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The Role of Contracts in Macroeconomic Performance

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Because prices are sticky, faster or slower monetary growth initially affects output. . . . But these effects wear off.

—Milton Friedman, *Newsweek*, July 12, 1982

Prices—including money wages—are sticky in the short run. . . . [This implies] that monetary and fiscal policies that add to demand will, in the short run at any rate, increase output and employment.

—James Tobin, *Asset Accumulation and Economic Activity: Reflections on Contemporary Macroeconomic Theory*

Temporary wage and price rigidities play a central role in macroeconomic fluctuations. As the two epigraphs indicate, traditional Keynesians and monetarists are in agreement on this point. So are many economists who use rational expectations in their models, an exception being the “new classical” models. The traditional assumption in microeconomics, on the other hand, is that prices and wages are perfectly flexible: all markets—including labor markets—are like auctions. When monetary or fiscal disturbances affect supply or demand in such markets, prices and wages change quickly, possibly by large amounts, to keep resources fully employed. When prices or wages are temporarily rigid, or *sticky*, the economy responds slowly to disturbances. During the period when prices and wages adjust, the economy can be in a state of excess demand (a boom), or excess supply (a slump) for a year or more.

Labor contracts between firms and their employees are one of the

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main reasons for wage rigidities. As many of the papers in this volume illustrate, labor contracts are motivated by, and in turn influence, incentives and risk sharing. They can be shown to have a good microeconomic rationale. The part of the contract that is important for macroeconomics, however, is its stipulation of a fixed nominal wage payment for some period of time. This wage payment introduces economy-wide wage and price rigidities.

Some explicit contracts stipulate a wage rate for up to three years into the future. Most contracts are less formal and shorter, however, and stipulate a fixed wage for only a year or so. Whatever the length, during the period of the contract the wage does not adjust to changes in market conditions. If there is a recession, the same wage applies. If the recession causes a drop in sales and profits, the hourly wage will remain the same. With full cost pricing, the firm's price will be about as rigid as the wage since labor is by far the largest input to production.

For these reasons employment contracts—whether implicit or explicit—play an important role in macroeconomic fluctuations. Many proposals to improve macroeconomic performance, that is, to reduce the size and duration of economic fluctuations, have proposed that labor contracts be made more flexible. Tying the wage to prices, productivity, sales, or profits through indexing or sharing arrangements is one of the most frequent proposals for increased flexibility. According to those macroeconomic theories that are based on price and wage rigidities, such proposals, if implemented, would improve macroeconomic performance.

The purpose of this chapter is to review the empirical evidence that labor contracts are important for generating wage rigidities in the United States, to review the empirical evidence that these wage rigidities, in turn, are an important propagator of economic fluctuations, and finally to show that microeconomic research on contracts that emphasizes risk sharing and incentives, in its current form, does not fully explain these empirical observations.

1. Employment Contracts in the United States.

Union Contracts

Of the twenty percent of U.S. workers that are unionized, about half are involved in collective bargaining situations that include enough workers (1000 or more) to be regularly tracked by the Bureau of Labor Statistics (BLS). In total, this group consists of about 10 million workers. Although only 10 percent of the labor force, this group receives enormous attention in the media and in public policy discussions. The most common length of contract is about three years. Unless there is an early

reopening or a delay in negotiating a new contract, the workers signing three year contracts will do so every three years; for example, the electrical workers negotiated contracts in 1976, 1979, and 1982 and so on. This pattern of bargaining activity gives rise to a three-year cycle. Every third year involves a relatively small group of workers.

All of the contract negotiations do not occur at the same time. Instead they are nonsynchronized—or staggered—over many different time periods. At any one time, only a small fraction of the workers are signing contracts; the remaining workers have either recently signed their contracts, or are about to sign their contracts in the near future. The period in which one contract is in force overlaps the period in which other contracts are in force. This staggered wage setting plays an important role in explaining both the persistence of economic fluctuations and the resistance of inflation to aggregate demand pressures.

