewards.⁹ Thus, HR professionals may feel that pay systems which emphasize such rewards will produce better results than would have been the case in the past.

The New Economics of Personnel.

We have already alluded to the new economics of personnel which developed in the 1970s and 1980s out of earlier roots.¹⁰ Until this development, many economists tended either to ignore institutional peculiarities of the labor market (such as unemployment) or simply accept them as given. Although originally a device to explain wage rigidity, the new economics of personnel has opened all HR practices to scrutiny. Phrases such as efficiency wages, implicit contracting, and agency problems, have become common in labor

economics. Empirical investigations have been undertaken into the duration of the employment contract and the role of seniority in pay status.¹¹

To some extent, the new economics of personnel can be accused of simply seeking rationalizations of what is observed in terms of standard economic theory. However, it also serves to focus attention on what in fact does occur in the labor market. There is even a potential - as occurred earlier in the financial setting - for theorizing to influence practice. So far, the chief suggestion in the 1980s to come from economics in the area of pay systems has been based on macro considerations. However, the growing interest in the economics of personnel may eventually contribute to micro-based suggestions, too. But before that can occur, a better understanding of the empirical reality is needed. This essay is a contribution to that understanding.

Macro and Micro Views of Pay Systems.

Prior to the Keynesian revolution in economic thought during the 1930s and 1940s, economists did not make a clear macro/micro distinction with regard to labor market phenomena or economic performance generally. Unemployment was largely "explained" in terms of micro-level wage rigidity; the assumption was, therefore, that the solution to the problem in the labor market lay in the labor market's wage-setting arrangements. Keynesian analysis suggested that the labor market's problem could not be fixed in the labor market, but was more appropriately addressed through fiscal and monetary policy.¹² With the notable exception of the Phillips curve literature, this approach took the attention of economists away from the macro implications of wage systems.

In the mid 1980s, however, the pendulum swung back. Martin Weitzman argued that the problem of the labor market could be solved in the labor market through reform of micro-level wage setting institutions.¹³ His solution was not flexibility of the base wage rate, but rather the promotion of widespread use of profit sharing and similar share arrangements. In effect, a shift toward a flexible bonus element of pay would perform the role

that flexible wages play in simple models. A change to a share economy, he argued, would have two beneficial macro effects: employment expansion (lower unemployment) and employment stabilization (fewer layoffs in recessions).

Since macro benefits of particular pay systems are inherently external to the firm, there will be insufficient adoption of such systems. However, before adding an overlay of external incentives (such as the tax breaks proposed by Weitzman), it is important to explore what private incentives firms have to install arrangements such as profit sharing. In addition, as will be discussed below, there are some potential overlaps of micro and macro interests if share pay systems are viewed as ersatz substitutes for flexible wages.

However, there are potential tensions between the micro and macro views of alternative pay plans. From the micro view, such plans may be seen as desirable if they induce higher productivity, i.e., fewer workers per unit of output. But from the macro viewpoint, the goal may be an expansion of employment. This expansion might entail lower measured productivity since in the Weitzman model firms travel down their marginal product of labor curves as they add employees. Unless the micro influences are sorted out, predictions about the macro responses are perilous.

Not all alternative pay systems are predicted by Weitzman to have beneficial macro effects. Basically, Weitzman-type plans involve the sharing of profits, value added, or revenues. Simple piece rates and related incentive plans (as defined below) do not meet his objectives. However, we take up such plans in subsequent sections because, at the micro level, they are often seen as partial substitutes for share plans. With one notable exception in the later data analysis, we do not include Employee Stock Ownership Plans (ESOPs) in our analysis since they are dealt with elsewhere in this volume.¹⁴ However, it is important to note that much of the empirical work done on alternative pay plans has focused on ESOPs. This bias stems from

the considerable tax subsidy provided to ESOPs and the resulting public policy concerns.¹³

Alternative Pay Systems.

There are in fact many pay systems in use that base part of employee compensation on something other than time spent on the job. Even firms which have only time-based pay usually would deny that the eventual rewards to their employees are simply a function of time. They might well argue that subjective merit evaluations and advancements, opportunities for promotion, etc., make pay ultimately contingent on performance. However, our definition of alternative pay systems is confined to programs involving an announced formula linking compensation to individual, group, or firm performance. Within that broad criterion, three major types of plans can be distinguished: incentive plans, profit sharing plans, and gain sharing plans.

***Incentive Plans.** Incentive plans, as we define them, link pay to individual or (small) group output. Many kinds of incentive plans exist. However, three basic types can be distinguished: piece rates, more elaborate incentives, and commissions. Piece rates essentially make pay proportional to output, although there may be an overlay of minimum guarantees and adjustments to allow for machine breakdowns and other mishaps beyond worker control. Piece rates have a long history in manufacturing and today are often identified with small firms in low-wage industries such as apparel production. But they are found in other industries as well, such as steel, and are sometimes used by firms with "sophisticated" HR policies such as the oft-cited Lincoln Electric Company.¹⁴

More elaborate incentives are essentially variants of piece rates which depart from proportionality. Typically, what is involved is a reward, or an extra reward, above a specified production standard. Names associated with such plans are the Taylor differential piece rate, Gantt task and bonus plans,

Halsey and Rowan premium plans, and Bedaux (or Bedeaux) point systems, among others. The idea for a "kink" in the piece rate goes back to the era of "scientific management" at the turn of the century (see below), and the plans listed above date from that period.¹⁷ Recent surveys of their usage are not available but as late as the 1950s, these turn of the century plans were still reported to be utilized by employers.¹⁸ However, their usage can be assumed to be declining.

Commissions, unlike other incentive plans, are generally based on a value measure rather than physical output. They are generally utilized as compensation systems for sales personnel. As in the case of other incentives, commission systems may involve a simple, flat percentage of sales or more elaborate arrangements involving kinks in the reward curve.

***Profit Sharing.** As in the case of incentive plans, profit sharing comes in many variants. Some profit sharing plans provide cash bonuses; others - the more common variety - take advantage of tax incentives and defer employee receipt of the bonus by placing it into a retirement fund. In principle, firms might pay bonuses on a discretionary basis but link them to profitability as an informal practice. It has been argued, for example, that the cash bonuses paid in Japan constitute a de facto profit sharing system.¹⁹ However, in the U.S. case it is less likely that practices not called profit sharing really are profit sharing than that what is called profit sharing is not.

American firms are prone to title their retirement plans as "profit sharing" in order to take advantage of looser regulatory standards while not necessarily gearing the bonus to profits. In 1986, for example, one survey of a sample of U.S. profit sharing plans reported that 45.7% of the sample based the bonus entirely on employer discretion while another 9.7% relied on a formula along with an additional discretionary contribution.²⁰ For that reason, the empirical analysis below is limited to formula-based plans unless

otherwise indicated.

***Gain Sharing.** Gain sharing plans entail cash rewards for workers in a plant or other large work unit. The most widely discussed plans are Scanlon plans, Rucker plans, and Improshare plans. However, firms with gain sharing often establish their own customized variants of these plans, such as the much-discussed Kaiser Long-Range Sharing Plan of the 1960s.²¹ With the exception of Improshare plans (which are based on physical output), gain sharing programs typically are based on a value measure. In the Scanlon case, the formula involves rewards for reductions in the ratio of payroll costs to sales adjusted for inventory (i.e., the gross value of production) relative to a base ratio. The Rucker plan is similar, but uses a net value of production (value added) in computing the ratio.

Scanlon plans are generally associated with the union sector. Both Scanlon and Rucker plans (and, usually the customized plans referenced above) entail mechanisms of "employee involvement." Workers are encouraged to make suggestions for cost reduction and productivity enhancement. Indeed, gain sharing programs may be regarded as forerunners of the "quality of working life" movement with its quality circles and similar accoutrements that developed in the 1970s. Improshare plans, in contrast, do not emphasize employee involvement systems and stand on the borderline between gain sharing and group incentive plans.

The Incidence of Alternative Pay Systems.

Unfortunately, there are no comprehensive national surveys of the American workforce which provide detailed information on the proportion of employees covered by the various pay systems described above. Two kinds of limited surveys which are available may be distinguished. From time to time, studies are undertaken of employer compensation practices by private researchers or groups. It is often the case that such surveys involve a

response bias, since firms which view themselves as innovators in the pay area are most likely to provide information. In addition, survey researchers deliberately use samples which are biased towards such firms in order to ascertain what the innovators are doing.

A recent survey of this type was undertaken by the American Productivity Center.²² Of the 1,598 responding firms, 32% reported having profit sharing, 28% reported having individual incentives, 14% had small group incentives, and 13% had gain sharing. It might be noted that of the last group, most of the reported plans were of the customized variety, i.e., not specifically of the Scanlon, Rucker, or Improshare types, even though these standard types are the most widely discussed in the HR literature.

Union agreements provide another source of information on plan usage, although sometimes share plans may not be included in the basic contract. A more serious problem, however, is that only 1 out of 7 private wage and salary workers was union-represented by the mid 1980s. Moreover, the U.S. Bureau of Labor Statistics (BLS) stopped surveying such contracts for budgetary reasons. The final BLS survey of "major" union agreements - those covering 1,000 or more workers - found that 2% of the contracts and about 1% of the workers covered by those contracts in January 1980 had profit sharing provisions.²³ This survey was taken before the increased interest in profit sharing in the union sector associated with concession bargaining.

In the 1980s, the major auto companies alone put about half a million union workers under profit sharing. Profit sharing also extended into other unionized sectors such as primary metals and telephone communications, among others. If the number of union workers with profit sharing is two-to-three times the total in autos, about 10-15% of private sector union workers would be covered by profit sharing. That is a significant increase in coverage compared with the 1970s. However, arguments that "the notion of contingent compensation is sweeping across industrial America" and will soon spill over

into nonunion settings seem overblown.²⁴ The attitude of union leaders toward profit sharing remains skeptical.²⁵ Worker attitudes have not been adequately surveyed to draw any conclusion. We do not know, therefore, whether the concession-era profit sharing plans will continue over the long haul.²⁶

Table 1 summarizes the characteristics of union concession agreements (excluding those in the construction industry) negotiated during 1981-88, where a "concession" has been defined as a first-year freeze or cut in the basic wage.²⁷ The table shows that the concession situations resulting in profit sharing were as likely as those that did not to feature an cost of living escalator (COLA) clause in the previous agreement. However, profit sharing concession contracts were more likely to have frozen or eliminated the COLA than others. Thus, one motivation on the employer side in negotiating for profit sharing was to shift from an externally-based contingency clause to an internally-based system. Specifically, employers felt in the 1970s that the Consumer Price Index had been driven by such factors as energy and agricultural price increases and a peculiar methodology involving mortgage interest rates which had little to do with "ability to pay." By gearing wages to profits, ability to pay was better reflected.

Concession agreements containing profit sharing were less likely than others to contain fixed bonuses (lump-sum payments). This characteristic may be an indicator that the two features were seen as partial substitutes. If so, the U.S. may be evolving to a system whereby "fixed" bonuses in fact vary with firm profitability. However, it is too early to tell if this interpretation is correct. Another possible interpretation is that use of profit sharing rather than fixed bonuses indicates a preference for contingency rather than fixity on the employer's part.

The profit sharing contracts of Table 1 seem to have involved more severe concessions than the others. Two forms of wage decreases occurred within concession bargaining: two-tier plans and across-the-board cuts. Under two-

Table 1: Union Concession Agreements, Nonconstruction: 1981-1988

	Contracts with Profit Sharing	Contracts without Profit Sharing
Percent of Situations involving COLA	29%	28%
Percent of COLA Situations with:		
COLA Freeze	29%	11%
COLA Elimination	16%	9%
Percent of Contracts with First-Year Wage Decrease	36%	14%
Percent of Contracts with Two-Tier Wage Plan	13%	13%
Percent of Contracts with Fixed Bonuses	28%	42%
Number of Contracts	133	1666

Note: Concession agreements are defined as those featuring a first-year freeze or cut in the basic wage. A COLA situation is one in which an active COLA clause was negotiated or where an existing COLA was frozen or eliminated. Construction contracts have been excluded. Profit sharing contracts include a few gain sharing plans and plans whereby pay is linked to the product price.

Source: Data for this table were drawn by Mitchell from biweekly contract listings appearing in the Daily Labor Report, a publication of the Bureau of National Affairs, Inc.

tier plans, pay was cut only for new hires; existing workers were typically spared nominal decreases. Two-tier features were equally likely to occur in profit sharing and non-profit sharing concessions. However, the more drastic across-the-board basic wage cuts occurred with greater frequency in profit sharing situations.

It is apparent from Table 1 that the profit sharing negotiated in the union sector in the 1980s was a reflection of a change in bargaining strength and union worker preferences for job security rather than an attempt to motivate employees. Employers were able to shift some risk of demand fluctuations to their unionized workforces and obtained a kind of wage flexibility. In some cases, greater wage flexibility was traded for job security assurances against a background of mass layoffs in the union sector.

About a fourth of the contracts surveyed by BLS in 1980 contained provisions for incentive wages. These contracts covered about a third of the workers in the sample, but not all workers under a contract containing provisions for incentive pay were necessarily covered by the pay plan. A survey taken in the mid-1980s of union contracts by a private reporting service found a similar proportion for use of incentives.²⁶ Less than 3% of the BLS contracts contained commission features.

As noted, there is no comprehensive survey of pay systems for all workers combined, i.e., union and nonunion. The BLS does provide a survey of benefits provided by "medium and large" firms annually. These firms represent almost a third of wage and salary employment in the private, nonfarm sector. Twenty-two percent of the full-time workers covered by the survey had profit sharing in 1986. Only 1 percentage point out of the 22% had pure cash profit sharing; the vast majority had deferred profit sharing or profit sharing with cash and deferred options.²⁷

The incidence of incentive plans is picked up in BLS area and industry wage surveys. However, these surveys do not cover all areas and all workers

and the incentive information is not regularly aggregated. In 1968-70, 14% of "plantworkers" in metropolitan areas (20% in manufacturing) were paid by incentive methods, down from 20% in 1961-63.³⁰ At least in manufacturing, the declining trend appeared to continue into the late 1970s.³¹ Industries with relatively large fractions of incentive workers included apparel, steel, and footwear.

This summary of the incidence of alternative pay systems leaves substantial information gaps. But it accurately reflects the state of available statistical knowledge. Profit sharing covers perhaps a fifth of the private workforce. Incentives - as we have defined them - cover a relatively small fraction of the workforce (probably less than a tenth), but are prominent in certain manufacturing industries and (as commissions) in sales work. Gain sharing has attracted substantial academic attention, but its actual coverage of the workforce seems to be negligible.³²

The Early History of Alternative Pay Systems.

The payment of workers by other than a time-based wage is hardly a new idea. Even in the pre-industrial era, such devices as sharecropping might be cited as forerunners of alternative pay systems. In the early 19th century, piece rates were certainly in use in manufacturing. Miners were sometimes paid according to the price of the ore they produced (a practice that has seen a revival in the 1980s). Examples of profit sharing were developed, with the "first" such plan variously claimed by the U.S., Britain, and France.³³

Writing in 1832, the pioneering author, Charles Babbage, proposed wider use of profit sharing:

"It would be of great importance, if, in every large establishment, the modes of paying the different persons employed could be so arranged, that each should derive advantage from the success of the whole, and that the profits of the individuals should advance as the factor itself produced the profit, without the necessity of making any changes in the wages agreed upon."³⁴

By the late 19th century, several interrelated themes involving alternative pay systems emerged. One was social harmony. Labor and capital

were seen in actual or potential conflict. A solution to "the labor problem" was to promote worker ownership of enterprises, thus merging labor and capital into a single interest. But workers were often seen as poor candidates to function as managers or entrepreneurs.³⁵ Thus, social harmonizers in both Britain and the U.S. (there was considerable international cross referencing in the literature of the day) often saw profit sharing as the best option.

"There can be no doubt that the soundest possible solution of the labour question will eventually be found in such a modification of the terms of partnership as shall bind the interests of the employer and workman more closely together. Under such a system the weekly wages would be regarded merely as subsistence money or advances... The balance... would be paid (as) a share in all surplus profits..."³⁶

Thus, in the good world to come, workers would see their interest in line with those of the employer, but would not be put in a managerial role. Social harmonizers often put forward their argument in a moral context rather than in terms of efficiency or profitability. They advocated public policies ("wise and permissive laws") which would stimulate profit sharing, although exactly what these policies would be in an era before significant direct taxes (and therefore tax incentives) was not clear.³⁷ Quaint though the language of 19th century commentators may seem, the views expressed are still present today, although of late they have been more forcefully presented on behalf of employee share ownership plans rather than on behalf of profit sharing.³⁸

Another theme which developed was union avoidance or better union-management relations, depending on the circumstances. Profit sharing, by creating labor-management harmony, would obviate the need for unions, according to some proponents. Incentive plans would make the worker want to be productive, thus foiling restrictive union workrules and restrictions. Alternatively, other plan proponents argued that the right kind of pay system would foster union-management cooperation.

Finally, among the advocates of alternative pay systems there were many who stressed efficiency. Appropriately designed pay systems would automatically overcome worker tendencies to shirk, thus economizing on

supervision. Karl Marx explained piece rates in precisely this fashion:

"...Since the quality and intensity of the work are... controlled by the form of wage itself, superintendence of labour becomes in great part superfluous."³⁷

In this regard, Marx was mirroring Adam Smith who viewed piece rates as so effective that workers under such plans were likely to over-exert themselves and "ruin their health and constitution."⁴⁰ However, advocates of pay systems for efficiency reasons often had in mind something more elaborate than a simple piece rate. Because they emphasized efficiency and spoke directly to the bottom line, efficiency-oriented advocates had a greater influence in the early part of this century than did the social harmonizers.

Despite the array of arguments in favor of alternative pay arrangements, skeptics were always present. These commentators ranged from a mild questioning to a complete rejection of basic assumptions. On the mild side, famed British economist Alfred Marshall wondered whether profit sharing was not simply a formalization of practices that existed anyway. Even in a firm without formal sharing, opportunities for employee advancement and job security were inevitably better during periods of profitability and prosperity. Thus, workers in such firms received an indirect form of sharing.⁴¹ Although not rejecting all forms of incentives, more severe critics rejected the notion of pay systems based on simple models of "economic man"; appropriate human relations policies were the best motivators according to this view.⁴²

***The Era of Scientific Management: 1880-1929.** The writings of Frederick Taylor combined a variety of the themes described above. Declaring that "...the best management is a true science," Taylor found the workplace of his day to be dysfunctional. "A large part of the organization of employers, as well as for employes, is for war rather than peace..." With the proper restructuring of managerial practices, however, including pay practices, "...it is possible to give the workman what he most wants - high wages - and

the employer what he wants - a low labor cost."⁴⁹

Taylor viewed the elimination of what he termed "soldiering" by workers (deliberate restriction of output) as the key to his system. The root cause of soldiering lay in the simple piece rates then in use. Employers would periodically cut the rates as productivity rose, thus eventually teaching their workers that extra effort would not long be rewarded. If rates were set scientifically, i.e., by detailed time-and-motion studies, rather than by rules of thumb, employees would come to see that the piece rates were objective. Appropriate studies should be undertaken to set the standards; under Taylor's differential piece rate system, workers who met or exceeded the standard would receive a higher pay rate. That is, the piece rate function was kinked at the standard.

