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THE GAP between theory and practice in wage determination has been difficult to bridge. Economists have long acknowledged that wage determination does not much resemble an auction process. In particular, the response of wages to labor market tightness or slack is surprisingly limited. But it was not until recently that the economics literature began seriously to explore the discrepancies.¹

There are many characteristics of the labor market that are difficult to interpret in a simple demand-supply framework with its assumptions about costless wage adjustments and free labor mobility. The most important of these is that the response of employers to changes in business conditions focuses much more heavily on quantity adjustments (hours and employment) than on wage rates. In addition, wage rates seem to be adjusted in response to variables (such as the consumer price index) or in ways that are hard to explain in a simple market context.

A number of implications flow from this irregular behavior. It can be expected that the wage-determination process will have significant linkages to price setting and inflation. In turn, these linkages suggest that the response to orthodox anti-inflation policies—such as monetary restraint—could be affected by particular wage-determination char-

1. The discrepancies were the subject of an early debate between institutionalists and theorists in the 1940s. See Richard A. Lester, "Shortcomings of Marginal Analysis for Wage-Employment Problems," *American Economic Review*, vol. 36 (March 1946), pp. 63-82. By the 1960s, macroeconomic textbooks simply included assumptions about wage rigidity in their models without much analysis of why the rigidity existed. For example, see Gardner Ackley, *Macroeconomic Theory* (Macmillan, 1961), p. 403. More recent texts have tended to rely on empirical observation of limited wage sensitivity to labor market tightness or looseness. See Robert J. Gordon, *Macroeconomics* (Little, Brown, 1978), pp. 311-15.

acteristics. One purpose of this paper is to explore the qualitative impact such characteristics may be expected to have on the effectiveness of anti-inflation policy.

Although the labor market is the site of important deviations from simple economic models, there are other areas of the economy where special characteristics may also be present. Thus, a second important question is the relative significance of labor market processes when set in a realistic empirical macroeconomic model. For example, a particular characteristic of wage determination might tend to reduce the effectiveness of monetary policy in reducing inflation. But there may be processes in other sectors that have the same effect. In a simple model in which the labor market was the only source of anomalous behavior, changing the labor market characteristic might have a much more dramatic effect than it would in the real world.

A third issue is the assessment of tightness in the labor market. Policymakers interested in measuring this concept have a choice of alternative indexes that may give divergent impressions. They can look at indicators such as unemployment rates, vacancies, and measures of turnover (quits, layoffs, accessions) that appear directly related to the degree of excess demand and supply. Or they can watch wage developments. Obviously, alternative models of wage determination will lead to different assessments of these different types of indexes.

Wage-Determination Practices

Substantial differences in the processes of wage determination are found in the U.S. labor market. A common distinction is between union and nonunion wage-setting practices. However, even within these two divisions considerable variation exists. Over time the relative size of the two sectors has changed and internal practices have evolved.² There is no single theory that can honestly purport to explain completely what is currently practiced and why it has evolved. However, there are some institutional and legal constraints that provide useful insights.

2. Union and association membership in 1978 was estimated to include 22.2 percent of the labor force and 26.6 percent of employees in nonagricultural establishments. These figures have generally declined since the mid-1950s. See U.S. Department of Labor, Bureau of Labor Statistics, "Labor Union and Employee Association Membership—1978," press release USDL:79-603, September 3, 1979, p. 2.

And newer theories of contracting and employer-employee linkages are helpful in understanding what is observed.

Property Rights in Jobs

Some labor markets function on a very casual basis. In such markets, individuals may be hired to perform a specific task for a day or other short periods of time. Hagglng over the payment to be made for the service may occur for each separate transaction. However, such arrangements are rare. More commonly, the word *job* implies some type of ongoing relationship between the employer and employee.

Usually, when an individual is hired, there is an initial understanding about terms and conditions of employment. These terms may eventually be changed. But for a significant period of time, the initial arrangement is expected to stand, a practice that imparts a certain rigidity to wage determination. At some point in the future the employer may find that he has a surplus or shortage of labor. In the case of a surplus, the employer typically reduces hours per worker, or numbers of workers, or both. Explicit wage cuts are unusual, although not unknown. When shortages occur, the employer may attempt to use the existing work force more intensively (say, by increasing overtime) or decrease hiring standards. Use of these quantitative adjustments suggests a resistance to viewing the wage-setting mechanism as the appropriate vehicle for cyclical adaptations. It also suggests a preference for tying internal labor market adjustments in the firm to a tangible indicator: the level of output.

These observations could be consistent with a property right in jobs of employees. If employees did have a formal property right, the value of that right would clearly be affected by either a price or quantity adjustment. Such rights could flow from an implicit or explicit contract with the employer. And such contracts might have contingency arrangements linked to the employer's demand for labor. It is in the nature of contingency provisions that they are linked to observable conditions, and that the responses they call forth are linked to those conditions in some reasonable way. An understanding that if output fell by, say, 10 percent, the employer could reduce labor input by up to 10 percent meets these criteria. It would surely be more reasonable than an arrangement that allowed the employer to reduce wages by

Legal Reinforcement of Property Rights

In some countries, the legal nature of the employment contract is specified in great detail. Systems of labor courts function in a manner similar to private arbitrators under union agreements in the United States. After a period of time, workers acquire tenure in their positions. No such formal arrangements exist in the American legal system.

There are certain public policies, however, that encourage formalized personnel management practices. First, the right to organize is protected by statute, and procedures are provided for union representation elections. In recent years, unions have been winning less than half of such elections.⁵ Nevertheless, the threat of organization exists for many employers and may influence their behavior. The notion of the "threat effect" in wage determination is familiar to labor economists.⁶ However, in response to potential organization by a union, management may adopt personnel practices similar to those in the union sector. In recent years, a subspecies of management consultants has developed whose function is to help nonunion firms retain their unorganized status. The heavy-handed tactics of these consultants have received considerable publicity, particularly from unions. However, much of their advice consists of suggesting that management demonstrate to its nonrepresented employees that no gains would accrue from unionization.⁷

A second source of legal reinforcement of formalized personnel management comes from the various equal employment opportunity laws that have been adopted since 1964. Under title 7 of the Civil Rights Act of 1964, employers are forbidden from engaging in discriminatory practices on the basis of race, sex, religion, or national origin.⁸ The first two categories have been the most important and have sparked a substantial volume of litigation. Federal government contractors are subject to more detailed scrutiny and are expected to implement

5. Unions won 45 percent of all NLRB representation elections in fiscal year 1979. See National Labor Relations Board, *Forty-Fourth Annual Report of the National Labor Relations Board for the Fiscal Year Ended September 30, 1979* (Government Printing Office, 1979), p. 297.

6. H. G. Lewis, *Unionism and Relative Wages in the United States: An Empirical Inquiry* (University of Chicago Press, 1963), pp. 23-24.

7. Jules J. Justin, *Managing Without a Union: Private and Public Sectors* (New York: Industrial Relations Workshop Seminars, Inc., 1978).

8. 78 Stat. 253.

whatever amount he felt appropriate whenever he felt that business conditions were bad.

All of this depends, however, on there being a property right in jobs. In the case of union agreements, such rights can be negotiated.³ And in the public sector, civil service statutes generally provide such rights. However, in the nonunion private sector, property rights in jobs are either the creation of the employer or the by-product of some regulatory program.

Nonunion employers do make unilateral offers of property rights.⁴ A nonunion firm may well provide its employees with company rule books that contain provisions similar to those in union contracts—grievance procedures, for example, or even arbitration in the event of unresolved grievances. Nonunion firms may establish policies of progressive discipline (a hierarchy of penalties typically starting with a warning) for misbehavior. Seniority may be given some weight in layoff, recall, and other decisions. General wage adjustments may occur only at stated intervals, often once a year. Formal progression plans, based on merit reviews with explicit criteria for evaluation, may be used to determine where an individual worker stands in the wage structure.

In general, good personnel management is thought to be characterized by formality, central control, and the elimination of situations in which individual workers are subject to arbitrary treatment by supervisors. Thus, employees of a firm with good personnel management policies can expect to hold their jobs for as long as the firm needs to have the job performed, assuming satisfactory performance. They can expect to advance through the wage structure and possibly up a promotion ladder on the basis of unbiased merit reviews and performance evaluations. An interesting question is why employers should want to offer such terms. As will be discussed later, it was not always the case that they did.

3. For discussion of the concept of property rights in jobs, see Frederic Meyers, *Ownership of Jobs: A Comparative Study*, Monograph Series:11 (Los Angeles: University of California, Los Angeles, Institute of Industrial Relations, 1964).

4. Unfortunately, information on nonunion practices is more difficult to obtain than that on union practices because of the absence of written contracts. Examples of available sources are Ronald Berenbeim, *Nonunion Complaint Systems: A Corporate Appraisal*, Conference Board Report No. 770 (New York: Conference Board, 1980); and Bureau of National Affairs, *Layoff and Unemployment Compensation Policies*, Personnel Policies Forum Survey No. 178 (Washington: BNA, 1980).

programs of affirmative action. Equal employment opportunity policy now extends to older workers, the handicapped (including mental and physical impairments), and Vietnam-era veterans. Many states have similar laws or ones more strict than the federal regulations and statutes.⁹

A by-product of this shift in public policy has been substantial scrutiny of existing personnel policy by government and the courts. This scrutiny, in turn, has elevated and enhanced the importance of personnel departments in firms. An employer charged with discrimination in hiring, promotions, layoffs, or wage setting will be hard-pressed to mount a defense without being able to demonstrate that uniform personnel practices are in place. Given that demonstration, the issue turns on whether those practices meet the regulatory agencies' and courts' current criteria for nondiscrimination. There is considerable incentive, therefore, for management to adopt uniform policies, to vest enough authority in the personnel department to ensure that those policies are implemented, and to hire experts to keep up with current regulations.

Direct regulation of the terms and conditions of employment is a third public policy that enhances the modern personnel function. In 1970, the federal Occupational Safety and Health Act created a new system of regulation with its accompanying litigation, experts, and stress on personnel management.¹⁰ In 1974, detailed federal regulation of private pension plans was established.¹¹ Concern over rising medical costs has also thrust federal policy into employment-related insurance programs.

In addition, older regulatory programs have become more complex. For example, under state workers' compensation programs, the notion of occupational stress as a job-related injury has developed and raised concerns about rising employer costs.¹² Personnel departments are also charged with dealing with the requirements of unemployment insurance, minimum wage, overtime, child labor, and other laws.