For example, the United Mine Workers signed a contract with the bituminous coal operators in May of 1981. The contract affected about 160,000 workers and lasted 40 months, expiring in September 1984. The contract stipulated wage increases that averaged 11 percent per year. The wage increases were \$1.20 in the first year, \$1.10 in the second year, \$1.00 in the third year, and \$.30 in the last quarter. Part of the wage increase was deferred to the second and third year of the contract. These deferred increases indicate that management and labor had expectations of continued high inflation. There were no indexing provisions in the contract; these increases would occur regardless of economic conditions and indicate the extent of the nominal rigidity that such contracts impose on the economy. As with the coal contract, most other union contracts have a significant amount of the wage increase in the second and third years of the contract. There is some front-end loading, however, in that the largest increases occur in the first year of the contract period.

Part of this front-end loading occurs because some of the contracts have indexing clauses. These indexing clauses stipulate that the wage increase in the later years will be greater if the consumer price index increases. For example, the contract would increase the wage rate by .5 percent if the consumer price index increases by 1 percent. This would be 50 percent indexing. Because some inflation was generally expected when these contracts were negotiated, both management and labor would expect that the wage would increase because of indexing. For this reason, the more indexing the less of a deferred increase would be necessary. Other things being equal, the larger the expected wage increase because of indexing, the smaller will be the scheduled deferred increase. About 50 percent of the workers in this group had indexed contracts; most of these contracts had less than 100 percent indexing.

As is now well known, a long and serious recession occurred during

the period of the 1981–84 coal contract. The unemployment rate increased dramatically from about 8 percent in mid-1981 to close to 11 percent by the end of 1982. Inflation began to come down. Yet the wage payments in this contract did not adjust throughout its entire term. The effect of the severe recession in the early 1980s is quite apparent in other contracts whose term expired during the recession and that were renegotiated. As a result, wage settlements overall dropped from nearly 10 percent to below 5 percent by 1984.

Most workers in large labor unions change their contracts about once every three years. Wage and salary decisions are made in collective bargaining meetings for which both management and labor leaders spend extensive time preparing. While the outcome of any one bargaining situation cannot be predicted with much certainty, a number of factors clearly influence the outcome in particular directions.

The first and perhaps the most important factor is the state of the labor market. If unemployment is high then labor will be in a relatively weak bargaining position. Conversely, if unemployment is low, then workers will be able to bargain for larger wage increases. The threat of a strike is more credible in good times than in bad. Moreover, firms are likely to settle for larger wage increases in tight market conditions, because they will be better able to pass on their costs in the form of higher prices.

A second factor influencing wage bargaining is the wage paid to comparable workers in other industries. Because not all contract negotiations are synchronized, there are two components of this comparison wage: the wage settlements of workers who have recently signed contracts, and the expected wage settlements of workers who will be signing their contracts in the near future. Looking back at the wage settlements in recently signed contracts makes sense in a current negotiation because those settlements will be in force during part of the contract period under consideration. This backward looking behavior tends to give some built-in inertia to the wage determination process. If one union group gets a big increase, then the next group of workers in the wage determination cycle will also tend to get a big increase. Lester Thurow describes the process as follows: "Suppose that this year the Machinists' union is negotiating a new three year contract. Last year the Auto Workers negotiated a three year contract for a 10% rise per year. No leader of the machinists can settle for less than 10% and still remain in office. And in two years time the auto leaders will be similarly imprisoned by what the machinists negotiate today" (*The Economist*, Jan. 1982). But looking forward at future settlements also makes sense, because the current contract will be in force when these changes take place. In other words, we would expect wage determination to combine elements of forward and backward looking behavior.

A third factor that influences wage decisions is the expected rate of inflation. If inflation is expected to be high, workers will ask for larger wage increases and management will be willing to pay them because their own prices are expected to rise. As with the effect of comparable wage increases, the effect of expected inflation will have both a backward looking element and a forward looking element.

In preparation for these negotiations management spends months surveying wages in other industries, estimating changes in labor productivity, forecasting changes in its own profits, and obtaining estimates of the general inflation during the upcoming contract period. To be adequately informed during the collective bargaining sessions, labor leaders must be equally and independently prepared; hence, they must also spend months preparing for negotiations. Moreover, there is the threat of a strike in almost every collective bargaining situation. An actual strike is obviously costly for both sides, but the mere preparation for a possible strike is also costly because the firm must accumulate and finance additional inventories. Hence, production will be abnormally high before negotiations, and abnormally low after negotiations as firms draw down inventories if a strike does not occur. These swings in production raise average costs to the firm. Given these high costs, it is understandable that many collective bargaining negotiations occur only once every three years.

