

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Explorations in Economic Research, Volume 4, number 1
(Indexation, The Brazilian Experience

Volume Author/Editor: M. Ishaq Nadiri and Affonso C. Pastore, editors

Volume Publisher: NBER

Volume URL: <http://www.nber.org/books/conf77-1>

Publication Date: 1977

Chapter Title: Indexing and the Fight Against Inflation

Chapter Author: Samuel A. Morley

Chapter URL: <http://www.nber.org/chapters/c9233>

Chapter pages in book: (p. 76 - 92)

Indexing and the Fight against Inflation

Policymakers and ordinary citizens all over the Western World are seeking ways to deal with an apparently unstoppable and socially divisive inflation. As during previous inflationary episodes, many are looking again at indexing of monetary contracts as a palliative or an aid in solving the inflation problem. Indexing means expressing contracts in real instead of money terms. This is done by periodically adjusting the nominal terms in which the contract is written for changes in the money price of the commodity or market basket of commodities to which the contract is tied. The desire for indexing stems partly from an inability to forecast the future price of commodities accurately in terms of money, or, in other words, to a loss of faith in money as a standard of value.

Broadly speaking, there are two main classes of contracts to which indexing can be, and has been, applied. They are wages and debts of various sorts. During the postwar period many countries have adopted some form of debt indexing, and cost of living escalators on wage contracts are also widespread. These measures have, by and large, been partial and voluntary. What is new in the current situation is the suggestion that we should consider adopting a far more comprehensive system of indexing, one which would cover all wage contracts and perhaps all debt contracts as well.

What are the arguments for and against comprehensive indexing? Would a shift to such a system aid the United States in its struggle to contain

NOTE: This paper was presented at the IPE-NBER Seminar on Indexation, Feb. 26-28, 1975. Partial support for the paper was provided by the U.S. Department of the Treasury. The author wishes to thank Ruben Almonacid, William Branson, Roberto Macedo, M.I. Nadiri, and Affonso Pastore for comments on previous drafts of this paper.

inflation as proponents claim? Is the experience of Brazil with its indexing system relevant for the United States? These are the main questions that I want to consider here.

In analyzing the relation between indexing and inflation I found it important to distinguish between situations in which relative prices do not change and those in which they do. Much of the disagreement about the effects of indexing is traceable to assumptions about relative price movements. Also, unlike most previous writing on the subject, my study focuses primarily on wage indexing, since the labor market is the key to our understanding of price and output movements during inflation and stabilization. The paper, then, is organized as follows. Section one is an analysis of wage and debt indexing in a one-sector economy. In section two the analysis is extended to wage indexing in a world where relative prices are changing. Section three contains a discussion of the Brazilian indexing system and its relevance to the problem of stabilization through indexing. Section four, finally, discusses some practical problems in the use of wage and debt indexing systems.

(II) WAGE AND DEBT INDEXATION IN A ONE-SECTOR ECONOMY

Indexing of Wage Contracts

Far and away the most important and least discussed type of indexing is cost of living adjustment (hereafter COL) of wages. Consider first how an automatic and complete system of COL adjustments would affect an economy. First we assume that all prices move together, or equivalently, that we are in a one-sector economy. As we shall see further on, one of the main differences of opinion between advocates and opponents of indexing concerns its effect in inflations where relative prices do change.

Wage contracts with full adjustment for changes in the COL are in effect written in real terms. That is, the real wage, or wage rate in terms of units of output, is independent of the price level. This has the very far-reaching implication that the level of employment is independent of the level of prices, too. For with COL adjustments, both businessmen and workers know exactly the real terms on which labor is being hired. The businessman will not hire the worker unless his real wage is less than or equal to his marginal product, and the worker will not accept employment unless the real wage that he receives at least compensates him for the disutility of working. If employment is independent of the price level, then so, too, is the level of production. In other words, the economy with full

COL adjustment would operate just like the neoclassical economy of macroeconomic theory, in which employment and output are determined by productivity and willingness to work, and in which the money supply only determines the price level, with no feedback into the real workings of the economy.

Because in our current system COL adjustments are not widespread, most of us are forced to predict future changes in the cost of living when entering into a labor contract. During periods of substantial price stability this is not particularly important, but during periods like the present, when prices are rising rapidly, an underestimate of price changes over the life of a labor contract will mean that the worker is working for a lower real wage than he realized or agreed to when he entered into the contract. Conversely, if he overestimates the future inflation rate he will demand an excessively high real wage, one at which it may be impossible for him to find work.