There have been periodic bouts of wage-price controls and guidelines

9. For a survey of EEO regulation, see Geraldine Leshin, *Nineteen-Eighty Report on Equal Employment Opportunity and Affirmative Action: The Roots Grow Deeper* (Los Angeles: UCLA Institute of Industrial Relations, 1980).

10. 84 Stat. 1590.

11. Employee Retirement Income Security Act of 1974 (88 Stat. 829).

12. Rosalind M. Schwartz, ed., *Occupational Stress, Proceedings of the Conference on Occupational Stress* (Los Angeles: UCLA Institute of Industrial Relations, 1977).

since the beginning of World War II. Although these programs have varied considerably in scope and detail, they have also fostered centralized and formalized personnel management. Controls and guidelines authorities look for regularities and documentation in considering cases and appeals. Program rules—sometimes inadvertently—will favor particular types of practices over others. Experts are required to keep up with the regulations and the regulators.

Historical Evolution of Modern Personnel Practices

Employers—even large employers—did not always find it advantageous to offer working conditions in accord with current personnel management principles. A recent study by Sanford Jacoby finds that such practices are basically a twentieth-century invention.¹³ At the turn of the century, employers commonly relied on foremen to recruit, retain, and supervise their labor forces. These foremen functioned as quasi-independent labor contractors. They were held accountable for meeting cost and production targets. But the details of how their goals were achieved was not considered a proper concern of management. Firms did not have personnel departments or personnel managers. Individuals in the employ of a single firm might well be paid different wages for identical work.

The development of internal labor markets in firms coincided with general corporate evolution toward internalizing, centralizing, and rationalizing other management functions. A literature on personnel management began to evolve. The implementation of personnel policies and the reduction in authority of foremen were linked by some of the early originators of personnel management to other social reform movements of the time.

A major breakthrough in the widespread adoption of personnel management techniques occurred in the World War I period, according to Jacoby, who notes the period coincided with a substantial increase in unionization.¹⁴ During the 1920s, employers retreated somewhat from the new personnel management techniques, while unionization of the work force also generally declined. However, the retreat was

13. Sanford Jacoby, "The 'Human Factor': An Historical Perspective on Internal Labor Markets in American Manufacturing Firms," working paper no. 21 (Los Angeles: UCLA Institute of Industrial Relations, 1980).

14. *Ibid.*

by no means total. Indeed, doctrines of welfare capitalism that evolved during this period as an employer alternative to unionization encompassed the offering of fringe benefits and other forms of paternalism. Personnel management received a second substantial boost in the 1930s, another period of rapid increase in unionization.

The historical connection between unionization and personnel management, combined with the policies advocated by modern consultants for nonunion employers, suggests that threat effects and union-to-nonunion spillovers occur in a broader sense than economists have considered. Union-type practices, concepts of equity, as well as wage rates, all have an influence on nonunion employers. Thus, it is important to investigate the special nature of union wage and employment policies.

The Modern Union Sector

A primary feature of the union sector is the explicit, fixed-duration contract. Such contracts are typically two or three years in duration and cover wages, fringe benefits, and workplace rules.¹⁵ Virtually all union agreements provide for grievance procedures to settle disputes arising during the term of the contract. Such disputes may involve individual protests of unjust discipline or any issue of contract interpretation.

There is nothing in the legal system that would prevent nonunion employers from offering explicit, long-term agreements to their workers. As already noted, some nonunion employers do offer conditions that resemble those of their union counterparts. But few go as far as the union sector. Some recent court decisions have suggested that nonunion employees may have more implicit rights than has heretofore been the general interpretation.¹⁶ And there have been suggestions that nonunion employers should be compelled by law to provide greater

15. Analysis of typical contract provisions in union agreements can be found in U.S. Bureau of Labor Statistics, *Characteristics of Major Collective Bargaining Agreements, January 1, 1978*, bulletin 2065 (GPO, 1980).

16. In one case, a union employee working for a private federal contractor was deemed to have certain protections by virtue of his employer's intimate involvement with the federal government. For a discussion, see Benjamin Aaron, "The Impact of Public Employment Grievance Settlement on the Labor Arbitration Process" in Joy Corrige, Virginia A. Hughes, and Morris Stone, eds., *The Future of Labor Arbitration in America* (New York: American Arbitration Association, 1976), pp. 21-23. Some recent cases in California have granted employees rights previously confined to union contract situations.

employee protection and rights.¹⁷ However, these are the concerns of the future; at this time it is safe to say that some other consideration explains the discrepancy in practices between the union and nonunion sectors.

That other consideration is the economic damage that unions are capable of inflicting on employers in case of an impasse. The effectiveness of strikes and their costs to employers vary from situation to situation. But it is difficult to find other plausible explanations of why employers should make concessions to union negotiators that they would not otherwise unilaterally give their employees.

Employer concessions tend to tighten the linkage between firm and worker. Wage premiums make alternative opportunities less attractive to employees, thus reducing quits. So do the fringe benefits and industrial jurisprudence processes that are associated with unionization.¹⁸ The union political process is likely to reflect the special interests of more senior workers, and the seniority systems that are formalized in union agreements work to shield such workers from layoffs and resultant income losses. Since seniority is valuable, workers who have acquired it are likely to remain with the firm.

By themselves, wage premiums and the shielding effect of seniority systems should reduce the sensitivity of union wages to external labor market tightness or looseness. If there is generally a queue of workers waiting to be hired at the premium wage, it is not clear why fluctuations in the length of the queue should matter to either party in negotiations. Furthermore, if a firm reduces its employment by laying off or terminating only workers with low seniority, senior workers will have little interest in whether or not there are layoffs.¹⁹

It has also been argued that models that postulate substantial union perception of the wage-employment trade-off implicit in the demand for labor are unrealistic.²⁰ Most of the anecdotal evidence on union

17. See Clyde W. Summers, "Protecting All Employees Against Unjust Dismissal," *Harvard Business Review*, vol. 58 (January-February 1980), pp. 132-39. See also the symposium on "Due Process for Nonunionized Employees" in Barbara D. Dennis, ed., *Proceedings of the Thirty-Second Annual Meeting*, Industrial Relations Research Association Series (Madison, Wis.: IRRA, 1980), pp. 155-86.

18. R. B. Freeman, "Individual Mobility and Union Voice in the Labor Market," *American Economic Review*, vol. 66 (May 1976, *Papers and Proceedings*, 1975), pp. 361-68.

19. Daniel J. B. Mitchell, "Union Wage Determination: Policy Implications and Outlook," *Brookings Papers on Economic Activity*, 3:1978, p. 538. (Hereafter BPEA.)

20. Daniel J. B. Mitchell, "Union Wage Policies: The Ross-Dunlop Debate Reopened," *Industrial Relations*, vol. 11 (February 1972), pp. 46-61.

wage concessions in the face of shrinking employment opportunities comes from extreme cases in which the demand curve itself is threatened with extinction. It is the ultimate threat to survival rather than the slope of the curve that provokes a reaction.

Collective Bargaining and Wage Determination

Union wage determination is a bargaining process. While capable of threatening economic damage to the firm—and obtaining concessions from this threat—strikes involve the loss of wage income to workers. Union strike benefits are generally modest.²¹ Unemployment insurance is not usually available to replace lost income during strikes.²²

Since each negotiation raises the potential for strike costs to both sides, both parties have an incentive to reduce bargaining costs. They do so by extending contract duration and thus reducing the frequency of bargaining. Longer horizons for wage setting tend to attenuate the significance of short-term labor market tightness or looseness at negotiation time. They require that the parties make projections concerning developments during the life of the contract and/or include contingency clauses with formulas to deal with future events. The most common contingency clause is the cost-of-living escalator that gears wage adjustments to the consumer price index (CPI).²³ But there

21. Sheldon M. Kline, "Strike Benefits of National Unions," *Monthly Labor Review*, vol. 98 (March 1975), pp. 17-23.

22. Two states, New York and Rhode Island, provide unemployment benefits to strikers under certain conditions. See Gordon Falk Bloom and H. R. Northrup, *Economics of Labor Relations*, 9th ed. (Irwin, 1981). In some cases, workers idled by a dispute who are not directly on strike can receive unemployment insurance payments. Some states provide benefits for workers who are locked out by employers. Thus, there is an incentive for employers to provoke a strike rather than to lock out employees overtly.

23. Some contracts include reopener clauses conditioned on inflation or other occurrences. Others contain "most favored nation clauses" (terminology borrowed from international trade negotiations) in which one party or the other agrees to revise the contract if more favorable terms are granted to a third party. See U.S. Bureau of Labor Statistics, *Characteristics of Major Collective Bargaining Agreements*, pp. 21, 51. Contracts where wage adjustments are triggered by external wage developments rather than price developments are rare, but not unknown. For example, a 1980 contract covering nurses at Kaiser-Permanente facilities in southern California makes wage partially contingent on a community wage survey. See Bureau of National Affairs, *Daily Labor Report*, July 11, 1980, p. B-2. Escalator clauses geared to prices covered 58.8 percent of workers under major collective bargaining agreements (those covering 1,000 or more workers) in November 1979. See Edward Wasilewski, "Scheduled Wage Increases and Escalator Provisions in 1980," *Monthly Labor Review*, vol. 103 (January 1980), p. 10.

are limited examples of other contingency clauses. In short, bargaining costs reinforce long-term horizons and give rise to the need to project future inflation—probably by some type of extrapolative process—or to link wage movements to price inflation mechanically.

The bargaining process reduces the need for unions to recognize the wage-employment trade-off explicitly.²⁴ Unions do not unilaterally determine wages; collective bargaining is bilateral. Generally, management resistance can be relied on to prevent a move too far up the demand curve, since the resulting wage cost increases cut into profits. In cases where management does not resist, for example because substitutes for union labor are available, unions can push for contract language limiting such substitutions.

Bargaining may also contribute to a certain rigidity of wage goals on both sides. The theory of strikes has suggested that strikes should be viewed as costly mistakes, and—in a variation of rational expectations analysis—that strikes should not be predictable.²⁵ This stems from the idea that both parties would benefit if they could agree to settle, without a strike, upon the terms that a strike would eventually bring about. The saving in strike costs would be an added gain that could be split between the two parties.

However, it has long been known that strike data exhibit cyclical regularities and can be partially explained by various economic indicators.²⁶ Thus both parties may have incentives to "stick to their guns," even when they both can see that a strike is likely to result from such behavior. This contradicts the idea developed above; the best explanation may be that in a long-term relationship, such as often exists between union and management, the objective is to minimize strike costs over the duration of the relationship, and not necessarily to minimize these costs in any particular negotiation.

