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Determinants of Wage Inflation around the World

SINCE 1973, dramatic and disruptive increases in the prices of fuel and food have captured the spotlight in discussions of price inflation in the United States and other economies. Besides contributing to substantial accelerations in consumer prices, these increases have spurred large redistributions of purchasing power, both within and between nations, and have imposed balance-of-payments difficulties on many countries. As a result of these developments themselves, and of the unwillingness of governments and central banks to offset their depressing effects on real economic activity, the explosions in food and fuel prices have been major causes of the present deep recessions in most nations.[1]

But central as food and fuel have been to the economic problems of the last two years, in most countries they were simply the last straw. In all industrial countries, though to sharply varying degrees, inflation had been recognized as a serious problem before 1973. It had helped provoke economic slowdowns, currency devaluations, floating of the U.S. dollar, and attempts at incomes policies, including the price-control program in 1971

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1. For several countries, including the United States, the link between increases in oil prices and the present recession is analyzed in Edward R. Fried and Charles L. Schultze, eds., *Higher Oil Prices and the World Economy: The Adjustment Problem* (Brookings Institution, 1975).

in the United States. The special factors of 1973 and 1974 descended on this already inflation-prone world.

The pre-1973 inflation focused both official concern and research activity on the behavior of wages. Table 1 records the annual rates of increase in the manufacturing sector of nine countries and the private nonfarm sector of the United States for the period 1961–74. By the early 1970s, even before spectacular price increases set in, rates of wage increase had accelerated in most industrial nations, sharply in most cases. The response of wages in individual countries to the special price shocks of 1973 and 1974 may help in understanding the underlying wage-price structure in each country. But the special shocks themselves will be treated as external to the more basic question of this paper: What determines the underlying and widespread wage inflation in the industrialized economies?

Table 1. Wage Inflation in Ten Countries, 1961–74[a]

Annual rate of change, in percent

Year	Belgium	Canada	France	Germany	Italy	Japan	Netherlands	Sweden	United Kingdom	United States
1961	6.1	2.6	7.8	11.6	6.1	16.5	13.8	8.6	7.8	2.9
1962	7.6	3.0	9.8	13.0	16.3	14.1	6.3	7.4	5.2	3.4
1963	10.4	3.5	10.9	6.9	19.0	11.7	9.6	10.3	4.7	2.8
1964	13.4	3.8	6.7	7.8	12.5	12.3	16.9	7.8	7.2	3.0
1965	10.4	5.0	6.0	9.9	5.9	12.7	12.0	11.8	9.4	3.7
1966	10.9	7.9	6.8	9.0	2.3	10.2	11.8	8.0	8.4	4.0
1967	9.3	7.6	7.8	5.8	10.5	12.0	11.1	10.2	2.9	4.8
1968	6.3	7.3	11.4	5.9	4.6	16.2	10.3	7.0	7.2	6.1
1969	9.4	7.5	13.3	9.1	10.8	18.3	13.2	8.9	8.0	6.3
1970	13.3	7.8	13.1	15.2	22.0	18.8	15.5	14.3	14.7	6.4
1971	14.7	7.6	11.7	14.0	18.1	15.7	14.4	7.4	14.1	6.8
1972	15.8	7.3	11.3	11.7	13.3	15.6	15.3	14.9	13.1	6.1
1973	17.7	8.5	13.5	13.2	21.4	24.5	14.8	10.9	13.3	6.1
1974	21.2[b]	13.0	19.2	14.8	19.1	33.5	19.0[b]	16.7	20.1	7.8

Sources: United States—wage data from COMETS data bank, whose source is *Employment and Earnings*, table C-16; other countries—derived from two tabulations provided by the U.S. Bureau of Labor Statistics, Office of Productivity and Technology, "Indexes of Output per Man-Hour, Hourly Compensation, and Unit Labor Costs, All Employees in Manufacturing, Twelve Countries, 1960–1974" (March 1975; processed), and "Estimated Hourly Compensation of Production Workers in Manufacturing, Ten Countries" (April 1975; processed).

a. Wages are compensation per manhour for all manufacturing workers except for France, Italy, and Sweden, for which they are compensation of production workers only, and the United States, for which they are hourly earnings of private nonfarm employees. Changes used in the regressions in this paper and reported in other tables are calculated as changes in the logs of wages and differ slightly from the annual changes shown here.

b. Calculated by the author by applying the 1973–74 percentage growth in the wages of production workers to the 1973 figure.