Nonunion Workers

It is very common for workers who are not in unions to receive wage and salary adjustments once each year. Although there is no formal contract involved, it is unlikely that this wage decision will be changed before the next scheduled adjustment period. Hence, the nominal wage rigidity is very similar to that in the union contracts. One difference is that the entire wage adjustment usually occurs at one time rather than part being deferred as in the second and third years of the large union contracts. This is probably due to the shorter time between wage adjustments.

In preparation for a wage adjustment, the management of nonunion firms must obtain information very similar to that obtained by management of unionized firms preparing for a collective bargaining meeting. In a large private firm there are usually specialists called wage and salary administrators who must make a wage decision. They obtain information about the current labor market situation. They conduct wage surveys or subscribe to a wage survey performed by an outside group. They also attempt to forecast the rate of inflation.

Although the wage decision will usually be made under more competitive conditions than exist in a collective bargaining situation, these factors—the state of the labor market and wage and price inflation—will influence the final outcome in similar directions. If unemployment is

very low and is expected to remain low for the next year, then management will know that it will have to pay a relatively high wage compared to other firms employing similarly skilled workers. An attractive wage will prevent workers from quitting and help lure workers from other firms if they are necessary for expansion. On the other hand if unemployment is high, there will be less worry that workers will quit to look for jobs elsewhere. Moreover, if sales projections for the coming year are poor, an expansion of production requiring more workers would be unlikely.

If wages are expected to be relatively high at other firms—either because of recent wage decisions at these firms or because of expected wage increases at other firms—then the wage will necessarily be higher. Information about both recent wage decisions and imminent wage decisions can be obtained from surveys.

Although there is little direct evidence on the scheduling of nonunion firms' wage increases, it is unlikely that they all occur at the same time. Hence, there is the same type of nonsynchronization that we observe for the union sector.

Many of the properties of formal negotiations pertain to the more informal wage setting procedures used by firms employing nonunion workers. A review of each worker's performance is costly, and obtaining survey information about wages paid elsewhere and forecasts of inflation requires time and expense. To make such an adjustment more than once a year is probably prohibitive for many firms. The same arguments against extensive contingency clauses also apply to this type of wage setting. Moreover, indexation would do little to improve the workings of annual wage setting arrangements; waiting less than a year to make an adjustment after the fact is usually adequate.

In a decentralized economy like the United States, firms and workers are left to their own to decide when their wages and salaries are adjusted. The fact that these decisions are not synchronized therefore seems natural; one would be surprised to see a coordinated wage (or price) adjustment without some centralized orchestration of such a move. Historical accident would be enough to explain why the auto workers always negotiate just before the machinists.

It is important to know, however, whether the lack of synchronization in the United States serves any microeconomic purpose. If it does not, then proposals for reforming the economic system to bring about more synchronization would be innocuous for microeconomic welfare, and could have some macroeconomic advantages.

Imagine what would happen if all wages and prices were set at the same time, and without a central planner to tell workers and firms what to do. A firm that thought that a relative wage increase was appropriate for its workers, would have a difficult time knowing what other wages would be in order to achieve that relative increase. A wage survey would

be impossible because there would be no wages to survey. Similarly, a competitive firm suffering from a decline in productivity might want to cut the wage of its workers relative to the price of the firm's product. But in a fully synchronized setting, it would not know what the price of its products would be, and hence would not be able to set the right wage.

Staggered wage setting is a way to provide information to firms and workers about wages and prices elsewhere. Even though other wages will be adjusted before the current contract expires, there will be some period of time when the desired relative wage is in force. Nonsynchronized wage and price setting seems desirable in a real-world decentralized economy without an auctioneer to call out wages and prices and balance supplies and demands before the market actually opens.

