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PRODUCTIVITY

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CHAPTER 2:

Productivity

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Chapter 2: PRODUCTIVITY

Productivity is often discussed in the national context. Politicians and business leaders sometimes bemoan national productivity trends or assert that America is losing the productivity "race" to other countries. "Competitiveness," a word with clear productivity overtones became a buzzword in the 1980s. Frequently, it is assumed that a failure of productivity to advance rapidly or to be high (there is often a confusion between the two concepts in public pronouncements) reflects a defect in national character.

I. A Definition.

Before productivity can be discussed intelligently, however, it must be defined. At the most general level, productivity is simply the ratio of output to input. But this definition, while valid, is hardly operational. Before productivity can be employed as an empirical concept, outputs and inputs must be specified, and they must be capable of being measured.

i. Inputs.

Most commonly, the input used for measuring productivity is labor input. Hours of work is a commonly used index of labor input for this purpose. However, in principle one could talk about capital productivity rather than labor productivity and use as an input measure some index of the value of capital services. There are also productivity measures which combine indexes of labor and capital inputs into a single index. These indexes, known as measures of "total factor productivity" or "multifactor productivity" will be discussed later in this chapter.

The common use of labor as the input, even when other factors of production are involved in the output process, is largely a matter of convenience. Measures of labor input are often easier to come by, and create fewer problems of interpretation, than measures of capital. However, the fact that labor is used as the input measure does not mean that labor is responsible for all output. Farmers could not produce wheat without land; to perform their jobs carpenters need saws, hammers, and other tools. If measured productivity rises -- with labor used as the input index -- it does not necessarily imply that employees are working harder; perhaps, instead, some new technology has been introduced, which permits more output to be produced with the same labor input. Or, in the case of the wheat farmer, perhaps the weather was more favorable.

The fact that labor is so often used as the input measure, and creates the impression that productivity derives from labor alone, is perversely helpful to HRM practitioners in focusing attention on the human aspects of productivity. Since the HRM function involves human resources, those carrying out that function may well be seen as the people best able to solve perceived productivity problems. But since productivity is the result of various forces, not every productivity problem is a "people problem." It is best for HRM professionals to acknowledge that possibility and to accurate analysis of the sources of productivity difficulties in their organizations.

- ii. Outputs.

Measurement of output can be simple or complex, depending on the kind of output under study. If productivity regarding a standardized product is being assessed, the unit of measurement can be relatively simple, e.g., tons of steel, barrels of oil, bushels of wheat. However, measurement can be complex when product quality is variable or when the product is not easily standardized. The question "how many workers does it take to erect a building?" has little meaning. Is the building a single family residence? An apartment house? A high rise office unit? A warehouse? Similarly, tons of airplanes would not be a useful output measure for a productivity index.

There are also measurement problems regarding outputs of multiple products. At the national level, output is the sum of production in many industries. Tons of steel cannot be added directly to bushels of wheat. Typically, therefore, aggregate output must be measured in value terms, since values (dollars) can be meaningfully summed. Even within industries or firms, value may be the most viable output measure because industries and firms often produce more than one product.

But value measures also raise problems, especially if the goal is to measure the trend in productivity. The value of the output of a product is the price of the product times the level of output in physical units. Over time, prices may change for reasons of general inflation or market conditions. In a period of general inflation, value of output per labor unit will tend to rise even if there is no change in physical productivity over time. Thus, whenever value is used to measure output, a price deflator or deflators must be found to eliminate the trend in prices.[1]

II. Productivity at the Employee Level.

We often speak of "rewarding" employee productivity in the field of human resource management. What is meant by employee productivity in this sense and why should it be rewarded? Given the discussion above, might not employee productivity reflect environment, capital, and technology rather than individual effort? If so, how can individual effort and proficiency be distinguished from these external influences on productivity?

i. A Review of the (Very) Simple Economic Model.

In elementary economics texts, productivity is mentioned in connection with wages and wage determination.[2] But the standard assumptions made are often far removed from the issues facing an HRM specialist. The simple model postulates a "production function" (F) which relates inputs of labor (L) and capital (K)-- and possibly other inputs such as materials -- to output (Q). That is, $Q = F(L,K)$. Often it is assumed that production takes place under "constant returns to scale" so that if L and K are increased by the same multiple (say, doubled), output will rise accordingly. That is, $2Q = F(2L,2K)$, or -- more generally -- $nQ = F(nL,nK)$.

Along with the assumption of constant returns to scale comes the supposition of diminishing marginal productivity. It is assumed that if one factor is increased while the other is held constant, the result will be positive, but diminishing, increments to output. That is, $\delta Q/\delta L > 0$ -- where $\delta Q/\delta L$ is the marginal product of labor -- and $\delta^{2}/\delta L^{2} < 0$. These assumptions lead to a downward sloping marginal product of labor curve. This curve relates incremental output to levels of labor input. For example, with a given capital stock, if 2,000 hours of labor were used, the curve would show the extra output that would result if labor input was incremented by 1 hour to 2,001 hours. A typical downward sloping marginal product of labor (MP_L) is shown on Figure 1.

The MP_L curve can be expressed in value terms by placing a value on the incremental output it represents. For a perfectly competitive firm, the value of each unit of output is simply the market price P. For a firm with some monopoly power, the incremental output must be valued by the extra revenue the firm will obtain by selling it. This value, known as marginal revenue (MR) in economics, is a declining function of output because the price of output falls as the firm tries to sell more and more in the product market. Multiplying MP_L by P (in the competitive case) or MR (in the noncompetitive case) yields the marginal revenue product of labor (MRP_L). MRP_L represents the extra revenue the firm will receive due to the hiring (and resulting production) of an additional increment of labor.

The MRP_L curve is also the short run demand for labor of the firm. At any market wage, W, the profit-maximizing firm will hire labor until $MRP_L = W$. All firms have their own MRP_L curves which, summed together, form the overall demand curve for labor. Interaction of the overall demand and supply determines W, which each firm then takes as a given. Figure 2 shows a firm which hires L_A units of labor when the wage per labor unit is W_A, because its MRP_L curve is equal to W_A at labor input level L_A.