Taylor did not view his pay system as a substitute for supervision. Indeed, he proposed the creation of a new overhead "planning department" within the firm to handle the standard setting professionally. The new scientific planners would supplant the existing, untrained and arbitrary foremen. In their place were to come "functional foremen" who would be carefully trained to carry out specific tasks, including wise discipline where needed. Using these techniques, firms could transform the "mental attitude" of their workers. Manual jobs would be broken down into relatively unskilled, but efficient, movements; workers would accept the new jobs because they would then be able to meet the standard - and obtain the reward - of the differential piece rate. They would therefore feel no need for unions.

Although recognizing early attempts at gain sharing and profit sharing, Taylor found such pay systems inappropriate. Gain sharing involved standard setting, but standards were set by unscientific methods and produced the same perverse incentives on the part of workers to obtain too-low standards. Moreover - and very important to Taylor who was anxious to discourage collective and collusive actions - workers were not rewarded as individuals

under gain sharing. Profit sharing did not reward individual effort either, although it did avoid standard setting.

Taylor's basic views were in accord with the prevailing national enthusiasm with efficiency, the application of science, and the uplift of the working class.⁴⁴ Not surprisingly, the Taylorist movement acquired a retinue of disciples, imitators, and consultants who one critic termed "fakirs."⁴⁵ Although a variety of "scientific" pay systems were devised by these individuals, the followers of Taylor gradually de-emphasized the pay aspects of his ideas and eventually emphasized such features as good planning, record keeping, etc. In a book published in 1915 (the year of Taylor's death), a contemporary observer predicted that the seemingly revolutionary doctrines of scientific management would come to be incorporated into the "general progress" toward better HR policy.⁴⁶ That is precisely what happened.

***Incentive Usage in the Era of Scientific Management.** It is difficult to measure the exact impact of scientific management on American pay practices. The 1890 Census of Population provided data on the number of reported "pieceworkers" as a proportion of the workforce. According to the Census, 18% of employees were so classified.⁴⁷ Although one economic historian has described the Census figures as "reliable data,"⁴⁸ others have recognized that the 18% number must be a substantial underestimate.⁴⁹ The problem is that the Census reporting form asked respondents to classify employees into various occupational categories. Workers were classified as pieceworkers only if they were on piece rates but did not fall into other categories. All we can say is that many workers were paid by the piece in the late 19th century, and that the 18% figure is surely an underestimate.

It does appear, however, that by the 1920s, a period generally viewed as the height of influence of scientific management, the manufacturing sector's use of incentive pay peaked. A National Industrial Conference Board survey put the proportion of the manufacturing workforce under incentives at over

50%. Ironically, despite Taylor's call for a move away from simple piece rates, most of the incentive systems in use were piece rates - not the more elaborate type of plan he favored; the more "scientific" schemes, with their kinked reward curves were apparently in a distinct minority.⁵⁰ Indeed, it appears that firms adopted their versions of scientific management due to a search for ways of economizing on supervisory overhead - not expanding it as Taylor wanted.⁵¹

Because of the widespread use of incentives during this period, general notions about how they should be implemented were crystallized. One in particular is important to stress, since it will figure in our later statistical analysis. It was argued that workers under incentives should generally earn more than what they would have earned under time rates.⁵² That is, the incentive payment should be seen by the worker as "gravy" on top of the regular wage:

"...Any (incentive) plan to be successful should provide that the sum of the base rate and the incentive pay will be appreciably above the market rate of the locality for that kind of work."⁵³

This idea of providing a "gift" of extra pay for extra effort, finds resonance in recent theoretical work in the new economics of personnel.⁵⁴ However, the personnel literature also recognizes a limit on the extent of the gift; folk wisdom in the field suggests that workers should not be able to increase their pay more than 25-30% above their base wage since such high pay might squeeze the wage hierarchy and demoralize their supervisors.⁵⁵

***Profit Sharing in the Era of Scientific Management.** As noted above, Taylor was not keen on profit sharing as a compensation system. The general view by the 1920s, which is still widely heard, was that profit sharing is too far removed from the worker to provide an incentive.⁵⁶ Profits vary for reasons other than worker effort and the return to individual effort through profit sharing is minuscule.

However, profit sharing continued to be a popular discussion point with

social reformers, such as those allied with the National Civic Federation.⁵⁷ Particularly in the period surrounding World War I, a wave of interest in profit sharing developed. Profit sharing proponents argued that piece rate systems might lead to perverse incentives, including an emphasis on quantity over quality, or a wastage of raw materials in an effort to exceed production standards. Since incentive-induced poor quality and wastage would harm profits, profit sharing was viewed by some as a better pay system. In addition, profit sharing was seen as a general tool for building employee loyalty and goodwill, even if it was not a direct motivator.⁵⁸

As in the case of incentives, the general view was that profit sharing should be an addition to the regular wage, not a substitute for it:

"...Effective profit sharing must ordinarily presuppose the payment of the full going rate of wages to participants. ...The object... is to induced a special degree of effort, efficiency, cooperation, or some other desirable result, not usually obtainable by the payment of a flat wage. Obviously, these special results cannot be expected unless the rewards which call them forth can be counted on to exceed the regular and usual wage."⁵⁹

This view of profit sharing is important in view of the macroeconomic arguments recently made by Weitzman. Weitzman assumes that the expected profit sharing bonus will substitute for the base wage, thus reducing the marginal cost of hiring to the firm and producing an employment expansion. That is, under the Weitzman proposal, base wages end up lower under profit sharing, leading firms to increase employment. However, the conventional view of HR managers dating back to the 1920s (if not before) is that profit sharing should be something extra. That notion suggests that wages will not be reduced by the addition of profit sharing, a point to which we return later.

Profit sharing attracted enough attention in the period surrounding World War I so that a government study of its usage was produced.⁶⁰ A number of large firms at the time had profit sharing plans, a few going back in origin to the late 19th century. However, profit sharing did not cover many workers and was often seen primarily as a form of executive compensation. In addition, stock ownership schemes had begun to compete with profit sharing and

diverted attention of employers from it.⁴¹

***Union Attitudes During the Era of Scientific Management.** Since piece rates were a common feature in U.S. industry in the late 19th century, they were not opposed per se by unions. There appeared to be a range of union attitudes, depending on the practices of the trade.⁴² However, unions did oppose scientific management for two basic reasons. First, Taylor explicitly proposed it as a way of eliminating union influence. Second, it was associated with de-skilling and the loss of worker autonomy. Time-and-motion analysis was particularly the target of union resentment. Indeed, at one point unions were able to obtain a congressional investigation of the use of stopwatches in federal government establishments. Frictions at nonunion workplaces over incentive plan implementation may well have led to union organizing drives.

A shift in attitude, at least on the part of union officialdom, occurred in the 1920s. There has been much comparison of the early-to-mid 1980s and the 1920s as periods of declining unionization, employer ascendancy, and sluggish economic conditions in manufacturing. Authors of the period cited a need for labor cost competitiveness, then as in the 1980s:

"The policy of demanding higher and still higher wages with little regard for the source whence the wages fund flows will no longer stand the test. If labor is to get greater returns, labor and management must accomplish more. The problem of incentives is now more vital than ever before in the history of industrial enterprise."⁴³

As in the 1980s, union leaders seemed to accept this type of criticism and embarked on a variety of cooperative experiments with those employers who were willing. The AFL went through a period of Taylorism and involved itself in time and motion studies and related incentive pay systems.⁴⁴ However, profit sharing - as opposed to incentives - was never popular with unions, just as it was not with the Taylorites. And, in any case, the era of experimentation in the union sector was ended by the Great Depression.

Alternative Pay Systems: 1930-1979.

In the period beginning in the 1930s and ending in the 1970s, the various alternative pay systems showed different trends of utilization. The use of incentive plans receded during the Great Depression, had a revival during World War II, and then resumed its secular decline. Profit sharing receded during the Depression, but then experienced mild waves of increased interest. Participative gain sharing, as represented by the Scanlon plan and its derivatives, was born in the 1930s, but never became widespread. Influences on these trends included the Depression itself, the growth of unionization in the 1930s and 1940s, public policy, the human relations movement, changes in technology and the workforce, and the increased status and professionalization of the HR function.

***Incentive Plans: 1930-1979.** One element in the decline of incentive plan usage was the influence of academic research and thinking. It had been thought that worker restriction of output under piece rates was largely a union phenomenon.⁴⁵ The combination of union decline in the 1920s and the use of scientific time and motion studies to arrive at work standards surely should have eliminated the problem. Yet pathbreaking research published by Stanley Mathewson in the early 1930s revealed extensive restriction of output among nonunion workers:

"American industrial managers have in recent years become fully convinced that the output of their employees bears a direct relations to the wages paid and to the methods of payment. As a consequence, 'incentive' wage plans in the form of premiums, bonuses, commissions and various kinds of piece rates have spread rapidly throughout our industries. Measured production and payment by results are now generally accepted in management circles as necessary conditions for stimulating wage-earners to put forth their best efforts. In the administration of the various incentive-wage plans, as well as in the principles on which the incentive plans are based, however, wage-earners often find their justification for restriction of output."⁴⁶

Fear of unemployment was cited as a significant motivation for output restriction in the report, a problem which could only intensify during the Depression.

A second wave of research questioned the basic model underlying the use of economic incentives. Critics of scientific management had long argued that the technique ignored the human factor in the work place. Interest in the use of psychology and "mental testing" of workers developed in the 1920s.⁶⁷ Through the use of these approaches, it was argued, workers could be matched with appropriate jobs. Or jobs might be re-designed to interest workers. It was argued, in terms reflecting a creeping Freudian influence, that workers had a "creative impulse" whose "suppression" was as dangerous as suppression of the sex drive.⁶⁸

Use of psychology in the workplace was not initially taken to mean that use incentives should cease; writers of the 1920s, however, viewed psychology as at least a needed adjunct to the pay system.⁶⁹ An important variable was the nature of work place relationships. As one text put it:

"The word 'incentive'... does not enjoy its full significance if it is restricted to its financial interpretation. Many incentives are of a non-financial nature. Of these, most find their opportunity for expression in the relationship which exists between the worker and his boss."

During the 1930s, however, the view of psychology as merely a complement to existing incentive techniques began to change. Incentive plans might appear to work in some cases, but what really mattered was the quality of human relations:

"There are many wage-incentive plans that are successful largely because the employers are carrying out the basic principle of consultation with their employees... The plan is working primarily because the employer has as a background the respect and loyalty of the employees."⁷¹

The famous "Hawthorne studies" undertaken by researchers at the Harvard Business School also seemed to indicate that incentive systems were unimportant in determining work outcomes. The Harvard researchers argued that personnel managers should be trained in counseling employees and diagnosing social situations in a manner similar to "the doctor-patient relationship."⁷² By the late 1930s, these ideas from academia found support among professional personnel administrators. As one noted approvingly:

"The new theory suggests that it is the emotional factor in human beings which makes for the greatest variation in success and failure."⁷³

Tools from behavioral science, such as worker attitude surveys, became increasingly in vogue in management circles, especially after World War II.⁷⁴

Union opinions about incentives in the 1930s varied as in previous periods. In the new mass-production industries that were threatened with unionization, however, employers began to see incentives and their associated time and motion studies as irritants to the employer-worker relationship. Some companies dropped their incentive systems in an attempt to avoid unionization.⁷⁵ And the new left-leaning industrial unions associated with the CIO were not keen on incentives, since they involved managerial discretion in standard setting and variation in worker incomes. Survey evidence suggests a decline in the use of piece rates by the mid 1930s.⁷⁶ Still further declines were reported by the end of the decade.⁷⁷

World War II produced a sharp change in union attitudes. Many employers in the 1930s, despite the difficulty they might be having with unions over the issue, expected that the use of incentive pay would increase. They argued that firms were being expected to support new social insurance programs and needed more productivity to foot the bill. In addition, workers of the future would be made lazy by New Deal relief programs and would need added incentives.⁷⁸ While such views were not appealing to union officials, particularly after Russia was attacked by Germany, left-wing unions decided to cooperate with management in increasing war production, including the implementation of wage incentives.⁷⁹

The war also provided another stimulus to the use of incentive pay rather than time wages. It was found to be easier to circumvent wage controls with incentives because of the periodic need to modify standards.⁸⁰ Controls authorities could not easily monitor such changes. Proponents of incentives hoped that the wartime experience would usher in a postwar trend toward growth in their use.⁸¹ Hostile union attitudes, they thought, must surely have been

altered by the wartime use of incentives:

"Wartime experience and modern management methods... have dispelled to a great extent labor's fears that wage incentives result in a speed-up."⁸²

Survey evidence suggests that employers did move to "professionalize" the time study function; standards were increasingly set by college educated engineers, although complaints continued about foremen setting rates without adequate training.⁸³ Despite the hope of wartime proponents, unions resumed their mixed stance regarding incentives in the postwar era. And even where unions were willing to accept incentives, their new grievance and arbitration mechanisms created a channel for complaints about changes in standards to be voiced.⁸⁴ Employers who utilized incentives now paid a price in the form of reduced flexibility and possible second guessing by arbitrators.

Thus, after World War II, the use of incentives resumed its decline.⁸⁵ Apart from the union influence, there were continued attacks on money as a motivator from behavioral scientists.⁸⁶ These views were not the only ones heard, of course. There were counterattacks by "practical" observers against overemphasis on "the present-day fashionable chorus of praise for human relations."⁸⁷ Postwar books by industrial engineers simply assumed as self-evident the need for direct wage incentive plans.⁸⁸ "Nuts and bolts" texts by practitioners also took the use of incentives as a given:

"Anyone who believes that incentive systems properly set up and administered are basically unfair to employees and serve management no good purpose needs to start his business education all over again."⁸⁹

Successful incentive plans merely required knowledge of rules of thumb which had developed over the years, e.g., after ten years, a plan becomes out of date and must be replaced because its standards have become inappropriate.⁹⁰

However, there was more involved in the decline in incentive use than simply an intellectual debate. Changes in workforce composition toward more hard-to-measure white collar work limited the possibilities of using wage incentives. Even in blue collar settings, it has been argued that as workers were turned by automation into machine tenders, it became more and more

difficult to create effective incentive plans."¹ For example, if the worker's task is to correct machine errors, a reward system based on such corrections would provide a perverse incentive first to cause errors and then to correct them."² In short, the dysfunctions of incentives became better known.

There is a final factor to be mentioned in accounting for the decline in the use of automatic incentive systems. In the 1930s and 1940s, the threat effect of union growth elevated the status of personnel departments and officials in firms. Employers had to rely on these departments either to deal with unions or to establish policies of union avoidance. This trend toward status elevation was continued, even after union representation of the workforce began to decline, by federal regulatory pressures in the labor market and tax-code manipulations of fringe benefits. Expertise in the HR area was a necessity to keep up with, and adjust to, regulations dealing with affirmative action, safety and health, etc. During periods of ascendancy of the HR function, there is a tendency for that function to assert control over line managers and industrial engineers.

The HR literature tends to emphasize performance appraisals and discretionary merit awards and bonuses as the proper way to provide incentives. Texts of the mid 1940s already supported these approaches to providing motivation and differential rewards to employees."³ Performance appraisal and merit systems are designed and monitored by HR professionals. Simple incentive systems are often the province of the line manager and the industrial engineer, not the HR department. As the status of HR rose, it is not surprising that the use of incentive wages declined. Personnel managers argued that wage incentives could cause supervisors to neglect adequate monitoring of subordinates on the assumption that the incentive scheme would automatically produce desired behavior."⁴

***Profit Sharing: 1930-1979.** Although some of the same forces which reduced the use of incentive systems over the long haul also affected profit

sharing, there were other counteracting influences. First, there was the view of profit sharing as a device for social amelioration. Second, well before the Weitzman proposal, profit sharing was seen to have certain features of possible benefit to macroeconomic performance and employment stabilization. Third, changes in tax law were implemented to foster profit sharing. Fourth, profit sharing - as a general employee benefit - falls in the province of the HR function; line managers and industrial engineers have little to do with its design and implementation.

The interest in profit sharing during the period surrounding World War I has already been noted. That period saw an increase in unionization and concerns about industrial strife. Similar concerns were resurrected in the 1930s, as union membership again grew rapidly and strike activity surged. Yet the limited number of profit sharing plans which existed in the 1920s declined in response to the Depression. With little or no profits to share, and uncertainty over the future course of government policy with regard to pay, firms discontinued or suspended their plans.⁷⁷

Senate hearings were held in the late 1930s with the idea of stimulating profit sharing as a way of reducing labor-management frictions, and reducing the lure of communism. The tax status of profit sharing payments was unclear; in the World War I period, the U.S. Treasury viewed such payments as "gratuities" and, hence, not deductible as business expenses.⁷⁸ Certainly, profit sharing was not tax favored.

Testimony on the part of union officials was decidedly unsympathetic to the promotion of profit sharing. John L. Lewis, president of the CIO, complained that management did not provide any opportunity for labor to participate in the managerial decisions that influence profits. Thus, workers should not bear the risks of variations in profits due to decisions over which they had no control. Moreover, workers needed stable - not variable - incomes. Similar views were expressed by William Green, president of the AFL,

who noted in addition that profit sharing had sometimes been used in conjunction with employer-sponsored employee representation schemes to avoid unionization.⁷⁷

Despite such views, the Senate subcommittee pursuing the issue reported that profit sharing would increase efficiency, decrease waste and turnover, and "eliminate labor unrest and conflict," among other virtues:

"(Profit sharing) makes workers a part of the profit system and by their participation transforms their sentiment from one of antagonism to that of acceptance and defense - the most powerful educational advance that could be devised."⁷⁸

To stimulate profit sharing, the subcommittee recommended that payments from deferred profit sharing trusts to workers (at retirement) should be exempt from income taxation. Moreover, the federal government should issue special bonds paying attractive interest rates as investment vehicles for such trusts and to ensure the protection of their asset values.