Long-term strategy for minimization of strike costs suggests that

24. Daniel J. B. Mitchell, *Unions, Wages, and Inflation* (Brookings Institution, 1980), pp. 68-72.

25. This view is often associated with the early analysis of J. R. Hicks. Hicks did suggest, however, that unions might strike periodically simply to remind employers of their potential to carry out a work stoppage. See his *The Theory of Wages* (New York: St. Martin's Press, 1963), pp. 140-47.

26. Albert Rees, "Industrial Conflict and Business Fluctuations," *Journal of Political Economy*, vol. 60 (October 1952), pp. 371-82; Orley Ashenfelter and George E. Johnson, "Bargaining Theory, Trade Unions, and Industrial Strike Activity," *American Economic Review*, vol. 59 (March 1969), pp. 35-49; Daniel J. B. Mitchell, "A Note on Strike Propensities and Wage Developments," *Industrial Relations*, vol. 20 (Winter 1981), pp. 123-27.

the parties should strive to understand each other's goals. Both sides have an incentive to establish their most important objectives. For example, the union might seek to establish over a period of time that keeping up with the CPI or with some comparison groups was a key objective and that the rank and file stood ready to bear substantial costs to obtain this goal. Management might seek to establish objectives such as profitability, competitive costs compared with rival firms, or the preservation of certain management prerogatives. Obviously, both sides have incentives to bluff about their objectives, and neither can be sure about the other side's true feelings.

If one side feels uncertain about the other's key objectives, it may feel impelled to probe the relationship. For example, if management began to suspect that keeping up with the CPI was not a key union objective, it might suggest capping or eliminating the escalator clause to probe the union's reaction. If management's suspicions were not put to rest by the union's response at the bargaining table, the employer might be tempted to push the issue to an impasse. Thus, anything that creates uncertainty about bargaining positions increases the probability of a strike.²⁷ This logic makes concessions and conciliatory behavior difficult. Today's goodwill gesture could be misinterpreted and probed in future negotiations. Perhaps an artful mediator or special circumstances (for example, imminent bankruptcy) may make it possible to label a concession temporary, unusual, and without precedent—but not always.²⁸

Historical Evolution of the Union Contract

The union contract is not a recent invention. Analysis of the development of contractual language suggests a process of evolution, helped along at times by public policy. Prior to World War II, union

27. Strike probabilities at the time of a renegotiation are not negligible. One study of major contract expirations in manufacturing found that about 14 percent led to a strike during 1954-75. These strikes involved 17 percent of the workers covered by these negotiations. See Bruce E. Kaufman, "The Propensity to Strike in American Manufacturing," in Barbara D. Dennis, ed., *Proceedings of the Thirtieth Annual Winter Meeting, Industrial Relations Research Association Series* (Madison, Wis.: IRRRA, 1978), p. 423.

28. The contract view of strikes presented above suggests that the incidence of strikes should tend to decline as the parties gain more experience with each other. For some empirical support of this hypothesis in a paper developing a similar theme, see Melvin W. Reder and George R. Neumann, "Conflict and Contract: The Case of Strikes," *Journal of Political Economy*, vol. 88 (October 1980), pp. 867-86.

agreements were mainly of one year's duration.²⁹ However, longer contracts with deferred wage adjustments, sometimes qualified by reopening clauses, were known at the time. Use of arbitration to settle disputes arising from contracts was well established, although many contracts provided for grievance mechanisms without final arbitration. Fringe benefits such as pensions and health insurance were quite rare. Escalator clauses were known but not common. Even private unemployment benefits—a forerunner of today's supplemental unemployment benefit (SUB) plans—had prewar precedents.³⁰ Generally, contracts of that period were shorter and less complex than their present-day descendants.

As the parties became more experienced in bargaining, longer contracts became more common. It became evident that strike costs during contracts could be minimized if management accepted arbitration of contract disputes in exchange for no-strike clauses. As escalators, which helped permit longer contracts, became more common, it was discovered that clever formulas and qualifications could help reduce some of the uncertainty that they created for management.³¹

29. Examples of early contract language can be found in Bureau of National Affairs, *Collective Bargaining Contracts* (Washington: BNA, 1941); and U.S. Bureau of Labor Statistics, *Union Agreement Provisions*, Bulletin 686 (GPO, 1942). Mitchell has been collecting pre-World War II union contracts from various sources for analysis. Some of the statements in the text result from analysis of those contracts.

30. William E. Simkin provided a 1931 contract between the American Federation of Full Fashioned Hosiery Workers and the Full Fashioned Hosiery Manufacturers Association, Inc., for the contract collection cited in the previous footnote. The agreement provides for a fund whose proceeds are to be used for "alleviation of distress caused by unemployment."

31. Some employers have a need to know in nominal terms what their future labor costs will be for purposes of bidding. Thus escalator clauses are rare in construction. Presumably this need to know the future nominal wage is attributable to lack of escalators in agreements signed by successful bidders. More generally, employers cannot be sure that their ability to pay will move with the CPI. While there have been examples in the past of contracts with wages geared to the price of the employer's product, such contracts do not necessarily protect worker purchasing power. (For examples of such contracts, see Bureau of National Affairs, *Collective Bargaining Contracts*, p. 603.) Profit-sharing arrangements effectively reflect the employer's price. A more common compromise is to use the CPI but include constraints on the operation of the escalator. For example, contracts may contain caps that stop the escalator above a certain limit. Or they may contain corridors that specify that a certain minimum amount of inflation must occur before the escalator comes into effect. Also, the escalator formulas often provide less than 100 percent protection against inflation, so that a 10 percent price increase may trigger less than a 10 percent wage increase. The art of qualifying escalators seems to have developed gradually. During 1968-77, the annual degree of protection

By smoothing out annual incomes in the face of layoffs, SUB plans helped cope with the standard practice of negotiating the wage level and allowing management to determine employment.

Fringe benefits might have been expected to be favored by unions, in keeping with their orientation toward senior workers. The wage control authorities stimulated interest in such benefits during World War II (and in subsequent programs), and the tax code provided favorable treatment for them. Controls and guidelines programs have also provided incentives for the use of long-term contracts and escalators.³²

In short, the modern union contract is the product of various forces. It reflects the logic of bargaining and bargaining costs. It evolved in part from practices that were probably in use by management before unionization.³³ And it reflects the influence—deliberate or inadvertent—of various government policies. As the contract developed, it contributed to general social norms regarding what a good employer should

from escalators contained in major contracts averaged 57 percent. Escalators in the 1950s apparently were much more likely to provide full protection. See Victor J. Sheifer, "Cost-of-Living Adjustment: Keeping Up with Inflation?" *Monthly Labor Review*, vol. 102 (June 1979), p. 15.

32. Controls and guidelines authorities are reluctant to override agreements signed prior to the beginning of their programs. As a result, wage increases pursuant to preexisting long-term contracts are more likely to go unchallenged. Thus, in periods when programs of wage controls are likely to be established, unions may feel it advisable to lock future wage goals into long-term contracts. On the other hand, during controls programs, the parties may shorten their contract durations so as not to be locked into contracts influenced by controls in the event the program is ended. This was the experience during the Nixon controls program. Escalators were granted favorable treatment under both the Nixon and Carter administration programs. Under the Nixon program, a time-weighting procedure was applied to the costing of escalator increases, which tended to lower the percentage increase attributable to them. The Carter guidelines program permitted escalators to be costed using assumed inflation rates substantially below actual rates of inflation. On the Nixon program, see Arnold R. Weber and Daniel J. B. Mitchell, *The Pay Board's Progress: Wage Controls in Phase II* (Brookings Institution, 1978), pp. 56-63, 363-67. There has been little analytical work published on the Carter program as yet. A critical discussion can be found in the U.S. General Accounting Office, *The Voluntary Pay and Price Standards Have Had No Discernible Effect on Inflation* (GPO, 1980). This report was especially critical of the treatment of escalators (pp. 90-92). However, the analysis presented below in the text provides some rationale for encouraging their use.

33. As David E. Feller notes, "Rules . . . contained in a collective agreement have their genesis as much in the nature of modern industrial enterprise as in collective bargaining, and there are substantial reasons apart from coercion why some employers accept the incorporation of those rules." See his "A General Theory of the Collective Bargaining Agreement," *California Law Review*, vol. 61 (May 1973), p. 721.

provide to workers, whether union or nonunion. Personnel managers, and their consultants and textbooks, today reflect the influence of union wage practices.

Modern Economic Analysis of Contracting

Recent economic literature has attempted to find micro-level explanations of the limited responsiveness of wage determination to labor market tightness or looseness. Since much of the work force is nonunion, the theory has sought explanations other than collective bargaining costs for the phenomenon. One possibility is that turnover costs are high enough to make both employers and employees desire to enter into contractlike relationships.³⁴ Such relationships would give nonunion wage determination a unionlike character. Wage changes would be made relatively infrequently, thus reducing responsiveness to immediate conditions.

Generally, turnover costs are considered to include recruitment, screening, and specific training costs for the employer, and loss of income by the employee while searching for a job. In the face of such costs, both parties have an incentive to reduce turnover. Employers with particularly high turnover costs would follow high-wage strategies to reduce the attractiveness of other labor market opportunities for their workers. Employers might hoard labor during temporary downturns in demand, producing the well-known procyclical fluctuation of productivity. If employers had made layoffs and demand then picked

34. The discussion below owes much to Arthur M. Okun, *Prices and Quantities: A Macroeconomic Analysis* (Brookings Institution, 1981). See also Michael L. Wichter and Oliver E. Williamson, "Oligational Markets and the Mechanics of Inflation," *Bell Journal of Economics*, vol. 9 (Autumn 1978), pp. 549-71. One of the important strands in the literature that led to the turnover-cost approach to wage setting dealt with the impact of specific capital on employment and hours fluctuations over the business cycle. See Walter Y. Oi, "Labor as a Quasi-Fixed Factor," *Journal of Political Economy*, vol. 70 (December 1962), pp. 538-55; Sherwin Rosen, "Short-Run Employment Variation on Class-1 Railroads in the U.S., 1947-1963," *Econometrica*, vol. 36 (July-October 1968), pp. 511-29; John H. Pencavel, "Wages, Specific Training, and Labor Turnover in U.S. Manufacturing Industries," *International Economic Review*, vol. 13 (February 1972), pp. 53-64; Donald O. Parsons, "Specific Human Capital: An Application to Quit Rates and Layoff Rates," *Journal of Political Economy*, vol. 80 (December 1972), pp. 1120-43; Dale T. Mortensen, "Specific Capital and Labor Turnover," *Bell Journal of Economics*, vol. 9 (Autumn 1978), pp. 572-86.

up, they might attempt to recall previously laid-off workers before engaging in new hiring. In short, the turnover-cost theory can be called upon to explain a number of real-world phenomena.³⁵

Turnover costs by themselves do not fully explain why labor market arrangements favor inflexible wage decisions and give the employer the right to determine employment and hours. For example, individual haggling costs have to be considered.³⁶ Just as retail stores find it advantageous to post prices rather than bargain with each customer, so employers would find continuous negotiations with each employee to be costly. Such costs would favor uniform wage policies applied to broad classes of employees.