Figure 1

A Marginal Productivity of Labor Schedule

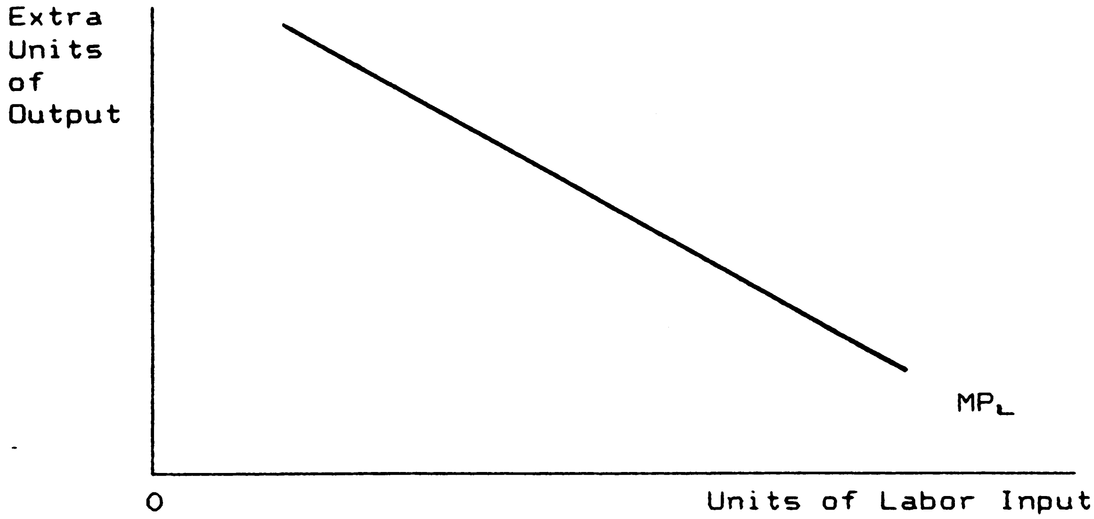
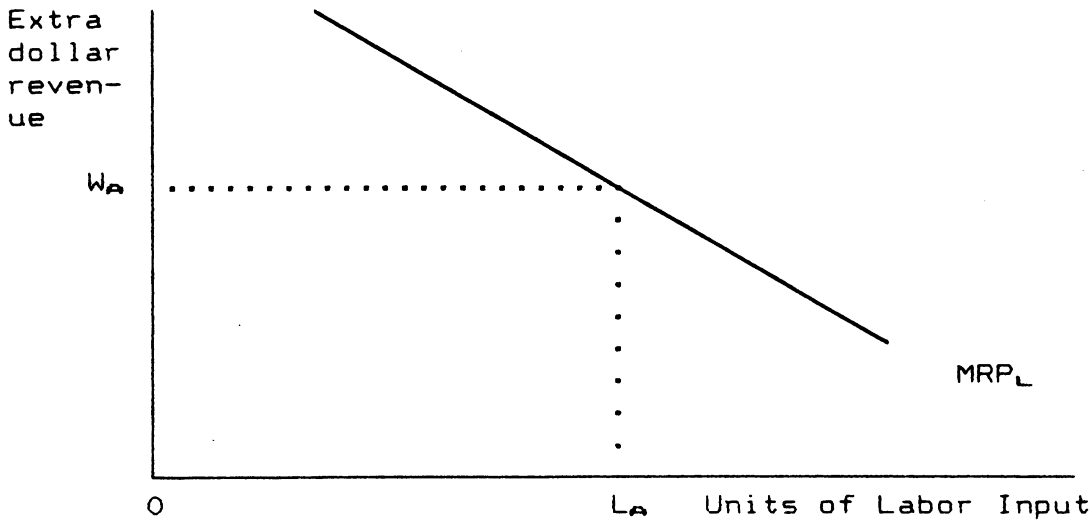


Figure 2

A Marginal Revenue Product of Labor Schedule



ii. Drawbacks of the Simple Model.

So far, the analysis should be familiar to most students. But what is often not apparent to students in elementary economics courses are the highly abstract assumptions underlying the exposition above. Most importantly, from the HRM perspective, labor is assumed in the model to be a homogenous commodity; one unit of labor is just like another. The only source of productivity variation in the model is the ratio of capital to labor K/L. At high values of K/L, the marginal product of labor for a specified input of L will be higher than at low values, assuming a given level of technology. This productivity effect has nothing whatsoever to do with motivation of employees; they are all assumed to be equally motivated. It has nothing to do with a clever pay system which rewards individual productivity. The employees expect payment W for each unit of labor they supply. They would like more, of course, but they know that no one will pay them more than the going market wage.

If the real world were like the simple model, productivity would not be a matter of concern to the HRM professional. It would instead be something about which the firm's engineers alone would worry. Engineers would have to pick that K and L combination which maximizes profits. Indeed, it is not clear what role (if any) an HRM professional would have in such a world. Perhaps they would be needed to find out from the labor auctioneer what the going wage was each day.

The simple model has certain uses in economics. It teaches the student notions of constrained maximization, a central economic concern. But as presented above, it is so far removed from the real world that it offers little guidance to HRM issues. However, we can introduce more realistic assumptions into the model on a step-by-step basis which will illuminate actual HRM practices.

iii. Complicating the Model by Recognizing Diversity.

In the real world, all units of labor are <u>not</u> equivalent. Even within a narrowly defined occupational group, some workers are more effective at their jobs than others. That is, given capital and technology, certain workers in a given occupation will add more to output than others. These differences among individuals reflect everything from inherited traits, parental upbringing and lifestyle, education, training, and work experience.

The simple model can be modified to recognize productivity differences between employees. Imagine a standard or average worker who, given capital and technology, would add 10 units of output for an extra hour worked. There might be other workers in the labor market who -- under the very same conditions -- would have a marginal product of only 8 units. Still others might have an MP_L = 12. How would the labor market react to such diversity in productivity? Would pay levels reflect these different productivities so that superior (inferior) employees would be rewarded (penalized) with superior (inferior) wages?

Much depends on information costs. The simple model assumes that information costs are zero. Workers and employers have no trouble finding each other and establishing wages. If that assumption is extended to the case of diverse productivity, employers will instantly and costlessly be able to differentiate between job candidates with marginal productivities of 8, 10, and 12 units. The lower productivity group will earn a wage of only 80% of the standard worker level; the higher productivity group will earn 120% of the standard wage. Effectively, with productivity diversity, the market will set a price for "efficiency units" of labor rather than for hours of labor.

Since workers fall into different occupational groups, yet another form of diversity can be introduced. Different occupations are not perfect substitutes for one another. When plumbing needs fixing, a plumber is called for the job, not a lawyer or a baker. But some occupations may be partial substitutes (dental technicians may be used to do some work of dentists) while others may be complements (the more lawyers are employed, the more legal secretaries are needed).

Each occupational group will therefore have its own labor market within which -- in turn -- there may be diversity of productivity. The markets will be interconnected by means of the substitute/complement relationships. A panoply of wage differentials will emerge reflecting alternative labor market conditions for the various occupations as well as individual productivity differences within occupations.

Still, in this modified model, there is little for the HRM professional to do other than monitor market wages. Differences in individual productivity exist, but they are apparent to employers, and the market sets differential wages accordingly. Individuals cannot be induced to change their productivity characteristics through anything the firm can control. Nor would the firm have any particular interest in changing employee productivities, since it is rendered indifferent between hiring slackers and hiring superworkers by compensating wage differentials.

iv. Dropping the Perfect Information Assumption.

Suppose firms could not tell in advance which workers had high inherent productivities and which had low. By itself, this deviation from perfect information would, at first, not seem to make much difference to the eventual outcomes. However, the firm would now need HRM professionals to design systems that would find the "lemons" in the workforce it had hired. And it would need HRM specialists to create mechanisms that would verify claims from candidates that they had above-average productivity.

Low productivity workers (lemons) might seek employment with the firm without revealing their substandard potential. But as soon as they began work, the HRM system would spot their inferior performance and offer the lemons a choice: They could leave the firm if they insisted on being paid the standard wage. Or they could accept a lower wage reflecting their true productivity level. Lemons would accept the lower wage offer since they would never find a firm at which they could hold a job long enough to receive the standard wage. Their only viable option would be to accept lower wages commensurate with their lower productivity.