While the bond idea never became part of public policy, the creation of tax preference (through deferral of taxation rather than total exemption from it) for deferred profit sharing plans was implemented in the 1940s. A preference for deferred (rather than cash) profit sharing was further advanced by World War II wage controls. During the controls period, creation of new cash profit sharing was virtually banned. Any new plans had to be of the deferred type.⁷⁹

There was some expansion in the use profit sharing in the 1940s.¹⁰⁰ And certainly, there was more written about it. Yet profit sharing was not a major force in compensation by any means. As one study noted:

"American studies of profit sharing constitute a considerable literature, disproportionate to the insignificant position the movement has attained in industry."¹⁰¹

Then as today, the tax incentives for profit sharing were similar to those given to pensions (and now other forms of work-related savings plans). Profit sharing was not really singled out for special tax treatment, deferred pay for retirement was. Thus, profit sharing merely competed with pensions (and later

other benefit plans) as a retirement practice. While no comprehensive surveys are available, profit sharing in the 1950s appears to have been concentrated in smaller firms.¹⁰²

Although profit sharing was sometimes used as part of a union avoidance policy by management, employers in the 1950s may have seen it as a two-edged sword, particularly if they were already organized. Unions were at their peak representation of the workforce at the time, and were seen as key players in anything having to do with compensation. Profit sharing, by seeming to legitimize a worker claim on profits, frightened some employers. A 1958 proposal by United Auto Workers president Walter Reuther that the auto industry share profits with stockholders, workers, and customers added to business consternation. Ironically, the proposal may well have been a bargaining and public relations ploy when it was first made.¹⁰³

Whatever its motivation in 1958, the profit sharing idea was subsequently reflected at American Motors, which implemented "progress sharing" with the UAW in the early 1960s.¹⁰⁴ Bargaining in the early 1960s occurred against a background of sluggish economic performance, a management offensive in bargaining, and the beginnings of foreign competition.¹⁰⁵ Wage negotiations of that era featured wage freezes, workrule relaxations, and innovative cooperative schemes. American Motors deal included elements of labor-management cooperation and workrule revision, thus foreshadowing the concession bargaining of the 1980s.

The Great Depression also spawned - or at least highlighted - some ideas about profit sharing as a device to increase de facto wage flexibility. Conventional economic analysis of the time put great emphasis on the need for wage flexibility to resolve the Depression. Moreover, commentators feared that growing unionization of the workforce would lead to increased wage rigidity.¹⁰⁶ But profit sharing could provide a compromise solution by separating compensation into a fixed and variable element:

"Profit sharing (plans act as)... a stabilizer of the wage scale by providing a flexible, supplementary payment that will fluctuate with business conditions, and yet also permit the company to control the wage cost so that it will bear a definite relation to company income."¹⁰⁷

By the early 1940s, this idea had evolved into a proposal that employment contracts should guarantee job security in exchange for wage variations linked to the firm's gross income.¹⁰⁸

Possible macroeconomic implications of profit sharing did not become a prominent issue again until the 1980s. However, the micro observation that profit sharing provided the firm with more wage flexibility was often made after the Depression.¹⁰⁹ Indeed, the possibility that simple incentive plans might give employers greater wage flexibility - because of the discretionary element in standard setting - was also noted.¹¹⁰

***Gain Sharing: 1930-1979.** Gain sharing plans were known in the 19th century, essentially functioning as group piece rates.¹¹¹ In the 1930s, however, a tie between gain sharing and worker participation in decision making was made in the development of the Scanlon plan. Joe Scanlon, an official of the Steelworkers, devised his plan to rescue a floundering company which had come to the union looking for wage relief.¹¹² Although as noted earlier, gain sharing plans of this type have never covered a large fraction of the workforce, they seemed to capture the interest and support of academics.

There were two components to this academic fascination. First, we have already noted the negative view of simple, individual incentives which came to be held by psychologically-oriented behavioral scientists. Even before the Scanlon plan, however, group bonus systems were seen as virtuous in that they were designed to "spur... cooperative effort rather than individual self-interest."¹¹³ By promoting gain sharing, post-World War II academics could see themselves as combining the best of economics, behavioral science, and the practical evidence of case studies of gain sharing usage.¹¹⁴

A second appealing feature of the Scanlon plan in particular was its emphasis on union-management cooperation. The 1930s and the period immediately after World War II, had been characterized by industrial strife and turmoil. With its feature of built-in union-management cooperation, the Scanlon plan appeared to be a "solution" to a major public policy goal - industrial peace. In any case, academic personnel textbooks of the early 1950s held out great promise for the Scanlon approach.¹¹⁵ Despite the lack of widespread implementation of Scanlon plans - even two decades into the postwar period - the praise continued:

"The Scanlon Plan is one of the most promising approaches yet suggested to securing widespread employee participation and obtaining industrial peace and higher productivity as well."¹¹⁶

The Current View of Pay for Performance.

Our historical survey of the use of alternative pay systems indicates that waves of interest and disinterest in these plans occur, linked to social, political, and economic developments. Interest does not necessarily translate into actual implementation. It seems likely, based on the BLS figures, that the incidence of profit sharing for production workers grew substantially in the 1980s, although for other occupational categories no trend is apparent.¹¹⁷ There may have been some growth in the use of gain sharing, but there are no continual surveys on which to base an estimate.

BLS has not issued any summary reports for trends in simple incentives in the 1980s. The Bureau of National Affairs, Inc. survey of union contracts shows little change during the 1980s in the proportion of contracts making provision for incentive plan operation.¹¹⁸ Thus, it appears that despite the evident growth of discussion and interest in alternative pay systems by personnel practitioners in the 1980s, the only major change has been the increased use of profit sharing in certain unionized industries.

The fact that a practice is being more widely discussed could mean that in the future more implementation will occur. Thus, it is useful to consider

contemporary views about alternative pay systems. Three viewpoints may be identified: academic, practitioner, and employee. These are considered below.

***Academic Views: Economic Theory.** Academic work on pay systems until recently was largely conducted by researchers with a behavioral science bent or by industrial engineers. Economists have had little to say about pay systems - especially from a micro viewpoint - until recently. The recent work in the economics field has been both theoretical and empirical.

The theoretical work - part of the new economics of personnel described earlier - accepts the basic neoclassical model, but attempts to account for types of behavior which did not previously attract the interest of economists. This work is still in an evolutionary stage. However, there are useful distinctions and issues raised in the new literature.

For example, it is important to separate two functions of incentive pay: sorting and motivation. Since incentive systems pay more to more productive workers, workers who are "inherently" more productive will tend to sort themselves toward incentive-using firms.¹¹⁷ Less productive workers may avoid employers with such systems. Empirical investigations of pay systems may therefore seem to detect a positive motivational effect, when what is being observed may be only sorting. At the same time, social forces such as interworker considerations of equity may dampen the link between pay and output. Thus, small pay differences may mask larger productivity differentials.¹²⁰ Both of these observations are useful to keep in mind with regard to the empirical evidence presented below.

On the other hand, some predictions of theory do not accord with empirical observation. The big drawback of incentive rates according to the personnel literature is the restriction of output by workers. Theory suggests that such behaviors might be offset by employers by paying higher piece rates when workers are first hired than in subsequent periods.¹²¹ Yet such practices are not observed, perhaps because they would require complex,

multiperiod individual contracting as employees turned over.

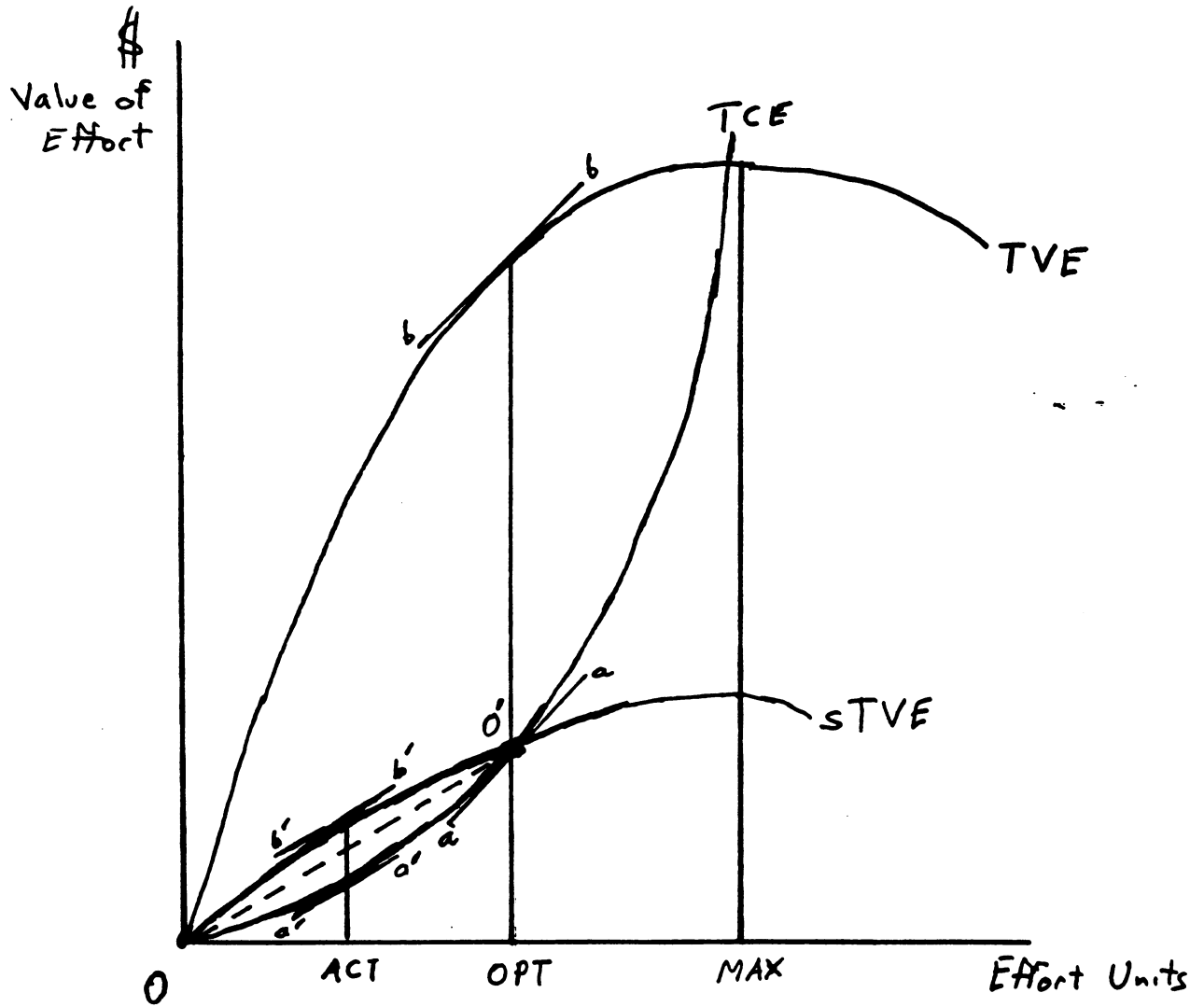
Use of simple theory can illuminate observed behavior. For example, the "improved" piece rate systems developed in the era of scientific management had in common the use of kinks in the reward function. Workers who exceed some output standard receive a higher piece rate or bonus. Why should these plan designers all have hit on this approach?

Absent any cost of monitoring, firms would hire effort units - rather than time units - from workers, setting wages so that the marginal value of effort (MVE) to the firm was just equal to its marginal physical/psychological cost to the individual worker (MCE). On Figure 1, the total value of effort (TVE) is depicted as a rising curve with diminishing returns which hits a maximum at the point of worker exhaustion (MAX) and then turns down. The total cost of effort is depicted as a rising curve which becomes steeper as exhaustion approaches. The optimum level of effort is depicted on Figure 1 at effort level = OPT which occurs where the slopes of the two curves are equal, i.e., where lines aa and bb are parallel. At that point, $MVE = MCE$. The firm would set a wage per effort unit equal to the slope of OO' , which depicts total labor costs at alternative effort levels. The earnings of the worker is measured by the vertical distance above OPT to the OO' line; the firm's surplus at OPT is the vertical distance between OO' and TVE.

With monitoring costs, however, the bargain cannot be transacted in effort units; instead, the worker under simple incentives receives a share of output value (s) in specific or ad valorem terms. He or she will then provide effort where $MCE = sMVE$, which will be less than optimal since s must be less than 1 (unless the firm is prepared to give all returns to workers). Consider, for example, a share system which seems to give the worker the same earnings at OPT that he or she would have under the optimum contract.

If the worker's earning schedule was set at $sTVE$, earnings would be the same at OPT as under the perfect contract. But, in fact, with $sTVE$ as the

Figure 1
Operation of an Incentive System



earnings schedule, the actual point of effort - the point which maximizes worker welfare - is $ACT < OPT$, where $a'a'$ is parallel to $b'b'$. At the same time, once the simple incentive bargain is struck, the employer will want effort consistent with $MVE = 0$, i.e., at MAX , since given the scheme's share parameter the firm's share $(1-s)$ is maximized at this point.

Put directly, the employer wants the worker to work to exhaustion - an effort level above that of the optimal contract. The worker will prefer an effort level below optimum. A simple piece rate, thus, may separate employee and employer interests rather than join them unless kinks are included in the schedule around the optimal point where $MCE=MVE$.¹²² An earnings schedule $Occ'c''$, for example, will induce the worker to supply OPT effort units, the optimum result. Such a schedule features a low base wage with a jump (cc') in earnings at the optimum point. Thus, scientific management writers can be interpreted as attempting to place kinks at the optimum contract level of effort. However, the fact that simple piece rates (without kinks) remained a common form of incentive suggests that identifying the proper kink point remained more elusive than these writers supposed.

There are ideas in the recent economic literature that might be applied to profit sharing and gain sharing plans, i.e., plans which cover firms or plants rather than individuals or small groups. The issue here is the fostering of teamwork. Theories of altruism in the context of the family developed in the 1970s emphasize that a properly structured family relationship can motivate all family members to act in the collective interest. Specifically, if the family head acts altruistically, sharing family gains in an appropriate manner, other family members - even "rotten kids" who are only self interested - will nevertheless behave altruistically, too.¹²³ The analogy with the employer who shares gains is evident.

***Academic Views: Empirical Economics.** Two strands in recent empirical economic literature regarding alternative pay systems. The first deals with

incentives, using information drawn from BLS industry wage surveys. A second strand involves use of profit sharing and, to a very limited extent, gain sharing.

-Incentive Research. Users of industry wage surveys in the past noted that incentive workers seemed consistently to earn more per hour than time workers.¹²⁴ Of course, productivity and wages are not necessarily the same thing, but the implication seemed to be that incentive workers were more productive. Competitive firms, at least, would have difficulty consistently paying higher wages unless they received something back (in the form of higher productivity or lower monitoring costs) in return. In addition, consistent with the sorting view, it appeared that individual establishments rarely have both time and incentive workers in a given occupation. That is, they were either under one regime or the other.¹²⁵ Indeed, there is some evidence that where the two pay systems were used in a single establishment for the same occupation, the wage advantage of incentive workers evaporates.¹²⁶

Two studies using 1970s data found significant wage premia for incentive workers. Seiler obtained detailed data from the mid 1970s for the footwear and men's and boy's suits industries. Using regressions on individuals covered by the surveys (over 120,000), and standardizing for such characteristics as unionization, he found a wage advantage of incentive workers of roughly 14%. Only a small fraction of the overall incentive differential was attributed by Seiler to a risk premium for accepting inherently more variable incentive wages.¹²⁷

Brown also found an incentive differential for the 1970s, using a broader range of industries than Seiler and establishment level data.¹²⁸ He broke down pay methods into standard time rates, time rates with discretionary merit pay, and incentive rates. Dummies for incentives suggested a roughly 10% pay premium compared to the time-with-merit systems. Yet there was also premium for standard time rates of about 6%. It may be - although Brown does not

suggest it - that the merit disadvantage reflected a lack of formalized HR policy, i.e., establishments reporting merit use are really saying they do not have standardized pay schedules.¹²⁷

Was the wage premium observed in these studies for incentive workers still present in more recent years? The fact that the incentive pay advantage has been observed for so long would lead one to suspect that it continued to exist into the 1980s. Table 2 provides relevant evidence.

Data on average hourly wages for time and incentive workers drawn from eleven BLS industry wage surveys covering the period 1979-86 were used to construct the table.¹²⁸ Industries were selected if their surveys provided data on time versus incentive workers by occupation and region.¹²⁹ A total of 716 occupation-industry-region observation cells were available. A simple regression of the log of hourly wages against regional and industry dummies, the percent of incentive workers in the cell, and the use of an incentive plan suggests a roughly 14% wage advantage for workers under incentives. This result is similar to that of Seiler.

The fact that the proportion of workers with incentives has a significant negative coefficients suggests that coverage by incentives is associated with worker characteristics which lower wages, even after standardization by occupation, region, and industry. Taken literally, the regression results imply that, other things equal, an occupation with 100% incentive coverage would have an average wage about 7% lower than one with zero coverage. Even so, there would be a net wage advantage for incentive workers since the 7% disadvantage would be subtracted from the 14% wage premium.¹³⁰ Evaluated at the mean proportion of workers with incentives for the regression (36%), the net premium for incentive workers is about 11%.

Still more detailed information was obtained from specially prepared BLS computer files for two industries in 1986 - structural clay products and furniture - using the individual worker as the unit of observation.¹³¹ Table

Table 2: Regressions Relating to Incentives and Hourly Wages in Eleven Industries: 1979-86

Dependent Variable	Log of Hourly Wage
Constant	1.76* (.02)
Proportion of workers with incentives	-.07* (.03)
Incentive plan	.14* (.01)
Region	a
Industry	b
R ²	.68
Adjusted R ²	.67
Number of observations	716

*Significant at 1% level.

a/ Includes three regional dummies. Excluded dummy is for northeast.

b/ Includes ten industry dummies. Excluded dummy is for structural clay products.

Note: Unit of observation is the average wage in an occupation-industry-region cell. Workers covered are production workers. Incentive plans are piece-work plans or bonus plan geared to exceeding a production quota. Figures in parentheses are the absolute values of the standard errors. See text and footnotes for further detail regarding this regression.

Source: Data drawn from 11 industry wage surveys for the period 1979-86. See text for details.

3 shows a substantial gross wage advantage of incentive versus time workers and - not surprisingly - somewhat greater variation in incentive wages. The table also presents regressions for the two industries of the log of hourly wages against a dummy for large establishments,¹³⁴ the presence of union bargaining, location in a metropolitan area, occupational dummies, and a dummy for coverage by an incentive plan. In both industries, after standardization for the other variables, a roughly one fifth wage advantage accrues to incentive workers. Thus, it appears that earlier findings of a positive and significant wage advantage for incentive workers continued to apply into the 1980s.

There has been a lack of statistical work by academic researchers regarding value-based incentives such as sales commissions. Survey evidence by business-related research groups suggests that commission-paid sales workers also have a history of earning more than time-based sales workers.¹³⁵ The differentials appear wide enough so that they would probably withstand the kinds of standardizing regression analysis which have been applied to other incentives by academics.