Moreover, staggered wage setting adds some stability to wages. With full synchronization, all wages and prices would be up for grabs each period; there would be no base for setting each wage. Tremendous variability would be introduced to the price system. In sum, synchronized wage and price setting—without a central organization to provide a basis or target for prices from which wage and price decisions could be made—would not be desirable. It would make wage adjustments difficult and would increase the volatility of prices.

Other Countries

Differences between wage setting behavior in the United States and in other countries are frequently noted by researchers. For example, in Japan most contracts last about one year, like most implicit contracts in the United States. However, in Japan a large number of wage decisions are synchronized each spring when there is a "Shunto" or simultaneous wage adjustment for the large companies. According to recent data, about 40 percent of the labor force negotiates contracts in the second quarter. This fraction is larger than in the United States or other industrialized countries, but is significantly less than 100 percent, so that there is still much staggering of contracts. The government is actively involved in the Shunto. Prior to the Shunto, extensive deliberations take place to determine the appropriate wage adjustment for that year. Governmental participation is integral to this process.

In Italy about 30 percent of the labor force is unionized and most of these workers have three-year contracts. Until recently there was extensive indexing in these contracts, however, so that the effective duration was shorter. In Canada about 65 percent of unionized workers have one year contracts, and there is little synchronization. In France contracts typically do not have a set determination date, but are most frequently changed about once per year. There is little synchronization. In Germany and England there is also little synchronization, with one year contracts being the most typical.

Overall there are surprising similarities in the wage setting institutions in the major industrialized countries. Even the synchronization that has been noted in Japan leaves much staggering in wage setting, and the high degree of indexation in Italy seems to be less important than it was in the 1970s.

2. Evidence that Nominal Wage Rigidities are Important.

The above micro data on wage contracts indicate that they are indeed important factors in generating nominal wage rigidities in the economy. But what is the evidence that these nominal wage rigidities are important in economic fluctuations? As mentioned in the introduction, many structural macro models have been developed that show that such wage rigidities are capable of generating the observed fluctuations. An important result of these models is that staggered contracts of about the same duration as those observed in the micro data are capable of explaining business cycles. The consistency of these structural models with the data is clearly some evidence in favor of the importance of wage rigidities for macroeconomic fluctuations.

Direct empirical evidence on the relationship between output fluctuations and price and wage fluctuations provides additional support for the view that price and wage rigidities are an important aspect of economic fluctuations. Consider the experience of the major industrialized countries—Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States—during the last 30 years. An effective way to summarize the output-inflation data is to look at the unconstrained infinite moving average relation between deviation of output from trend and inflation. The infinite moving average, which is reported for these 7 countries in Taylor (forthcoming), shows the dynamic interaction between inflation and output. The results are easily summarized: there is a striking similarity among the moving average representations in the countries. The effect of output shocks is to increase inflation, while the effect of inflation shocks is to decrease output. In other words the intertemporal cross correlation between inflation and output shocks reverses sign when we switch variables. The only exception is Japan, which we noted above has somewhat different wage-setting institutions than the other countries. With this one exception, the reverse cross correlation is apparently a central part of economic fluctuations.

An explanation for this finding is as follows: (1) positive deviations of output from the trend level represent periods of excess demand during which prices and wages tend to be bid up gradually, and then raise the inflation rate with a lag, and (2) increases in inflation are not completely tolerated by policy makers so that such increases result in less than fully

accommodative policies that cause the economy to go into a recession after a lag. Less than fully accommodative policies could occur with monetary tightening in the face of inflation shocks, but fiscal policy could also be used. The story is similar in the case of shocks of the opposite sign: decreases in output eventually cause declines in inflation, and decreases in inflation eventually cause increases in output.

Particular realizations of these cross relationships are well known in these industrialized countries. For example, the increase in inflation in the late 1960s and during the two oil shocks in the 1970s all led to recessions. More recently, in early 1986, a surprise decline in inflation largely caused by reductions in the price of oil were expected to lead to high growth rates of real output. Most economic forecasters raised their forecast of world economic growth after observing the decline in oil prices in early 1986. These are all examples of the negative effect of inflation on output when inflation is dated prior to output.

On the other hand, inflation fell soon after the recessions in the 1970s and early 1980s. These are examples of the positive effect of output on inflation when output is dated prior to inflation.