Workers with above average productivity characteristics might demand a proportionately higher wage from the firm at the time of hiring. The firm could simply offer to put them on the payroll at the standard wage with a proviso that if they turned out to be above standard in productivity, their wage would be immediately increased correspondingly. HRM professionals would be available to help monitor initial performance of those who claimed to be better than average performers.

Adding considerations of employee productivity differences improves the simple economic model. But even recognition of diversity of performance and imperfect information leaves the model still far removed from reality. However, the revised assumptions do lead to wage differentials which reflect personal productivity differences and occupational differences. Yet the role of the HRM professional remains quite limited; he/she is basically an evaluation expert.

We have so far proposed that HRM professionals might act as designers of immediate post-hiring monitoring systems to spot lemons and verify claims of superworkers. But note that the firm might well substitute some kind of piece work pay formula for a time-based wage system to avoid the need for (costly) HRM specialists and supervisors. If workers were paid on the basis of units of output, rather than by units of time (3¢ per widget rather than $6 per hour), lemons who produced only 80% of the standard rate would receive only 80% as much hourly pay as the standard worker. And superworkers would receive proportionately more than the standard employee. Thus, a firm might decide to use an industrial engineer (rather than an HRM specialist) to determine the standard level of productivity and set the piece rate so that the average worker would earn the going market wage for such workers.

v. Screening Costs.

In fact, the imperfect information story just described carries within it a hidden element which brings it closer to reality than first appearances suggest. Firms face the danger of hiring lemons at the standard wage. If the lemons succeed in remaining in employment at that wage, they will harm the firm. The marginal productivity of lemons will be below the wage they are paid; they will contribute less incremental value to the firm than they cost. In short, profits will be reduced if lemons sneak in and are retained undetected.

The potential presence of unidentified lemons in the labor market will induce the firm to undertake some expenditure to screen them out (or appropriately reduce their pay). After all, the HRM professionals, industrial engineers, and supervisors to which allusion has been made must also be paid. The more workers the firm hires, the more such "overhead" personnel it must also take on to handle the monitoring. Thus, each new hire effectively imposes an implicit cost on the firm.

Workers will be hired for one of two reasons. They may be replacements for workers who have left the firm previously. Or they may be hired to expand existing production, i.e., as net new additions to the firm's workforce. Consider now the first motivation: replacing departing workers.

Since each hire imposes a cost, each departure must also be costly, because in the steady state a departure requires a replacement. The firm therefore has an incentive to reduce turnover (and, therefore, new hires). That is, the presence of lemons in the labor market, i.e., diversity of employee productivity, automatically gives the firm an incentive to hang on to its existing workforce, whose productivity characteristics it already knows.

The addition of the incentive to maintain a given workforce takes the story a long way (but not all of the way) towards the real world of HRM. Maintaining a given workforce means that an employer-employee relationship develops. Workers do not swirl in and out of the firm. Keeping turnover down necessarily involves catering to worker interests and concerns. If workers are unhappy, they might quit, thus imposing hiring and screening costs on the firm. It is worth expending money on HRM specialists who will cater to worker needs and reduce turnover. Employee diversity of productivity in fact extends the role of HRM beyond simple monitoring.

In addition, the accidental hiring of lemons could be avoided if workers can be screened for productivity characteristics <u>before</u> they are hired. HRM professionals with expertise in interviewing (or in training other managers to interview), reviewing résumés and credentials, and administering tests can reduce the costs of post-hiring monitoring. Obviously, there are trade offs involved. "Perfect" pre-hiring screening would be costly and probably unattainable. And perfect post-hiring monitoring would also be very costly. The firm will engage in some screening, some monitoring, and also live with knowledge that some lemons have crept into the workforce but are hard to identify. Indeed, one of the tasks of the HRM professional in such a firm would be to identify where the trade offs should be made through a cost/benefit analysis.

vi. Modifying Personal Productivity.

Up to this point, individual employee productivity has been assumed to be a given. Workers might change their productivity through education, or even -- over time -- through job experience (learning by doing).[5] But at any moment in time, workers would expend a fixed level of effort and would have fixed effectiveness characteristics.

In fact, much of the actual practice of HRM suggests that firms do <u>not</u> find the fixed productivity assumption to be valid. For example, the piece rates that were mentioned earlier are used in some modern firms and -- many years ago -- were much more widespread than they are now. Piece rates, and related bonus systems, which gear worker pay to worker output, were historically designed to be more than simple measurement devices. While piece rates and bonus systems do pay low productivity workers less than high productivity workers, the intent in installing such systems was to <u>stimulate</u> workers to raise their own productivities, i.e., to expend more effort. Piece rates and bonus systems were intended to be motivational tools.

The issues surrounding piece rates and bonuses will be discussed in a later chapter which will explore some of the drawbacks of these arrangements. However, the fact that such pay systems have declined in usage does not mean that the notion that employees can be motivated has been abandoned. To the contrary, other devices which were believed to be more effective (but not perfect!) motivators have replaced automatic incentive systems. These include merit pay systems, opportunities for promotion and advancement (career ladders), and other methods both of recognizing superior employee performance and of penalizing substandard work.

All such rewards and penalties require an evaluation system. Such systems, which HRM specialists classify under the heading "performance appraisal," will be discussed in a subsequent chapter. But at this point, let it simply be noted that performance appraisal is a measurement device, a device to measure employee productivity. It is used even when output is not easily quantified, as is often the case with professional, technical, managerial, and service employees.

vii. Teamwork.

As more reasonable assumptions have been added to the simple economic model, it has begun to look more realistic. However, one element may have struck the reader as peculiar. Up to this point, workers identified by the employer as substandard are not terminated. Rather, their wages are simply lowered to the point at which the firm is indifferent between using them and using higher quality workers. But in the real world, substandard workers -- especially after they have been warned -- are likely to be terminated. This is particularly the case with workers discovered to exhibit low productivity shortly after hiring. Indeed, firms often have formal probationary periods -- during which termination is easier under company rules than later-- precisely to weed out poor performers.

Why do firms use termination rather than reduced pay when lemons are uncovered? One answer lies in the concept of teamwork.[4] Employees often must work in groups. The most obvious example is an assembly line in which work is passed from one employee to the next. A lemon anywhere in the line will reduce the productivity of all of the group. If a standard worker can process 100 widgets per hour as it passes down the line, but one worker in the line can process only 80 widgets, the overall line speed cannot exceed the 80-widget constraint. Assume the line consists of 9 standard productivity (100-widget) workers and one (80-widget) lemon. The one lemon has effectively turned 9 other standard workers into lemons!

Lemons, in short, can have multiplier effects. They may so drastically lower overall productivity of the group that there is no positive wage at which it would pay to hire them. In such cases, the firm will elect termination when it uncovers a lemon, rather than a pay reduction.

The assembly line example is an extreme one because of the passing of work in a linear fashion from one worker to the next. However, the team concept is more general. There are relatively few cases, in fact, where employees work in total isolation so that a lemon does not reduce the productivity of others. For example, scientists, engineers, and managers often form task forces and similar groups to accomplish goals and projects. If one member of the task force does not pull his or her weight, costs are inflicted on the entire team.