The global scope of recent inflation has intensified efforts to model the interdependence of inflation among nations and even to model inflation as a global phenomenon.[2] It is analytically useful to distinguish between direct and indirect sources of the interdependence of inflation. Direct effects include the influence of export and import prices on the prices of domestically produced output or on domestic wages. Indirect sources include aggregate-demand effects that arise from changes in the volume of real exports or direct foreign investment and from financial-capital flows. A particular foreign event is likely to have both direct and indirect effects. A change in exchange rates, for instance, can be expected to change both the volume and the price of exports; how much will depend on domestic supply conditions.

In this paper, I am not concerned with the determinants of nominal aggregate demand in individual countries nor, therefore, with the indirect effects on domestic inflation that work through aggregate demand. Whether individual governments can control demand or, as some argue, foreign influences have largely deprived them of that ability, is not the issue here. If they had been politically desirable, I am sure nations could have pursued at least somewhat more or less restrictive fiscal and monetary policies than they did. The problem for them and the issue for this paper is how inflation and real activity would have responded.[3]

The part of the inflation problem I want to focus on is the determinants of domestic wages—in particular, the sources of wage inflation, including the influence of domestic labor markets, domestic prices, export and import prices, and other factors that may be important for wage determination in particular countries. This treatment reflects my conception of the main root of the inflation problem. Unless adverse special factors become the rule in coming years, as some pessimists predict, the behavior of wages will again determine how inflationary the future will be.

2. This literature is growing rapidly. The papers presented at the Conference on Worldwide Inflation, Brookings Institution, November 21–23, 1974, form an up-to-date collection of research from economists in several countries.

3. Taking demand levels as given obviously precludes any comprehensive description of the origin of recent inflation rates. And confining the analysis to wages misses much of the extra price inflation of the past two years, not all of which is attributable to "special factors." Clearly, world demand played the major role in the 1973 rise of prices for raw materials other than oil. Although supply disappointments were surely more important than demand expansions, nobody questions world *excess* demand as the source of rising food prices. Some analysts might even want to make the cartelization of oil prices an endogenous variable to be explained along with other developments in the world economy.

Issues in Wage Behavior

What determines the movement of wages remains an unsettled question. The answer cannot be the same everywhere, and different hypotheses are emphasized by economists from different countries. At a minimum, one would expect relatively open economies, in which trade is a large fraction of gross national product, to be influenced more by foreign price and wage developments than would relatively closed economies. Beyond this, it is hard to generalize and many theories of wage determination are candidates for testing against the data.

William Nordhaus, in his provocative earlier article in *Brookings Papers*,[4] tested five theories of wage determination by employing each one as the sole explanation of wage behavior in each of seven countries. He was able to reject three of them conclusively: a simple Phillips curve, in which current unemployment is the only explanatory variable; his version of a monetarist approach, in which real output and the money supply are the explanatory variables; and a "frustration" hypothesis, in which real consumption is the main explanatory variable. The present study proceeds in much the same spirit as Nordhaus', but tries to explain events in various countries and to generalize from those results rather than to pick among theories. Besides pursuing some alternatives to the explanations of wage behavior that Nordhaus tried, I will allow more than one view of wage behavior to be expressed in the wage equations for each country.

EXTENDED PHILLIPS CURVES

In the United States, most explanations of wage behavior continue to emphasize the importance of labor-market conditions and the existence of a modified Phillips curve. In some other countries, a conviction seems to be growing that such a relationship has broken down, if it ever existed at all, and that wage inflation is insensitive to labor-market conditions. Studies of Phillips-curve relations have almost always included factors other than current labor-market conditions in explaining wage changes. Most commonly, the influence of past changes in living costs has been added as an explanatory variable. The rationale for doing so, and alternative hypotheses about the role of past price changes in wage equations, are discussed below.