Are these correlations consistent with other business cycle theories—such as the real business cycle theories described by King and Plosser (1984)? There are many structural explanations of any reduced form correlation, but in my view the above explanation is still more complete than alternative business cycle theories. It is clearly beyond the scope of this paper to discuss all alternative theories. Real business cycle theories do not attempt to deal with the timing relations between inflation and output that I documented and emphasized above. In principle, the negative relation between inflation and output could be due to shifts in the production function, rather than to the tightening of monetary policy. However, to focus on one example, it is difficult to think of a productivity shock that could have led to the large recessions in 1981–82. Moreover, shifts in productivity *per se* do not generate the timing relationship between inflation and output noted above.

3. The Optimal Contract Model.

The basic optimal contract model was originally put forth by Azariadis (1975) and Baily (1974) to give a microeconomic rationale for the nominal wage rigidities and the economic fluctuations discussed above. In this section I argue that the results available thus far do not provide such a rationale.

A basic property of a contract is that it specifies actions to be taken in the future, for example the wage to be paid the next year. Hence, in order to build a model of contracts it is necessary to consider a situation where some events explicitly take place in the future. At the time that the

contract is written these events are unknown. The typical assumption is that future productivity growth is unknown. The labor contract must be written in advance of the time when the disturbance occurs.

Neither firms nor workers know in advance what type of a disturbance will, in fact, occur. They are likely to have some idea of the *probability* of a particular disturbance occurring. Suppose, for example, that everyone thinks that there is a 50 percent chance that a negative shock will occur, and a 50 percent chance that a positive shock will occur. It is as if a coin is tossed: heads, labor productivity shifts up; tails, labor productivity shifts down.

Suppose that the contract is one year in duration, and applies only to the next year when the uncertain disturbance will occur. Under these circumstances it is optimal for the contract to be written in the form of *contingency clauses* that stipulate what the level of employment and the wage rate will be in the case that the next period is a good year and in the case that it is a bad year. These contingencies will take the following form: if productivity is high, employ workers for X hours and pay real wage W . If productivity is low, employ workers for x hours and pay real wage w . This contingency provision is an important feature of optimal contracts and tends to make them more flexible than contracts that do not contain it. The fact that contracts can be made contingent tends to reduce their potential as a source of rigidity that can explain departures from potential GNP.

Both the workers and the firm will want the best contract that they can get. The workers will want to maximize their utility, and the firm will want to maximize profits. However, both utility and profits depend on the unknown productivity shock that will occur next year. Hence, both utility and profits are viewed as random from the perspective of the year when the contract is drawn up. Therefore, the firm must maximize the *expected value* of profits, and the worker must maximize the *expected value* of utility. Based on the contingencies written into the contract, the firm calculates its profits in the high productivity case and in the low productivity case. Because the probabilities of each case are the same, the firm's expected profits are just the average of the two cases.

The workers' assessment of their utility in the next period will also involve an averaging of the two future possibilities. However, the uncertainty about the future productivity shock has a special additional effect on the preferences of workers. Optimal contract theory assumes that workers are "risk-averse" when dealing with this uncertainty. In terms of their employment contract, this means that they would prefer a contract giving them lower average income if that contract also stipulated that the income would be the same amount in the high productivity case and in the low productivity case. Paying the same income whether the workers are more or less productive clearly reduces the risk to the worker.

While it is typically assumed that workers are risk-averse in the optimal contract model, firms are usually assumed to be "risk neutral." The reason for assuming that firms are not risk-averse (while workers are) is that firms are larger and probably find it easier to obtain insurance elsewhere.

From these conditions the specific form of the optimal contract can be deduced. First, the contingent levels of employment in the two productivity situations will be efficient in the same way that the auction market is efficient. The reason is that by using contingencies the firms and workers can fix their contract so that the employment level responds to the productivity shock just as in the auction model. Since it is in both the worker's and the firm's interests to have a contract that is efficient, and since the auction market is efficient, the contract will be set up this way. The important idea here is that contingent contracts allow for sufficient flexibility to obtain the efficient level of employment. This result shows that if contract theory is to provide a good explanation of economic inefficiencies, such as the departures of real GNP from potential, it must explain why these contingencies do not exist in the real world.