Consider now how an inflationary cycle and stabilization work under our current arrangements. Keep in mind that we are still working with an economy in which all prices rise at the same rate. As long as prices are rising at a rate which everyone can correctly predict, regardless of what that rate is, the level of output and employment should be at the level corresponding to the normal full employment of the labor force. Now suppose that there is an unexpected increase in aggregate demand. This will cause an unexpected inflation. It will mean that businessmen can afford to offer higher nominal wages than before because they know that these higher wages can be more than offset by the higher prices at which output can now be sold. The result is the classic demand-pull inflationary boom. Output and employment rise above their normal levels for as long as the inflation rate is higher than workers expect it to be.

Now look at the opposite side of this inflationary cycle, the stabilization phase. Suppose that the government wants to drive the inflation rate to a lower level. To do that it must in some way induce people to lower their prediction of what the future inflation rate will be. For otherwise, the actual inflation will tend to settle at the rate expected by the public, a rate that is unacceptably high. But how do you lower people's expectations? We unfortunately do not know of any other way to convince them except by actual inflation rates that are lower than expected. Of course, the government can make optimistic statements and crop forecasts, but in the final analysis it is results that count. Thus, during the typical stabilization inflation rates are below what workers expect them to be. That means that workers will be demanding salary increases which turn out after the fact to be too high. Businessmen will be forced to lay off workers because their selling prices are not high enough to allow meeting their salary demands.

This is why unemployment rises. It is obvious that this "supernormal" unemployment can occur even if the actual inflation is positive, so long as it is less than people expect it to be. This is also why stabilization is more difficult the more firmly inflation is entrenched in people's expectations.

In an economy with automatic COL adjustments, the high output cost of stabilization would be eliminated. This is just a particular instance of the independence of employment and output from the price level discussed above. Let us see how such a system would work. Under indexing, workers would not demand wage increases to cover expected future inflation because any losses in real wages they suffer through inflation are immediately returned to them through the COL adjustment. Here is the crucial difference between the system with and without indexing. Because no price level forecast is built into current wage levels, it is not possible for workers to overpredict inflation and to demand too high a money wage—which is what causes the recession during stabilization. A reduction in the actual inflation rate through restrictive demand management by the government will be smoothly and automatically matched by a reduction in the rate of increase in money wages. Under the ideal index, the real wage never deviates from its equilibrium level, and neither does unemployment. Further on we will consider some of the practical problems involved in constructing the "ideal" index. Assuming that these are not insurmountable, indexing offers the possibility of moving an economy from a high to a lower rate of inflation without incurring the high unemployment cost usually associated with such a maneuver. This is the main reason why the indexing proposal has begun to attract supporters.

The main proponent of indexing is Milton Friedman. He has argued for the measure in several short *Newsweek* articles and in longer papers in *Challenge* and *Fortune*. Judging by the comments on these papers, there is some confusion over his argument, which has been construed by some to mean that indexing reduces the rate of inflation. This is untrue, of course. The rate of inflation in an economy is not determined by the existence or absence of indexing, except possibly in the short run. Friedman does argue that the rate of inflation will be lower in an indexed economy. However, that is not because of a direct relationship between indexing and prices, but because the government is unlikely to have the willpower to carry out stabilization in a nonindexed economy, since the high unemployment rates it causes are unacceptable to the public. Indexing, by reducing this unemployment cost, makes stabilization more feasible and more likely. One cannot put this better than Friedman himself:

How can we make it politically feasible to end inflation much sooner? As I see it, only by adopting measures that will reduce the side effects from ending inflation. These side effects fundamentally reflect distortions introduced into relative prices

by *unanticipated* inflation or deflation, distortions that arise because contracts are entered into in terms of *nominal* prices under mistaken perceptions about the likely course of inflation.

The way to reduce these side effects is to make contracts in *real* terms, not nominal terms. This can be done by the widespread use of escalator clauses.¹

Indexing of Debt Contracts

Before turning to an analysis of wage indexing in a multisector economy, we pause to consider the macroeconomic effects of debt indexing. The idea of expressing debt repayment in terms of commodity units rather than money is not new. Early English contracts were tied to corn, and gold clause ties were common in the nineteenth century. In the postwar world indexing of various types of debt was widespread; it was used in China, Finland, France, Sweden, Austria, Brazil, and several other countries.² Two postwar innovations were the use of a price index rather than a commodity tie, and the extension of indexing to short-term loans. China even went so far as to index bank deposits. During the 1950s indexed bonds proved to be extremely popular. By 1956 indexed bonds accounted for 92 percent of all bonds issued in that year in Israel, 84 percent in Finland, and 60 percent in France. In 1960 it was estimated in Finland that 80 percent of the volume of financial credit outstanding had an index clause.³ But the idea has never taken hold in either England or the United States, where no indexed securities have ever been issued except for the famous and abortive Kardex Company bonds issued when Irving Fisher was associated with the company in 1925.