Even absent assembly lines and task forces, employees usually work in proximity to others. Social groups often form at the workplace. Employees who are rude, disruptive, or who have other personal problems may adversely affect the productivity of others, and may induce costly turnover of fellow employees. This is especially the case if the poor performer is a supervisor or manager. Thus, problem workers -- once identified -- may be subject to dismissal because they produce what economists call negative "externalities." They inflict costs on others which may outweigh any contribution the problem employee may make to firm output.

The measurement of individual employee productivity therefore involves an estimate (whether quantitative or qualitative) of two factors. There is, first, the incremental personal contribution the employee makes to output. And there is, second, the external impact (positive or negative) the employee has on other workers. Workplaces are organizations, and -- as such -- the externalities may be the more important consideration for many types of jobs.

III. Productivity at the Plant and Firm Level.

It would be unusual for a multi-product firm to wish to compute global productivity measures covering all divisions. But such indexes can be useful on a more local basis. If there are productivity problems, managers are likely to want to know which divisions, plants, or products are involved. At these disaggregated levels, productivity calculations can be useful for certain purposes. But it is important to note certain drawbacks.

i. Productivity, Profitability, and Unit Labor Costs.

Productivity is basically an efficiency concept in the technical sense, not in the economic or commercial sense. A plant may be highly efficient compared to others, and yet may not be economically viable. Decisions to open or close plants will hinge importantly on the costs of inputs (including labor) as well on the technical efficiency with which inputs are combined.

Ultimately, in evaluating a plant in terms of its contribution to the firm, what matters is profitability, not productivity. But profitability will reflect productivity even though the two concepts are not the same. Thus, if a plant seems to be substandard in profitability, it is important to find out whether the poor performance is due to substandard productivity or to high costs of inputs.

Ideally, in investigating productivity of a plant, it would be best to use a measure of input which includes all factors of production (labor, capital, materials) broken down in as much detail as possible. However, for practical purposes, such calculations may well be too complex and -- even if feasible-- would probably provide little information beyond what a simpler calculation, based only on labor as an input, could offer.

A handy concept, when labor is used as the input measure, is "unit labor cost" (ULC). Unit labor cost is defined as total labor costs per unit of output. Using the earlier notation, ULC = WL/Q.[5] The ULC formula can be rearranged as W/(Q/L), i.e., unit labor cost is equal to the average wage divided by the level of productivity. Thus, a plant which pays relatively high wages can be economically viable <u>if</u> it can also achieve a relatively high productivity level.

It is for this reason that, for example, much of the world's manufacturing capacity still operates in relatively high wage countries. Were wage levels the only consideration in determining costs, world manufacturing would long since have relocated to extremely low wage nations. As it is, low wage countries tend to succeed in world markets mainly with products for which technology and productivity are sufficiently comparable across countries so that the remaining element in competitiveness is the cost of labor.

ii. Uses of Productivity Data.

Multi-plant firms may find it useful to compare plant productivity and unit labor costs within product lines. Wage levels can easily be obtained from payroll records as can labor input. Assuming the plant produces output which can be reasonably quantified, productivity measures can be easily calculated. Of course, a plant which is relatively high cost, but which does not turn out to be poor in productivity performance, may not be viable economically. On the other hand, a high cost plant with low productivity may have a problem, either technical or involving employee relations, which could be (or should be) addressed.

Firms often fail to make productivity evaluations, even when data to do so are readily available. But sometimes when such measurement is undertaken, other data are still needed to pinpoint the source of productivity problems. On the HRM side, symptoms such as high employee turnover, heavy absenteeism, and high rates of employee grievances, may indicate that the solution to a productivity problem lies with improved HRM rather than with technical areas such as replacement of antiquated machinery. In a multiplant firm, the hypothesis that, say, grievance rates are negatively associated with productivity might be checked statistically.

At unionized firms, productivity calculations can be useful for "workrule bargaining." Typically, union contracts specify a variety of workrules to which the employer must adhere. For example, the number of machines to be operated by an employee may be stated in the contract. As technology changes, such workrules often become out of date and a source of added costs to management.

Some companies have estimated the productivity improvement that would accrue from a relaxation of workrules and then used these figures to "buy out" the rules from the union. The unit labor cost saving which results can be used to offer higher pay, severance benefits, and early retirement options in exchange for greater management flexibility. Obviously, in such situations, measurements of productivity and estimates of potential cost savings are critical to intelligent bargaining.

iii. Comparisons with External Data Sources: Trends.

Generally, even if firms compute productivity data for internal use, they will be reluctant to share them with outsiders, especially competitors. But within a product line, a firm might find it quite useful to compare its productivity performance with those of other firms in the industry. Data on industry-level productivity trends increasingly are being made available by the U.S. Bureau of Labor Statistics (BLS). Examples of such trends from selected industries as reported by the BLS are shown on Table 1.

The industries selected for Table 1 illustrate various influences on productivity. For example, in the bituminous coal industry, productivity moved in an erratic fashion in the 1970s, first falling and then rising. The shift toward high

Table 1

Output per Employee Hour in Selected Industries, 1959-84

(annual rates of change)

	1959-69	1969-73	1973-79	1979-84
Bituminous coal mining (SIC 121)	5.3%	-3.4%	-3.9%	8.7%
Telephone communications (SIC 4811)	5.7	4.9	6.8	7.1[1]
Steel (SIC 331)	1.7	4.3	0.0	4.3
Commercial banking (SIC 602)	n.a.	3.4	.6	.8[1]

[1]Data for 1979-83.

Source: U.S. Bureau of Labor Statistics, Productivity Measures for Selected Industries, 1958-84, bulletin 2256 (Washington: GPO, 1986).

productivity western strip mining, and away from eastern underground mining tended to raise output per hour in the coal mining industry. But this positive effect was offset by deteriorating union-management relations in the eastern states.

An aggravating factor was an internal political struggle for leadership of the Mine Workers union during this period. Toward the end of the 1970s, however, a concerted effort was made by both labor and management to ameliorate their relationship and the productivity situation improved. Thus, the coal experience illustrates how the labor relations climate can influence productivity trends.[6]

A contrasting picture emerges from the telephone communications industry. Output per hour has rapidly and steadily increased in this sector. (The output index is derived from revenue for various telephone services deflated by appropriate price measures). Here, the story is dominated by rapidly improving technology, including adoption of electronic switching systems, satellite communications, and computer applications. Leading edge technology has long been a feature of the telephone industry, going back to the development of the dial telephone in the 1920s, and the productivity numbers reflect this tradition.

In banking, productivity was also positively affected by computerization. (Banking output is defined by BLS in term of demand deposit transactions, loans, and fiduciary (trust) activity). As a service industry, however, elements of banking have proved resistant to automation. The cashless and checkless society, with transactions occurring entirely through electronic means, remains in the future. Thus, banking productivity trends -- while positive -- have not been extraordinary. Banking's record illustrates some of the difficulties in raising productivity in service oriented sectors.