Second, the real wage that is paid to the workers in the two states is not the same as in the auction model. It will be such that the workers' income does not depend on the state of productivity. This property is entirely due to the risk-aversion assumption. It gives the workers some insurance against fluctuations in income as the economy moves from good to bad productivity situations.

Why Aren't Contingency Clauses More Common?

Few contracts seem to be negotiated contingent on events that may occur in the future. We have noted that some of the contracts in recent years have included cost-of-living adjustments whereby the wage is indexed to the consumer price level. However, these clauses rarely involve 100 percent protection from cost-of-living changes, and many contracts (about 50 percent) do not have any such clauses. Moreover, cost-of-living clauses represent only one of many possible contingency clauses. More pertinent to the central concerns of this volume, the contracts could be directly linked to the profits of the firm or to the workers' productivity.

The primary reason why more contracts are not indexed to the cost of living is that such indexing can be harmful if prices are rising because of supply side shocks. Suppose that the marginal productivity of labor is reduced because of a shift in the production function. Such a shift will eventually require a reduction of the real wage, so that it is equal to the marginal productivity of labor. But a 100 percent indexed contract will prevent such a decline. The escalator clause will call for an increase in the wage in the same proportion as the increase in prices. It is understandable that many firms and workers are reluctant to institute an

arrangement that prevents necessary adjustments in the real wage. Of course if the reason for the increase in the price is a general monetary induced inflation, then there will be no need for a reduction in the real wage. Unfortunately there is usually no way to tell in advance whether the price rise is caused by monetary effects or shifts in the production process.

Why aren't more contracts linked to other variables such as productivity or profits? In many cases it is difficult to verify a fully objective measure of such variables. The firm may be tempted to modify its accounting and thereby affect profits in a way that would keep the wage down. Verification is usually costly for productivity measures as well.

A final reason that contracts do not have many contingency clauses is that they add complexity. There are good reasons to have a straightforward contract that the rank and file can easily understand and vote on. Similarly, contingency clauses appear to add uncertainty about the wage that the workers will actually earn. Many workers would object to this added uncertainty.

4. Historical Comparisons.

One way to test whether a more flexible wage system would improve economic performance is to look at United States economic history. Before the Second World War, macroeconomic performance was much worse than after. From 1952 to 1983 the standard deviation of output from trend was 3.6 percent. During the gold standard period from 1891 to 1914 the standard deviation was 4.8 percent. From 1910 to 1940 the standard deviation was 10.1 percent. Hence, the fluctuations in output and employment were larger in magnitude than in the postwar period.

However, wages and prices were also apparently more flexible in the earlier period. The institution of three-year labor contracts did not occur until after the war. Moreover, the data suggest that there was much less persistence of inflation. In the aggregate, wages and prices moved more quickly. Microeconomic studies by Cagan (1979) and others also suggest more flexibility in the earlier period.

The comparison therefore presents a puzzle. Less flexibility of wages and prices should lead to a deterioration in economic performance. The comparison suggests the opposite. Of course many other changes could have led to the improvement in performance. There were fewer bank panics in the postwar period because of deposit insurance. Automatic stabilizers made income fluctuations smaller. And monetary policy was conducted with the aim of promoting stability.

Nevertheless, the historical comparison should make one pause to think through the macroeconomic effects of more flexibility at the microeconomic level. DeLong and Summers (1986) have recently ar-

gued that more flexibility can be destabilizing because of its effects on expectations, and thus on real interest rates. The discussion of staggered wage setting in this paper indicates that volatility could be increased if wage setting were synchronized.

Economic performance would probably be improved if wages and prices became less rigid than they seem to be now because of a move to more flexible remuneration. More flexibility would mean that inflation could be controlled with fewer and shorter recessions. In the language of contemporary macroeconomic textbooks, price adjustment would occur more quickly so that contractionary monetary policy would have a smaller effect on output. But if wage setting became too flexible or too synchronized, macroeconomic performance might get worse because, with larger fluctuations in the real interest rate, investment demand would be subject to larger swings. Again to use textbook language, the aggregate demand curve might become more volatile.

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