What are the arguments for and against this type of indexing? Most recent writing on the subject of debt indexation has been concerned with the portfolio aspects of the problem rather than macroeconomic aspects. Indexed debt instruments offer both borrowers and lenders protection against unexpected price movements. Sarnatt [14], Siegel [15], and Fischer [4] apply the risk-return approach of modern portfolio theory to the problem. Risk is defined in terms of the variation of future prices over the life of the contract. In the absence of indexed securities, there is no risk-free financial asset. Sarnatt shows how the introduction of an indexed asset makes portfolio investors better off by allowing them to choose an optimal combination of inflation risk and return by combining unindexed and indexed debts. Fischer extends the analysis in two directions. First he expands the portfolio choice to three assets, the third being equity, an asset both of whose nominal and real returns are uncertain. Second, he uses a random walk model of future inflation. With this three-asset model he shows in a very elegant way the relationship between the prices and

returns of indexed and unindexed debt. His main result is that if real returns on equity are negatively correlated with inflation, indexed bonds will command a premium over nominal bonds: the real rate of interest required to induce bondholders to hold an indexed bond will be less than the expected rate on nominal bonds. This is because the portfolio holder cannot hedge against inflation by holding equity. Obviously, if equity is a hedge against inflation there need be no such premium, which may explain why indexed bonds never succeeded in the United States.

What are the macroeconomic effects of debt indexing? To my knowledge, the most complete analysis of this question is offered by Robson. He, like other earlier writers, bases his analysis on the relationship between indexing, saving, and investment. At one time, debt indexing was supported in the belief that it would increase saving and thus be anti-inflationary. The argument ran that with indexing the real rate of interest would rise, which would increase saving. A variant of this view is that if indexed securities were available, less saving would take the form of real asset accumulation, that is, indexing would reduce the overall demand for commodities to be used as a hedge against inflation. But, as Robson showed, the issue is a good deal more complicated than that. In order to be anti-inflationary, one must show that saving rises *and* investment falls with indexing, for, if the extra saving is channeled into extra capital formation, there will not be any lessening in demand. Robson looks at the market for loanable funds. If everyone on both sides of the market has the same expectations about inflation, ex-post real rates on nominal and indexed securities will be equal and indexing will have no effect. But this is not true if expectations differ. Then it is only for the marginal borrower and lender that expected inflation rates are equal. All those borrowers who think that the inflation rate is going to be less than the rate expected by the marginal borrower will issue indexed securities. For them the perceived real interest rate will have fallen with indexing. That should increase investment demand. By the same argument, all lenders who think that the inflation rate is going to be greater than the rate expected by the marginal lender will purchase indexed debt instruments. For them the perceived real interest rate will have risen, which will increase saving. One cannot conclude whether the net anti-inflationary effect of indexing is positive or negative because both investment and saving will rise. However, in either case indexing should increase capital formation, which is anti-inflationary in the long run, even if not in the short run.

While these various analyses of indexed debt are interesting, they ignore the strongest argument in favor of the device—its effect during stabilization. During stabilizations the rate of inflation is being forced down by restrictive government demand-management policies. In an economy without indexation, the burden of this maneuver rests on borrowers. If

there is an *unexpected* deflation or just a rise in prices at a rate less than expected, borrowers will discover *ex post* that they borrowed at too high a nominal rate of interest. This is precisely analogous to the case in the labor market, where we saw that during stabilization labor tends to demand too high a real wage, with the result that unemployment rises. Stabilization without indexing of wages places the burden of adjusting expectations about prices on the labor force. In the market for loanable funds stabilization without indexing places this same burden on borrowers.

When we analyzed the arguments for and against indexing of wage contracts, we found that the strongest argument in favor of the measure was that it made stabilization politically feasible by eliminating much of its unemployment cost. That argument is reinforced by the same considerations in the funds market. An economy without indexed debt instruments will find it politically difficult to stabilize because of the risk that during the stabilization period borrowers will go bankrupt. Locked into high nominal interest rates they thought would be covered by rising prices, borrowers may be forced into a financial crisis. Then the pressure on the government to ease up on the stabilization policy will intensify—it will be politically difficult to allow businesses to go bankrupt and workers to be unemployed when the government has the means to increase demand and avoid this unpleasant situation.

Debt indexing eliminates the problem of bankruptcy due to unexpected deflation. The rate of interest *ex post* is equal to some contracted interest rate, presumably the real rate, plus the rate of inflation. As the rate of inflation falls, so does the nominal interest rate. Hence, stabilization would not bring the threat of bankruptcy to firms and, also to the point, would not bring political pressure for its abandonment.