Finally, the steel industry showed dramatic productivity increases after a recession-related slump in the early 1980s. The productivity improvement occurred at a time of great economic distress in the industry, due largely to import competition. As a result of the strong competitive pressures, the industry reduced its capacity by closing its least productive facilities. Thus, the steel industry's productivity record illustrates the influence that product market pressures can have in forcing an efficiency improvement.

Although the story behind the productivity trends varies from industry to industry, the availability of published trend data now allows firms to compare their productivity performance with those of the overall industry within product lines. Most human resource professionals, unfortunately, have not caught up with the substantial expansion of productivity statistics from the BLS and other sources. Many have not take advantage of the ability of computers to extract useful information from personnel and payroll records. However, the newer generation of quantitatively oriented managers now emerging from the nation's business and management schools will be in an advantageous position to take advantage of the new data sources. Thus, use of productivity statistics within firms can be expected to increase.

iv. Absolute Productivity Information.

The nation's gross national product (GNP) is the total value of goods and services produced. Firms contribute to the GNP by buying materials and using capital and labor to produce a more refined product. Each advance in the stage of production, e.g., from iron ore to steel to automobiles, represents "value added" by the processing enterprise. That is, a firm will (hopefully) produce output which is worth more to its consumers than the materials which entered that output.

Valued added can be viewed in two ways. It can be seen as the difference between the revenues the firm receives for its product and the costs of the materials that went into the production process. Alternatively, value added can be viewed as the sum of the rewards to the factors of production which added value to the product, i.e., wages and benefits to employees and profits, depreciation, and interest to capital owners.

Table 2 shows GNP per full-time equivalent (FTE) employee for various sectors. The table includes four industries (coal mining, primary metals, telephone and telegraph, and banking) which correspond to the sectors discussed in the previous section. As can be seen from the table, the GNP produced per FTE in the sectors covered varies widely. These differences, however, do not necessarily reflect efficiency differentials between industries. For the most part, the differences are the result of variations in the importance of the non-labor input in each. Where industries are capital intensive, there will be a proportionately higher return to capital included in value added.

Two industries added to Table 2 -- apparel and oil and gas extraction -- provide extreme illustrations of this principle. The apparel industry utilizes labor intensive technology, and thus produces a small return to capital. In addition, it tends to use relatively cheap, unskilled labor so that its labor return is also low. In contrast, oil and gas extraction involves substantial investment in both equipment and land or mineral rights. And workers in the industry are comparatively well paid. Thus, its contribution to GNP per FTE is at the other end of the spectrum from apparel.

Table 2

GNP per Full-Time Equivalent Employee
in Selected Industries, 1985

(dollars)

Sector	GNP/FTE
All private industries	$76,888
Coal mining	91,848
Primary metals	43,462
Telephone & telegraph	97,593
Banking	43,650
Apparel & other textile products	19,213
Oil & gas extraction	169,718

Source: Survey of Current Business, vol. 66 (July 1986), pp. 63, 66.

While the differences across industries would not be especially useful managerial information, within-industry comparisons can be helpful. Firms have (or should have) information from their internal accounting systems to generate comparable data for their own operations. These data can be compared with the industry averages to point to superior or inferior productivity performance.

IV. National Productivity.

We began this chapter by noting the tendency of politicians to bemoan lagging productivity trends. Why should there be this concern? More specifically, while productivity performance is obviously of interest to managers at the micro-level, why should anyone be concerned with aggregate productivity trends at the national level? Below some answers are suggested to these questions. Also presented are data on the actual course of national productivity.

i. Productivity as Ability to Pay.

One reason for the concern about national productivity, perhaps the most crucial, is living standards. In 1985, the GNP per full-time equivalent worker in the private sector was 1.4 times higher in "real" terms, i.e., adjusted for inflation, than it was in 1947. Labor compensation (wages, fringes, and payroll taxes) accounted for 52% of the GNP in 1947 and only a slightly higher fraction in 1985 (54%).

If wages in 1947 had somehow been raised to purchasing power standards of 1985, about 87% of GNP would have gone to labor, leaving nonwage income at an unsustainably low level for a capitalist economy. Although data for carrying out the precise calculation are not available, it is evident that going back a few years before 1947 would have produced a situation in which more than 100% of GNP would have had to go to labor to maintain 1985 purchasing standards. Such a situation cannot exist under any economic system.

Private GNP per FTE is a measure of productivity at the national level. The data just cited show that productivity is not simply an efficiency index; it also has much to do with living standards. It is the rise in productivity which has made the long term advance of real wages possible. Thus, a period of poor productivity growth, such as set in after the early 1970s, is also going to be a period in which living standards will not much advance. Clearly, that is something about which politicians (and all citizens) must be concerned. Management, in particular, must be concerned since the business community is often held responsible for adverse economic developments.

Rising productivity, in short, means rising economy-wide "ability to pay." A period in which productivity performance deteriorates is likely to create difficulties in the workplace. Workers will not experience the increases in real wages during such periods that they may previously have come to expect. If real wages are pushed up in some sectors in spite of the productivity trend, those sectors' wage rates will progressively become more and more out of line with others. As will be seen in a later chapter, such a process took place in the union sector of the workforce in the 1970s, with dramatic and adverse consequences for unions in the 1980s.

ii. Productivity and Inflation.

It is often said that "wages should rise with productivity." Sometimes, this proposition is advanced as a moral prescription, since it suggests that workers ought not expect pay increases unless they work for them. But, despite the appeal of the Puritan ethic, we already know that productivity trends reflect many influences including growth in the stock of capital, technological advance, etc. Thus, the proposition -- while valid -- turns out to be more empirical than moral.

We noted earlier that the share of labor compensation in private GNP was about the same in 1947 and 1985 (52% vs. 54%). It is from this constancy that the linkage between (real) wages and productivity develops. The value of total output (GNP) can be expressed as the multiplicative product PQ, where P is a price index for output and Q measures the volume of output. Similarly, the value of labor compensation can be expressed as WL, where W is a wage index (including all forms of labor compensation) and L is an index of the volume of labor employed. Let s be the share of labor compensation in the value of output. Then s = WL/PQ.

Given the definition of s, it is easy to see (by simple rearrangement of the terms) that W/P = s(Q/L). W/P is the real wage and Q/L is labor productivity. If s is relatively constant -- as we know it is -- then real wages will move with productivity as an empirical fact, regardless of the morality or ethics involved. The simple equation also contains another lesson. Since W/P is fixed by productivity (as an empirical matter), then periods in which W rises faster than productivity will be periods in which P must also be rising. Put another way, periods in which wages rise faster than productivity will also be periods of inflation.

This observation has been used on occasion in government wage control programs aimed at preventing or reducing inflation.[7] For example, during the Kennedy/Johnson administrations in the early 1960s, federal policy makers urged that businesses (and unions) not raise wages faster than productivity. It was thought that if this prescription were followed, the economy could expand without accelerating inflation.

Although this policy statement, known as the wage/price guideposts, had some transitory effect on wage setting, it was not ultimately successful in preventing rising inflation. The subsequent Nixon administration, after grappling with inflation for several year, eventually imposed mandatory wage and price controls, using the productivity rule as a guide. In an effort to reduce price inflation from about 5-6% per year to 2-3% a year, the Nixon administration proposed that wages should at a 5.5% annual rate. Using the simple equation described above, the reader can easily deduce that the underlying assumption of this program was that productivity growth could be expected of about 3% per annum.