Another consideration is the bilateral relationship and the inherent possibility of "exploitation" on both sides. The payment of a wage premium, the existence of specific job skills, and the search costs of finding a new job mean that there is a potential surplus to be divided between worker and employer. Once a relationship has begun, management can limit its vulnerability to exploitation by refusing to haggle, that is, by establishing uniform wage policies. But workers also would prefer some protection.

While it would be difficult for workers and management to agree on precise formulas that will determine wage payments indefinitely into the future, there may be understandings that future wage deter-

35. For example, the internal labor market literature and the analysis of the "dual" labor market can be analyzed in terms of the turnover-cost approach. See Peter B. Doeringer and Michael J. Piore, *Internal Labor Markets and Manpower Analysis* (Lexington Books, 1971); Michael L. Wachter, "Primary and Secondary Labor Markets: A Critique of the Dual Approach," *BPEA*, 3:1974, pp. 637-80. Doeringer and Piore originally pointed to the neoclassical interpretation of their findings (pp. 14, 76). Later, however, Piore became critical of this interpretation (see his comments on the Wachter paper, pp. 684-88).

36. The importance of minimizing haggling costs in employment contracts is emphasized in Oliver E. Williamson, Michael L. Wachter, and Jeffrey E. Harris, "Understanding the Employment Relation: The Analysis of Idiosyncratic Exchange," *Bell Journal of Economics*, vol. 6 (Spring 1975), pp. 250-78, especially pp. 270-71. In an earlier paper, Simon noted that employment contracts typically contain an unspecified element. The worker agrees to permit the employer—within some reasonable range—to assign tasks, which may be pleasant or unpleasant to varying degrees. Under the implicit contract, however, the detailed tasks on a day-to-day basis may not be delineated. If the worker can be confident that the employer will take his preferences into account, he would presumably be willing to work for less than if his preferences are ignored. Hence an area of surplus is created, which can be divided as part of a long-term understanding. See Herbert A. Simon, "A Formal Theory of the Employment Relationship," *Econometrica*, vol. 19 (July 1951), pp. 293-305. Such a long-term understanding is an alternative to haggling on a daily basis about wages for each day's tasks.

minations will be "fair."³⁷ Such understandings can be viewed as worker protection provisions. What is fair may be a subject of disagreement, but there is no reason why the definition should be centered on labor market tightness or looseness. Possible sources of guidance to what is fair might be wage decisions made by other employers or movements in the CPI.³⁸

The fairness criterion might also explain the preference for flexibility in employment and hours rather than for wage adjustments to cyclical movements in demand. As already noted, an employer might have a difficult time convincing workers that a wage cut was justified by financial conditions. However, workers can readily see that output is declining, and cuts in the quantity of labor used to produce that output may be acceptable because of the obvious relationship between inputs and outputs.

Since fairness is an ambiguous concept, popular definitions of what is fair might change over time, or might vary from society to society. In particular, in the United States the publicity surrounding major union achievements and practices may influence the concept of fairness of nonunion workers. Thus, the coincidence of rapid unionization growth and the development of personnel management techniques noted earlier can be linked.

Obviously, the encompassing nature of the turnover theory is both a strength and weakness. It says that employers have an incentive to offer fair treatment, so virtually any practice that seems fair can be explained by the theory. In addition, it has a self-reinforcing tendency that might be used to explain whatever is observed. If employers in seeking to reduce turnover costs adopt centralized, formalized, and uniform wage policies, workers seeking jobs will be confronted with take-it-or-leave-it offers from some employers and "no vacancies" at

37. General understandings of fairness are common in business dealings, even if they are not set down in legal language. See Stewart Macaulay, "Non-contractual Relations in Business: A Preliminary Study," *American Sociological Review*, vol. 28 (February 1963), pp. 55-67.

38. On wage imitation, see Robert J. Flanagan, "Wage Interdependence in Unionized Labor Markets," *BPEA*, 3:1976, pp. 635-73; George E. Johnson, "The Determination of Wages in the Union and Non-Union Sectors," *British Journal of Industrial Relations*, vol. 15 (July 1977), pp. 211-25; Susan Vroman, "Union/Non-Union Wage Spillovers," *British Journal of Industrial Relations*, vol. 18 (November 1980), pp. 369-76; and Daniel J. B. Mitchell, "Union-Nonunion Wage Spillovers: A Note," *British Journal of Industrial Relations*, vol. 18 (November 1980), pp. 372-76. The use of outside wage comparisons is an important element of public-sector wage setting. See Geraldine Lesbin, *The Prevailing Wage Concept in Public Sector Bargaining* (Los Angeles: UCLA Institute of Industrial Relations, 1977), chap. 1.

others. Job applicants will not be given the opportunity to underbid existing job holders. This will increase search costs, thus making employees all the more anxious to avoid such costs and establish contractlike relationships with their employers.

Empirical testing of a theory in which anything is possible is obviously difficult. The problem is complicated by lack of a clearcut guide as to what should be measured.³⁹ For example, specific training is often cited as a source of turnover costs. But if employers attach premiums to the obtaining of specific training, workers will have incentives to invest in it. In addition, if the labor market arranges itself in a way that leads employers to believe that workers are likely to remain, employers might be willing to invest in general training. Thus, the distinction that human capital theory makes between specific training and general training does not exist in many real-life situations.⁴⁰

It is also unclear how to differentiate the turnover-cost model of implicit employer-employee understandings from alternative models of implicit contracting. Some authors have used differential risk preferences between workers and employers to explain such contracting.⁴¹ There is some connection between the two models; if turnover costs lead to special treatment of senior workers—including a reduced probability of layoff—then the risk aversion of these workers will be automatically catered to by employers.

39. The Los Angeles-based M & M Association, an employers' group, did produce estimates of turnover costs from a member survey for 1979. The average cost of replacing an employee was \$3,378.50 for production and maintenance workers, \$1,975.83 for office and technical workers, and \$9,115.83 for salary-exempt workers. Of these totals, 38 percent for the first two categories and 75 percent for the last went for advertising; travel expenses for recruiters and applicants; expenses for interviewing, reference checks, paperwork, and testing; and medical examinations. The rest went for induction procedures, substandard production by new employees, and time spent by supervisors and fellow workers performing on-the-job training. However, no distinction is made between specific and general training. Exit costs for the three categories were estimated as \$233.25, \$315.67, and \$1,240.33. Hence, the costs of turnover in a steady-state situation were \$3,611.75, \$2,291.50, and \$10,356.16. It should be noted that the M & M Association included data only from firms that could provide detailed information. Firms that could provide only rough estimates of totals estimated steady-state turnover costs for the three categories of \$1,029.09, \$1,332.84, and \$4,260.39. Not surprisingly, those firms that thought it worthwhile to collect detailed data were the ones with the higher costs of turnover. Source: M & M Association, *Turnover and Absenteeism Manual* (Los Angeles: M & M, 1980), sec. III, tables I and II.

40. Mark Blaug, "The Empirical Status of Human Capital Theory: A Slightly Jaundiced Survey," *Journal of Economic Literature*, vol. 14 (September 1976), p. 837.

41. An early incorporation of risk-sharing behavior in contracting was made by

Generally, the risk aversion models of contracting need some supplementation to produce the kinds of contracts and practices actually observed. For example, the lack of contracts fully specified in real terms—even when escalators are used—presents a theoretical problem.⁴² In the union sector, the bargaining considerations involved in protecting a union-induced wage premium may be part of the explanation. Sometimes contracting models suggest complete guarantees of wage income, including guarantees against fluctuations in employment.⁴³ Since employment and hours fluctuations are permitted in the real world, institutional arrangements that reduce the income effects of employment fluctuations, such as unemployment insurance, may need to be invoked. If unemployment insurance systems are not fully experience-rated (and they are not), an incentive is provided to use layoffs as an adjustment mechanism, rather than offering complete income guarantees or maintaining employment and adjusting wages.⁴⁴

Steven N. S. Cheung in connection with landlord-tenant relationships in agriculture. See his "Transaction Costs, Risk Aversion, and the Choice of Contractual Arrangements," *Journal of Law and Economics*, vol. 12 (April 1969), pp. 23-42. Examples of the labor market literature include Costas Azariadis, "Implicit Contracts and Underemployment Equilibria," *Journal of Political Economy*, vol. 83 (December 1975), pp. 1183-1202; Martin Neil Baily, "Wages and Employment under Uncertain Demand," *Review of Economic Studies*, vol. 41 (January 1974), pp. 37-50; and Robert E. Hall and David M. Lilien, "Efficient Wage Bargains under Uncertain Supply and Demand," *American Economic Review*, vol. 69 (December 1979), pp. 868-79.

42. In reviewing the evidence on contracting, one author finds lack of support for the notion that wage contracting is conducted in real terms. He views this finding as weakening the case for the risk aversion theory of implicit contracting. See James E. Pearce, "Trade Unionism, Implicit Contracting, and the Response to Demand Variation in U.S. Manufacturing," research paper number 8003 (Federal Reserve Bank of Dallas, April 1980).

43. Indeed, as Robert E. Hall noted in comments on an earlier version of this paper, an extreme form of contract theory suggests that firms would not use labor costs as a guide to pricing decisions. Labor costs would become totally fixed and would not affect marginal decisionmaking. It is sometimes argued that Japanese firms, for example, with their "lifetime" employment contracts, undercut foreign prices during recessions because their labor costs are fixed. However, Japanese firms can lend their permanent workers to other firms and make use of nonpermanent workers and suppliers who do not offer lifetime commitments. Hence, it would be difficult to come up with real-world examples of such extreme contracting behavior. In addition, the transactions cost view suggests that in the product market, firms might use cost markups to guide pricing decisions in ways that seem fair to customers. Thus, labor costs might enter pricing through the markup channel. See Arthur M. Okun, "Inflation: Its Mechanics and Welfare Costs," *BPEA*, 2:1975, pp. 362-63.

44. Martin Feldstein, "The Effect of Unemployment Insurance on Temporary Layoff Unemployment," *American Economic Review*, vol. 68 (December 1978), pp. 834-46.