4. "The Worldwide Wage Explosion," *BPEA, 2:1972*, pp. 431–64.

Recent research on the United States has demonstrated that demographic shifts in the composition of unemployment have made the aggregate unemployment rate a misleading indicator of labor-market tightness.[5] For the United States, a measure of unemployment that weights demographic groups by their average wage and hours of work and standardizes for their shifting relative importance in total unemployment is used here as the measure of labor-market tightness. This adjustment could not be made for the other countries. But it was possible to calculate unemployment rates for males for all the others except Italy and France, and rates for adult males for Canada. These alternative measures were compared with the total unemployment rate in each country, but the absence of an age breakdown for all but Canada makes this comparison less useful than it might have been in establishing the importance of demographic shifts.

Because of a suspicion that the unemployment statistics for some of the countries studied were not adequate measures of labor-market tightness, I constructed output gaps for each country similar to the gap that is utilized in Okun's law for the United States. Data for the population aged 15 to 64 were available for each country, and by lagging these data five years I approximated the adult working-age population. The trend growth rate in the ratio of real private nonfarm output[6] to the previously described population measure was then estimated by regression. This trend rate of growth had to capture many effects, including trends in participation rates, in hours of work, and in productivity. The population data were then used to estimate trend GNP year by year, and this was blown up by 5 percent and smoothed by using a centered three-year moving average to form an estimate of potential GNP, from which gaps were calculated. The gaps constructed in this way can be interpreted as alternatives to unemployment rates as measures of demand pressure.

For all countries but Japan, Sweden, and the United Kingdom, the unemployment rate for males has been falling relative to the overall rate, indicating that labor markets in recent years have been tighter than total unemployment rates indicate. In addition, until 1974, the gaps in Japan, the Netherlands, and Sweden have been falling relative to unemployment rates.

5. See, for example, George L. Perry, "Changing Labor Markets and Inflation," *BPEA, 3:1970*, pp. 411–41, and Franco Modigliani and Lucas Papademos, "Targets for Monetary Policy in the Coming Year," *BPEA, 1:1975*, pp. 141–63.

6. Real GDP (gross domestic product) was used for the United Kingdom and the Netherlands, and real GNP for Japan, because nonfarm output was not available for those countries.

COST-OF-LIVING EFFECTS

As just noted, Phillips-curve analysis has generally included past changes in living costs, in addition to labor-market variables, in explaining wage changes. The usual formal models hypothesize that wages are adjusted for the expected change in living costs, either because the appropriate context is bargaining and the expected real wage is the object of the bargaining, or because the appropriate context is market clearing and the labor supply is defined in terms of the expected real wage. Previous studies have used a wide variety of lags in past living costs in attempts to measure the expected rate of price increase.

The existence of cost-of-living escalators in union contracts offers a more direct connection between the consumer price index and wages. The importance of such escalators varies from country to country and over time. Compared with the expectational model, cost-of-living escalators would involve a shorter lag on consumer prices in explaining wage changes.

Although the known existence of escalators seems to guarantee that living costs will have some effect on wages, this effect need not take place if the size of the wage bargain itself is smaller when an escalator clause is present. If escalators in some contracts are the only structural link through which living costs affect wages, consumer prices will enter the equation only to the extent that escalators produce a wage increase different from that arrived at in wage situations that do not have escalators. In most periods, this difference is likely to be negligible, at least when averaged over all wage situations. When consumer prices move abruptly for reasons not directly related to wage costs, as they did with the fuel-price explosion of 1974, workers protected by escalators almost surely do better than others. However, even then, the fraction of workers covered by escalators and the degree to which those escalators pass price changes through into wages will determine the empirical importance of consumer prices in explaining wages.