The interrelationship between wage change, productivity change, and inflation is an empirical fact. However, the ability to use that fact to control inflation is another matter. Ultimately, neither the Kennedy/Johnson nor the Nixon administrations were able to reduce inflation permanently via their productivity guidelines. Nor was a subsequent attempt in the late 1970s by the Carter administration successful. Thus, unless there is both a sharp change in political climate and a resurgence of inflation, it is unlikely that productivity guidelines will again be imposed on wage setters in the near future.

iii. Competitiveness and Productivity.

The connection between productivity, wages, and unit labor costs has already been noted at the level of the plant. But the same concept can be applied at the national level. We already know that s = WL/PQ and that ULC = WL/Q. Thus, ULC = sP. Since in the long run s is roughly constant, unit labor costs can be expected to rise at roughly the same rate as the price level over extended periods.

We will examine American unit labor costs trends relative to other countries in a subsequent chapter. However, note that unit labor costs are particularly important as determinants of success in the international market place for labor-intensive products. General upward pressure on unit labor costs will make American goods less competitive relative to foreign goods, and thus tend to reduce exports and increase imports. Such changes in the international balance of trade will either cause job losses in American industries or lead to offsetting devaluations of the U.S. dollar in currency exchange markets.

More rapid productivity growth -- other things equal-- tends to slow the rise of unit labor costs. Thus, better productivity performance can lead to improved competitiveness of American firms in world markets. This linkage between competitiveness and productivity is still another factor behind official concern over national productivity trends.

V. Trends in U.S. Productivity.

At several points above, reference has been made to a deterioration of American productivity performance in the 1970s. It is useful, at this point, to examine the evidence surrounding this deterioration. When did it happen? What caused it? What can be done -- if anything -- to improve national productivity growth?

i. The Empirical Record.

Table 3 shows a quarter century review of American productivity performance. The dip in the productivity trend is clearly visible from the top row of the table. Output per labor hour rose at almost a 3% annual rate from the late 1950s until the early 1970s. But during the remainder of the 1970s, productivity growth averaged less than 1% per annum. Some pick up in productivity growth occurred in the 1980s, but the pre-1970s rate has never been restored. As we have already suggested, the growth in real wages during the period of the productivity slowdown was drastically reduced.

Table 3

Trends in Labor Productivity, Multifactor Productivity, and the Capital/Labor Ratio, 1959-85

	1959-73	1973-79	1979-85
Labor productivity[1]			
Private sector	2.9%	.8%	1.1%
Private nonfarm	2.8	.6	.9
Manufacturing	3.2	1.5	3.1
Multifactor productivity[2]			
Private sector	1.9	.4	.2
Private nonfarm	1.7	.3	.1
Manufacturing	2.7	.7	2.1
Capital/labor ratio[3]			
Private sector	2.6	1.2	2.6
Private nonfarm	2.2	1.1	2.6
Manufacturing	1.8	2.9	3.7

[1]Output per hour of all persons.
[2]Output divided by an index of capital and labor inputs.
[3]Capital services per hour of all persons.

Source: U.S. Bureau of Labor Statistics, Trends in Multifactor Productivity, 1948-81, bulletin 2178 (Washington: GPO, 1983), pp. 22-24; Monthly Labor Review, vol. 110 (June 1987), p. 102.

Various explanations have been put forward to explain the dip in productivity growth.[8] Some have argued that the problem is illusionary, and that productivity is not being properly measured in the growing service sector. There <u>are</u> difficult problems involved in measuring service productivity. Table 3 shows that the productivity slowdown occurred in manufacturing as well as other sectors in the 1970s, but that a pick up occurred thereafter. But even if we are having trouble getting the numbers exactly right, there is no doubt that the 1970s saw slower productivity growth than in earlier periods and that the 1980s did not bring forth a complete productivity growth recovery for the economy as a whole.

It has also been argued that the productivity slowdown was rooted in insufficient investment in the 1970s. As we have noted previously, the simple economic model predicts that labor productivity will be linked to the capital/labor ratio. Table 3 shows that there was a slowdown in the growth of this ratio in the 1970s. But it also suggests that the trend in the capital/labor ratio cannot be the chief explanation of the slowing of productivity growth.

In the private, nonfarm sector, the capital/labor ratio rose at the same rate in the 1960s and 1980s. Yet productivity in the 1980s did not recover its pre-1970s pace of advance. Indeed, in manufacturing the growth of the capital/labor ratio progressively accelerated, but productivity growth did not.

ii. Multifactor Productivity.

The impact of capital on productivity can be further quantified. Consider a production function, Q = F(K,L), where Q = real output, K = capital input, and L = labor input. Differentiated, this relationship implies that:

$$(1) \qquad dQ = [(\delta Q/\delta K)dK] + [(\delta Q/\delta L)dL]$$

Let P represent the price level. Divide both sides of equation (1) by Q, multiply the first bracketed term of the right-hand side by PK/PK and the second bracketed term by PL/PL, and rearrange terms. The result is:

$$(2) \qquad dQ/Q = [(\delta Q/\delta K)PK(dK/K)]/PQ + [(\delta Q/\delta L)PL(dL/L)]/PQ$$

Note the following: dQ/Q, dK/K, and dL/L, are, respectively, the percent change in output, the percent change in capital input, and the percent change in labor input over some relevant time period. PQ is the value of output. In economic theory, $\delta Q/\delta K$ and $\delta Q/\delta L$ are the marginal products of labor and capital which are equal, respectively to the real price of capital (the rental rate) and the real wage. Multiplying these real quantities by P converts them into nominal terms, i.e., the money price of capital R and the money wage W. Thus, equation (2) can be rewritten:

(3) Percent change in output = [(RK/PQ) x percent change in capital] + [(WL/PQ) x percent change in labor].

RK/PQ and WL/PQ are the respective shares of capital and labor in the value of output. Thus, absent any effects on output other than from capital and labor, if the change in capital and the change in labor are weighted by their respective shares in the value of output, the change in output can be predicted, using equation (3). If the percent change in output is greater than can be explained by equation (3), there is a rise in "multifactor productivity" (or "total factor productivity") which is defined simply as the left-hand side of equation (3) divided by the right-hand side.

The middle panel of Table 3 shows trends in multifactor productivity (which accounts for the influence on output of both capital and labor). As can be seen from the table, the same productivity slowdown which appeared using the labor productivity definition appears when multifactor productivity is used. Thus, the slowdown cannot be fully explained by changes in the capital/labor ratio, since these changes are reflected in the multifactor measure. The productivity slowdown problem, in short, cannot be attributed simply to inadequate investment flows.

Of course, other things equal, growth in the capital/labor ratio will raise productivity, even if other forces are retarding productivity growth. The fraction of GNP devoted to nonresidential gross investment did not decline in the 1980s, relative to other periods. But, because of substantial dissaving on the part of the federal government (a budget deficit), foreign capital inflows were required to sustain the level of investment.[9] By the mid-1980s, there was concern among economists that net foreign borrowing by the U.S. for domestic investment might prove unsustainable in the long run. Resulting high interest rates would then choke off business investment, ultimately harming productivity growth.

iii. Proposed Explanations of the Slowdown.