In short, recent economic analysis of wage determination provides many insights into real-world behavior without abandoning assumptions of economic rationality. The most rigorous versions of contracting theory, however, often do not predict precisely the form of employer-employee wage arrangements that characterize actual practice. In contrast, the turnover-cost models are general enough to encompass almost any form of behavior. These models, with their emphasis on the use of fair standards for wage setting, do provide a link with the historical development of personnel management techniques and unions.

Contracting in a Macroeconomic Model

Contracting or contractlike behavior can be expected to be associated with three important characteristics of wage setting. First, the influence of labor market tightness or looseness will be attenuated. Fluctuations in indexes such as the unemployment rate need not be associated with dramatic shifts in wages or even the rate of change of wages. Second, at any moment in time some observed wage behavior is occurring pursuant to previously determined arrangements. Thus, it is possible that past circumstances—such as previous rates of wage or price inflation—are carried into the present. Third, in the most extreme form of contracting, written union-management agreements, use of explicit escalation is common. Thus, inflation of the present (or very recent past) is mechanically reflected in some wage adjustments. The degree to which these three characteristics are present or absent in the labor market should have some influence on the responsiveness of the inflation rate to anti-inflation policy. However, in order to predict what the effect will be, a model that includes behavior in other markets must be specified.

Initially, we examine a simple four-equation model. This model is relatively general in form and probably reflects the relationships many macroeconomists carry about in their heads. It is first solved algebraically for the next-period values of critical variables. Because the dynamic implications are also of interest, a simulation over a multi-period horizon is also presented. The goal is to explore the influence of the three contract-related characteristics on the effectiveness of monetary and fiscal policy in influencing the inflation rate.

While a simple four-equation model can be expected to give some

insight into the probable qualitative impact of these contract-related characteristics, it cannot offer much guidance on the quantitative impact. A larger model with an empirical basis is needed for such estimates. Thus, after the four-equation model is explored, we try similar experiments on the large-scale quarterly UCLA business forecasting model. This model is similar in broad outlines to other large-scale models such as those maintained by Data Resources, Inc., and Wharton. As it turns out, although the big model produces the same qualitative effects as the four-equation model, it suggests that inertia in other areas of the economy reduces the importance of variations in contract-related behavior in the labor market.

Contracting in a Simple Model

Contracting in the labor market suggests that the process of wage-change determination will be altered to reflect a multiperiod horizon. Continuous decisions about wages are not made. Instead, a wage policy is established for some duration. Generally, the longer the horizon for the contract, the less attention will be paid by wage setters to short-term transitory phenomena. In particular, it might be expected that longer contracting horizons will attenuate the influence of the real state of the labor market on wage decisions. This should be the case for both explicit and implicit understandings with employees in the nonunion sector.

In a simple classical model, the labor market clears and determines a real wage. It is the real wage that is equated with marginal productivity on the demand side and with the marginal utility of leisure on the supply side. While it is true that the classical model operates on a real basis with money as a veil and nominal values of little or no consequence in equilibrium, in disequilibrium situations *nominal* values must adjust. In the case of an excess supply of labor and a given money supply, the nominal wage will fall until such time as the market clears. Past rates of wage or price inflation, or even current rates of price inflation, should not alter this prediction. In a simple classical model, nominal wages must fall absolutely so long as there is excess supply.⁴⁵

45. This does not mean that the price level is irrelevant to how far the nominal wage must fall. All other things equal, a higher price level would lead to a higher *equilibrium* nominal wage. However, the text is explicitly focused on situations of disequilibrium.

In the spectrum from the simple classical auction-type labor market to the contracting market, past and current values of price inflation and/or past values of wage inflation become more and more relevant in determining current wage changes, and demand and supply conditions in the labor market become less relevant. Where negotiating costs in union settings induce a combination of long-term agreements and escalator clauses, the importance of current price inflation is accentuated. Hence, the major contrasts between classical auction processes and contracting processes in the labor market can be highlighted by adjusting the wage-change determination equation in a macro model to reflect differences in the response to particular explanatory variables. Specifically, in a classical market an excess supply or demand variable should be the primary determinant of wage change. Nonescalated contracting markets should show little wage-change sensitivity to excess supply or demand, but will probably be particularly sensitive to lagged wage and/or price inflation. Escalated contracting markets should put major emphasis on current price-change determination and little emphasis on anything else.

Consider the following model featuring a money market, a labor market, and a product market.⁴⁶ Traditional monetary policy is represented by exogenous manipulation of the money supply, M^s , while traditional fiscal policy is represented by deliberate changes in net government expenditures (expenditures minus taxation), E . Manipulations of monetary and fiscal policy will have some impact on the rate of price inflation and hence the absolute level of prices, P , and P , respectively, and on wage inflation and the absolute level of wages, W and W . Also affected will be the overall level of real output, Y , and employment of labor, L , and the rate of interest, r .

In the money market, it is assumed that the demand for money, M^d , is equated with supply, and that money demand is a positive function, A , of the price level and the level of real output, but a negative function of the interest rate. That is:

$$(1) \quad M^d = A(P, Y, r); \partial A/\partial P > 0, \partial A/\partial Y > 0, \partial A/\partial r < 0.$$

The labor market is initially assumed to be characterized by the classical economic condition, wage = marginal revenue product of

46. Since an interest rate appears in this model, there is implicitly a securities market in the background. However, by Walras's law, explicit treatment of this market is unnecessary.

labor. This can be expressed more generally as a function, B , linking employment, L , and the real wage, W/P . Thus,

$$(2) \quad L = B(W/P); \partial B/\partial(W/P) < 0.$$

Following the classical assumption, increases in the real wage have a negative effect on labor demand. Therefore, increases in W have a negative effect, while increases in P have a positive and offsetting effect. Equation 2 can be solved for P and viewed as a price markup equation.

Also in the labor market, a dynamic process occurs that determines wage change, \dot{W} , at any point in time. Under purely classical conditions, wage change might be assumed to be only a function of demand and supply conditions. If the labor supply is greater than the level of employment, wage increase should be retarded. Indeed, as noted earlier, nominal wages should fall absolutely. Much of the empirical work on wage determination, however, suggests that current and lagged price inflation, \dot{P} and \dot{P}_{-1} , and lagged wage inflation, \dot{W}_{-1} , might play some role in the determination of wage change. Thus, a general specification of the dynamic wage-change process⁴⁷ can be represented, using the function C , as:

$$(3) \quad \dot{W} = C(\dot{P}, \dot{P}_{-1}, \dot{W}_{-1}, L); \partial C/\partial \dot{P} > 0, \partial C/\partial \dot{P}_{-1} > 0, \\ \partial C/\partial \dot{W}_{-1} > 0, \partial C/\partial L > 0.$$

It is generally assumed that lagged and current price inflation has a positive effect on current-period wage inflation, as does lagged wage

47. The simplified model and the UCLA macroeconomic model (discussed below) determine wage rates without explicit reference to the union and nonunion sectors. The assumption implied is that the presence of these and other differentiations within the labor market can be embodied in the parameters of a single wage equation, without keeping track of the many different labor markets that exist. In response to Robert Flanagan's discussion of an earlier version of this paper, the authors simulated a version of the model that explicitly assumed two labor markets, with different wage levels and parameters specified for the union and nonunion sectors. The simulation results were identical to five decimal places for all variables, assuming that the unionized sector held a fixed share of the labor market. A slow drift in the union share would not change the results significantly. Considerable variation in the unionized share might, however, imply that no single wage equation, with fixed parameters, could adequately approximate the results that would be observed using a more disaggregated approach. A full two-sector (or multisector) model would have to include equations that determined the size of the sectors in response to changes in relative wage levels. Such a model is beyond the scope of this paper.

inflation.⁴⁸ Higher levels of employment are also generally assumed to have a positive effect on wage inflation.

Finally, there is the product or goods market. It may be assumed that the demand for output determines total output unless the economy is bumping against a capacity constraint. Output demand can be assumed to be a function, D , that increases with real money balances (wealth effect), decreases with the interest rate (higher interest rates make investment in plant and equipment and consumer durables less attractive), and increases with net government expenditures, E (stimulative fiscal policy). Thus:

$$(4) \quad Y = D(M^s/P, r, E); \partial D/\partial(M^s/P) > 0, \partial D/\partial r < 0, \partial D/\partial E > 0.$$

The system of equations 1 through 4 is quite general. Since the model described is meant to be short run, no assumptions need be made about the stability of particular relationships. In particular, the wage-determination system of equation 3 might or might not be assumed to have "accelerationist" tendencies over several periods.

To close the model, a fifth relation between output and labor input (a short-run production function) can be added, that is, $Y = f(L)$. This permits the substitution of L for Y in equations 1 and 4. In addition, the following identities permit the substitution of \dot{W} and \dot{P} for W and P in all equations: $W = (1 + \dot{W})W_{-1}$, $P = (1 + \dot{P})P_{-1}$, and $M^s = (1 + \dot{M}^s)M^s_{-1}$. The functions A , B , and D become A^* , B^* , and D^* as result of the substitutions. A modified system of four equations with four unknown or endogenous variables (\dot{P} , L , r , and \dot{W}) and four predetermined or exogenous variables (\dot{M}^s , \dot{W}_{-1} , \dot{P}_{-1} and E) emerges:

$$(1') \quad \dot{M}^s = A^*(\dot{P}, L, r) \quad \text{Money market}$$

$$(2') \quad L = B^*(\dot{W}, \dot{P}) \quad \text{Classical labor market} \\ \text{(wage = marginal revenue product)}$$

$$(3') \quad \dot{W} = C(\dot{P}, \dot{W}_{-1}, \dot{P}_{-1}, L) \quad \text{Wage-change determination process}$$

$$(4') \quad L = D^*(\dot{M}^s, \dot{P}, r, E) \quad \text{Product market}$$

48. The role of lagged prices and wages can obviously be rationalized by assuming adaptive expectations on the part of wage earners. Even if wage earners are entirely concerned about future prices and are willing to "let bygones be bygones," their observable behavior, in the absence of direct measures of expectations of future prices or wages, may resemble adaptive expectations. A further discussion of expectations can be found below.

The expected signs of influences of the right-hand side variables on the left-hand side variables are shown under the equations.

Suppose that inflation, \dot{P} , is running at a higher than acceptable rate and that the monetary and fiscal authorities wish to exercise their policies in order to slow the rate of price increase. The effectiveness of monetary and fiscal policy is measured by the magnitude of the overall impact (worked through the complete system) of changes in the rate of growth of the money supply and of the flow of net government expenditure on the rate of price inflation. In algebraic terms, effectiveness is measured by $d\dot{P}/dM^s$ and by $d\dot{P}/dE$. It may then be asked how contracting in the wage-change determination process affects these two magnitudes.