[III] INDEXING WITH CHANGING RELATIVE PRICES

So far we have been considering the arguments for and against indexing in an economy where relative prices do not change even though the overall price level may. Yet much of the opposition to indexing arises when people think about its effects in an inflation that seems to be caused by rising prices in one particular sector. For example, with indexing, inflation in an important sector like agriculture or fuel would be spread immediately to all other sectors through its impact on the cost of living and thus on nominal wages. A recent article by Walter Heller in the *Wall Street Journal* is a good example of this point of view:

An automatic across the board indexing system would have promptly translated skyrocketing commodity prices not only into higher interest rates but into higher

wages. Thus it would have put relentless cost-push pressure on the general price level. Under the present system, one has at least a fighting chance to avoid converting the 1973-74 "soft-core" inflation . . . into a "hard-core" price-wage spiral reaching well into the future.

Because of its uneven impacts, then, our existing system throws sand into the gears of inflation. Indexing would oil the gears and speed the process of inflation.⁴

Heller's argument has great intuitive appeal but I believe that it is wrong. As we saw in the one-sector model, wage indexing is equivalent to fully incorporating any price feedback into nominal wage demands. Labor supply is a function of the real rather than the nominal wage. Now if one believes, as I do, that any full equilibrium in the labor market must incorporate the price feedback from all sectors, one must conclude that the full or long-run equilibrium of a multisector model will be the same with or without indexing, except in one possibly important case to be discussed below. Hence any difference between the indexed and the unindexed multisector economy can only be temporary.

To look more carefully at the short-run differences between the reactions of an economy with and without indexing, one can construct a simple two-sector model in which labor supply in each sector is a function of nominal wages in the short run and real wages in the long run. Indexing is equivalent to perfect foresight, or to the introduction of current prices into the labor supply functions. In the goods markets relative prices would be set in the commodity markets and the aggregate price level, by the quantity theory equation. Now impose on this economy an exogenous supply shock—say, a reduction in the output of one sector. To motivate the exercise one could think of the sector as agriculture and of the shift as being an exogenous worsening in the weather. What are the effects on output and prices of such an adverse shock in the short and the long run, or equivalently, in the indexed and the unindexed economy?

Because of the quantity theory equation this question turns out to be an easy one to answer. In the short run, prices in the affected sector go up and output falls. If the demand for the output of the sector is price-inelastic (elastic), prices and output fall (rise) in the other sector. In the inelastic case, since output is falling in both sectors, we know that the aggregate price index must rise. In the elastic case, since prices are going up in both sectors, the output index of the economy as a whole must fall. Hence we know that in the short run the aggregate price index must rise and total output must fall.

Now compare this short-run, or unindexed, solution to the long-run, or indexed, solution. Moving to indexing means allowing labor to react to changes in the price level. Since in either the elastic or the inelastic case the aggregate price level rises after a reduction in supply in one sector, and

since a price rise reduces labor supply in both sectors, the output level of the economy will fall further in the long run than it did in the short, and the long-run price level will be higher.

The short-run differences between the indexed and the unindexed two-sector economies are exactly parallel to the one-sector case. In the one-sector model we found that whenever the price level is higher than expected by labor, output temporarily rises above its long-run equilibrium level. In the two-sector economy the supply shock unexpectedly raises prices above the level perceived by labor. Even though output falls, it is higher than it will be in the long run, when the full supply-reducing effects of rising prices become reflected in wage demands.

To return to the Heller argument, our conclusion is that indexing has no effect whatsoever on the final equilibrium level of either prices or output, but that it does affect the speed with which the economy reaches equilibrium after, say, an oil embargo or a crop failure. Under our current arrangements it is true that sectors other than those in which the inflation originates are insulated for a time from rising sectoral prices. But only for a time. As the cost of living increases workers will begin to demand compensating increases in their wages, despite the fact that prices may not have risen in their own sectors. The process is fast and automatic under indexing and, I am tempted to say, slow and painful without indexing. During the disequilibrium adjustment period, prices will be higher under indexing, but that says nothing about their final level.

We have stressed that the final level of prices and output should be independent of indexing. Yet one could make quite a strong case for the position that, in actuality, the rate of inflation might well be higher for the unindexed economy because of the problem of expectations. Predictions of future inflation are not a problem in the indexed economy because all rises in the COL are automatically reflected in ex-post wage adjustments. By contrast, in the unindexed economy workers must forecast future inflation rates, and it is therefore possible that the economy will react to a one-time shock by moving to a permanently higher rate of inflation. For the "new" theory of inflation demonstrates that an economy can reach its equilibrium level of output at any rate of inflation as long as that rate is forecast correctly. Now, if the rise in food prices that we have just been analyzing were to lead labor to forecast a rise in the inflation rate, the unindexed economy would be forced to choose between accepting a permanently higher rate of inflation equal to the new rate expected by workers, or accepting a period of stabilization while those expectations are forced back to their original level. In the indexed economy, prices would jump immediately to their long-run level, but there would be no change in the permanent rate of inflation. If one thinks that governments are unwilling to pay the political price of stabilization, then the one-time shift in supply,