-Profit Sharing Research. Statistical research by academics on profit sharing in the U.S. has been extremely limited. Because of the Weitzman proposal, recent research has tended to focus on employment stabilization and expansion rather than motivation. For example, Kruse finds less cyclical employment fluctuation among profit sharers than among other firms.¹³⁶

Much of the recent statistical research on profit sharing and related plans seems to have been undertaken using European data sets. Thus, FitzRoy and Kraft find evidence of a productivity-boosting and a profit-boosting effect of profit sharing using a sample of German metalworking firms.¹³⁷ A similar finding is made for French worker cooperatives by Defourney, Estrin, and Jones, and for Italian cooperatives by Jones and Svejnar.¹³⁸ Because of

Table 3: Regressions Relating to Incentives and Hourly Wages in Structural Clay Products and Furniture (1986)

Industry	Structural Clay Products	Furniture
Dependent variable	Log of Hourly Wage	Log of Hourly Wage
Constant	1.73* (.01)	1.48* (.01)
Large Establishment	.03* (.004)	.08* (.003)
Union	.18* (.004)	.09* (.004)
Metropolitan area	.02* (.004)	.10* (.003)
Incentive plan	.21* (.005)	.21* (.003)
Occupation	a	b
R ²	.37	.35
Adjusted R ²	.37	.35
Number of observations	13971	39943
Mean Incentive Hourly Wage	\$8.81	\$8.06
Coefficient of variation	.31	.32
Mean Time Hourly Wage	\$7.22	\$5.91
Coefficient of variation	.27	.29

a/ Includes thirty-four occupational dummies.

b/ Includes forty-eight occupational dummies.

Note: Workers covered are production workers. Incentive plans are piece-work plans or bonus plan geared to exceeding a production quota. Figures in parentheses are the standard errors.

Source: Data from industry wage survey computer tapes supplied by U.S. Bureau of Labor Statistics.

the mix of worker ownership and profit sharing in some of the studies, American readers may be reluctant to apply the findings to simple profit sharing plans under U.S. institutional arrangements.

Part of the explanation for the limited empirical work on profit sharing is undoubtedly that accessible data sets are not available. The BLS conducted biennial surveys of Employer Expenditures for Employee Compensation (EEEC) until the late 1970s, but did not explicitly break out profit sharing in these surveys. We will make limited use of this survey below.¹³⁷ An annual survey by the Chamber of Commerce of the United States does pick up profit sharing in its questionnaire, although the data have ceased to be separately published. Unfortunately, the Chamber refuses to make its data available to outside researchers.¹⁴⁰

Lack of data has led some researchers to use tax records available from the Internal Revenue Service (IRS) as a source of information. For example, Kruse used IRS data covering 1971-85 linked to COMPUSTAT estimates of productivity (sales per employee); he found that profit sharing was associated with productivity increases of 2.5-4.2%.¹⁴¹ In an earlier study using 1981 IRS data, Chesole concluded that deferred profit sharing was being used by employers as a pension substitute.¹⁴² The difficulty with using IRS data is that they cover only deferred profit sharing (which qualifies for favored tax treatment) and include plans with discretionary as well as formula-based distributions.

Under the current regulatory system for pensions and profit sharing, there is an incentive to substitute profit sharing for pensions. Profit sharing gives the firm more flexibility in the size of its annual contribution than a defined contribution pension plan and the rules regarding fund investments are looser. However, this usage may be a comparatively recent phenomenon in the history of deferred profit sharing and ought not apply to cash profit sharing in any case.

In the early 1950s, the National Industrial Conference Board collected data from employers on fringe benefit packages which included also information on profit sharing. It is possible to construct an index of fringe benefit "richness" from these data. Specifically, the survey indicated the presence of a pension, life insurance, or hospital insurance plan and whether the plan was entirely employee paid, paid by both the employer and employee, or entirely employer paid. Thus, each benefit can be coded from 0 (for no plan) to 3, respectively. The indexes for the three benefits can be summed, producing values from 0 (no benefits) to 9 (rich benefits).¹⁴³

It might be noted that there is substantial precedent in the industrial relations literature for the use of indexes of the type described above in situations where groups of human resource practices are involved. Perhaps the most prominent example is a paper by Kochan and Block which scored contractual features in union agreements.¹⁴⁴ Below, we also construct similar indexes for other human resource policies.

Table 4 shows the result of regressions of the fringe index (0-9) and of the pension index (0-3) against a size-of-firm index,¹⁴⁵ industry dummies, and a profit sharing dummy. Separate regressions were run for the presence of any profit sharing, deferred profit sharing only, or cash profit sharing.¹⁴⁶ As can be seen, in no cases were the profit sharing variables significant. The presence of profit sharing did not reduce the richness of other fringes, as would be the case if a substitution effect were occurring. It appears, therefore, that in the early post-World War II period, profit sharing was installed for reasons such as employee motivation or cost flexibility and not as a pension substitute. In that period, it might be noted, the regulatory tilt toward profit sharing and against pensions did not exist.

Table 4 does not reflect the entire compensation package - just the fringe component - so it cannot be said with certainty that profit sharing did not substitute for cash wages. As described earlier in this essay, the

Table 4: Regressions Related to Use of Fringe Benefits and Profit Sharing

Dependent Variable	Fringe Index	Fringe Index	Fringe Index	Pension Index	Pension Index	Pension Index
Constant	5.87* (.67)	5.86* (.67)	5.87* (.67)	1.39* (.44)	1.39* (.44)	1.40* (.44)
Size of Firm	.29* (.08)	.30* (.08)	.29* (.08)	.30* (.05)	.30* (.05)	.30* (.05)
Profit Sharing						
All	-.02 (.32)	-	-	.16 (.21)	-	-
Deferred	-	.13 (.40)	-	-	.14 (.26)	-
Cash	-	-	-.06 (.53)	-	-	.27 (.35)
Industry	a	a	a	a	a	a
R ²	.22	.22	.22	.23	.23	.23
Adjusted R ²	.15	.15	.15	.16	.16	.16
Number of Observations	419	419	419	419	419	419

*Significant at the 1% level.

a/ Includes thirty-four industry dummies.

Note: See text for variable definitions. Figures in parentheses are the absolute values of the standard errors.

Source: National Industrial Conference Board, Fringe Benefit Packages, studies in personnel policy no. 143 (New York: NICB, 1954).

Weitzman proposal for profit sharing depends on substitution of the expected profit-sharing bonus for the base wage to obtain the employment-expansion effect. The historical evidence indicates, however, that the folk wisdom surrounding profit sharing is that it is supposed to be installed as something extra ("gravy") for employees, i.e., not subtracted from other forms of pay. Table 4 suggests that as far as the fringe component was concerned, no evidence of substitution was present. Unless there was a wage reduction, the profit sharing payment was gravy.

The BLS EEEEC survey, to which reference was made above, included deferred profit sharing with pensions and grouped cash profit sharing with a variety of miscellaneous "nonproduction" bonuses. Pension contributions dwarf those for deferred profit sharing but cash profit sharing may be a significant component of the bonuses. On that supposition, Table 5 presents regressions of total compensation and straight-time wages against the hourly value of nonproduction bonuses (in dollars) and other available variables from a tape containing results of the 1974 survey.¹⁴⁷

If a substitution effect was occurring for cash bonuses, the bonus coefficient in the compensation regressions should be zero, since bonuses would simply be offsetting some other compensation component. And if the substitution was for wages - as might be expected with a cash bonus - the coefficient in the wage equation should be -1.¹⁴⁸ On the other hand, if the bonus is simply an add on (gravy), the coefficient in the compensation equations should be +1 and zero in the wage equations.¹⁴⁹

In fact, the bonus coefficient is greater than one in the compensation equations for nonoffice workers and greater than zero in the wage equations for nonoffice and office workers. It is likely that the bonus variable is in part acting as a proxy for some other unspecified pay-raising influence. However, the regressions lend no support to the notion that cash profit sharing is offset elsewhere in the pay package. They tend to support the

Table 5: Regressions Related to Compensation Levels and Bonus Payments: 1974

Dependent Variable	Nonoffice Workers		Office Workers	
	Total Compensation Per Hour	Hourly Straight-Time Wage	Total Compensation Per Hour	Hourly Straight-Time Wage Per Hour
Constant	5.36* (.47)	4.38* (.38)	8.29* (.77)	7.09* (.68)
Union	1.31* (.06)	.95* (.05)	.44** (.20)	.27 (.17)
Metropolitan Area	.35* (.05)	.29* (.04)	.62 (.09)	.58 (.08)
Industry	a	a	a	a
Region	b	b	b	b
Size of Firm	c	c	c	c
Bonus Payment	1.24* (.24)	.83* (.19)	.37* (.05)	.27* (.04)
R ²	.60	.55	.28	.26
Adjusted R ²	.57	.54	.27	.25
Number of Observations	3428	3428	3428	3428

*Significant at the 1% level.

**Significant at the 5% level.

a/ Includes 67 industry dummies.

b/ Includes 3 regional dummies.

c/ Includes 8 dummies for size of firm classification.

Note: See text for details on variable definitions. Figures in parentheses are the standard errors.

Source: Computer tape from U.S. Bureau of Labor Statistics.

gravy view of cash profit sharing.

***Academic Research on Management Views about Pay Systems.** Data sets on the use of particular pay systems are often not linked to any direct performance or outcome measures. Thus the user is forced to infer outcomes from pay differentials. A possible solution is to ask those who are directly affected by alternative pay systems for their attitudes concerning these plans.

The groups directly affected are employees, union officials, and managers. As noted above, information on employee attitudes generally is very limited. In the abstract, individuals may believe in "pay for performance." But one recent survey suggests that employees are not keen on "pay for performance" systems applied to themselves. On the other hand, if incentives are to be used, employees were reported to prefer individual incentives to profit sharing.¹⁵⁰ There are no comprehensive surveys of the attitudes of union officials. In our review of union attitudes earlier in this essay, we relied on published statements and contract outcomes. That approach is typical of those who have written in this area.

Surveys of managers' views are more common, in part because mailing lists of managers are available from various sources. Thus, Voos surveyed managers of unionized firms in Wisconsin about various HR practices including profit sharing and gain sharing. The managers who had plans in effect generally believed their plans had improved productivity, quality, and profitability, and lowered unit labor costs. There is no way of ascertaining from such survey data whether these managerial impressions are ex poste rationalizations for their firm's policy. Those managers from firms which discontinued plans were - not surprisingly - less positive in their evaluations but, again, the issue of a rationalization is raised.¹⁵¹

There may be differences, however, in the perceptions of unionized and nonunion managers regarding such plans. Unionized managers were found in one

study to be somewhat more likely to cite indirect benefits - such as the provision of a retirement plan or an educational effect about profits - than about direct benefits to the firm.¹⁵² A survey of 545 managers by Mitchell and Broderick permitted disaggregation by union status of the respondent's firm and by whether the firm did or did not have a particular pay plan.¹⁵³ The survey covered profit sharing, gain sharing, simple incentive plans, ESOPs, and "tax-credit ESOPs".¹⁵⁴ Table 6 summarizes the highlights of the survey with regard to the three types of plans under discussion in this essay.

In general, simple incentive plans were most likely to be cited as best for productivity improvement, but least likely to be seen as enhancing worker loyalty or providing labor cost flexibility. This result is in accord with the textbook stereotypical view of simple incentives as being direct individual or small group motivators. It is also in keeping with a New York Stock Exchange survey of managerial attitudes toward alternative pay systems.¹⁵⁵

Profit sharing plans were seen as providing an advantage mainly in the loyalty and labor cost flexibility areas. Unionization made little difference in these perceptions. But as Voos found, respondents who actually had a plan were more likely to see the plan in positive terms.

Respondents who had profit sharing plans were less likely to agree than others with the view that the plan created worker demands for participation in management. This finding - when combined with the propensity of managers with plans to say nice things about them - suggests that managers considered such potential demands to be Bad Things. It was found that agreement with that view was positively correlated with unionization. Thus, it may be that managers in the union sector have been inhibited from using profit sharing by the fear that unions would then provide a voice for participative demands. The small number of respondents with gain sharing were more likely than others to associate participative demands with their plans. However, at least in the

Table 6: Managerial Attitudes Toward Alternative Pay Systems

	Profit Sharing	Gain Sharing	Simple Incentive
Percent of Managers Responding that Plan Best for:			
Raising Productivity	28[30]	26[59]*	42[55]*
Increasing Loyalty	48[49]	18[41]*	15[20]*
Linking Labor Costs to Firm's Economic Condition	53[56]*	28[57]*	19[23]*
Percent of Managers agreeing that Plan Creates Demand for Employee Participation in Management			
Cash Bonus	44[39]*	34[69]*	n.a.
Deferred	39[33]*	-	-
Note: Percent of Respondents with Plan	53%	6%	23%

Note: Figures in brackets [] refer to responses from individuals whose firms have the plan listed at the column head.

n.a. = not asked in survey.

*Chi-square test on a contingency table indicates that pattern of responses by those with plan was significantly different from those of other respondents at 5% level.

Source: Daniel J.B. Mitchell and Renae F. Broderick, "Flexible Pay Systems in the American Context: History, Policy, Research, and Implications," forthcoming in Recent Advances in Industrial Relations.

Scanlon plan case, gain sharing is explicitly linked to participation and firms which set up such plans have elected to create participative institutions.

The Case Study Approach.

While interesting, surveys of managerial attitudes do not generally provide objective performance measures. Managers may say they think a particular plan increases productivity, but absent a productivity index, it is not possible to be sure an effect actually occurs. Thus it is important to consider studies which have tried to measure directly the impact of pay for performance systems.

***Incentive Plans.** There is a great deal of evidence from case studies that individual incentive pay can motivate individual performance, indeed much of this research is decades old.¹⁵⁶ The case study evidence suggests that gains of 10-25 percent are common when incentive pay is used properly. There is also good reason to believe that incentives can attract and selectively retain good performers because such performers end up being paid more than other workers. However, the literature on incentive pay plans is full of vivid descriptions of counterproductive types of behavior which piece rate incentive plans produce.¹⁵⁷ Most of the early accounts are from the manufacturing world, but the same kind of issues arise when salespersons and other service personnel are put on incentive pay.

Numerous case studies have shown that when piece rate plans are put into place an adversarial relationship develops between system designers and employees.¹⁵⁸ Employees seek to obtain rates that maximize their pay relative to the amount of work that they do. As our historical review has already indicated, case study investigators find that employees work at slow rates in order to mislead time study experts. They hide new work methods and new procedures. In addition, informal norms develop about just how productive people should be and workers thus set limits on their own production.

Employees who go beyond this limit may be socially ostracized or otherwise penalized.

Other dysfunction reactions include producing at extremely low levels when the rates are set at levels that the employees consider too difficult to reach - a kind of quasi-strike - and using union grievance procedures to eliminate rates that are too difficult. Employees may also do only what is measured, ignoring other needed activities. In the case of production workers, this may mean not cleaning up and leaving material-handling work undone. In the case of salespersons, it may mean not doing customer service activities and tying up customers to reduce sales.

Since many support jobs and non-production jobs do not lend themselves to piece rate pay, the typical organization that has incentive pay will have only a part of the work force on it. This bifurcation has often been found to lead to a we/they split in the work force that can be counterproductive and lead to noncooperative work relationships.¹⁵⁷ Thus, positive productivity effects may be offset by intergroup workplace frictions.

Because incentive plans by themselves are relatively complicated and need to be constantly updated, case analysis suggests that a significant number of people are required to maintain them. The problem of maintaining incentive systems is further complicated by the adversarial relationship that develops between employees and management. Since employees try to hide new work methods and attempt to avoid changes in their rates (unless, of course, it is to their advantage), management needs to be extremely vigilant in determining when new rates are needed. In addition, each time a technological change is made or a new product is introduced, new rates need to be set.

Finally, there is the ongoing cost of computing wages relative to the amount of work and kind of work employees have performed during a particular performance period. These calculations require engineers, accountants, and payroll clerks. Case studies suggest that the support costs of an incentive

system are significantly greater than those associated with a straight hourly pay.

The combined effects of dividing the work force into those who are and are not on incentive pay and the adversarial process of rate setting can create a hostile, differentiated organizational culture. In particular, incentive-related hostilities have been found to produce a culture of low trust, lack of information sharing, conflict between groups, poor support for joint problem solving, and inflexibility because individuals want to protect their wage rates. In some instances, these reactions are caused not so much by the incentive concept itself, but by the way it has been managed.

Incentive pay clearly fits some organizational situations better than others. It fits situations best where the work is designed for individuals or - in some cases - for small groups. Management experts find that incentive pay best fits work that is simple, repetitive, stable and easy to measure comprehensively. More than any other system, it divides the organization creating isolated individuals or small groups who often feel they are competing with each other. Thus, the prevailing view is that it is very important that simple incentives be used only where the need for integration is negligible or where other mechanisms can be used to produce it. Finally, from the management perspective, it helps a great deal if the nature of the work is stable, so that it can be carefully studied and there is not the need constantly to revise standards and payment approaches.

***Gain Sharing.** There has been a considerable amount of research on gain sharing. Perhaps the most important thing known about gain sharing plans is that they have often produced desirable results where implemented. Figure 2 lists some of the common positive results that have been found in case studies of gain sharing plans.¹⁴⁰ Particularly impressive is the finding of the U.S. General Accounting Office (GAO) that firms with plans in place over five years averaged an annual savings of 29 percent in labor costs.¹⁴¹ We know somewhat

Figure 2

CLAIMED EFFECTS OF GAIN SHARING

Coordination, teamwork, and sharing of knowledge are enhanced at lower levels.

Social needs are recognized via participation and mutually reinforcing group behavior.

Attention is focused on cost savings, not just quantity of production.

Acceptance of change due to technology, market, and new methods is greater because higher efficiency leads to bonuses.

Attitudinal change occurs among workers, and they demand more efficient management and better planning.

Employees try to reduce overtime; to work smarter, not harder or faster.

Employees produce ideas as well as effort.

When unions are present, more flexible administration of union-management relations occur.

When unions support the plan, they are strengthened because a better work situation and higher pay result.

Unorganized locations tend to remain nonunion.

less about the frequency with which gain sharing is a success, but even here there is evidence to suggest that they enhance productivity in 50 to 80 percent of the reported cases.¹⁶² Apart from the productivity effect, proponents often claim that gain sharing can produce the other results listed in Figure 2.

It is easy to criticize the research studies upon which the conclusions about the effectiveness of gain sharing are based. Unfortunately, most of the studies do not meet rigorous methodological standards; they fall more in the realm of magazine reports than research studies. Their typical failings include lack of comparison or control sites, measurement of only a few features of the organization and a lack of longitudinal data. There also is the possibility of a tremendous underreporting of negative results, as is true with any literature that relies on case reports. Successful gain sharing companies such as Herman Miller have been featured in the literature for decades and studied many times. But few researchers seem interested in and willing to study the firms that try gain sharing and for one reason or another abandon it after a short trial.

There are some important exceptions to the general point about poor research which are worth mentioning. Schuster¹⁶³ has done a longitudinal study of the Scanlon Plan, and White¹⁶⁴ has analyzed the experience of 22 companies with the Scanlon Plan. Goodman and Moore have also done a longitudinal study of the Scanlon Plan.¹⁶⁵ Bullock and Bullock have provided longitudinal data on two custom-designed plans.¹⁶⁶ Importantly, the better studies tend to be consistent with the more casual reports concerning the positive effects of gain sharing as well as the problems entailed as described below.