VALUE-ADDED PRICE EFFECTS

Although lagged consumer prices have commonly been used in wage equations, the models underlying their use can be questioned. No evidence that I know of relates labor supply positively to real wages. And while protection of real wages is an understandable aim of unions in bargaining situations, a model based on this fact ignores the employer on the other side

of the bargaining table. The recent price explosions illustrate the issue plainly. Food and fuel prices went up, sharply raising the consumer price index. But producers of other goods experienced no expansion of profits or increases in demand that would put them in a position to pay larger wage increases: the value of labor's product to them did not rise. The erosion of real wages could heighten labor militancy and tip the scales at the bargaining table to some degree. And in a world in which prices and wages are not pinpointed by market forces, some employers may deliberately take account of the cost of living in making their wage adjustments, buying employee goodwill by doing so. But the link between consumer prices and wages is weak and uncertain at best if it rests on such grounds.

Lagged value-added prices of employers can enter wage equations through models that meet some of these objections. These prices can be thought of as a combination of costs, most of which are wage costs, and profits. With costs given, a rise in value-added prices raises profits and the value of the marginal product of labor to the firm. In the context of market-determined wages, such a rise in the value of labor's product directly raises the wage a firm is willing to pay for a given amount of labor. Similarly, in a bargaining context, such increases in value-added prices enhance the employer's ability as well as his willingness to raise wages. In either context, the use of some lag on value-added prices can be justified—either because one thinks wage changes depend on previously achieved profitability, or because they offer a measure of expected prices and profitability and one thinks of wages as determined by the future position of firms after wages change. For the individual firm, unemployment and value-added prices can be thought of as complementary in a wage equation, one as a proxy for the real labor supply and the other for nominal labor demand.

WAGE-INERTIA MODELS

Except for prices set by markets beyond the firm's or industry's control, changes in value-added prices reflect mainly prior changes in wages. Thus, besides the view of wages chasing actual or prospective profits, embodied in the type of model just described, the presence of lagged value-added prices in a wage equation can simply imply a world of considerable inertia in wage increase—a wage-wage as opposed to a price-wage view of inflation dynamics. Several years ago, I described rates of wage increase as having a large "habitual" component in order to convey this concept without tying

it to formal price-expectations models that seemed unsatisfactory. Robert Hall has recently presented a formal model implying considerable inertia in wage inflation, which he estimates using unemployment and lagged wages as explanatory variables.[7] In this issue, Arthur Okun offers the best discussion to date on the general question of why rates of price and wage increase have so much inertia. If wages just chase wages, subject to the state of other structural determinants such as unemployment rates, then lagged wage changes should substitute for value-added prices in a wage equation. If instead, or in addition, wages chase profits or profits chase labor, then value-added prices should be the better explanatory variable.

EXPORT AND IMPORT PRICES

An hypothesis that has been popular among Scandinavian economists, and was originally associated with Odd Aukrust, emphasizes the export sector in smaller, open economies as a principal determinant of wage behavior, and hence economy-wide price inflation.[8] Export prices are set in world markets, and when they rise, wages in the export industries follow. As in the value-added price model, the source of this result can be either the upward push exerted by market forces on the demand for labor in these industries as the value of its marginal product rises or simply the stronger bargaining positions of trade unions in the export industries. The usual versions of this model then have other wages following those in the export sector through imitative effects, or "labor solidarity."

Instances in which a country's export prices are set entirely by world markets are probably not common. However, the essentials of the Scandinavian model have obvious plausibility for small, open economies, particularly under a regime of fixed or heavily managed exchange rates.

Import prices can act comparably to export prices to the extent that they affect the prices and profitability of import-competing industries. However, here causality becomes more complicated and harder to untangle.[9] An average of import prices will include raw or semifinished inputs, and the rise in

7. Robert E. Hall, "The Process of Inflation in the Labor Market," *BPEA, 2:1974*, pp. 343–93.

8. See Gösta Edgren, Karl-Olof Faxén, and Clas-Erik Odhner, "Wages, Growth and the Distribution of Income," *Swedish Journal of Economics*, vol. 71 (September 1969), pp. 133–60. See also Odd Aukrust and others, *Instilling fra Utredningsutvalget for inntektsoppgjrene* (Oslo: 1966) (often referred to as the Aukrust Report).

9. Nordhaus, in "Worldwide Wage Explosion," offers a model of pricing constrained by the trade balance in an open economy. In his formulation, only import prices matter.

their prices would not broaden the scope for wage increases on the demand side. The average will also include imports that do not compete with domestic production but directly enter consumer prices. If the cost of living is important in wage determination, import prices could influence wages through that route, though it is a distinctly different one from that contemplated in the Scandinavian model.