which caused a once-and-for-all change in prices under indexing, may well lead to a permanently higher inflation rate without indexing. Judging by recent events in the U.S. economy, I judge that this possibility is not just a curiosity, but is indeed occurring at present. People talk as if the bad harvest (of 1974) was going to cause a permanent inflation, not just a one-time rise in prices. Wage demands reflect these pessimistic expectations about future prices, and this, of course, makes it that much more difficult to avoid inflation in the future.

(III) INDEXING IN BRAZIL

In recent years Brazil has applied monetary correction to a wide variety of monetary contracts, including taxes, wages, and debt instruments.³ During the period these measures were being adopted, Brazil successfully reduced her inflation from around 90 percent in 1964 to some 15 percent in 1973 while maintaining a real annual growth rate of some 4 percent per capita. It is not too surprising then that Brazil should be held up by advocates of indexing as an example of the successful application of their program, namely successful stabilization without the usual output cost.

My purpose here is not to argue whether this sort of post-hoc reasoning is wise in the Brazilian case. I want to make another point which seems to have been overlooked in all the discussion of indexing in Brazil. It is simply this. On the wage side Brazil is *not* an example of the sort of indexing system proposed by Friedman. In the Friedman system, which is the one that we have been discussing in this paper, inflation correction on wages is always *ex post*. Wage adjustments are made for past inflation but not for future expected inflation. This is not the case in the Brazilian system. In Brazil, wage increases are granted to restore the real wage prevailing over the previous twenty-four months and to offset future or expected increases in prices and productivity. Some part of the current wage level is thus an offset to expected future inflation. Much of the argument over the application of the wage policy was over the underforecasting of inflation.

The key element in the Friedman wage indexing system is *ex-post* adjustment. Wages should contain no expected inflation component, for that is the only way to avoid the unemployment costs of stabilization. Whether wages are set in private negotiations or by government decree, if they contain an offset to inflation over the life of the contract for which they are set, any successful effort to reduce the inflation below that forecast rate must mean by definition that *ex-post* real wage levels are going to be higher than planned. If employment is a function of the real wage, it must

fall during stabilization so long as wage indexing contains an expected inflation component. This is precisely what ex-post indexing is designed to avoid.

There is a certain irony in the failure of Brazil, where the government had the power to change the form by which wages were set in an inflationary economy, to use that power for introducing fundamental reforms. Expected inflation, which had been an informal feature of previous wage negotiations, instead of being eliminated was specifically legalized in binding wage formulas which included future inflation. True, the rate of expected inflation was arbitrarily reduced, but that simply opened the government to charges of favoritism whenever the rate of inflation was underforecast, as it often was in the early years of the program. All of this controversy could have been avoided by an ex-post system, where inflation transfers between workers and capitalists are automatically restored. By continuing with a new version of the old expectations system—with the government rather than unions making the forecasts—the government has put itself in the unenviable position of seeming to decide on the incidence of inflation. This has tended to maximize controversy over wage policy without gaining any permanent benefit in stabilization properties for the economy.

For all the supposed imperfections of the Brazilian inflation program, one has to admit that the rate of inflation in Brazil was reduced with an extraordinarily small loss in output and employment. How was this done with a wage policy which I have argued was not a particularly good stabilization tool? I contend that stabilization in Brazil is really an example of the successful use of wage and price controls coupled with consistent macropolicy, rather than indexing. The government, as we have seen, had the power to arbitrarily set the rate of expected inflation at any level. It used this power to bring down the inflation of wage rates at the same time it was controlling and reforming the tax system to reduce government deficits and expansion of the money supply. In a market economy, without any central control over wage settlements, the move to lower expected inflation rates requires a period of unemployment because expectations about inflation do not fall instantaneously. But in the Brazilian case expectations could be and were lowered by decree, thus obviating the need for a period of unemployment. One should not forget that the government also actively intervened in price setting. It set up a price control commission and forced price decisions on the major corporations that were roughly consistent with both wage and fiscal policy. Thus, if there is a lesson to be learned from the Brazilian case, it is the enormous advantage of being able to control prices and wages during a period when restrictive fiscal and monetary policies are being applied in order to reduce the rate of inflation. But Brazil should not be studied as an example of wage indexing.