Bullock and Lawler in a review of the gain sharing literature provided some further data on how plans are structured and installed.¹⁶⁷ They report for example that the typical plan pays out monthly, focuses on labor costs,

shares over 50% of the gain with the employees and is implemented by a consultant with the involvement of the employees. A more recent study by O'Dell and McAdams reports similar findings as well as data which suggest the typical plan pay bonuses which range from 5 to 10 percent of base pay, cover most employees in the organization's unit where they are installed, and are in organizations with less than 5,000 employees.¹⁴⁸ Unfortunately no study has related detailed features of the plan and its implementation to plan success. Thus, although we know something about how plans are structured and implemented, little data exist on how these are related to success.

Some case analysis deals with the situational factors which favor gain sharing plans. For example, White found that participation and managerial attitudes are critical to the success of gain sharing plans. As Figure 3 illustrates, although there is a bias in the literature toward describing successful gain sharing plans, there have been case analyses and illustrative reports concerning why gain sharing plans fail and on which obstacles must be overcome to achieve positive outcomes. An important barrier seems to be lower-level management resistance; gain sharing plans often are resisted by managers who see their authority and competence challenged and their roles changed in uncomfortable ways.¹⁴⁹

Relatively little is known about the internal machinery through which successful gain sharing operates. Gain sharing proponents cite numerous mechanisms, including the fact that they operate as effective pay incentive plans, they stimulate problem solving, they cause people to work smarter, they cause social pressures that encourage people to be good performers, they cause other organizational changes which contribute to organizational effectiveness, and they create organizational goals that lead to teamwork and cooperation. These may all be paths through which gain sharing plans work, but at this point, little research has been done which documents the specifics and identifies relative importance. In fact, it is quite possible that gain

Figure 3

FREQUENT PROBLEMS WITH GAIN SHARING

Formula structure. The formula needs to be accurately measure what is going on in the organization. Rigid formulas that do not reflect employee behavior may be developed and lead to failure because employees see no relationship between performance and reward.

Formula change. The formula needs to change as the products, technology, and activities of organizations change. Rigid plans that do not put in place a process to allow for change often fail when change is needed.

Payout level. It is important that some bonuses be paid, particularly at the beginning. Sometimes payments are not made initially because the performance level that must be achieved before a bonus is paid is set too high.

Management attitudes. Unless managers are favorably disposed to the idea of participation, the plan will not fit the management style of the organization. In some organizations, plans have been tried simply as a pay incentive plan without regard to the management style, and have failed because of a poor fit.

Plan focus. Many plans focus only on labor savings. This approach presents problems in organizations where other costs are great and are under the control of the employees. It can lead to the other costs being ignored or even increased in order to reduce labor costs.

Communication. For a plan to work, employees must understand and trust it enough to believe that their pay will increase if they perform better. For this belief to occur, a great deal of open communication and education is needed. Often this element is ignored and, as a result, plans fail.

Union cooperation. The local union must be supportive. In most of the places where gain sharing has been tried, the local union has supported it. However, some failures have occurred in situations where unions have not supported the plan sufficiently.

Threat to supervisor. Gain sharing changes the roles of supervisors. They are forced to deal with many suggestions, and their competence is tested and questioned in new ways. Unless supervisors are prepared for and accept these changes, the plan can fail. This point goes along with the general point that management must be prepared to manage in a different way.

Figure 3 - continued

Participative structure. Gain sharing requires congruent participative structures. Sometimes these are not in place or they are poorly managed and as a result the plan fails because as an incentive plan gain sharing is a relatively weak intervention.

sharing works for different reasons in different situations. Such factors as technology and organizational size may well influence why and how a plan operates.

Particularly interesting are questions having to do with what the bonus formula contributes to participative management and vice versa. The congruence argument, which is largely untested, suggests that economic participation and participation in decision making alone has little impact but that together they are quite powerful. Partial support for this view is provided by data on the institutionalization of gain sharing plans. Most studies that have reviewed gain sharing plans have noted that some survive for many years. This is in contrast to the relatively short term effectiveness of participative management programs such as quality circles.

***Profit Sharing.** The limited case research on profit sharing plans suggests that these programs are much less effective than gain sharing plans in influencing individual or group performance and in producing the kind of social and cultural outcomes listed in Figure 3. This result is particularly relevant to large organizations where the relationships between individual performance and corporate profits is virtually nonexistent. Thus, the case analysis research is consistent with the general view of profit sharing which has been expressed throughout this century.

However, before dismissing profit sharing as completely useless from an organizational effectiveness point of view, there are three things that even a deferred profit sharing plan in a large corporation can accomplish. First, there is some potential symbolic and communications value in paying people based on organizational performance. It can effectively point out to employees that they are part of the organization and that cooperative effort is needed. Since corporate executives are often paid on the basis of profit sharing, it can also help to assure that there is some alignment between the rewards received by top management and those received by people throughout the

organization. This parallel treatment can help avoid the all-too-common problems which result when executives receive large bonuses, while lower-level employees receive none.

Second, some companies, most notably Hewlett-Packard, seem to have used their profit sharing plans as vehicles for educating employees about the financial condition of the business. When employees are actually sharing in the profits, it brings alive for them the issue of what profits mean for the firm and how they are calculated. Thus, profit sharing can increase employee interests in learning about profits and organizational effectiveness.

Third, case analysis suggests that perhaps the most important advantage profit sharing offers is that it makes the labor costs of an organization variable, and adjusts these costs to the organizations ability to pay. With profit sharing, it is possible to reduce costs significantly without reducing the number of employees or the base wage. This effect has proven to be a particularly desirable feature for organizations that are cyclically sensitive. Without profit sharing, changes in labor costs in these firms would be handled through increases and decreases in the size of the workforce, an expensive practice that can lead to the liquidation of valuable human resources.

There are some frequently cited cases where profit sharing appears to have worked well, perhaps the most famous of these is the already-mentioned Lincoln Electric Company.¹⁷⁰ One survey of 108 companies using profit sharing plans found that over 50 percent of the company executives surveyed felt the plans improved efficiency, reduced costs, and lowered turnover.¹⁷¹ There also are some studies comparing profit sharing firms with non-profit sharing plans, and in general those studies have found that profit sharing firms perform better.¹⁷² Although it is difficult to attribute causation with cross-section research studies like these, it seems reasonable to conclude that profit sharing plans can contribute to organizational financial performance.

Linking Pay System Data to Financial Performance.

The case study approach provides one route to linking actual outcomes with particular pay systems. It provides more direct information than managerial attitude surveys. On the other hand, individual cases always raise questions about generalizability. Another research method is, therefore, to marry data sets dealing with pay plan incidence to others dealing with financial performance. In the past, such research has tended to be published under the auspices of plan proponents.¹⁷³ But there has been recent, independent research suggesting that particular pay systems do have positive productivity effects.¹⁷⁴

Another area in which detailed information on HR practices can be helpful is isolating the degree to which there are alternatives to alternative pay systems. Firms have many practices in place - other than incentive plans, profit sharing, and gain sharing - which are supposed to reward good behavior, e.g., performance appraisal systems and related merit awards. These programs may substitute for automatic pay system rewards in fostering desirable financial outcomes for the enterprise.

Complementarity is also an issue with regard to HR practices. The literature on sharing arrangements, in particular, often associates economic sharing with sharing of decision making. As noted above, managers do not necessarily believe the two forms of sharing must go together. Nonetheless, it may be the case that as a matter of actual practice, they do tend to go together. If so, disentangling their independent effects becomes important.

Finally, there is a growing body of literature concerned with - and controversy about - the linkage of HR practices and strategic planning of the firm.¹⁷⁵ HR managers are being advised that pay systems should be designed to mesh with the organization's design and business objectives.¹⁷⁶ There may be differences in results depending on such factors as firm size and industry. And the objective may not be an absolute performance target; rather, the

purpose of a particular pay practice may be to enhance the firm's ability to adapt to change and to share the risks of an unstable environment between shareholders and employee-stakeholders.

***The Columbia Business Unit Data Set.**

A new data set pertaining to human resource policies and practices of U.S. private employers has been developed which allows us to examine some of these issues empirically. The data come from survey responses of 495 business units, which were obtained from a questionnaire originally mailed to over 7,000 business unit executives by a team of researchers at Columbia University's Graduate School of Business.¹⁷⁷ These units (a more detailed point of observation than the overall firm) were asked to report extensive information on their internal human resource policies for the years 1986-87. The responses were matched to financial performance data contained in the COMPUSTAT file, including information on revenue, profitability, assets, and equity on an annual basis for the 1983-86 period.

Human resource policy and practice information available from the survey cover eight key areas. These are human resource planning, job design and analysis, selection and staffing, training and development, performance appraisal, compensation, employee involvement and communications, and employee relations/union relations. The survey instrument used to obtain this information ran 29 pages and is available from the authors.

Although the Columbia business unit survey provides data for four occupational categories - managers, professional/technical, clerical, and manufacturing/production - we will limit our analyses to the latter two groups. Four business units reported having no clerical employees; 100 reported having no manufacturing production workers. The data are available separately for unionized and nonunion business units in each occupational category. Since the point of observation is the business unit (or COMPUSTAT

business line), rather than the corporate entity or parent company, corporate-parent overhead allocations to business units are not included in this data base's economic performance measures.

***Compensation Policies and Economic Performance.**

The upper panel of Table 7 provides descriptive statistics pertaining to the businesses' compensation policies and practices for union and nonunion clerical and manufacturing/production employees. The differences in the incidence of compensation plans as between clerical and production employees are not striking. Consistent with previous information, union workers are less likely to have profit sharing and more likely to have gain sharing than nonunion employees.

There are some anomalies on Table 7 which suggest less-than-perfect reporting of plan usage by respondents. The very low rates of usage of incentive bonus plans (which include piece rates) for manufacturing production workers are inconsistent with other data. Although the proportions of such workers reported as covered by "stock option" plans is low, the figures are surprisingly high for production workers. Such plans were originally designed for executives in high tax brackets at a time when capital gains were given favored tax treatment. Respondents may have mistakenly included various stock purchase plans in replying to the survey.

It is likely that the respondents most accurately reported the presence of profit sharing, gain sharing, and ESOPs. Relatively few firms, however, have gain sharing so that the sample provides little information about it. It may be expected, therefore, that any correlations found between economic participation and enterprise performance are going to be dominated by profit sharing and ESOPs.

In order to explore what relations may exist between performance and economic participation, we must first define the economic performance measures that will serve as dependent variables. Then we must specify the compensation

Table 7: Summary Statistics from Columbia Business Unit Survey

	Clerical Workers			Manufacturing Production Workers		
	Union	Nonunion	All	Union	Nonunion	All
Proportion of business units with plan:						
Profit Sharing	.15	.42	.36	.18	.46	.37
Gain Sharing	.05	.03	.04	.06	.05	.05
Stock Option	.12	.22	.20	.09	.23	.19
ESOP	.45	.48	.47	.37	.45	.42
Incentive/bonus	.04	.03	.03	.05	.03	.04
Mean value of:						
ROI (%)	10	10	10	10	10	10
ROA (%)	8	8	8	8	8	8
PROD (\$000s)	221	210	212	247	224	235
ROI _T	10	11	11	11	12	11
ROA _T	9	10	9	9	10	10
PROD _T	13	13	13	15	14	14
EP (0-5)	1.9	2.6	2.4	2.5	2.7	2.6
UNION (0-1)	1.0	0.0	0.2	1.0	0.0	0.5
NEP (0-18)	10.2	8.3	8.6	9.7	8.6	9.2
LC (0-8)	3.7	3.1	3.2	4.5	3.8	4.2
FBR (0-13)	10.1	10.4	10.3	10.3	10.5	10.4
IS (0-2)	0.9	1.3	1.2	0.7	1.2	0.9
FHR (0-8)	5.2	4.6	4.7	5.9	5.0	5.5
SHR (0-6)	3.8	3.5	3.6	4.1	3.2	3.7
SZ	582	935	884	1832	1180	1520
PART (0-1)	.45	.33	.35	.47	.42	.44
INFO (0-1)	.62	.53	.55	.62	.56	.60
Number of Observations	85	406	491	210	185	395

For source and variable definitions, see text.

measure(s) as well as certain control variables which will serve as independent variables in the analysis.

As measures of economic performance, we use (1) return on investment (ROI), the ratio of operating income to equity investment, (2) return on assets (ROA), the ratio of operating income to identifiable assets, and (3) productivity (PROD), the ratio of net sales revenue to employees.¹⁷⁸ These measures will initially be examined cross-sectionally for the most recent year included in the data base (1986 in most cases). Then they will be examined longitudinally, using the 1983-86 percentage growth trend of ROI, ROA, and deflated PROD as dependent variables.¹⁷⁹ Mean values for the sample are shown on the middle panel of Table 7.

Our interest is in the presence of a compensation system or systems linking an element of compensation to some measure of employer or employee performance. As a measure of the use of such plans, we initially constructed a composite index of economic participation (EP), which includes the following items: (1) profit-sharing plan (PS), (2) gain sharing plan (GS), (3) stock option plan (SO), (4) employee stock ownership plan (ESOP), and (5) production incentive or bonus plan (INC). This index ranges from zero (no plans) to five (all plans in use) for the business units included in the data base. As was previously noted in connection with the discussion of Table 4, use of such indexes is common in the industrial relations literature. However, because of the special interest in pay systems, we also examined the different types of pay plans separately.

One obvious linkage for which to look is between EP and the performance variables. With regard to the ROI and ROA variables, however, a conceptual problem exists. In the long run, enterprises should not be expected to make above-normal profits. If the kinds of plans included in EP were of value to the firm, the employer should have adopted them. But so should other competitive employers. Thus, even if the EP plans were profit enhancing in

the short run, there may be no long-run correlation between EP and ROI or ROA. On the other hand, there might be an association between EP and a measure such as PROD which is not directly linked to profits.

Apart from any effect on absolute performance of the enterprise, EP plans may assist the business unit in adapting to volatile economic conditions. The mid 1980s are widely viewed as a period of adjustment for many U.S. businesses. An interesting question is whether the business units in our sample were able to improve their performance during this difficult period. While absolute profitability may not be linked to EP for competitive reasons, EP might be associated with trend improvements in the three indexes (denoted ROI_t , ROA_t , and $PROD_t$) during the 1983-86 period for which we have data. Thus, the analysis below includes the performance measures both in absolute form and in trend form.

In the OLS regression analysis that follows, we have implicitly treated the EP plans as exogenous variables, along with the other right-hand side variables described below. We do not have a complete theory of why firms select particular pay plans or other human resource practices. Thus, it is possible to object that we have not properly controlled for the influence of the performance variables on the right-hand side variables. Particularly with regard to EP plans, however, the reverse causal links between the performance measures and the presence of a plan or plans are not evident. Undoubtedly examples of, say, profit sharing plans established because firms were profitable can be found. But in the 1980s, it is equally possible to find examples of such plans implemented because firms were in economic difficulty, as occurred in various union concession bargaining situations.

***Other Independent Variables.**

There are likely to be other influences on economic performance besides the pay system. These influences may be correlated with the incidence of particular pay systems. To standardize for such other influences, a variety

of control variables have been included in the analysis. Mean values of these variables are reported in the bottom panel of Table 7.

First, a dummy for the presence of a union (UNION; where union = 1, no union = 0) is an obvious control, since numerous empirical studies provide a basis for positing a relationship between UNION and the economic performance measures. A second independent variable used in this analysis is noneconomic participation of employees (NEP). This variable is one of a group of controls designed to capture internal firm human resource policies other than pay. The index of NEP encompasses the (1) existence of a formal employee participation program, (2) extent of issues covered by the participation program, including (2a) introduction of new technology, (2b) quality of product/service, (2c) work unit performance, (2d) plant/facility/office layout, (2e) supervision, (2f) safety and health, and (2g) work flow/work speed; (3) performance appraisals of peers conducted by employees; (4) existence of a formal information-sharing program for employees; and (5) extent of issues covered by the information-sharing program, including (5a) business conditions, (5b) introduction of new technology, (5c) work flow, organization, and scheduling, (5d) work unit performance or quality data, (5e) company investment plans, (5f) company marketing plans, (5g) compensation in competing firms, and (5h) budget/income/financial statements.

The NEP index ranges from zero (no noneconomic participation) to 18 (complete noneconomic participation along all dimensions listed above) for the business units included in the data base. In order further to explore the impact of noneconomic participation, we also experimented with the different specification of this concept. Employee participation of any type was represented by a dummy PART (where 1 = presence of any plan). Information sharing of any type was represented by a dummy INFO.

Earlier it was noted that fringe benefits might be substitutes for plans such as profit sharing. Fringe benefits may also have effects on performance

by making outward mobility of employees more costly for them, to the extent that benefits are non-vested or only partially vested. The incidence of fringes may also be an index of paternalistic or other human resource policies. Data available from the survey enable us to construct as a third control variable an index of fringe benefit richness (FBR). It is composed of the provision of (1) day care, (2) health insurance, (3) dental care, (4) eye care, (5) a retirement plan, (6) paid vacation, (7) paid sick leave, (8) tuition reimbursement, (9) paid personal leave, (10) paid legal fees, (11) paternity leave, (12) maternity leave, and (13) employee counseling. This index ranges from zero (no fringe benefits) to 13 (provision of all of the above-listed benefits) for the business units included in the data base.¹⁸⁰

As noted earlier, incentive pay has sometimes been seen as a substitute for conventional "policing" by supervisors - that is, as a device to reduce shirking. Therefore, as a fourth control variable, it is important to measure the intensity of supervision (IS) in examining the relationship between employee economic participation and businesses' economic performance. To do this, we have constructed an IS index which includes (1) the presence of a formal performance appraisal system, and (2) the presence of a formal program to train personnel to conduct performance appraisals. This index ranges from zero (no appraisal system or training) to 2 (use of appraisal and appraisal training).

The human resource management literature contains a variety of concepts and propositions about "good" policies and practices. One way to summarize these is by the formality of human resource practice (FHR), where formality presumably reduces arbitrary treatment of employees. The index of FHR, used as the fifth control variable, includes (1) the presence of a formal written human resource plan, (2) the presence of a formal job design program, (3) the use of written skill tests in employee selection, (4) the use of written aptitude tests in employee selection, (5) the use of promotion-from-within to

fill nonentry job vacancies, (6) the presence of a formal employee training and development program, (7) the presence of a formal grievance or complaint procedure for the unit's nonunion employees,¹⁸¹ and (8) the conducting of attitude surveys among employees. This index ranges between zero (no programs of the type listed above) and 8 (presence of all of them).

Another dimension of the human resource function is its status, that is, its role in key business decisions. As a proxy for this factor, we have constructed a sixth control variable: the status of the human resource function (SHR) index, a scaled variable the involvement of human resource executives in the business planning process. The index runs from 0 (never involved) to 6 (always involved).