STRUCTURES AND INSTITUTIONS

Finally, overriding any of these hypotheses about wage behavior are questions about the importance of institutional or political forces and about whether these forces can change "structures" in the middle of a data period. Governments have attempted price-wage restraint programs at various times, occasionally with some success. So as not to let these successes interfere too much with the estimation of other influences on wages, I used the studies by Lloyd Ulman and Robert Flanagan and by Anne Romanis Braun to establish the periods in which incomes policies had been used effectively in different countries and formed dummy variables to account for them.[10] The literature is not unambiguous on this subject, but I ended up hypothesizing wage-restraint effects for France in 1964 and 1965, Sweden in 1971, the United Kingdom in 1967, and the United States in 1964–66. Generally, these years follow the ones in which wage restraints were introduced. I accepted Robert J. Gordon's verdict that the 1972 controls in the United States acted entirely on prices.[11]

Other discontinuities may have been important in the wage histories of various countries. Changes in wage behavior have sometimes been abrupt. With inflation accelerating, lags may have shortened in the last couple of years and even the variables that matter, or the extent to which they matter, may have changed. A hard test for any wage equation will be its ability to predict 1973 and 1974. And an interesting question will be what accounts for the different performances in various countries during the past couple of years. Before getting into these issues, conventional wage equations embodying the hypotheses just discussed will be presented.

10. Lloyd Ulman and Robert J. Flanagan, *Wage Restraint: A Study of Incomes Policies in Western Europe* (University of California Press, 1971); Anne Romanis Braun, "The Role of Incomes Policy in Industrial Countries Since World War II," *International Monetary Fund Staff Papers*, vol. 22 (March 1975), pp. 1–36.

11. "Wage-Price Controls and the Shifting Phillips Curve," *BPEA, 2:1972*, pp. 385–421.

Empirical Test

All estimated equations in this paper were fitted by ordinary least squares using annual data through 1972, leaving 1973 and 1974 for post-sample predictions. The data period starts in the early 1960s, with the earliest available date varying for different countries.

The various hypotheses about wage determination required trying several variables in the equation for each country. These included four price variables: import prices, export prices, private nonfarm deflators (except for Japan, the Netherlands, and the United Kingdom, for which only GNP or GDP deflators were available), and consumer prices; and three labor-market measures: aggregate and male (or, for the United States, weighted) unemployment rates, and output gaps, lagged wages, and, for Canada, lagged U.S. wages. The dependent variable in all cases was $\Delta \ln W_t$, where W denotes wages. In order to avoid mining the data too deeply, as well as most of the obvious problems of simultaneous-equation bias, all price variables (P) were constrained to the form

$$0.2\,\Delta \ln P_t + 0.6\,\Delta \ln P_{t-1} + 0.2\,\Delta \ln P_{t-2}.$$

Wage changes were simply lagged a year, except in the case of Sweden, for which they were lagged two years to allow for the known two-year settlement cycle.

In the initial equations reported for each country, each variable was given a chance to appear in the wage equation alongside all the others. Some equations subsequently were constrained in different ways. In most cases, if a coefficient had the sign predicted by a hypothesis, it was kept in the equation.[12] Since the labor-market variables were used as inverses, the expected correct sign was positive for all variables. When the Durbin-Watson statistic for an equation was less than 1.5, as it was in a small number of cases, the equation was reestimated using the rho correction for first-order serial correlation, and the rho value is reported.

There were two reasons for keeping variables in the equations without requiring some minimum value for the t-statistic on their estimated coefficient. The main one is statistical. Where more than one price is reported as an explanatory variable, usually each had a large t-statistic when entered without the other but neither did when they were entered together. The

12. The exception is that I also disregarded an occasional coefficient that was trivial in both size and t-statistic even if it had the right sign.

second reason is that I did not expect the individual wage equations to be well-determined, and I was not surprised. While the results are quantitative, rather than taking each coefficient too seriously, I was more interested in the amount of support that the equations for all countries taken together give to the various views about wage determination.