(IV) PRACTICAL PROBLEMS

While a strong case can be made for indexing on theoretical grounds, there are several formidable practical problems of implementation which have caused many to oppose the measure. The first is, of course, that no perfect index exists in a world where different prices are rising at different rates. The index which perfectly reflects changes in the cost of living of the rich would be inappropriate in the case of the poor. Prices in different regions of the country or different sectors of the economy behave differently. Relative prices between sectors and regions are constantly changing. This means that even with indexing, inflationary redistributions cannot be entirely eliminated. Indeed, inflation risk could be exacerbated by indexing because of the speed with which inflationary impulses would be transmitted between sectors. However, I do not think that these problems in the use of any aggregate index are weighty enough to dictate abandoning indexing altogether. For the question that one must ask is whether indexing with an admittedly unsatisfactory index is better than the other alternative policies available to us. Obviously, everyone would prefer a world with stable prices and no need of indexing. But that is not the world we live in. In our current situation indexing appears to me to be less bad than any other alternative I have considered for either living with or getting rid of inflation.

A second practical problem with the indexing of wages concerns time lags. Clearly, it is impossible to adjust wages instantaneously as prices rise. If the system is such that the equilibrium real wage is reached at the time of the periodic inflation adjustment, then over time the average real wage will obviously lie below this equilibrium whenever there is an inflation. One solution for this is to make a provision for future expected inflation prior to the next wage settlement. This, as we have seen, was the solution used in Brazil. But it is not a good solution for the reasons discussed in section three. The most obvious alternative is to reduce the adjustment period and eliminate the inflation forecast. However, if this is done, one must reimburse wage earners, *ex post*, for all losses due to inflation. To do this it is not sufficient to simply adjust wages by the amount of inflation. For, whenever prices go up, workers in effect make an interest-free loan to business; they should be reimbursed for this loan. Leaving aside productivity for the moment and referring to Figure 1, suppose that the equilibrium real wage in the labor market is \bar{W} . Suppose that wages have been set so that $W_{t-1}/P_{t-1} = \bar{W}$. Now prices rise to P_t . Before any wage readjustment the real wage has fallen to W_{t-1}/P_t . Over the period $t-1$ to t , the worker has lent an amount equal to the triangle ABC to the businessman. At time t , he should receive a COL adjustment in his nominal wages equal to the inflation over period t . His wage should be raised to

$$\frac{W_{t-1}P_t}{P_{t-1}}$$

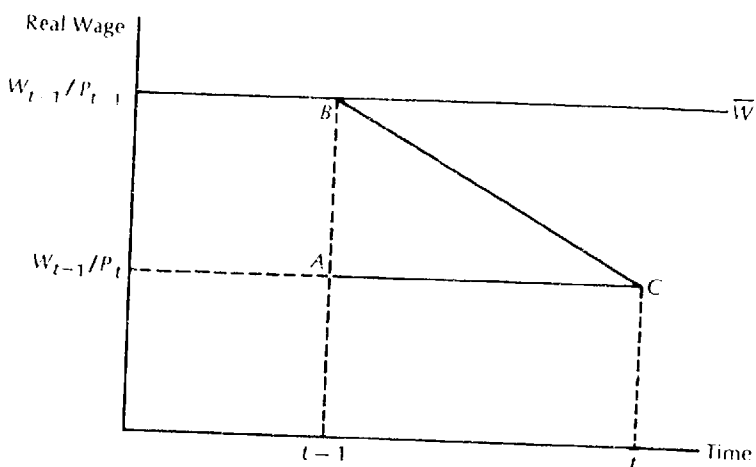


FIGURE 1

That will restore the real wage level to \bar{W} . But in addition, the worker should be compensated for the loan he has inadvertently made. If the rate of inflation over the period is constant, he should get $1 + r$ times the area in triangle ABC where r is the rate of interest over the adjustment period.

$$\text{Inflationary loan repayment} = W_{t-1} \left(\frac{P_{t-1}}{2P_t} \right) (1 + r)$$

for $P_{t-1} = 1$

The advantage of the ex-post system lies in the difference it represents from the system based on predicted inflation—that wages are based solely on ex-post price levels. They have no expected future inflation built into them. Wages only go up after prices have gone up, never before. In this kind of indexing any wage increases are the result of past inflation, and there is no basis for claiming that they could be a cause of future inflation. That is not true of the indexing system which uses an inflation forecast in setting wage levels. There, indexing could be a self-fulfilling prophecy.