The seventh control variable is recent labor cost pressure (LC). Our index of this influence includes (1) the presence of a two-tier pay schedule, (2) the use of lump-sum cash payments to employees, (3) reported increased domestic competition, (4) reported increased foreign competition, (5) reported increased business deregulation, (6) use of pay freezes or reductions, (7) use of fringe benefit freezes or reductions, and (8) use of workforce reductions. This index ranges from zero (no labor cost pressures of the type listed above) to 8 (all elements of labor cost pressure present). In addition to the seven control variables, our regression estimates also include firm size (SZ) and industrial classification (IC), the latter via the use of industry dummy variables.¹⁸²

***Empirical Results.**

Regression estimates of the economic performance equations using cross-section data are shown separately for clerical and production workers in Table 8. The composite economic participation variable (EP) is positively related to ROI and ROA for the business units included in this study, but the coefficients are insignificant. In the case of productivity (PROD), however, EP is significant for production workers.

TABLE 8: REGRESSIONS RELATED TO ECONOMIC PERFORMANCE OF FIRMS AND ECONOMIC PARTICIPATION OF EMPLOYEES, 1986

Dependent Variable	<u>CLERICAL WORKERS</u>			<u>PRODUCTION WORKERS</u>		
	ROI	ROA	PRUD	ROI	ROA	PROD
Constant	7.61* (2.68)	6.08* (2.23)	180.23* (40.45)	7.39* (2.33)	6.03* (2.18)	211.62* (52.73)
EP	.88 (.52)	.82 (.50)	6.91 (4.36)	.94 (.63)	.85 (.58)	17.88** (8.27)
UNION	-.92 (-.63)	-.75 (-.46)	6.15 (4.37)	-.72 (-.45)	-.79 (-.49)	12.17** (5.87)
NEP	.86 .55	.98 .67	10.53** (4.93)	1.14** (.51)	.94 (.60)	16.63** (7.98)
LC	.70 (.51)	.56 (.42)	8.46 (5.96)	.74 (.57)	.64 (.46)	9.58 (6.54)
FBR	-.46 (-.35)	-.32 (-.20)	4.83 (3.21)	-.64 (-.46)	-.50 (-.37)	8.24 (5.62)
IS	-.40 (-.26)	-.35 (-.22)	8.44 (5.35)	-.48 (-.33)	-.41 (-.30)	9.94 (6.48)
FHR	.48 (.36)	.43 (.31)	8.84 (5.82)	.60 (.40)	.53 (.33)	9.82 (6.44)
SHR	.21 (.14)	.18 (.12)	3.66 (2.31)	.33 (.20)	.26 (.19)	5.33 (3.76)
SZ	-.19 (-.12)	-.21 (-.13)	3.45 (2.31)	-.28 (-.19)	-.25 (-.16)	4.97 (3.27)
IL	a	a	a	a	a	a
R ²	.34	.30	.37	.36	.32	.38
Adjusted R ²	.33	.29	.36	.35	.31	.37
Number of Observations	491	491	491	395	395	395

TABLE 3: (continued)

Dependent Variable	CLERICAL WORKERS			PRODUCTION WORKERS		
	ROI	ROA	PROD	ROI	ROA	PROD
Coefficients for individual pay plans:						
PS	1.23** (.59)	1.04 (.69)	10.63** (4.89)	1.37** (.62)	1.06 (.73)	19.64** (9.13)
GS	.49 (.33)	.42 (.30)	4.09 (3.02)	.44 (.32)	.47 (.33)	8.83 (5.64)
SO	.59 (.41)	.56 (.39)	5.42 (3.36)	.55 (.38)	.52 (.36)	9.59 (6.06)
ESOP	.99 (.63)	1.02 (.66)	7.33 (4.82)	1.05 (.70)	.90 (.62)	14.42** (6.75)
INL	.44 (.29)	.34 (.28)	3.98 (2.34)	.65 (.43)	.61 (.40)	8.37 (5.67)
Coefficients for Individual Noneconomic Participation Plans:						
PART	.67 (.52)	.62 (.46)	1.04** (.48)	.72 (.61)	.69 (.54)	1.16** (.52)
INFO	-.32 (.26)	-.29 (-.30)	-.62 (.53)	-.40 (-.32)	-.27 (-.24)	-.61 (-.47)

*Significant at the 1% level.

**Significant at the 5% level.

△/Includes controls for eight industries.

Note: See text for details of variable definitions. Figures in parentheses are standard errors.

Source: Columbia University human resource study data tapes.

These results are in keeping with a competitive, long-run equilibrium model. As noted earlier, according to such a model, EP and the other control variables may have an impact on the efficiency of the enterprise, but if all competitive enterprises adopt the appropriate policies, there will be no correlation between absolute profitability and the independent variables which measure human resource practices. Of the seven human resource variables in the four regressions involving ROI and ROA, only one instance of a significant coefficient occurs, a finding which we would prefer not to exaggerate since it could simply reflect chance. Despite the seeming accord of the EP index results with long-run competitive equilibrium, it will be shown below that when EP is disaggregated, positive and significant relations between certain components of EP and performance emerge.

EP does appear as positively associated with PROD for production workers, along with UNION and NEP. Since various studies have linked unionization with higher productivity - and since this effect would be enhanced by our lack of control for wage level - we are inclined to interpret this equation as \times suggesting that EP has a productivity-boosting effect, even after standardization for unionization and non-economic participation.

The individual plan coefficients reported on Table 8 suggests that most of the explanatory power of the EP variable comes from profit sharing.¹⁰³ This panel shows the regression coefficients from separate regressions run for each of the EP components separately (along with the other explanatory variables). Not only is profit sharing significant and positive in the PROD equations, but it is also positively and significantly associated with ROI.¹⁰⁴ Our experiment with the alternative specification of the use of noneconomic participation suggests that the explanatory power comes from employee participation rather than information sharing.¹⁰⁵

Trend regressions appear in Table 9. The regression results reported can be interpreted as providing information about the ability to adapt and adjust

TABLE 9: REGRESSIONS RELATED TO FIRMS ECONOMIC PERFORMANCE TREND AND ECONOMIC PARTICIPATION OF EMPLOYEES, 1983-86

Dependent Variable	<u>CLERICAL WORKERS</u>			<u>PRODUCTION WORKERS</u>		
	ROI _T	RUA _T	PROD _T	RUI _T	RUA _T	PROD _T
Constant	7.38* (2.82)	6.21* (2.16)	8.15* (3.03)	7.81* (2.93)	6.69* (2.37)	9.20* (2.86)
EP	1.28** (.59)	1.19** (.53)	1.48** (.66)	1.52* (.49)	1.38** (.63)	2.19* (.82)
UNION	-.66 (1-.42)	-.72 (-.45)	.84 .56	-.91 (-.61)	-.96 (-.64)	2.30* (.86)
NEP	1.36** (.62)	1.20* (.44)	1.33* (.64)	1.46** (.69)	1.43** (.67)	2.12* (.77)
LC	1.11** (.54)	1.05** (.50)	1.16** (.55)	1.28** (.59)	1.22** (.57)	1.58** (.73)
FBR	-.31 (-.19)	-.25 (-.16)	-.33 (-.21)	-.41 (-.28)	-.31 (-.23)	-.60 (-.44)
IS	.36 (.21)	.24 (.17)	.72 (.45)	.40 (.26)	.34 (.22)	.59 (.35)
FHR	1.04** (.47)	.88 (.56)	1.12** (.51)	1.23** (.58)	.96 (.63)	1.32** (.59)
SHR	.56 (.38)	.41 (.24)	.29 (.18)	.69 (.44)	.48 (.32)	.71 (.46)
SZ	-.18 (-.11)	-.23 (-.14)	-1.34** (-.65)	-.33 (-.22)	-.29 (-.17)	-1.54** (-.72)
IC	a	a	a	a	a	a
R ²	.37	.32	.34	.38	.35	.39
Adjusted R ²	.36	.31	.33	.37	.34	.38
Number of Observation	491	491	491	395	395	395

TABLE 9: (continued)

Dependent Variable	<u>CLERICAL WORKERS</u>			<u>PRODUCTION WORKERS</u>		
	RUI _T	RUA _T	PRUD _T	RUI _T	RUA _T	PROD _T
Coefficients for individual plans:						
PS	1.50** (.69)	1.39** (.62)	1.59** (.73)	1.61** (.75)	1.55** (.72)	2.29** (.87)
GS	.61 (.42)	.48 (.34)	.59 (.38)	.60 (.42)	.55 (.38)	.80 (.54)
SU	.87 (.56)	.74 (.49)	.87 (.54)	.95 (.67)	.80 (.55)	1.13** (.52)
ESUP	1.35** (.63)	1.23** (.56)	1.32** (.58)	1.24** (.56)	1.20** (.57)	1.64** (.78)
INC	.67 (.47)	.64 (.42)	.73 (.44)	.72 (.42)	.67 (.40)	.75 (.43)
Coefficients for individual Noneconomic Participation Plans:						
PART	.72 (.46)	.68 (.39)	1.23** (.56)	.77 (.49)	.73 (.46)	1.42** (.68)
INFO	-.37 (-.28)	-.39 (-.25)	-.72 (-.43)	-.38 (-.25)	-.44 (-.31)	-.80 (-.57)

*Significant at the 1% level.

**Significant at the 5% level.

±/Includes eight industry dummies.

Note: See text for details of variable definitions. Figures in parentheses are standard errors.

Source: Columbia University human resource study data tapes.

in a difficult economic period. No matter which measure of improved economic performance is used - ROI_T , ROA_T , and $PROD_T$ - EP appears as a positive and significant influence, along with NEP and LC. The finding that labor cost pressures (LC) in the 1980s led to steps which improved performance in the 1980s seems in keeping with popular impressions of the structural changes which took place during this period. Plan-specific coefficients reported on Table 9 show that the impact of economic participation is dominated by the profit sharing and ESOP components of EP. We take the linkage between economic participation and performance trend as a suggestive result, indicative of the potential of participative measures, both economic and non-economic, to assist enterprises in a period of transition.¹⁸⁴

Conclusions.

The use of alternative pay systems in the American labor market is a result of a complex set of economic, historical, and institutional forces. There is a folk wisdom which has grown up around the different types of plans. For examples, the perils of perverse incentives from simple piece rate schemes are now well known, and the use of such plans has apparently decreased until it is found mainly where the perversities are most controllable or alternatives are not available. Profit sharing is seen as a more general motivator and as a method of making labor costs variable, stabilizing employment, and sharing risks with employees. Gain sharing is the least widely used approach and is often viewed as requiring more elaborate employee decision-making participation than the other pay plans.

Our evidence on profit sharing, both in terms of the practitioner literature and the data analysis, suggests that it does not substitute for other forms of pay. This finding, if true, raises questions about a recent macro argument for profit sharing, i.e., that it will increase labor demand, although the labor cost flexibility argument remains. During difficult transition period of the mid 1980s, firms which featured economic

participation for employees seemed to make the adjustment from recession to recover more easily. Given recent prognostications that firms will be faced with more shocks and greater needs for adaptability in the future,¹⁸⁷ further experimentation with alternative pay systems on the part of U.S. management and labor is desirable.

FOOTNOTES

1. The phrase "human resources" has tended to replace the word "personnel" in recent years, except in the economic literature where the phrase "new economics of personnel" is popular. We use the terms interchangeably in this essay, but tend to use "personnel" when referring to older practices and literature.
2. For example, during 1947-87, output per hour in the nonfarm business sector rose at an annual rate of 2.5%. Real compensation per hour rose at a rate of 2.4% during the same period. Source: U.S. President, Economic Report of the President, February 1988 (Washington: GPO, 1988), p. 300.
3. Robert M. Solow, "Growth Theory and After," American Economic Review, vol. 78 (June 1988), pp. 307-317; Edward F. Denison, Trends in American Economic Growth, 1929-1982 (Washington: Brookings Institution, 1985).
4. John Sheahan, The Wage-Price Guideposts (Washington: Brookings Institution, 1967); Arnold R. Weber and Daniel J.B. Mitchell, The Pay Board's Progress: Wage Controls in Phase II (Washington: Brookings Institution, 1978), pp. 15-17, 28-54.
5. Harry C. Katz, Thomas A. Kochan, and Jeffrey H. Keefe, "Industrial Relations and Productivity in the U.S. Automobile Industry," Brookings Papers on Economic Activity (3:1987), pp. 685-715; Lester C. Thurow, "Economic Paradigms and Slow American Productivity Growth," Eastern Economic Journal, vol. 13 (October-December 1987), pp. 333-343; Thomas E. Wiesskopf, Samuel Bowles, and David M. Gordon, "Hearts and Minds: A Social Model of U.S. Productivity Growth," Brookings Papers on Economic Activity (2:1983), pp. 381-441.
6. For a recent exception, see Ronald G. Ehrenberg and George T. Milkovich, "Compensation and Firm Performance" in Morris M. Kleiner, Richard N. Block, Myron Roomkin, and Sidney W. Salshurg, eds., Human Resources and the Performance of the Firm (Madison, Wisc.: Industrial Relations Research Association, 1987), pp. 87-122.
7. Armen A. Alchian and Harold Demsetz, "Production, Information Costs, and Economic Organization," American Economic Review, vol. 62 (December 1972), pp. 777-795.
8. Audrey Freedman, "How the 1980s Have Changed Industrial Relations," Monthly Labor Review, vol. 111 (May 1988), pp. 35-38.
9. In the late 1960s and early 1970s, about 40-45% of college freshmen identified "being very well off financially" as very important or essential as a life goal. By the mid 1980s, the figure had risen to over 70%. See Alexander W. Astin, Kenneth C. Green, and William S. Korn, The American Freshman: Twenty Year Trends (Los Angeles: UCLA Graduate School of Education, Higher Education Research Institute, 1987), pp. 23-24.
10. A survey may be found in a symposium on "The New Economics of Personnel" in the Journal of Labor Economics, vol. 5 (October 1987), Part 2.
11. Katherine G. Abraham and Henry S. Farber, "Job Duration, Seniority, and Earnings," American Economic Review, vol. 77 (June 1987), pp. 278-297; Robert E. Hall, "The Importance of Lifetime Jobs in the U.S. Economy," American Economic Review, vol. 72 (September 1982), pp. 716-724.

12. Daniel J.B. Mitchell, "Wages and Keynes: Lessons from the Past," Eastern Economic Journal, vol. 12 (July-September 1986), pp. 199-208.
13. Martin L. Weitzman, The Share Economy: Conquering Stagflation (Cambridge, Mass.: Harvard University Press, 1984).
14. ESOPs in their standard American form do not possess the macroeconomic properties sought by Weitzman, although they may - of course - have desirable microeconomic properties. Meade has proposed an alternative ESOP arrangement under which workers have shares only when employed, thus making the ESOP more like profit sharing. See J.E. Meade, Alternative Systems of Business Organization and of Workers' Remuneration (Boston: Allen & Unwin, 1986), pp. 115-119.
15. See, for example, U.S. General Accounting Office, Employee Stock Ownership Plans: Little Evidence of Effects on Corporate Performance, GAO/PEMD-88-1 (Washington: GAO, 1987).
16. James F. Lincoln, Lincoln's Incentive System (New York: McGraw-Hill Book Co., 1946). Additional reference to the Lincoln Electric case will be made later in the text.
17. Modern personnel texts often omit descriptions of these various plans. However, they were still described in detail in texts through the 1950s. For details on the various plan formulas, see - as an example - William W. Waite, Personnel Administration (New York: Ronald Press Co., 1952), pp. 293-310.
18. Walter Dill Scott, Robert C. Clothier, and William R. Spriegel, Personnel Management: Principles, Practices, and Point of View, sixth edition (New York: McGraw-Hill Book Co., 1961), pp. 572-573.
19. Richard B. Freeman and Martin L. Weitzman, "Bonuses and Employment in Japan," Journal of the Japanese and International Economies 1:1987, pp. 168-194. Not all researchers accept the view that the Japanese bonus system produces Weitzman-type macroeconomic effects. See, for example, Sushil B. Wadhvani, "The Macroeconomic Implications of Profit Sharing: Some Empirical Evidence," Economic Journal, vol. 97 (Conference 1987), supplement, pp. 171-183.
20. Hewitt Associates, 1987 Profit Sharing Survey (1986 Experience) (Lincolnshire, Ill.: Hewitt Associates, 1987), pp. 12-13.
21. "Long Range Sharing Plan for Kaiser Steel Employees," Monthly Labor Review, vol. 96 (February 1963), pp. 154-160.
22. Carla O'Dell and Jerry McAdams, People, Performance, and Pay (Houston: American Productivity Center, 1987), p. 8.
23. U.S. Bureau of Labor Statistics, Characteristics of Major Collective Bargaining Agreements, January 1, 1980, bulletin 2095 (Washington: GPO, 1981), pp. 40-41, 49.
24. The quote in the text - by a management attorney - appears in "Union Input is Viable Tool in Mergers, Acquisitions, Banker Says," Daily Labor Report, June 8, 1988, p. A2.
25. See, for example, John L. Zalusky, "Labor's Collective Bargaining Experience with Gainsharing and Profit-Sharing" in Barbara D. Dennis, ed., Proceedings of the Thirty-Ninth Annual Meeting, Industrial Relations Research

26. To the extent that there has been any survey work, it has tended to involve stock ownership rather than profit sharing. One study of workers in a concession bargaining situation suggested that they did not put high priority on preserving already-existing stock ownership as compared to more traditional wage, benefit, and job security features of their contract. See James B. Dworkin, Sidney P. Feldman, James M. Brown, and Charles J. Hobson, "Workers' Preferences in Concession Bargaining," Industrial Relations, vol. 27 (Winter 1988), p. 13. On the other hand, survey data has been cited suggesting that two thirds of American workers would prefer working at a firm with substantial worker ownership. See Derek C. Jones, "Alternative Sharing Arrangements: A Review of Their Effects and Some Policy Implications for the U.S.," Economic and Industrial Democracy, vol. 8 (November 1987), p. 493.

27. Data for Table 1 were drawn by Mitchell from biweekly contract listings appearing in the Daily Labor Report, a publication of the Bureau of National Affairs, Inc. The construction industry is excluded from the table because the casual linkage between employer and employee in the industry makes implementation of contractual features such as fixed bonuses and profit sharing difficult. In addition, escalator clauses are comparatively rare in construction.

28. Bureau of National Affairs, Inc., Basic Patterns in Union Contracts, eleventh edition (Washington: BNA, 1986), pp. 122-123, 125.

29. U.S. Bureau of Labor Statistics, Employee Benefits in Medium and Large Firms, 1986, bulletin 2281 (Washington: GPO, 1987), p. 81. Some deferred profit sharing plans may have involved contributions to an ESOP. However, because ordinary ESOP plans cover relatively few workers in this survey, most deferred profit sharing can be assumed to have gone into other investment vehicles. (Most of the workers covered by stock ownership plans in the survey were under payroll-based plans - a scheme encouraged by the tax code of that period - which involves payments of a (small) fixed proportion of payroll).