Contracting

Contracting is most likely to enter the model through the wage-change determination process. First, if contracts attenuate supply-demand influences on wage determination, the impact shows up in the model in the linkage between the wage-change determination and L . In a simultaneous-equation system, such an influence is not confined just to that linkage; rather, it spreads throughout the system in complex ways. Second, a stronger linkage of past wage and price inflation and current wage change can be expected due to contracting. Finally, the use of escalator clauses in explicit union contracts may strengthen the linkage between current price inflation and current wage inflation.

How do the contracting impacts on wage change affect the effectiveness of monetary and fiscal policy? One way to deal with the question is to linearize the equations and solve for the two measures of effectiveness, $d\dot{P}/dM^s$ and $d\dot{P}/dE$. The contracting impact can be summarized in a linear system by increases or decreases in the magnitudes of particular coefficients. Then the impact of changes of those magnitudes on the two measures of efficiency can be calculated. These calculations are described in an unpublished appendix (available from the authors). The results are shown in table 1.

Two aspects of the contracting impact cause difficulty for monetary and fiscal policy in fighting inflation. Although the intent of demand restraint is often obscured in public statements by government officials, its primary mechanism is the creation of economic slack. In the context of the four-equation model, this slackness appears as a reduction in

Contracting impact	Influence of monetary/ fiscal policy on inflation	Implication for inflation restraint
Attenuation of supply- demand linkage to wage-change determination	Reduction in effectiveness	If inflation has occurred in the past, difficulty in slowing inflation through demand restraint is increased.
Long-term contracts (ignoring escalation)	No change	If inflation has been high in the past, it will tend to be high in the present.
Escalator clauses	Increase in effectiveness	If inflation has occurred in the past, difficulty in slowing inflation through demand restraint is reduced.

employment, L . A lower value of L reduces the rate of wage change. Given the assumed linkage of wage and price change, the rate of inflation is then indirectly reduced. But if the initial linkage between L and \dot{W} is reduced, then so is the indirect effect on price inflation. In the context of the simple simultaneous model presented above, the complex interactions of the variables do not offset this chain of reasoning.

Long-term wage contracts have a different influence from the attenuation effect in strengthening the importance of past wage and price inflation as determinants of current wage inflation. Since the past cannot be changed, monetary and fiscal policy can influence only the present. In the wage-change equation, the only real present influence is L . Whatever the effectiveness of monetary and fiscal policy (operating through L) may be, the inflation rate today will be more closely linked to past inflation rates (operating through \dot{W}). In particular, if the inflation rate has been high in the past, it will tend to be high in the present.

Escalators, on the other hand, create a contemporaneous echo effect that enhances the efficiency of monetary and fiscal policy. Wage change is more dependent on a current variable (price inflation) with an escalator clause. To the extent that some price moderation is induced by demand restraint (by inducing economic slack and reducing

wage inflation), the price moderation reinforces the wage-moderation effect, which in turn reinforces the price-moderation effect in a continuing cycle.

Dynamic Simulations of the Four-*Equation Model*

The algebraic solution of the linearized model indicates the first-period qualitative directions of change in the measures of effectiveness of monetary and fiscal policy with respect to changes in parameters that represent the influences of long-term contracts, escalators, and attenuation of slack in the labor markets. Obviously, a critical issue is the speed of response of prices and wages to changes in monetary or fiscal policy. To examine this feature, dynamic simulations of the four-equation model were performed.

Given any arbitrary rate of growth of the money supply, the rate of inflation in both prices and wages will eventually equal this rate, and the rate of unemployment will stabilize at a level that has been set for convenience at 6.0 percent. Results in the base case are roughly equal to those simulated by Tobin.⁴⁹

The model was specified and initialized to yield a steady-state solution with the same chronic (expected) inflation in both wages and prices, which is also equal to the initial rate of growth of the money

49. See James Tobin, "Stabilization Policy Ten Years After," *BPEA*, 1:1980, pp. 19-71, especially pp. 66-68. Since full employment is eventually restored regardless of the rate of money growth, there is no long-run trade-off between unemployment and inflation. The presence of inertia in wage adjustments, however, does imply short-run trade-offs exist. As John B. Taylor noted in comments on an earlier draft of this paper, the interpretation of the source of wage inertia can be critical to the policy implications of the model. Specifically, if rational expectations are assumed, then wage earners should not persistently err in their estimates of real wages. A thoroughly convincing announcement of an anti-inflation policy would then permit prices to be reduced with far less unemployment than would be implied by adaptive expectations. Nevertheless, even under the assumption of rational expectations, if wage and price decisions are staggered over time, and multiperiod contracts overlap, then inertia will emerge. Taylor has estimated empirically a model of the U.S. economy, with constraints imposed that were developed assuming rational expectations. See John B. Taylor, "Estimation and Control of a Macroeconomic Model with Rational Expectations," *Econometrica*, vol. 47 (September 1979), pp. 1267-86. Simulations of his model give short-run trade-offs similar to those presented here. Taylor has also developed an approach for distinguishing wage expectations from wage inertia. See his "Aggregate Dynamics and Staggered Contracts," *Journal of Political Economy*, vol. 88 (February 1980), pp. 1-23, especially pp. 18-20. He concludes that rational expectations matter greatly despite the existence of contracts.

supply. The real output level is constant in steady state, as is the level of employment and the interest rate. (Alternatively, one can regard the results as deviations from trend increases in real output, employment, and real wages.)

Union contracts and similar institutional practices in the nonunion sector may have three types of effects on wage determination. First, in the absence of these practices, higher unemployment rates or other indicators of slack in the labor market might lead to stronger effects on wage rates than has been observed. Second, explicit union contracts and informal implicit long-term understandings in the nonunion sector may act to lengthen the period of adjustment to anti-inflationary policies that create slack in the labor markets. Third, wider use of escalator clauses may speed the transmission of price reductions (or increases) to wage determination. A base-case equation and three alternative wage parameter specifications were designed to indicate the potential effects of these features, as follows:

Base wage equation

$$(5a) \quad \dot{W} = 0.30 \dot{P} + 0.70 \dot{P}_{-1} + 0.0 \dot{W}_{-1} + 0.1(L - 100)$$

Wage equation with stronger unemployment effects

$$(5b) \quad \dot{W} = 0.30 \dot{P} + 0.70 \dot{P}_{-1} + 0.0 \dot{W}_{-1} + 0.2(L - 100)$$

Wage equation with long-term contracts

$$(5c) \quad \dot{W} = 0.10 \dot{P} + 0.20 \dot{P}_{-1} + 0.70 \dot{W}_{-1} + 0.1(L - 100)$$

Wage equation with escalators

$$(5d) \quad \dot{W} = 0.90 \dot{P} + 0.10 \dot{P}_{-1} + 0.0 \dot{W}_{-1} + 0.1(L - 100)$$

The equations with stronger unemployment effects (5b) doubles the weight given to the measure of labor-market slack, holding constant prices and wages. The equation with long-term contracts (5c) shifts part of the weight from current and previous prices to previous wage rates. Finally, equation 5d reflects more widespread use of escalators by shifting much of the weight from previous prices to current prices.

Four experiments were run, one for each of the four wage equations. In each experiment the model was initialized at steady-state 10 percent inflation. The money supply, starting in year 0, was held constant throughout the rest of the twenty-year simulation. That is, money growth that had been 10 percent per year was abruptly cut to zero.

Table 2. Results of Simulations of Four-Equation Model^a

Year	Base equation		Stronger unemployment equation		Long-term equation		Escalators equation	
	\dot{P}	U	\dot{P}	U	\dot{P}	U	\dot{P}	U
0	10.0	6.0	10.0	6.0	10.0	6.0	10.0	6.0
1	7.4	7.4	7.1	7.4	7.9	7.5	2.9	6.6
2	5.2	8.4	4.6	8.2	7.0	8.8	2.9	6.7
3	3.4	9.0	2.4	8.6	5.9	9.8	0.5	6.6
4	2.0	9.3	0.7	8.8	4.8	10.6	-0.3	6.5
5	0.8	9.5	-0.7	8.6	3.6	11.2	-0.4	6.5
6	-0.2	9.4	-1.6	8.4	2.4	11.6	-0.5	6.4
7	-0.9	9.3	-2.1	8.0	1.2	11.7	-0.4	6.3
8	-1.4	9.0	-2.3	7.5	0.1	11.8	-0.3	6.3
9	-1.7	8.7	-2.3	7.1	-0.9	11.6	-0.3	6.2
10	-1.9	8.4	-2.1	6.7	-1.9	11.3	-0.2	6.2
11	-1.9	8.0	-1.8	6.3	-2.7	10.9	-0.2	6.1
12	-1.9	7.7	-1.4	6.0	-3.3	10.3	-0.2	6.1
13	-1.7	7.3	-1.0	5.8	-3.8	9.6	-0.1	6.1
14	-1.6	7.0	-0.6	5.7	-4.1	8.9	-0.1	6.1
15	-1.4	6.8	-0.3	5.6	-4.3	8.1	-0.1	6.1
16	-1.2	6.5	-0.1	5.6	-4.3	7.3	-0.1	6.1
17	-1.0	6.3	0.1	5.7	-4.1	6.4	-0.1	6.0
18	-0.8	6.2	0.2	5.7	-3.8	5.6	-0.0	6.0
19	-0.6	6.0	0.3	5.8	-3.4	4.9	-0.0	6.0
20	-0.5	5.9	0.3	5.8	-2.9	4.3	-0.0	6.0

a. \dot{P} = inflation rate; U = unemployment rate.

The simulation results for the rate of inflation and the rate of unemployment are summarized in table 2.

The base equation implies that an abrupt termination of money growth could eliminate inflation in five years. The unemployment rate would rise until year 5, with a peak of 9.5 percent, and would remain above 8.0 percent until year 12. It would take about twenty years for inflation to be eliminated and full employment restored.

This model, like that simulated by Tobin, shows damped oscillatory behavior in all four simulations. Zero money growth therefore leads to a period when prices are falling before the steady state is reached. The greatest rate of deflation, using the base equation, is -1.9 percent, and it comes about ten periods after the anti-inflationary policy is introduced.

If the wage-determination process were more responsive to labor market conditions, as simulated with the stronger unemployment

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equation, demand policies would be significantly more effective. Inflation would be essentially ended by year 4 and the unemployment rate would not exceed 9.0 percent.