For any of the ten countries studied here, a more detailed analysis of wage behavior would almost surely provide a better-fitting wage equation, although at the risk of mining the data too hard and worsening the post-sample predictive accuracy of the equations. By contrast, for several of the countries, the present equations appear quite successful both inside and outside the sample period; and some hypotheses are accepted or rejected with enough persistence to offer evidence on the nature of wage inflation.

Conventional Wage Equations

Estimated wage equations are presented in table 2 for the ten countries under study. These equations contain all the explanatory variables that passed my simple criterion of having the right sign. They are referred to as "conventional equations" to distinguish them from some others presented below. Viewed together, the estimates presented in table 2 suggest several broad conclusions.

External prices are important in all countries for which trade is a large fraction of GNP except France. The Scandinavian hypothesis that export prices are a significant factor in determining domestic wages is supported for Italy, the Netherlands, Sweden, and the United Kingdom. In each of these cases, it is plausible that the export industries sell at prices heavily influenced by world markets and that these prices, in turn, are significant determinants of wages in those industries and others. The presence of import prices in the Belgian and German equations requires the interpretation that import-competing industries in these countries play a similar role. Consumer prices were rejected as an explanatory variable in both cases, so the possibility that import prices entered as a component of a cost-of-living effect on wages does not seem acceptable. Finally, for Canada, U.S. wages are an important external influence, a result found in previous studies of that country.[13]

13. See, for instance, Lester D. Taylor, Stephen J. Turnovsky, and Thomas A. Wilson, *The Inflationary Process in North American Manufacturing* (Toronto: University of Toronto, 1972).

Sources: Estimated from the basic equation,

$$\Delta \ln W = a_0 + a_1(1/U) + a_2 \Delta \ln (P \text{ lagged}) + a_3 \Delta \ln (W \text{ lagged}),$$

where wages, W, of all workers in manufacturing is the dependent variable (see table 1, note *a*), U is the unemployment rate, and P is prices. Details and exceptions are given in the footnotes. For sources of the basic wage data, see table 1. Price deflators are from Organisation for Economic Co-operation and Development, *National Accounts Statistics, 1961–72*, and preceding relevant issues, and from various individual country publications. Import and export prices are from International Monetary Fund, *International Financial Statistics*, vol. 28 (July 1975), and ibid., *1973 Supplement* (1974). Consumer prices are from OECD, *Main Economic Indicators*, various issues. Unemployment data are from various official publications, unpublished tabulations, and material relating to the individual countries. Miscellaneous other sources were used as necessary to supplement information in the sources given above.

a. The numbers in parentheses are *t*-statistics.
b. Inverse of unemployment rate for males.
c. Variables are lagged using the following weights: $0.2\ (t) + 0.6\ (t-1) + 0.2\ (t-2)$.
d. Variable is lagged one year, except Swedish wages which are lagged two years.
e. Lagged U.S. wages are an average of the current and immediately preceding year.
f. Incomes-policy dummies are as follows: France, +1 in 1964–65; Sweden, +1 in 1971; United Kingdom, +1 in 1967; United States, +1 in 1964–66. Dummies are zero in all other years.
g. This equation was corrected for first-order serial correlation with a value of rho = 0.63.
h. Inverse of total unemployment rate.
i. Inverse of output gap.
j. Weighted unemployment rate with 1966 composition.

Table 2. Conventional Wage Equations, Ten Countries[a]