30. John Howell Cox, "Time and Incentive Pay Practices in Urban Areas," Monthly Labor Review, vol. 94 (December 1971), pp. 53-56.

31. Norma W. Carlson, "Time Rates Tighten Their Grip on Manufacturing Industries," Monthly Labor Review, vol. 105 (May 1982), pp. 15-22.

32. Gain sharing tends to occur in smaller firms. And there seem to be relatively few such plans in use. See General Accounting Office, Productivity Sharing Programs: Can They Contribute to Productivity Improvement?, AFMD-81-22 (Washington: GAO, 1981).

33. See J.J. Jehring, "The Development of the Profit Sharing Idea in the U.S." in J.J. Jehring, William J. Howell, Jr., and L. Reed Tripp, A New Approach to Collective Bargaining?: Progress Sharing at American Motors (Madison, Wisc.: Center for Productivity Motivation, University of Wisconsin, 1962), pp. 1-23, especially p. 5; Great Britain, Board of Trade, Report by Mr. D. F. Schloss on Profit Sharing (London: HMSO, 1894), p. 25, 161.

34. Charles Babbage, On the Economy of Machinery and Manufactures (Philadelphia: Carey and Lee, 1832), pp. 160-161.

35. Nicholas Paine Gilman, Profit Sharing Between Employer and Employee: A Study in the Evolution of the Wage System (Boston: Houghton, Mifflin and Co., 1891), p. 7; Francis A. Walker, The Wages Question: A Treatise on Wages and the Wages Class (New York: Henry Holt and Co., 1876), p. 282.
36. W. Stanley Jevons, The State in Relation to Labour (New York: Macmillan and Co., 1887), p. 142.
37. U.S. Commissioner of Labor, The First Annual Report of the Commissioner of Labor (Washington: GPO, 1886), p. 293. Carroll D. Wright, a noted progressive reformer of the period was then commissioner.
38. See, for example, Louis O. Kelso and Patricia Hetter Kelso, Democracy and Economic Power: Extending the ESOP Revolution (Cambridge, Mass.: Ballinger Publishing Co., 1986).
39. Karl Marx, Capital: A Critique of Political Economy (New York: Modern Library, 1906), p. 605.
40. Adam Smith, An Inquiry into the Nature and Causes of the Wealth of Nations (New York: Modern Library, 1937), pp. 81-82.
41. Alfred Marshall, Principles of Economics, ninth (variorum) edition (New York: Macmillan Co., 1960 [1920]), pp. 625-626.
42. Ordway Tead, Human Nature and Management: The Applications of Psychology to Executive Leadership (New York: McGraw-Hill Book Co., 1929), p. 12.
43. Frederick W. Taylor, The Principles of Scientific Management (New York: Harper & Brothers Publishers, 1911), pp. 7-10. A sample of writings concerning Taylorism can be found in Clarence Bertrand Thompson, ed., Scientific Management: A Collection of the More Significant Articles Describing the Taylor System of Management (Cambridge, Mass.: Harvard University Press, 1914).
44. Samuel Haber, Efficiency and Uplift: Scientific Management in the Progressive Era, 1890-1920 (Chicago: University of Chicago Press, 1964).
45. Robert Franklin Hoxie, Scientific Management and Labor (New York, D. Appleton and Co., 1916), p. 117.
46. Horace Bookwalter Drury, Scientific Management: A History and Criticism (New York: Columbia University Press, 1915), p. 168.
47. U.S. Census Office, Department of the Interior, Report on Manufacturing Industries in the United States at the Eleventh Census: 1890 (Washington: GPO, 1895), Part 1, pp. 13, 20.
48. Stanley Lebergott, "The American Labor Force" in Lance E. Davis, Richard A. Easterlin, and William N. Parker, eds., American Economic Growth: An Economist's History of the United States (New York: Harper & Row, 1972), p. 200.
49. John H. Pencavel, "Work Effort, On-the-Job Screening, and Alternative Methods of Remuneration" in Ronald G. Ehrenberg, ed., Research in Labor Economics, vol. 1 (Greenwich, Conn.: JAI Press, 1977), p. 229.
50. National Industrial Conference Board, Systems of Wage Payment (New York: NICB, 1930), pp. 5-9.

51. It has been noted that growth in firm size in the late 19th century made direct supervision more difficult. Hence, firms sought ways of using the pay system to reduce the need for supervision by providing automatic incentives. That was not exactly what Taylor had in mind, but his early emphasis on the differential piece rate may have suggested that use of any piece rate system was somehow scientific. See E.J. Hobsbawn, "Custom, Wages and Work Load in Nineteenth Century Industry" in Peter N. Stearns and Daniel J. Walkowitz, eds., Workers in the Industrial Revolution: Recent Studies of Labor in the United States and Europe (New Brunswick, N.J.: Transaction, Inc., 1974), p. 245.

52. J.E. Walters, Applied Personnel Administration (New York: John Wiley & Sons, 1931), p. 143.

53. Ordway Tead, Human Nature and Management: The Applications of Psychology to Executive Leadership (New York: McGraw-Hill Book Co., 1929), p. 261. This idea remained a constant in the personnel literature. For example, in the immediate post-World War II period, an article on incentives listed elements of good practice. The first question was "Does your base-wage rate meet standards for the area in which your plant is located, for your industry, for specific jobs?" See "Pay Plans for Higher Production," Modern Industry, vol. 11 (April 15, 1946), p. 56.

54. George A. Akerlof, "Labor Contracts as Partial Gift Exchanges," Quarterly Journal of Economics, vol. 97 (November 1982), pp. 543-569. As George Strauss notes, the gift exchange for employee loyalty need not involve a sharing arrangement; it could simply entail a higher-than-market wage. See his "Participatory and Gainsharing Systems: History and Hope," unpublished organizational behavior and industrial relations working paper no. OBIR-17, School of Business, University of California, Berkeley, January 1987, p. 16.

55. See George W. Torrence, The Motivation and Measurement of Performance (Washington: Bureau of National Affairs, Inc., 1967), p. 36. A 25% rule of thumb also appears in Claude Edward Thompson, Personnel Management for Supervisors (New York: Prentice-Hall, 1948), p. 132.

56. A.M. Simons, Personnel Relations in Industry (New York: Ronald Press Co., 1921), p. 213; Walter Dill Scott and Robert C. Clothier, Personnel Management: Principles, Practices, and Points of View (Chicago: A.W. Shaw, 1923), p. 397.

57. National Civic Federation, Profit Sharing by American Employers (New York: National Civic Federation, 1920).

58. Arthur W. Burritt, Henry S. Dennison, Edwin F. Gay, Ralph E. Heilman, and Henry P. Kendall, Profit Sharing: Its Principles and Practice (New York: Harper & Brothers, 1918), pp. 53-60; Daniel Bloomfield, ed., Financial Incentives for Employees and Executives, vol. II (New York: H.W. Wilson, 1923), pp. 58-59.

59. Arthur W. Burritt, Henry S. Dennison, Edwin F. Gay, Ralph E. Heilman, and Henry P. Kendall, Profit Sharing: Its Principles and Practice (New York: Harper & Brothers, 1918), p. 8. The idea of profit sharing payments being an amount above the going wage is a continuing theme. For example, a textbook published three decades later indicates that profit sharing payments should be "over the normal remuneration that should otherwise be paid to... employees in the given situation." See Walter Dill Scott, Robert C. Clothier, and William R. Spriegel, Personnel Management: Principles, Practices, and Point of View, fourth edition (New York: McGraw-Hill Book Co., 1949), p. 385.

60. Boris Emmet, Profit Sharing in the United States, U.S. Bureau of Labor Statistics, bulletin 208 (Washington: GPO, 1917). See also National Industrial Conference Board, Practical Experience with Profit Sharing in Industrial Establishments, research report no. 20 (Boston: NICB, 1920).
61. Sanford M. Jacoby, Employing Bureaucracy: Managers, Unions, and the Transformation of Work in American Industry: 1900-1945 (New York: Columbia University Press, 1985), pp. 198-199.
62. David A. McCabe, The Standard Rate in American Trade Unions (Baltimore: Johns Hopkins Press, 1912).
63. Daniel Bloomfield, ed., Financial Incentives for Employees and Executives, vol. I (New York: H.W. Wilson, 1923), p. 5.
64. The Taylor Society, Scientific Management in American Industry (New York: Harper & Brothers Publishers, 1929), pp. 18-21.
65. Carroll D. Wright, Regulation and Restriction of Output, eleventh special report of the Commissioner of Labor (Washington: GPO, 1904).
66. Stanley B. Mathewson, Restriction of Output Among Unorganized Workers (Carbondale, Ill.: Southern Illinois University Press, 1969 [1931]), pp. 53-54.
67. Walter Dill Scott and M.H.S. Hayes, Science and Common Sense in Working with Men (New York: The Ronald Press, 1921).
68. Ordway Tead and Henry C. Metcalf, Personnel Administration: its Principles and Practice, first edition (New York: McGraw-Hill Book Co., 1920), pp. 14-15.
69. Ordway Tead, Human Nature and Management: The Applications of Psychology to Executive Leadership (New York: McGraw-Hill Book Co., 1929), pp. 242-253.
70. Walter Dill Scott and Robert C. Clothier, Personnel Management: Principles, Practices, and Points of View (Chicago: A.W. Shaw Co., 1923), p. 114.
71. Comment by Carroll E. French reported in Richard Stephen Uhrbrock, A Psychologist Looks at Wage-Incentive Methods (New York: American Management Association, 1935), p. 31.
72. F.J. Roethlisberger and William J. Dickson, Management and the Worker: An Account of a Research Program Conducted by the Western Electric Company, Hawthorne Works, Chicago (Cambridge, Mass.: Harvard University Press, 1967 [1939]). The studies were undertaken during 1927-32. Although the full report appeared in 1939, earlier summaries of the research were available as early as 1934. See especially pp. 590-604. The quote appears on p. 598.
73. Jean L. Shepard, Human Nature at Work (New York: Harper & Brothers Publishers, 1938), p. 217. The author was a personnel executive at Lord & Taylor.
74. Sanford M. Jacoby, "Employee Attitude Surveys in Historical Perspective," Industrial Relations, vol. 27 (Winter 1988), pp. 74-93.
75. Daniel Nelson, "Scientific Management and the Workplace, 1920-30" in Sanford M. Jacoby, ed., Managing the Workplace: A New Approach to Industrial History (New York: Columbia University Press, 1989), forthcoming.

76. A survey by the National Industrial Conference Board in 1935 showed about the same percentage (56%) of time workers in manufacturing as in 1924. But the proportion of piece rate workers fell from 37% to 22%. The big growth was in workers covered by "premium and bonus systems" Although these systems are not clearly defined, they probably included discretionary rather than formula bonuses in many cases. In addition, the proportion of time workers in 1935 was higher than in 1928 when it stood at 47%. See National Industrial Conference Board, Financial Incentives: A Study of Methods for Stimulating Achievement in Industry (New York: NICB, 1935), p. 17; National Industrial Conference Board, Systems of Wage Payment (New York: NICB, 1930), p. 8.

77. A National Industrial Conference Board survey in 1939 found that 52% of a sample of companies reported the use of wage incentives for some of their employees, down from 75% in a similar survey in 1935. See National Industrial Conference Board, Some Problems in Wage Incentive Administration, studies in personnel policy no. 19 (New York: NICB, 1940), p. 10.

78. National Industrial Conference Board, Financial Incentives: A Study for Stimulating Achievement in Industry (New York: NICB, 1935), pp. 34-39.

79. An example of the union approach to incentives during this period can be found in United Electrical, Radio & Machine Workers of America, U.E. Guide to Wage Payment Plans, Time Study, and Job Evaluation (New York: UE, 1943).

80. William B. Wolf, Wage Incentives as a Managerial Tool (New York: Columbia University Press, 1957), p. 68.

81. J.K. Loudon, Wage Incentives (New York: John Wiley and Sons, 1944), pp. 9-10.

82. "Pay Plans for Higher Production," Modern Industry, vol. 11 (April 15, 1946), p. 52.

83. National Industrial Conference Board, Some Problems in Wage Incentive Administration, studies in personnel policy no. 19 (New York: NICB, 1949), pp. 20-21; Phil Carroll, Better Wage Incentives (New York: McGraw-Hill Book Co., 1957), p. 6.

84. Van Dusen Kennedy, Union Policy and Incentive Wage Methods (New York: Columbia University Press, 1945), p. 63. See also U.S. Bureau of Labor Statistics, Incentive-Wage Plans and Collective Bargaining, bulletin 717 (Washington: GPO, 1942), pp. 9-14.

85. About 30% of "plant workers" in manufacturing were reported to be on wage incentive plans during 1945-46. See Joseph M. Sherman, "Incentive Pay in American Industry," Monthly Labor Review, vol. 65 (November 1947), pp. 535-538.

86. See, for example, William Foote Whyte et al, Money and Motivation: An Analysis of Incentives in Industry (New York: Harper & Brothers, 1955).

87. Malcolm P. McNair, "Thinking Ahead," Harvard Business Review, vol. 35 (March-April 1957), pp. 15-16, 20, 25-34, 39. The quote is from p. 15. See also Robert N. McMurry, "The Case for Benevolent Autocracy," Harvard Business Review, v. 36 (January-February 1958), pp. 82-90.

88. For an example, see Benjamin W. Niebel, Motion and Time Study, fourth edition (Homewood, Ill.: Richard D. Irwin, Inc., 1967), pp. 532-534. This text refers to the use of "indirect", i.e., discretionary, rewards. But these

are described as likely to be ineffective and the reader is referred to personnel texts should there remain any interest in information about such arrangements.

89. Theodore A. Toedt, Lawrence C. Lovejoy, Richard M. Story, Jr., and Dorian Shainin, Managing Manpower in the Industrial Environment (Dubuque, Iowa: Wm. C. Brown Company Publishers, 1962), p. 719.

90. H.K. von Kaas, Making Wage Incentives Work (No city: American Management Association, 1971), p. 6.

91. Garth L. Mangum, "Are Wage Incentives Becoming Obsolete?," Industrial Relations, vol. 2 (October 1962), pp. 73-96. Mangum argued that automation would eventually end wage incentives but the trend was being slowed by the fact that "the incentive philosophy is deeply ingrained in many industries." (p. 96) Similar views can be found in Robert B. McKersie, Carroll F. Miller, Jr., and William E. Quarterman, "Some Indicators of Incentive Plan Prevalence," Monthly Labor Review, vol. 87 (March 1964), pp. 271-276.

92. Martin Brown and Peter Philips, "The Decline of Piece Rates in California Canneries: 1890-1960," Industrial Relations, vol. 25, Winter 1986, pp. 81-91.

93. J.E. Walters, Personnel Relations: Their Application in a Democracy (New York: The Ronald Press, 1945), pp. 144-145.

94. Wilfred Brown, Piecework Abandoned: The Effect of Wage Incentive Systems on Managerial Authority (London: Heinemann, 1962), p. 26.

95. National Industrial Conference Board, Profit Sharing (New York: NICB, 1934), p. 22.

96. Boris Emmet, Profit Sharing in the United States, U.S. Bureau of Labor Statistics bulletin 208 (Washington: GPO, 1917), p. 6, footnote 1.

97. U.S. Senate, Survey of Experiences in Profit Sharing and Possibilities of Incentive Taxation, Hearings, November 21 to December 14, 1938, 75th congress, 3rd session (Washington: GPO, 1939), pp. 104-109, 189-199.

98. U.S. Senate, Survey of Experiences in Profit Sharing and Possibilities of Incentive Taxation, Report, 76th congress, 1st session (Washington: GPO, 1939), pp. 129-130.

99. Kenneth M. Thompson, Profit Sharing: Democratic Capitalism in American Industry (New York: Harper & Brothers Publishers, 1949), pp. 226-227.

100. Sanford M. Jacoby, Employing Bureaucracy: Managers, Unions, and the Transformation of Work in American Industry, 1900-1945 (New York: Columbia University Press, 1985), p. 266.

101. Bryce M. Stewart and Walter J. Couper, Profit Sharing for Wage Earners and Executives (New York: Industrial Relations Counselors, 1951), p. 11.

102. P.A. Knowlton, Profit Sharing in Practice: Report on Visits to Profit-Sharing Establishments (Revised) (No City: Profit-Sharing Research Foundation, 1953), p. 1.

103. For the business reaction, see Chamber of Commerce of the United States, Reuther's Profit-Sharing Demand (Washington: Chamber of Commerce, 1958).

104. J.J. Jehring, William J. Howell, Jr., and L. Reed Tripp, A New Approach to Collective Bargaining?: Progress Sharing at American Motors (Madison, Wisc.: Center for Productivity Motivation, University of Wisconsin, 1962).

105. The "current emphasis on cost reduction" was cited in the early 1960s as a factor explaining a renewal of interest in alternative pay systems. See Robert B. McKersie, "Wage Payment Mechanisms of the Future," British Journal of Industrial Relations, vol. 1 (June 1963), pp. 191-212. The quote is on p. 192.

106. Sumner H. Slichter, Towards Stability: The Problem of Economic Balance (New York: Henry Holt and Co., 1934), pp. 139-142.

107. National Industrial Conference Board, Profit-Sharing and Other Supplementary-Compensation Plans Covering Wage Earners, studies in personnel no. 2 (New York: NICB, 1937), p. 12.

108. Willford I. King, The Causes of Economic Fluctuations: Possibilities of Anticipation and Control, revised printing (New York: The Ronald Press Co., 1941), pp. 324-330b. King was a well known business cycle researcher at the National Bureau of Economic Research and elsewhere. He felt his proposal went further than the standard profit sharing plans of the period in that he proposed sharing losses as well as gain. The actual distinction is not clear. It might be noted that in the late 19th century, Carroll Wright, the first U.S. Commissioner of Labor, linked profit sharing with employment stabilization, although he did not explain the linkage. See U.S. Commissioner of Labor, The First Annual Report of the Commissioner of Labor (Washington, GPO, 1886), p. 281.

109. See, for example, Walter Dill Scott, Robert C. Clothier, and William R. Spriegel, Personnel Management: Principles, Practices, and Point of View, fourth edition (New York: McGraw-Hill Book Co., 1949), p. 389; Kenneth M. Thompson, Profit Sharing: Democratic Capitalism in American Industry (New York: Harper & Brothers Publishers, 1949), p. 7.

110. William B. Wolf, Wage Incentives as a Managerial Tool (New York: Columbia University Press, 1957), pp. 68-69.

111. Great Britain, Board of Trade, Report on Gain-Sharing and Certain Other System of Bonus on Production (London: Her Majesty's Stationery Office, 1895).