Long-term contracts seriously worsen the period of adjustment. Inflation is not brought to zero until nearly ten periods have passed, and the peak rate of unemployment is 11.8 percent, more than 2 percent higher than the peak rate in the base case simulation. The oscillation period is longer and the overshooting problem is intensified. Deflation peaks at -4.3 percent and the unemployment rate is almost 2 percent below full employment by year 20. A considerable period would have to elapse before steady state would be reached.

According to the four-equation model, escalators offer considerable promise in reducing the pain and speed of adjustment to anti-inflationary policies. Inflation ends after two periods, and the peak unemployment rate is 6.7 percent.⁵⁰ Escalator clauses would, of course, worsen the situation when exogenous price shocks cause temporary increases in the overall rate of inflation. Crop failures that lead to food price increases, OPEC crude oil price increases, and other such price shocks would raise wages more quickly if escalators were more extensively adopted.

Dynamic Simulations of the UCLA Macroeconomic Model

UCLA's Business Forecast Project uses a large-scale, empirically estimated model for economic forecasting.⁵¹ The key wage equation in the UCLA model determines the annual percentage rate of change of the hourly index of wage compensation in the nonfarm business sector. This index was chosen as the critical wage indicator because it corresponds exactly with the numerator of the index of unit labor costs in the nonfarm sector published by the U.S. Bureau of Labor Statistics. Standardized unit labor costs, in turn, provide the key path from wages to the implicit price deflator for gross domestic product in the nonfarm sector, which is the pivotal price term in the model.

Wage changes are predicted as a function of the current rate of

50. Real-world escalators generally do not provide for wage decreases due to price deflation. In principle, equation 5d should be modified to reflect this fact. The limited oscillation suggests that such modification would have little effect.

51. Thomas Y. Miracle, ed., *The UCLA Business Forecast for the Nation and California in 1981*, Proceedings of the Twenty-ninth Annual Business Forecasting Conference (Los Angeles: UCLA Business Forecasting Project, December 1980).

change in the implicit price deflator for consumption expenditures, lagged price changes, and the inverse of the unemployment rate, adjusted for demographic changes. The demographic adjustment, developed by Data Resources, Inc., is nearly zero in 1956, rises gradually to a value of about 0.5 percent in 1966 and is 1.4 percent in 1979. The lagged price term is:

$$(6) \quad GPCLAG(t) = GPCLAG(t-1) + 0.6 [GPCLAG(t-1) - GPCLAG(t-2)] + 0.04 [GPC(t) - GPCLAG(t-2)],$$

where GPC is the current percentage change in the consumption deflator and $GPCLAG$ is the lagged price term.

In equation 6, the lagged price term is a second-order Pascal lag specification. Current adaptive inflationary expectations, $GPCLAG$, equal the expectations in the previous quarter, plus 60 percent of the change in expectations in the previous quarter, plus 4 percent of the difference between the current rate of inflation and expectations two quarters previously. If 10 percent inflation had been the actual inflation rate long enough to make the lagged price term also equal to 10 percent, and then the consumption deflator were to become perfectly stable, with zero change, then the lagged price variable would drop to 5 percent in seven quarters and would be 2 percent in thirteen quarters. This specification means that if inflation has been rising in the past it will be "extrapolated" to rise more rapidly in the future unless offset by a substantially lower rate of inflation in the current quarter. First-order adaptive expectations specifications do not have this extrapolative component, and a brief variation, such as took place in the third quarter of 1980, will produce lower inflationary expectations immediately. The second-order specification, on the other hand, can ride over a temporary deviation because of the trend component.

Quarterly data over the period from the first quarter of 1956 through the second quarter of 1980 were used to estimate the base forecasting equation (t -statistics in parentheses):

$$(7a) \quad GJRWSSNF = 0.96 + 0.292 * GPC + 0.546 * GPCLAG \\ (3.05) \quad (3.88) \\ + 9.352 * [1/(RU - RUADJ)], \\ (2.77)$$

$$\bar{R}^2 = 0.565; \text{ Durbin-Watson} = 2.13$$

where $GJRWSSNF$ is the annual percentage change in the hourly wage and benefit compensation index for the nonfarm business sector, RU is the rate of unemployment, and $RUADJ$ is the demographic adjustment. An increase in the adjusted unemployment rate from 5 to 10 percent would slow the rate of change in wages by about 1 percent.⁵² A sustained 1 percent increase in inflation would eventually increase wage compensation by 0.83 percent.

This equation reflects, to some extent, each of the three effects of unions and informal contracts on wage determination discussed above. First, long-term contracts and implicit long-term understandings between employers and employees are reflected in the significant weight given to past price movements. Second, the coefficient of the inverse of the adjusted unemployment rate is rather small. An increase in adjusted unemployment from 5 percent to 10 percent would reduce the rate of increase in wage compensation by only about 1 percent. Finally, the effects of escalator clauses on wage gains are captured in the coefficient of the current inflation term. This equation implies considerable inertia in wage adjustments, so it is used for simulations entitled "long-term contracts."

To simulate the effects of more widespread use of escalators, the coefficients of this equation were altered to shift much more weight to the current rate of inflation. This alternative equation, called the "escalators" equation, is as follows:

$$(7b) \quad GJRWSSNF = a + 0.7*GPC + 0.13*GPCLAG + 9.35*[1/(RU-RUADJ)].$$

The constant term, a , in equation 7b was adjusted to yield the same prediction as the base forecasting equation for the first quarter of the simulation period (the third quarter of 1980).

Stronger impacts of unemployment on wage determination were simulated by raising the coefficient of the inverse of adjusted unemployment to 109.35, a value almost ten times larger than the empirical estimate. This larger coefficient means that an increase in the adjusted unemployment rate from 5 percent to 10 percent would reduce wage

52. The results of the UCLA macroeconomic model also agree roughly with Okun's review of six macroeconomic Phillips curve estimates; all six pointed to a very costly short-run trade-off between unemployment and inflation. See Arthur M. Okun, "Efficient Disinflationary Policies," *American Economic Review*, vol. 68 (May 1978, *Papers and Proceedings, 1977*), pp. 348-52.

compensation gains from an initial value of 10 percent to virtually zero. The following equation is therefore called the "stronger unemployment" version of the wage equation:

$$(7c) \quad GJRWSSNF = a + 0.29*GPC + 0.55*GPCLAG + 109.35*[1/(RU-RUADJ)].$$

The constant term, a , was adjusted to yield the same forecast for the first quarter of the simulation period as the base forecasting equation (7a).

Four simulations were performed to evaluate the effects of changing the wage equations as described above (see table 3). The first simulation is the base UCLA macroeconomic forecast presented in September 1980, called the "base forecast." All other simulations (labeled "spending cuts") examine the effects of a fiscal policy designed to reduce the rate of inflation. In four quarters, starting in the third quarter of 1980, real federal government expenditures for goods and services are reduced until the spending cuts reach \$30 billion in 1972 dollars. These reductions are sustained until the last quarter of 1984.

The empirical estimates of the wage equation reflect a considerable lag between a given reduction in the rate of increase in prices and the full transmission of reduced inflation in wages. Therefore, the simulation using the empirically estimated wage equation is labeled "long-term contracts." A third simulation involved a change in the basic model's wage equation with a switch to the specification with stronger escalation features, as described above. This simulation is called "escalators." Finally, the key wage equation was altered to show a much less attenuated response to unemployment. This simulation is called "stronger unemployment."

The annual results of these simulations for four variables are presented in table 3. The variables are: (1) the percentage change in real GNP, (2) the official rate of unemployment, (3) the percentage change in the implicit price deflator for gross domestic product in the nonfarm business sector (hereafter called the inflation rate), and (4) the percentage change in the index of hourly compensation in the nonfarm business sector (hereafter called wage changes).

The results for real GNP, under all simulations reported in table 3, continue to reflect the business cycle features of the base forecast. Spending reductions initiated in 1980 would not, of course, alter very

Wage equation	1980	1981	1982	1983	1984
<i>Change in real GNP</i>					
Base forecast	-1.3	1.2	4.4	2.4	2.8
Spending cuts					
Long-term contracts	-1.5	-0.9	4.5	2.7	2.9
Escalators	-1.5	-0.9	4.5	2.7	3.1
Stronger unemployment	-1.5	-1.0	4.5	2.9	3.2
<i>Rate of unemployment</i>					
Base forecast	7.4	7.8	7.5	7.5	7.2
Spending cuts					
Long-term contracts	7.5	8.6	8.2	8.2	7.7
Escalators	7.5	8.6	8.3	8.1	7.7
Stronger unemployment	7.5	8.6	8.3	8.1	7.6
<i>Inflation rate</i>					
Base forecast	9.6	9.2	9.1	9.1	8.6
Spending cuts					
Long-term contracts	9.6	8.9	8.6	8.8	8.2
Escalators	9.6	8.9	8.5	8.3	7.5
Stronger unemployment	9.6	8.9	8.2	8.1	7.5
<i>Wage changes</i>					
Base forecast	10.0	10.8	10.4	10.3	10.1
Spending cuts					
Long-term contracts	9.9	10.6	10.1	10.0	9.7
Escalators	9.9	10.2	8.9	8.5	8.2
Stronger unemployment	9.9	9.4	8.7	9.0	9.5

substantially the results for 1980. Real GNP declines in 1981 under all alternatives, but it is predicted to show only modest recovery under the base forecast. For 1981, a maximum deviation in real GNP results is shown. After this period, real GNP recovers in 1982 under all alternatives, and then returns to potential GNP growth (approximately 2.7 percent) in 1983 and 1984.

Bear in mind that the assumed \$30 billion (1972 dollars) federal spending reduction is substantial measured by feasible spending reductions, but it is not too large relative to total real GNP. (In 1979, real GNP was \$1,431.6 billion in 1972 dollars.)⁵³ Results for the unemployment rate are correspondingly small. In 1981, the predicted

53. U.S. Department of Labor, *Employment and Training Report of the President* (GPO, 1980), p. 380.

unemployment rate is 8.6 percent for all spending cut alternatives. (Recall that all alternative wage equation results include the cut in spending.)

Unemployment rate differences among the alternative wage equations are not discernible in the first year. By 1984 the unemployment rate is reduced by amounts that vary only slightly among the alternatives. The difference between the rate in the base forecast and those in the three alternative wage equations is about one-half as large in 1984 as in 1981. This reflects a process in the model to restore full employment after a deflationary period.