Given the importance of productivity movements, it is not surprising that considerable effort has been expended by economists to explain the productivity slowdown. Quantitative estimates have been made of such factors as the impact of government regulation (anti-pollution and safety requirements imposed on business which diverted resources from production), changes in the education and experience levels of the workforce, and the reduction in research and development expenditures which occurred in the 1970s. None of the obvious explanations appears to go very far in explaining the slowdown.

Perhaps this is not surprising. Much of the productivity growth rate prior to the 1970s was not explained by measurable influences in statistical studies. Economists simply attributed the large, unexplained portion of productivity growth to technological advance and improved managerial techniques. Thus, when productivity growth slowed, the reason was largely unknown.[10]

iv. The HRM Element in Productivity.

There have been suggestions that the slowdown in productivity growth was linked to a deterioration in employee relations which began in the late 1960s. The evidence we have on this deterioration comes from the union sector of the economy. During the late 1960s, strike activity rose sharply. Not only did union members seem more defiant of their employers; they also became more likely to defy their union officials. Contracts which were negotiated by union leaders were more frequently voted down by union members in this period than previously.

Unfortunately, we have no handy indexes to gauge the climate of HRM among nonunion employers. However, it is obvious that the late 1960s were generally years in which authority of all kinds was increasingly questioned, not only in the U.S., but also abroad. There were outbreaks of student demonstrations and protests on university campuses, and signs of intergenerational conflict. Juvenile delinquency rates rose. Racial tensions increased. Anecdotal evidence suggests that these social strains were eventually felt in the workplace, and complicated the HRM function.

No easy way of quantifying these social influences on productivity exists. Efforts made to do so have foundered on a lack of hard data.[11] But inability to quantify does not imply that the human element in productivity should be dismissed as irrelevant. Absent alternative explanations, in fact, it must be assumed that improving the HRM climate at the employer (micro) level would improve macro productivity performance. But caution is also required. As already noted, there is a tendency-- simply because productivity is usually measured using only labor as the input -- to attribute all productivity problems to human resource issues. Excessive claims ultimately do a disservice to the improvement that can come from improved HRM techniques.

One of the outgrowths of the 1970s was the development of the quality of working life (QWL) movement, an effort to address the human side of productivity.[12] Although the QWL label has been stretched to encompass many workplace innovations and experiments, its general theme has been employee "involvement" in traditional management decisions. QWL programs often involve cooperative employer/employee committees -- such as "quality circles" -- to address workplace problems and enhance productivity.

These efforts have most often taken place at the local workplace, but have sometimes extended into areas of upper management. In a few cases, they have included placement of employee or union representatives on corporate boards of directors. The guiding thought behind QWL programs is that workers have a stake in "their" firms and that the current generation wants formal recognition of that stake through participative channels into management. Note that this stakeholder premise is in line with the position taken in the introductory chapter to this text.

Of course, had the productivity challenge simply evaporated after the 1970s, there would have been little pressure to continue or extend QWL experiments in the 1980s. But the challenge still exists and QWL appears to have taken permanent root as a result. Even so, not all QWL experiments are destined to succeed. What can be said is that experimentation is warranted. In some cases, solutions to productivity problems will be found through QWL innovations.

VI. Policies to Promote Productivity Growth.

The productivity slowdown led to various suggestions for federal government action to reverse it. However, the inability to point quantitatively to a specific cause of the slowdown has hindered efforts to produce convincing proposals for such action. Generally, suggestions have fallen into three categories: investment incentives, industrial policy, and fostering a better climate of HRM at the workplace.

i. Investment Incentives.

Although there are some programs of direct federal subsidy to certain forms of investment, much of the efforts to encourage investment have been made through the tax code. Perhaps the most prominent example has been periodic creation of accelerated depreciation allowances for capital equipment. Such incentives were increased in the early 1980s and were credited with maintaining investment in the face of high real interest rates.

Raising the rate of investment would undoubtedly improve productivity performance. However, it would take a very ambitious program to have more than a marginal impact over a 3-5 year horizon. In any case, Congress repealed much of the tax incentive program for investment in 1986, in an effort at tax "simplification" and reform.

ii. Industrial Policy.

There has been a strain of support for "economic planning" in the U.S. at least since the 1930s when -- at the bottom of the Great Depression -- a form of such planning was briefly tried as part of the Roosevelt administration's "New Deal" policies. The New Deal's planning component was terminated as unconstitutional in 1935 by the Supreme Court. It's only remaining legacy is the current structure of American labor law with regard to unions and collective bargaining, an issue to be discussed in a later chapter.

During World War II, however, a massive military build up was accompanied by substantial government intervention in the economy. Prior to the war, productivity had been virtually stagnant for a decade. But from 1940-45, real GNP per full-time equivalent employee rose at a 3% annual rate, despite the influx to the workforce of inexperienced young and female workers and the disruption of male employment by conscription. The impressive conversion to war production in the early 1940s-- with the cooperation of government, business, and labor -- has remained in the American political memory and contributed to the industrial policy proposals of the 1970s and 1980s.

Proponents of industrial policy generally argue that economic performance could be improved if concerted, cooperative efforts were made to develop "key" industries. Usually, some kind of tripartite mechanism is envisioned, involving representatives of business, government, and unions, to identify which industries are key. Some proposals call for creation of a special investment bank to channel funds to such industries. Often cited in support of these arrangements are examples of such cooperation in Japan.[13]

Opponents of industrial policy have countered that such a program would likely evolve as a protection device for older, declining industries which have been hurt by import competition and deregulation. They have been fearful of excessive government involvement in the direction of the economy and have expressed skepticism about the importance of industrial policy in Japan. Even if the program did not become a captive of older industries, opponents argue, government have trouble identifying "winners" among new industries.[14]

Apart from these economic considerations, the management community is unlikely to give enthusiastic support to creation of a mechanism that would give labor unions a new, prestigious role in economic policy. For much the same reason, unions and liberal Democrats have found the idea of industrial policy appealing. Thus, political factors will play a strong role in determining whether the U.S. ever embarks on such a program.

iii. Fostering an Improved HRM Climate.

Various government programs in Western Europe have required medium to large sized firms to establish "works councils" through which management is supposed to consult with elected worker representatives. In some cases, government regulations also require that worker representatives sit on corporate boards. Such systems are sometimes termed "co-determination." The effectiveness of these mandatory arrangements in either raising productivity or furthering "industrial democracy" has been questioned. However, these policies can be viewed as an attempt to impose a QWL-type framework by fiat on business.