112. For a history and background, see Frederick G. Lesieur, ed., The Scanlon Plan: A Frontier in Labor-Management Cooperation (Cambridge, Mass.: Technology Press of Massachusetts Institute of Technology, 1958).

113. Ordway Tead and Henry C. Metcalf, Personnel Administration: Its Principles and Practice, 3rd ed. (New York: McGraw-Hill Book Co., 1933), p. 304.

114. Researchers at MIT, in particular, reported on case studies of use of the Scanlon plan. (Scanlon had become a staff member of the MIT Industrial Relations Section). See, for example, George P. Shultz, "Worker Participation on Production Problems: A Discussion of Experience with the 'Scanlon Plan'", Personnel, vol. 28, Nov. 1951, pp. 201-211.

115. Paul Pigors and Charles A. Myers, Personnel Administration: A Point of View and a Method, second edition (New York: McGraw-Hill Book Co., 1951), pp. 344-349.

116. George Strauss and Leonard R. Sayles, Personnel: The Human Problems of Management, second edition (Englewood Cliffs, NJ: Prentice-Hall, 1967), p. 681.

117. As noted above, 22% of the full-time workforce in medium and large firms had profit sharing in 1986. This proportion was the same for the three occupational categories reported: professional-administrative, technical-clerical, and production workers. Unfortunately, the surveys taken earlier in the decade report coverage by profit sharing in a different fashion, namely the percent of full-time workers in establishments in which all workers were covered by profit sharing. This estimate omits workers under plans with less than full coverage. In 1981, the figures for coverage by plans for all workers in the three groups were, respectively, 20%, 21%, and 13%. See U.S. Bureau of Labor Statistics, Employee Benefits in Medium and Large Firms, 1981, bulletin 2140 (Washington: GPO, 1982), pp. 39-40. The production worker figure jumped with the 1983 survey, coinciding with the implementation of profit sharing in the auto industry.

118. Twenty-eight percent of the sample had incentive provisions (other than prohibitions and requirements for advance approval by unions) in the 1979 survey, versus 29% in the 1986 survey. The proportion of contracts prohibiting incentives or requiring advance union approval increased over this period. See Bureau of National Affairs, Inc., Basic Patterns in Union Contracts, ninth edition (Washington: BNA, 1979), pp. 103-104; Bureau of National Affairs, Inc., Basic Patterns in Union Contracts, eleventh edition (Washington: BNA, 1986), pp. 122-123, 125.

119. Edward P. Lazear, "Salaries and Piece Rates," Journal of Business, vol. 59 (July 1986), pp. 405-431.

120. Robert H. Frank, "Are Workers Paid their Marginal Products?", American Economic Review, vol. 74 (September 1984), pp. 549-571.

121. Edward P. Lazear, "Salaries and Piece Rates," Journal of Business, vol. 59 (July 1986), pp. 422-425.

122. The model suggested here was applied in a different context in Murray L. Schwartz and Daniel J.B. Mitchell, "An Economic Analysis of the Contingent Fee in Personal-Injury Litigation," Stanford Law Review, vol. 22 (June 1970), pp. 1125-1162; and Daniel J.B. Mitchell and Murray L. Schwartz, "Theoretical Implications of Contingent Legal Fees," Quarterly Review of Economics and Business, vol. 12 (Spring 1972), pp. 69-76. It was extended in Kevin M. Clermont and John D. Currihan, "Improving on the Contingent Fee," Cornell Law Review, vol. 63 (April 1978), pp. 529-639. Incentive schemes with discontinuities sometimes have desirable properties in other contexts. See Alan S. Blinder and Harvey S. Rosen, "Notches," American Economic Review, vol. 75 (September 1985), pp. 736-747. However, the incentive case in the text starts with the assumption of monitoring costs which give rise to shirking and contract enforcement problems. In the Blinder-Rosen model, the incentive schemes considered (for example, tax subsidies to charitable giving) work in the right direction (all encourage more giving), but notch schemes may be more efficient than continuous subsidies. By contrast, the continuous incentive scheme in the text can work in the wrong direction (reduced work effort).

123. Gary S. Becker, The Economic Approach to Human Behavior (Chicago: University of Chicago Press, 1976), pp. 253-281, especially p. 270.

124. U.S. Bureau of Labor Statistics, Effect of Incentive Payments on Hourly Earnings, bulletin no. 742 (Washington: GPO, 1943), p. 1; William B. Wolf, Wage Incentives as a Managerial Tool (New York: Columbia University Press, 1957), pp. 21-24.

125. Sandra L. King, "Incentive and Time Pay in Auto Dealer Repair Shops," Monthly Labor Review, vol. 98 (September 1975), pp. 45-48. There may be internal equity issues which keep time and incentive workers in separate establishments, apart from the influence of sorting.

126. John H. Pencavel, "Work Effort, On-the-Job Screening, and Alternative Methods of Remuneration" in Ronald G. Ehrenberg, ed., Research in Labor Economics, vol. 1 (Greenwich, Conn.: JAI Press, 1977), pp. 225-258, especially 241-248. Pencavel's data were not drawn from BLS industry wage surveys, but from a special survey undertaken by Rees and Shultz in the Chicago area in the 1960s. See Albert Rees and George P. Shultz, Workers and Wages in an Urban Labor Market (Chicago: Univ of Chicago Press, 1970).

127. Eric Seiler, "Piece Rate vs. Time Rate: The Effect of Incentives on Earnings," Review of Economics and Statistics, vol. 66 (August 1984), pp. 363-376. Seiler measures risk by within firm variance of incentive vs. time wages. He regresses the firm wage premium for incentive pay against the difference in the two variances and uses the coefficient of the difference in variance as a proxy for the risk premium. Since these regressions cross occupational lines, questions are raised about the results. He reports that within occupational groups the proportion of the differential attributable to risk rose, but states - without further explanation - that the more aggregated regressions are probably more accurate (pp. 374-375).

128. Charles Brown, "Firms' Choice of Method of Pay," unpublished working paper, University of Michigan, November 1987.

129. Brown's finding does not mean that use of a merit system cannot improve employee performance. There is some evidence that employee performance does respond to merit awards and that the response increases with the amount of money placed in the merit program. See Richard E. Kopelman and Leon Reinhardt, "Research Results: The Effect of Merit-Pay Practices on White Collar Performance," Compensation Review, vol. 14 (Fourth Quarter, 1982), pp. 30-40.

130. The industries used were structural clay products, corrugated boxes, motor vehicle parts, men's and boy's suits and coats, boys' shirts and nightwear, iron and steel (gray iron), iron and steel (malleable), iron and steel (foundries), pressed glass (containers), hosiery mills (except womens'), and hosiery (womens'). Only one wage survey - the latest available - was used for an industry. Hence, the industry dummies captured both industry and time. No separate time dummies were included.

131. Regions used were northeast (New England and Mid Atlantic), midwest (middle west, North Central, Great Lakes), south (border, southwest, southeast), and west (mountain, Pacific).

132. It is really not correct to extrapolate the regression coefficients of Table 2 to situations with 0% or 100% coverage. Our methodology screened out such cases, since we deliberately included only cases where there was a mix of incentive and non-incentive workers so that a comparison pair could be obtained. It should be noted that the pairing technique means that the incentive plan dummy is orthogonal to all of the other independent variables

and, hence, its coefficient is unaffected by the presence of those variables. However, the coefficient of the proportion of incentive workers is not orthogonal to the region and industry variables and, hence, these variables must be included to obtain an accurate estimate of that coefficient.

133. The assistance of Martin Personick and George L. Stelluto of the BLS in obtaining the files is gratefully acknowledged.

134. Large size is defined as 100 or more employees in furniture and 250 or more employees in structural clay products.

135. David A. Weeks, Compensating Field Sales Representatives, personnel policy study no. 202 (New York: National Industrial Conference Board, 1966), p. 41; Carla O'Dell and Jerry McAdams, People, Performance, and Pay (Houston: American Productivity Center, 1987), pp. 75-83. Data on hours worked are not available in these studies, hence it is not possible to tell whether commissioned sales workers work longer hours than those under time-based pay.

136. Douglas L. Kruse, "Profit-Sharing and Employment Variability: Microeconomic Evidence," unpublished working paper, Department of Economics, Harvard University, November 1987.

137. Felix R. FitzRoy and Kornelius Kraft, "Cooperation, Productivity, and Profit Sharing," Quarterly Journal of Economics, vol. 102, February 1987, pp. 23-35; Felix R. FitzRoy and Kornelius Kraft, "Profitability and Profit-Sharing," Journal of Industrial Economics, vol. 35 (December 1986), pp. 113-130.

138. Jacques Lefebvre, Saul Estrin, and Derek C. Jones, "The Effects of Workers' Participation on Enterprise Performance," International Journal of Industrial Organisation, vol. 3 (June 1985), pp. 197-217; Derek C. Jones and Jan Svejnar, "Participation, Profit Sharing, Worker Ownership and Efficiency in Italian Producer Cooperatives," Economica, vol. 52, November 1985, pp. 449-465.

139. Recently, a similar survey by BLS has been developed, but it, too, fails to separate profit sharing from other types of payments. The new survey is drawn from the establishments used to compute the BLS' Employment Cost Index. We urge the BLS to consider adding more detailed questions on alternative pay systems to this survey.

140. We urge the Chamber to change its policy. Data access need not involve a loss of confidentiality for survey respondents and outside access would add credibility to the Chamber's data.

141. Douglas L. Kruse, "Profit-Sharing and Productivity: Microeconomic Evidence," working paper, Institute of Management and Labor Relations, Rutgers University, August 1988.

142. Allen Cheadle, "Incentives, Flexibility or ?: Explaining Patterns of Profit Sharing Activity," unpublished working paper, Department of Health Services, University of Washington, May 1988.

143. The data appear in National Industrial Conference Board, Fringe Benefit Packages, studies in personnel policy no. 143 (New York: NICB, 1954). Obviously, the coding scheme, and the equal weighting of the three plans, is somewhat arbitrary. See footnote 144 below for additional experiments with the data format. Information on plan details or employer expenditures on them are not available.

144. Thomas A. Kochan and Richard N. Block, "An Interindustry Analysis of Bargaining Outcomes: Preliminary Evidence from Two-Digit Industries," Quarterly Journal of Economics, vol. 91 (August 1977), pp. 431-452. Other examples include John C. Anderson, "Determinants of Bargaining Outcomes in the Federal Government of Canada," Industrial and Labor Relations Review, vol. 32 (January 1979), pp. 224-241; Paul F. Gerhart, "Determinants of Bargaining Outcomes in Local Government Labor Negotiations," Industrial and Labor Relations Review, vol. 29 (April 1976), pp. 331-351; Thomas A. Kochan and Hoyt N. Wheeler, "Municipal Collective Bargaining: A Model and Analysis of Outcomes," Industrial and Labor Relations Review, vol. 29 (October 1975), pp. 46-66; John C. Anderson, "Bargaining Outcomes: An IR Systems Approach," Industrial Relations, vol. 18 (Spring 1979), pp. 127-143; Peter Feuille, Wallace E. Hendricks, and Lawrence M. Kahn, "Wage and Nonwage Outcomes in Collective Bargaining: Determinants and Tradeoffs," Journal of Labor Research, vol. 2 (Spring 1981), pp. 39-53; Jack Fiorito and Wallace E. Hendricks, "Union Characteristics and Bargaining Outcomes," Industrial and Labor Relations Review, vol. 40 (July 1987), pp. 569-584.

145. The index was coded 1 for firms of less than 250 employees, 2 for those with 250-499, 3 for 500-999, 4 for 1000-4999, 5 for 5000-9999, and 6 for 10,000 employees and over.

146. Some readers may question the use of ordinary least squares regressions, given the nature of the dependent variables. We experimented with multinomial logit equations and - bifurcating the fringe and pension indexes - with probit. The computer had difficulty converging using logit but the resulting equations did not indicate a significant profit sharing effect. The probit equations also did not indicate a significant profit sharing effect.

147. The other variables were a dummy for the presence of union bargaining, a dummy for location in a metropolitan area, dummies for 67 two-digit industries, 3 regional dummies (northeast, north central, south, and west), and 8 dummies for size of firm (less than 50 employees, 50-99, 100-249, 250-499, 500-999, 1000-2499, and 2500 or more employees). We avoided putting compensation variables into these equations to avoid compromising the reduced form nature of the regressions; other compensation variables might themselves reflect the presence of bonuses, blurring the causal arrows. Data used for the regressions were the basis of tables appearing in U.S. Bureau of Labor Statistics, Employee Compensation in the Private, Nonfarm Economy, 1974, bulletin no. 1963 (Washington: GPO, 1977).

148. Since we are using the actual value of the bonus, rather than its expected value, the coefficient should be biased toward zero, i.e., somewhat less in absolute value than 1, due to the errors-in-variable effect.

149. It can be (correctly) argued that the use of the bonus variable in the regressions is inappropriate, since the decision to pay a bonus is as endogenous as the decision on the level of compensation or wages. A full model should explain the bonus decision within a simultaneous equation framework. It is possible, for example, that the same forces which raise pay increase the bonus, thus creating a positive correlation between the two, which masks a substitution effect. (Similar criticism can be made of the earlier regressions we have presented). We simply acknowledge this potential weakness in the evidence and note that the available data sets do not provide adequate information for more elaborate models.

150. "Developments in Pay Systems are Examined at BNA Conference," Daily Labor Report, June 20, 1988, p. C-3.

151. 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.
152. Laura B. Cardinal and I.B. Helburn, "Union Versus Nonunion Attitudes Toward Share Arrangements" in Barbara D. Dennis, ed., Proceedings of the Thirty-Ninth Annual Meeting, Industrial Relations Research Association, December 28-30, 1986 (Madison, Wisc.: IRRR, 1987), pp. 167-182, especially p. 171.
153. Daniel J.B. Mitchell and Renae F. Broderick, "Flexible Pay Systems in the American Context: History, Policy, Research, and Implications," forthcoming in Recent Advances in Industrial Relations.
154. Tax-credit ESOPs, known as PAYSOPs in their last form, were stock ownership arrangements with lavish tax benefits but tight limits on the value of shares which could be distributed. These plans have been discontinued by changes in the tax code.
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165. P. Goodman and B. Moore, "Factors Affecting Acquisition of Beliefs About a New Reward System," Human Relations, 1976, pp. 571-578.

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168. O'Dell and McAdams, People, Performance and Pay, op. cit.

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171. Bert L. Metzger, Profit Sharing in Perspective (Evanston, Ill.: Profit Sharing Research Foundation, 1964).

172. "As You Were Saying - Share Profits -Don't Freeze Them," Personnel Journal, 1972, 54, p. 51.

173. See, for example, Bion B. Howard and Peter O. Dietz, A Study of the Financial Significance of Profit Sharing (Chicago: Profit Sharing Research Foundation, 1969). This study used a variety of financial performance measures from COMPUSTAT and compared profit sharing with other firms. Generally, the profit sharers were found to exhibit better performance.

174. For example, Shepard reported that in the chemical industry, profit sharing boosts value-added productivity by about one tenth. He estimated production functions and included profit sharing variables as inputs. See Edward Morse Shepard II, The Effect of Profit Sharing on Productivity, doctoral dissertation, Department of Economics, Boston College, 1986.

175. David Lewin, "Industrial Relations as a Strategic Variable" in Morris M. Kleiner, Richard N. Block, Myron Roomkin, and Sidney W. Salsburg, eds., Human Resources and the Performance of the Firm (Madison, Wisc.: Industrial Relations Research Association, 1987), pp. 1-41.

176. Renae Broderick, "Making Performance Pay" in Prentice-Hall, Compensation (loose leaf service), March 9, 1988, pp. 585-590.

177. The survey is discussed more fully in John Thomas Delaney, David Lewin, and Casey Ichniowski, "Human Resource Management Policies and Practices in American Firms," working paper, Industrial Relations Research Center, Graduate School of Business, Columbia University, September 1988. An initial response rate of 11% was obtained. Eliminating unusable responses brought the rate down to 6.5%. Although this rate was low, it was not surprising because of the extensive information required by the questionnaire. Analysis of the COMPUSTAT information on non-respondents did not suggest any bias in the sample obtained.

178. "Net" indicates that revenue from returned or cancelled goods and services has been deducted from gross sales in the PROD variable. It should be stressed that the denominator for PROD is the total number of employees,

even in the separate regressions we run for clerical workers and manufacturing production workers.

179. The ROI and ROA variables pose a potential problem for trend analysis since they can be zero or negative in the base period. Set a floor for both variables of +1% for 1983 and 1986. Thus, improvements within the negative range over the period, e.g., from -3% in 1983 to -2% in 1986, would be considered as zero changes. (Very few observations were affected by this lower limit). Percent changes were calculated as $100 \cdot dx/x$, where x is the value of ROI or ROA in 1983 and dx is the change in ROI or ROA over 1983-86. Despite the floor restriction, the methodology still counts changes from low bases as larger than those from high bases. Experiments with other formats suggested that the results reported in the text are not very sensitive to the particular trend definition used. Ideally, it would be nice to have separate price deflators for the PROD variable for each firm, for regressions involving trends in PROD. In the absence of such deflators, however, we used the GNP deflator in the trend regressions. This does not, of course, correct for differential firm inflation rates, but simply reduces the magnitude of the trend variable. Unless the rate of firm-specific inflation is correlated with the independent variables, however, the resulting regression coefficients are unbiased estimates of the impact of the variables on real productivity increases.

180. To the extent that economic participation plans lead to offsetting cost savings via reduced fringe benefits, our entry of FBR in the regressions tends to weaken the impact of EP.

181. All business units had some nonunion employees, even if they were unionized. Hence, a unionized unit could still have a formal grievance mechanism for its nonunion employees.

182. Industry classifications used for control purposes were 1) agriculture, forestry, fisheries, 2) mining and construction, 3) durable manufacturing, 4) nondurable manufacturing, 5) transportation, communications, utilities, 6) wholesale and retail trade, 7) finance, insurance, real estate, 8) services.

183. The coefficients for PS, GS, SO, ESOP, and INC come from regressions identical to those on the first panel of Table 8 except for use of the pay plan dummies.

184. Since the significance disappears when ROA is substituted for ROI, we are unsure about the interpretation of the result. Apparently, there is a more positive association with the denominator of ROI than with ROA, which wipes out the significance with the overall ratio. The reason for such a result should obtain is unclear.

185. The coefficients for PART and INFO come from regressions identical to those of the first panel of Table 8 except for the use of the PART and INFO variables.

186. When noneconomic participation is broken down into the PART and INFO variables, only PART manages to appear with significance in any of the regressions of Table 9. Moreover, INFO appears with a negative sign. The PART and INFO regressions are identical to those of the first panel of Table 9, except for the substitution for NEP. Similarly, the coefficients for the pay plans taken separately come from regressions identical to the first panel except for the substitution for EP.

187. See, for example, Michael J. Piore and Charles F. Sabel, The Second Industrial Divide: Possibilities for Prosperity (New York: Basic Books, 1984).