Country and period	Constant	Labor market[b]	Lagged prices[c]				Lagged wages[d]	Lagged U.S. wages[e]	Incomes-policy dummy[f]	Summary statistic		
			Non-farm deflator	Consumer prices	Export prices	Import prices				$\bar{R}^2$	Durbin-Watson	Standard error
Belgium	0.007	0.188	0.742	...	...	0.719	...	...	...	0.571	1.5	0.0169
1963–72	(0.2)	(2.0)	(1.2)			(1.4)						
Canada	−0.048	0.246	0.773	0.149	...	...	...	0.627	...	0.810	2.6	0.0060
1964–72	(−1.7)	(3.1)	(1.5)	(0.4)				(1.5)				
France	0.042	...	0.365	...	...	...	0.479	...	−0.037	0.737	1.6	0.0130
1963–72	(2.3)		(0.3)				(0.9)		(−2.6)			
Germany	0.022	0.040	0.639	...	...	0.562	...	...	...	0.900	[g]	0.0141
1963–72	(1.0)	(2.6)	(1.5)			(1.5)						
Italy	−0.153	0.831[h]	...	...	1.036	...	...	...	...	0.424	1.5	0.0426
1962–72	(−1.6)	(2.7)			(1.6)							
Japan	0.026	0.191[i]	...	...	...	...	0.514	...	...	0.651	1.7	0.0142
1961–72	(1.0)	(3.8)					(3.1)					
Netherlands	0.060	0.146[i]	...	0.435	0.821	...	...	...	...	0.553	2.3	0.0184
1962–72	(1.8)	(1.2)		(0.7)	(1.2)							
Sweden	0.052	...	...	...	0.783	...	0.402	...	−0.069	0.506	1.9	0.0179
1963–72	(1.9)				(2.5)		(1.3)		(−2.7)			
United Kingdom	−0.040	0.138[h]	...	1.211	0.806	...	...	...	−0.044	0.764	2.6	0.0174
1962–72	(−0.8)	(1.4)		(2.0)	(1.7)				(−2.3)			
United States	0.009	0.049[j]	0.853	0.145	...	...	...	...	−0.001	0.976	2.5	0.0024
1960–72	(3.2)	(4.9)	(2.3)	(0.5)					(−0.6)			

The importance of value-added prices as opposed to consumer prices is plain in the results. The private nonfarm deflator dominates consumer prices in Belgium, Canada, France, Germany, and the United States. Export prices, which are the significant value-added price according to the Scandinavian model, dominate the consumer price index in Italy, the Netherlands, and Sweden. Rather than the nonfarm deflator, the total GNP deflator was available for Japan, and the GDP deflator for the Netherlands and the United Kingdom; in the last two the consumer price index proved a stronger explanatory variable. The GNP deflator was better than the CPI in Japan, but lagged wages proved better still.

A Phillips curve exists for eight of the ten countries. Only for France and Sweden was no labor-market effect found. However, in Japan and the Netherlands, my calculated gap proved superior to any of the unemployment measures as the labor-market variable. The significance of this result is hard to judge without a good deal more knowledge about the unemployment statistics and the labor markets in these countries. Because layoffs are rare in Japan, the unemployment rate is a poor measure of labor-market conditions. Some measure of the difference between vacancies and job seekers is the kind of statistic required to measure labor-market pressure. A crude GNP gap such as I have calculated could be a proxy for such a measure.[14]

The unemployment rate for males (or the weighted rate in the United States) worked better than the total rate in four of the five countries for which unemployment entered the equations and for which such a rate was available. Only in the United Kingdom did the total rate perform better than that for males. Where the rate for males worked, it had drifted lower than the total rate through time. This is the crudest sort of evidence, but it is at least consistent with the view that Phillips curves, measured by total unemployment rates, may have moved out a bit in other countries besides the United States as a result of demographic changes. Unemployment rates

14. The implications for social policy of an unemployment rate that does not respond to the gap may be quite special: If it means only that the unemployment rate is a poor measure of the number of persons out of work, then the country needs a better statistic. But if it means that workers are like tenured professors, whose classes simply get smaller as the gap grows, then the social cost of curing inflation with a recession is less than it would be otherwise. Of course, the same gap will presumably do less to slow inflation if it does not cause layoffs than if it does. But the demand for labor will be reduced in this case, even if the supply of the unemployed is not enlarged.

that separate out young workers would be needed to examine this question more closely, and these were available only for Canada.

While these broad results stand out from the equations viewed as a group, individually the equations have lots of problems. Some of the lagged price coefficients appear unrealistically high. The Italian labor-market coefficient is much larger than is credible. France is on a random walk, with its inflation rate influenced neither by real factors such as the labor market nor prices in the world outside its borders. More generally, several of the equations fail to predict well the most glaring fact about the wage histories of Japan and most European countries in this period: the abrupt accelerations that took place between 1968 and 1970.