From time to time, there have been proposals in the U.S. that the federal government should either require or foster European-style productivity consultation committees in American firms. While mandatory programs have received little serious support, there has been increased attention to creating a climate supportive of voluntary cooperative and participative programs. Although the Reagan administration generally eschewed government intervention in the workplace, it did encourage educational efforts aimed at fostering productivity-enhancing cooperative experiments. Agencies such as the Federal Mediation and Conciliation Service and the Bureau of Labor-Management Relations and Cooperative Programs (a division of the U.S. Department of Labor) have been the main instruments of this effort.[15]

To some extent, the tax code has been used to foster forms of financial participation by employees in the enterprise. For example, various tax subsidies provide substantial incentives to establish Employee Stock Ownership Plans (ESOPs). Under ESOPs, stock in the firm is accumulated for employees, often as part of a retirement savings program. Most ESOPs own only a small share of their companies' stock. But there are some examples of worker-owned enterprises through the ESOP mechanism. Certain types of profit sharing plans also receive indirect subsidies through the tax code.[16]

Financial participation of employees and participation in management decision making have some obvious linkages. If employee pay is tied partly to the economic performance of the firm, employees may want some voice in how management decisions -- which affect performance -- are made. Put another way, the "stakeholder" position of the employee in the firm is enlarged by financial participation. However, the empirical fact is that most financial participation plans do not have accompanying managerial participation mechanisms.

iv. Education.

The American workforce has experienced a long term rise in educational attainment. Presumably, this increasing stock of human capital which is embedded in the typical employee contributes to higher productivity.[17] However, concern has been expressed that the U.S. educational system could do a better job at preparing students for entering the workforce. While the quantity of education has risen, there may be a lag in quality, as evidenced by such measures as declining Scholastic Aptitude test scores in the 1970s.

In the U.S., the funding of education -- especially elementary and secondary education -- occurs at the state and local level. The federal government can exercise some leverage, through conditional subsidies to local educational authorities. But it cannot directly change course content or other educational policies. Thus, when concerns do arise at the national level, they tend to be expressed through exhortations from official study groups.[18] The notion that American productivity and competitiveness could be better served by its educational system began to be widely expressed in the 1980s. However, as in the case of investment in physical capital, the short run effects of improvements in the stock of human capital on measured productivity are inherently very small.

VI. Private Initiative and Productivity Improvement.

It is evident from this survey that the initiative with regard to productivity improvement in the U.S. currently lies at the level of the firm. But as in many fields, the actual practice of HRM often lags behind the latest, most innovative practice. Even such obvious first steps toward productivity improvement, such as productivity measurement and use of available data sources, are not always taken. If, as we have suggested, there is considerable scope at the level of the firm for improving productivity through enhancement of the HRM climate, younger managers now entering the workforce have both a challenge and an opportunity.

Sources of Productivity Information

Macroeconomic Trends:

Economic Report of the President (annual)
Handbook of Labor Statistics (periodic publication of the U.S. Bureau of Labor Statistics)

Industry Level Data:

Productivity Measures for Selected Industries (annual publication of the U.S. Bureau of Labor Statistics)
National income account data appear in the Survey of Current Business with annual industry breakdowns usually in the July issue.

Studies:

1. Edward F. Denison, Accounting for Slower Economic Growth: The United States in the 1970s (Washington: Brookings Institution, 1979).

2. Sar A. Levitan and Diane Werneke, Productivity: Problems, Prospects, and Problems (Baltimore: Johns Hopkins University Press, 1984).

3. Marta Mooney, Productivity Management, number 127 (New York: The Conference Board, 1982).

4. U.S. Bureau of Labor Statistics, A BLS Reader on Productivity, bulletin 2171 (Washington: GPO, 1983).

5. U.S. Bureau of Labor Statistics, Trends in Multifactor Productivity, 1948-81, bulletin 2178 (Washington: GPO, 1983).

6. White House Conference on Productivity, Productivity Growth: A Better Life for America (Springfield, Va.: National Technical Information Service, 1984).

FOOTNOTES

1. Prices do not always rise, although since the end of World War II general indexes of prices have almost always risen on a year-to-year basis. Even during periods of general inflation, some prices may fall absolutely. Price deflators for value-based measures of output are needed as long as prices vary, whether the variation is up or down.

2. The analysis below should be familiar to students who have had an elementary course in economics. If it does not seem familiar, review any standard microeconomics textbook.

3. Productivity enhancement through education, training, and experience is discussed in a later chapter.

4. Issues of teamwork are discussed in Armen A. Alchian and Harold Demsetz, "Production, Information Costs, and Economic Organization," American Economic Review, vol. 62 (December 1972), pp. 777-795, especially 779-781.

5. Suppose, for example, a plant uses 4,000 hours of labor per week at an hourly wage of $10. Its weekly labor costs are thus $40,000. If the plant produces 1,000 widgets, its unit labor cost per widget is $40,000/1,000 widgets = $40/widget.

6. William H. Miernyk, "Coal" in Gerald G. Somers, ed., Collective Bargaining: Contemporary American Experience (Madison, Wisc.: Industrial Relations Research Association, 1980), pp. 1-48.

7. Craufurd D. Goodwin, ed., Exhortation & Controls: The Search for a Wage-Price Policy: 1945-71 (Washington: Brookings Institution, 1975); 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).

8. A list of readings on productivity appears at the end of this chapter.

9. U.S. President, Economic Report of the President, January 1987 (Washington: GPO, 1987), pp. 107-113.

10. Perhaps part of the problem in economic research has been the concentration on aggregate data rather than industry studies. By the 1980s, however, some attention had been turned on industry level research, e.g., Martin Neil Baily and Alok K. Chakrabarti, "Innovation and Productivity in U.S. Industry," Brookings Papers on Economic Activity (2:1985), pp. 609-632. Baily and Chakrabarti argue that the slowdown has been caused by a reduced

pace of technological advance, based on detailed study of the chemical and textile industries.

11. An attempt to measure the effect of workplace disharmony on productivity -- and an argument that increased disharmony reduced productivity growth -- can be found in Thomas E. Weisskopf, 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.

12. Louis E. Davis and Albert B. Cherns, eds., The Quality of Working Life, two volumes (New York: The Free Press, 1975).

13. See, for example, Lester C. Thurow, "A World-Class Economy: Getting Back into the Ring," Technology Review, vol. 88 (August/September 1985), pp. 27-37: Lester C. Thurow, The Case for Industrial Policies, occasional paper, Alternative for the 1980's (Washington: Center for National Policy, 1984); Report of a Study Group, Restoring American Competitiveness: Proposals for an Industry Policy, report no. 11, Alternatives for the 1980's (Washington: Center for National Policy, 1984). The study group which authored the last citation was chaired by Lane Kirkland, president of the AFL-CIO, Irving Shapiro, former chairman and CEO of Du Pont, and Felix Rohatyn of Lazard Freres & Co. A survey of the industrial policy issue can be found in Kenan Patrick Jarboe, "A Reader's Guide to the Industry Policy Debate," California Management Review, vol. 27 (Summer 1985), pp. 198-219.

14. Charles L. Schultze, "Industrial Policy: A Dissent," The Brookings Review, vol. 2 (Fall 1983), pp. 3-12; U.S. President, Economic Report of the President, February 1984 (Washington: GPO, 1984), pp. 87-111.

15. The program took the form of sponsorship of publications and conferences on innovative HRM practices and attempts to stimulate labor-management cooperative committees.

16. ESOPs and other compensation systems are discussed in a later chapter.

17. Education and training are taken up in a subsequent chapter.

18. See, for example, National Commission on Excellence in Education, A Nation at Risk: The Imperative for Educational Reform (Washington: U.S. Department of Education, 1983), known as the "Gardner Report."