The lowest inflation rates are predicted using the equations with a stronger unemployment effect and more widespread escalators. Both of these equations imply that inflation could be lowered more than 1 percent below the base equation forecast inflation in 1984. Spending cuts alone, as simulated in the model without alteration of equation 7a, imply that inflation would be reduced by only 0.4 percent in 1984.

Comparisons between the Two Models

The four-equation model differs from the UCLA macroeconomic model in numerous respects; those relevant to the effectiveness of monetary and fiscal policy are summarized below.

In the four-equation model, a lag was specified between price changes and wage adjustments, but no lag was specified between wage changes and price adjustments. The UCLA macroeconomic model reflects lagged price adjustment as well as lagged wage adjustment. A temporary increase in productivity does reduce prices as much as it reduces unit labor costs. Unit labor costs are standardized to reflect more permanent changes.

Higher unemployment does not immediately and substantially reduce wages in the four-equation model. However, product market slack acted instantaneously in the price equation. Product market slack is measured in the UCLA macroeconomic model by the gap between actual and potential real GNP. But product market slack does not instantaneously reduce prices, given unit labor costs, just as labor market slack does not immediately and substantially reduce wages, given prices. The labor markets are not alone in showing considerable attenuation of adjustments with respect to temporary periods of slack.

There was only one price in the four-equation model, whereas there are numerous prices in the UCLA macroeconomic model. More strategically, some key prices are not linked to wages or the GNP gap as strongly as others. Energy prices are dominated by the price for imported petroleum and domestic decontrol policies, not domestic wage changes. Similarly, food prices are strongly influenced by changes in producers' prices at the farm level, which are treated as exogenous. External price changes are therefore more important than is recognized in the simplified model.

Automatic stabilizers were not represented in the four-equation model, whereas the UCLA macroeconomic model has several significant mechanisms that prevent reductions in employment and wage income from reducing disposable income immediately in the same proportion. Increases in unemployment compensation and other transfer payments and reduced personal income taxes paid to federal, state, and local governments all cushion income from reductions in employment.

The four-equation model treated the expenditures on the GNP as identical to the income received by consumers. In the UCLA macroeconomic model, corporate profits absorb a larger share of short-run variations in national income than wages do. Furthermore, dividends do not vary proportionately with profits. Although the long-run adjustment leads to a stable dividend payout ratio, the short-run variation in national income is greater than the variation in personal income. These mechanisms lengthen the time from an initial reduction in GNP to the full consumption adjustments.

Changes in the money supply led to immediate adjustment of the (single) interest rate used in the four-equation model, and interest rate adjustments passed immediately into the (implicit) investment equations. In the UCLA macroeconomic model, changes in the money supply affect short-term rates but do not affect long-term interest rates as quickly. Long-term rates reflect longer-term inflationary expectations. Business fixed investment is a function of the cost of capital, which is tied to long-term rates; therefore a change in the money supply does not affect investment as quickly as in the four-equation model. The four-equation model, since it had no lag between changes in the money supply and full investment adjustments, exaggerates the speed of response of investment to monetary developments.

In summary, most of the differences between the four-equation model and the UCLA macroeconomic model imply longer adjustment periods and weaker responses than were represented in the smaller model. Even if widespread use of escalators made wages adjust rapidly to prices, other mechanisms would slow down the speed of adjustment. According to the UCLA macroeconomic model, widespread use of escalators would not permit monetary and fiscal policy to eliminate inflation in two years with less than 1 percent increase in the employment rate, as suggested by the smaller model.

Implications for Labor Market Measurement

The institutional and analytical models developed in this paper suggest a rationale for the attenuated influence of traditional measures of labor market slackness or tightness (such as the unemployment rate) on wage-change determination. Given this attenuation, it must be concluded that measures of excess demand or supply in the labor market should not be judged primarily on their ability to predict wage inflation. Changes in prices are by far better predictors of wage change than is the unemployment rate. If the wage-change prediction test were applied literally, one would be led to the absurd conclusion that labor market slackness or tightness is better measured by movements in the CPI than by the unemployment rate.

Since the contracting model suggests that employers substitute layoffs and unfilled vacancies for wage adjustments as adaptations to changing demand levels, special interest is focused on these measures. However, data on layoffs, quits, and other measures of turnover are currently confined mainly to manufacturing, although manufacturing represents less than one-fourth of nonfarm payroll employment. It would be desirable to have such data on a more comprehensive basis.⁵⁴ In addition, the U.S. Bureau of Labor Statistics ceased collecting vacancy data in 1973. Since that time, analysts have had to rely on proxies for vacancies, such as help-wanted advertising indexes. The contracting model suggests that employers will vary in their vacancy

54. Technical details of the turnover survey can be found in U.S. Bureau of Labor Statistics, *BLS Handbook of Methods for Surveys and Studies*, Bulletin 1910 (GPO, 1976), chap. 4, pp. 43-48. Unfortunately, after this paper was prepared, budget cuts at the BLS led to elimination of the turnover series in December 1981.

strategies according to factors such as industry or firm size. But the help-wanted advertising indexes cannot be disaggregated in this fashion. Some of the observed cyclical response in help-wanted advertising could reflect changes in employer mix rather than changes in employer policy.⁵⁵

Tenure on the job is of special interest to researchers in contracting because contracting theory suggests long-duration employer-employee relationships. The Labor Department currently collects biennial data on tenure on the job. Unfortunately, the two-year collection interval makes analysis of cyclical adjustment in job tenure difficult. More frequent collection would be helpful to researchers, particularly since some industry and occupational disaggregation is already possible.⁵⁶

Finally, the contracting approach suggests that nonunion employers will exhibit certain unionlike characteristics in terms of wage determination and other practices, despite the absence of formal, written agreements. Yet detailed information on employment practices (such as the availability of grievance machinery or the use of merit plans) is collected only for union contracts. Obviously, such information is easier to collect from union agreements since analysts need only read the contract. The obtaining of similar data from nonunion employers would require survey and questionnaire techniques. At present, such information is available only from limited surveys conducted by private organizations such as the Conference Board and the Bureau of National Affairs.⁵⁷ It is difficult to determine from such surveys how representative the respondent firms are of the universe of nonunion employers. Indeed, union and nonunion firms are sometimes mixed together in the surveys.

55. There are technical problems with vacancy data, but many of these are mirror images of the difficulties in defining and measuring unemployment. For example, employers' searching activities must be defined, and individuals may often be hired for positions for which no vacancy (defined by some criteria) appeared to exist. In measuring unemployment, individuals' searching activities must also be defined; many individuals leave or lose jobs and drop out of the labor force without entering the state of unemployment. However, the latter problems have not been raised as arguments for not collecting unemployment data, while the former have been cited as reasons not to collect vacancy information. See National Commission on Employment and Unemployment Statistics, *Counting the Labor Force* (GPO, 1979), pp. 118-22.

56. The latest available data on job tenure are for January 1978. See Edward S. Sekscenski, "Job Tenure Declines as Work Force Changes," *Monthly Labor Review*, vol. 102 (December 1979), pp. 48-50.

57. As cited in footnote 4.

Conclusions

The story of labor market contracting can be derived either from analytical models based on turnover costs and/or risk sharing, or from the historical and institutional analysis of wage determination in the union and nonunion sectors. The story is one of labor markets far removed from auction processes, in which workers willing to work at the prevailing wage may have trouble finding employment and employers are sometimes unable to find workers to fill vacancies at the wages they are willing to pay. Thus, contracting models inevitably take on a Keynesian flavor. Real fluctuations in employment and output are possible because wage (and price) changes in response to excess demand and supply are limited. The partial detachment of the wage and price mechanism from real market forces makes possible the existence of ongoing inflation momentum.

There are some hidden features in a contracting world, however. In particular, in the collective bargaining sector, where contracting is most formalized and where negotiating and impasse costs contribute to the long-range horizon, there is an incentive to write contingency clauses to avoid contract reopenings. The main example of such contingency clauses in the real world is the escalator, which links wages to prices. To the extent that price inflation is sensitive to real economic fluctuations, the use of escalators can create a backdoor channel for wage inflation sensitivity to those fluctuations. A real slowdown's anti-inflation effect is amplified by the wage-price interaction inherent in escalator behavior. Escalators obviously pose a symmetrical danger during periods of economic expansion. And they may speed the reaction of wage inflation to price inflation (or deflation) that stems from exogenous sources of the OPEC type.

Is contracting a help or hindrance to anti-inflation demand-restraint policies? The answer is obvious, but ambiguous. In a pure auction model, anti-inflation policy would be highly effective. But in such a model, it is not clear why anyone would care much about inflation. If all markets were able to adjust costlessly to depreciation of the *numeraire*, leaving relative prices unaffected, inflation would not be a problem. Thus, in the extreme case, contracting is the villain that creates both unemployment and the *problem* of inflation. However, if

the question is simply whether more or less contracting within a world of significant contracting behavior is helpful to traditional anti-inflation policy, the answer is "it depends." The attenuation of the influence of real output on wage and price inflation is harmful. But escalator clauses may have the (presumably unintended) effect of increasing rather than attenuating the real-output effect.

At the macro level, the impacts of contracting can be described by the use of lagged coefficients (to convey lethargy and long-term horizons), alternative degrees of wage sensitivity of price change (to simulate escalators), and weakened coefficients of real output indexes—such as unemployment rates—in wage-change equations (to simulate the attenuation effect). In this paper, whether the model used was a simple four-equation set of relationships or an elaborate many-equation forecasting model, the results were qualitatively similar. Escalators helped reduce inflation under a regime of demand restraint; other aspects of contracting made inflation reduction more difficult. Our opinion is that the limited scope of escalators (they cover very few nonunion workers, and many union workers, especially in short contracts, are uncovered) suggests that quick and painless cures for inflation are not likely to be developed solely through induced labor-market slack.

Although the UCLA macroeconomic model and the four-equation model gave qualitatively similar results, the specifications and calibrations used led to significantly more pessimistic quantitative estimates in the large-scale model. The only source of inertia in the four-equation model came from the wage equation; all other adjustments were instantaneous. In the large-scale model there are other substantial sources of inertia, especially in the price-adjustment sector. Product market slack, like labor market slack, does not immediately lower prices. Significant external price shocks keep unit labor costs from fully determining the prices to which wage earners are reacting. In fact, there are many areas of the economy that are characterized by lethargy. Plans are made in advance and continue in the face of changed circumstances. It may well be that the explanation for such behavior is similar to the turnover-cost theory invoked for the labor market; if decisionmaking is itself costly, then it pays to make long-term plans that cut down on the frequency of decisions. In any case, the stickiness associated with contracting in the labor market is likely to be reinforced in other sectors of many-equation models and the real world.