A knotty question confronted by all indexing systems is how to handle productivity. In the Brazilian system an adjustment is made for the future expected gain in productivity, a forecast which has generally been too low. As a result, workers' real wages have risen far less than the growth rate of output, which must have caused a significant transfer from wages to profits. (There has also been a large rise in employment.) For the reasons just advanced against building forecasts into current wage levels, a better way of dealing with productivity is to make the correction ex post, just as we did for inflation. Again some adjustment has to be made for the loan aspect of uncompensated productivity increases. Looking at Figure 2, if productivity is increasing at the rate λ , then the real wage at time t should be

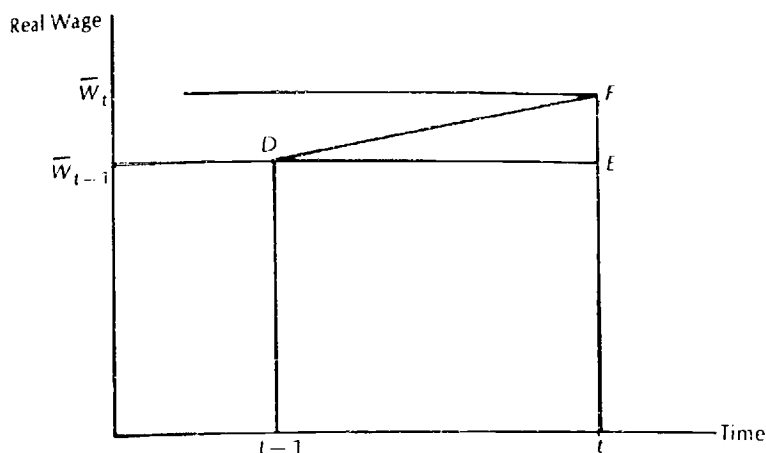


FIGURE 2

equal to $\bar{W}_{t-1} (1 + \lambda) = \bar{W}_t$. Again, workers make a loan to business equal to triangle DEF , for which they are compensated. That amount is

$$\frac{W_{t-1} \lambda (1+r)}{2}$$

Putting both the inflation and productivity corrections together, wages at time t should be:

$$W_{t-1} \left(1 + \frac{P_t - P_{t-1}}{P_{t-1}} + \lambda \right)$$

In addition, a lump-sum payment should be made at time t of

$$\frac{W_{t-1} (1+r)}{2} \left(\frac{P_t - P_{t-1}}{P_t P_{t-1}} + \lambda \right)$$

The advantage of this system is that it makes inflation nondiscriminatory and does not build in erroneous expectations about the future. It would handle sudden changes in inflation and, equally important, sudden changes in productivity. It would meet the objection of many that indexing would create an explosive inflation when the rise in prices comes from a real fall in output due to adverse weather or a change in the terms of trade caused by events like the oil embargo. Both of these occurrences mean a fall in the average output per worker, which is, of course, reflected in a drop in the productivity term of our wage equation. Lambda could even be negative. When that happens real wages would not rise at their trend rate. In this way real incomes would be adjusted downward to reflect the reduction in supply available to the economy.

Several critics of indexing maintain that, if all incomes and assets were protected from inflation by indexing, any reduction in net supply would

cause an explosive inflation, since the role of prices in reducing aggregate demand would be drastically diminished. This would be particularly true if the tax system were indexed as Friedman has advocated. On the supply side, indexing tends to make the aggregate supply of the economy independent of prices. It will do the same thing on the demand side. For prices reduce demand in three ways, two of which would be negated by comprehensive indexing. First, rising prices may redistribute income in the private sector to people with higher propensities to save, i.e., from wages to profits. Second, inflation redistributes income to the government, since the entire tax system is written in nominal terms and since the tax rates are progressive. Third, rising prices reduce the real money supply, which reduces demand through its effect on investment and consumption. Only the third effect would be left were comprehensive indexing adopted. There is, thus, the possibility that the demand and supply curves of the economy will be so close to vertical that the price level will be extremely unstable. Friedman's answer to this charge is that it is not too serious, since the opposite side of the argument is that the real sector is more stable, i.e., closer to its full employment level, which is more important than the price level.

I find the prospect of such price instability unattractive. To avoid it we could either make the COL adjustment less than complete or not index the tax system. In the former case, during any inflation, there would be a transfer from wages to profits that would never be made up. In the latter case, the transfers would be to the government. Most wage indexing schemes have the former effect. While this means that inflation transfers income from wages to profits, the partial adjustment also reflects the undoubted fact that each of us can avoid some of the costs of inflation because of our ability to substitute away from high-priced products. This is a value-ridden question, but I think that the advantage lies on the side of not indexing government tax liabilities. This makes the tax system an automatic stabilizer of prices. But more important, it means that inflation would not redistribute income between groups in the private sector, as would any scheme of partial indexing. As I see it, the biggest danger of inflation is that it sets various groups against each other because it takes income away from some and gives it to others. Taking income away from everybody equally and giving it to the government should create a strong constituency in favor of price stability and relieve social tensions between labor and business at the same time.

CONCLUSION

In my opinion comprehensive indexing has two overwhelming advantages over any alternative systems. They are, first, that indexing makes the

unemployment and output level of the economy more independent of the level of prices, and second, that it reduces the social frictions generated by inflation by eliminating the redistribution of income and wealth caused by unexpected deflation. In an economy without indexing it is the role of expected prices in wage and debt contracts which is the major deterrent to successful stabilization, for these guarantee unemployment and financial hardship when the economy moves from one inflation rate to a lower one. Ironically, and apparently contradictory to logic and intuition, a system that compensates for past price increases automatically may have lower inflation rates than one that does not, because reaching a desired price level generates less political opposition with indexing than without. That is just the result of removing the price level further from the real world with indexing than without. If the important variables in the economy like employment, the terms of borrowing, and investment are unaffected by the level of prices, then the public will be relatively indifferent to what price level the government decides to set. None of these advantages of indexing are reversed in a sectoral inflation, as some critics have claimed.

Inflation is a terribly divisive social phenomenon. Under our present arrangements every group is forced to try to protect its real income by using whatever political or economic power it has. Maximum discord is generated. Indexing is a mechanism that would make these inflation adjustments automatically and without any strife. It is a remedy that would make the disease of inflation easier to live with and at the same time easier to cure because of the reduced unemployment during stabilization. Not many inflation medications can make such a claim.

In attempting to decide on the applicability or wisdom of indexation, both proponents and opponents have studied Brazil as an example of wage indexing. This is an error. Brazil should not be thought of as an example of wage indexing, at least of the sort proposed by Friedman. For the Brazilian system does not merely adjust wages ex post for past inflation, but, instead, raises them in advance for future expected inflation. This is fundamentally different from the Friedman proposal, which is that inflation adjustments should always be made ex post. The Brazilians did reduce inflation successfully with their indexing system, but this was due to the government's power to enforce wage and price levels consistent with restrictive monetary and fiscal policy. Thus, Brazil's case should be thought of as the successful application of selective price and wage controls—and not indexation—during stabilization.

NOTES

1. Milton Friedman, "Using Escalators to Help Fight Inflation," *Fortune* (July 1974), p. 96.
2. For descriptions of debt indexation in various countries, see Collier [1], Finch [3], OECD [12], Robson [13].

3. Robson [13], pp. 57-58.
4. Walter Heller, "Has the Time Come for Indexing?," *Wall Street Journal* (June 20, 1974).
5. For a more complete description of the Brazilian system, see Fishlow [5] and the other papers in this volume.

REFERENCES

1. Collier, Robert P. *Purchasing Power Bonds and Other Escalated Contracts*. Taipei, Taiwan, ROC: Buffalo Book Co., 1969.
2. Fellner, William. "The Controversial Issue of Comprehensive Indexation." Mimeo.
3. Finch, David. "Purchasing Power Guarantees for Deferred Payments." In *International Monetary Fund Staff Papers*, February 1956, 1-22.
4. Fischer, Stanley. "The Demand for Index Bonds." MIT, Department of Economics, Working Paper 132, May 1974.
5. Fishlow, Albert. "Indexing Brazilian Style: Inflation without Tears?" In *Brookings Papers on Economic Activity*, Washington, D.C.: The Brookings Institution, 1974, 1, 261-80.
6. Friedman, Milton. "Using Escalators to Help Fight Inflation." *Fortune*, July 1974.
7. ———. "Facing Inflation." *Challenge*, November 1973.
8. Gramlich, Edward M. "The Distributional Effects of Higher Unemployment." In *Brookings Papers on Economic Activity*, Washington, D.C.: 1974, 2.
9. Giersch, Herbert et al. *Essays on Inflation and Indexation*. Washington, D.C.: American Enterprise Institute, 1974.
10. Hein, John. "A Note on the Use of Indexes Abroad." *Journal of Finance*, December 1969, 546-53.
11. Morag, Amotz. "For an Inflation-Proof Economy." *American Economic Review*, March 1962, 177-85.
12. Organization for Economic Development and Coordination, Committee on Financial Markets. *Indexation of Fixed Interest Securities*. Paris: OECD, 1973.
13. Robson, Peter. "Index-Linked Bonds." *Review of Economic Studies*, October 1960, 57-68.
14. Sarnat, Marshall. "Purchasing Power Risk, Portfolio Analysis and the Case for Index-Linked Bonds." *Journal of Money, Credit and Banking*, August 1973, 836-45.
15. Siegel, Jeremy J. "The Theory and Consequences of Contracting in Nominal Terms." Chicago: University of Chicago, Graduate School of Business, May 1974.
16. Vega, Ramon. "Wage Escalator Clauses and Inflation: The Experience of Selected European Countries." Washington, D.C.: U.S. Treasury, October 1973.