Wage Explosions and Wage Shares

As table 1 shows, in Japan and France, rates of wage increase jumped to a new plateau in 1968. In Belgium, Italy, Germany, Sweden, and the United Kingdom, wages exploded in 1970. Equations such as those in table 2 presume continuous and unchanging responses of wages to their specified determinants. In most cases, these determinants did not change in a way that predicted the explosions.

Models that lead to a lot of inertia in wage equations can help explain how wage inflation stayed on a higher plateau once wages exploded. The harder question is why wages suddenly accelerated the way they did and when they did. In France and the United Kingdom, unemployment had been rising through the year of the explosions. In the other five countries just noted, unemployment was falling and relatively low in the year of the explosions. But in no country was unemployment lower than it had been in previous boom periods. The possibility that economies crossed a new threshold in labor-market tightness does not seem acceptable. Nor was there any unusual burst of price inflation preceding the wage explosions. If economic variables were important, it must have been through some cumulative effect that they finally caused the acceleration in wage inflation.

One hypothesis to explain the wage explosions is an extension of the argument that value-added prices of employers help determine wages. The increase in the value of labor's product (VLP) decomposes into the sum of the increase in value-added price (P) and the increase in productivity (Q/L).

The difference between the growth in the value of labor's product and labor's hourly earnings (W) defines whether labor's share is growing or shrinking. Unless changes in the government's share offset it, this difference will also define what happens to capital's share. New value-added taxes were introduced in several European countries during the late 1960s and early 1970s. But the deflators took no abrupt upturn *before* the wage explosions to indicate that these new taxes enlarged the government share in this period. Thus, the relation between changes in VLP and W can be taken to reflect mainly the relation between the shares of labor and of capital.

If equal certainty and permanence attached to changes in P and in Q/L, then the hypothesis that changes in value-added prices are a structural determinant of wage changes would predict that same role for changes in productivity. But, in fact, productivity has substantial cyclical and random components as well as a trend. The trend may not stay constant for long; and at any time, the acceleration of the trend may be uncertain. The trend in the shares of labor and capital will mirror this uncertainty.

In the mature and relatively tranquil labor market of the United States, that part of VLP growth represented by productivity is not a major issue in wage determination. To a good approximation, cyclical productivity movements are largely reflected in cyclical swings in profit margins. And there seems to be no great disagreement about the trend in productivity, at least at fairly aggregated levels. When the issue arises in public debate, the range of estimates covers only a few tenths of a point in the annual growth rate.

In the "miracle growth" economies of many European countries and Japan, the situation appears to have been less stable and the issue of shares less settled. The productivity trend in the 1960s could not have been well established or easy to estimate. Even if the distribution of guesses relative to the mean guess were no different from that in the United States, the absolute uncertainty would have been several times greater. This greater uncertainty in itself would make shares a bigger issue in labor negotiations. In addition, the high profitability and investment booms in most European countries and Japan in the 1960s were certainly not lost on their labor movements. If labor came to perceive that it could have gotten a larger share of the benefits from the 1960s boom, this perception could account for the subsequent wage explosions.

An hypothesis of this sort clearly would not apply equally to each of the seven countries in this study that experienced abrupt wage explosions. Nor is it meant to be set against an hypothesis that constant shares are a norm

toward which wage and price developments will push the economy. A report by the Organisation for Economic Co-operation and Development (OECD) has identified rising trends in the share of employee compensation in national income over the 1955–69 period.[15] But in addition, for all countries considered here except the United Kingdom (and Sweden, which is not covered by the report), it shows slowdowns in the growth of the compensation share starting a few years before the wage explosion, following above-trend increases in the preceding years.

The United Kingdom is the weakest candidate for the shares explanation of the wage explosion. Income shares are a keen topic in Britain; yet, British labor could not have perceived its own industries as overly prosperous by conventional standards. On the other hand, more radical trade unions may have been quite prepared to see industries bankrupted in order to force their nationalization. In turn, employees in the public sector have often been the thorniest problem in Britain's attempt to moderate wages directly. The incomes policy that originated with the freeze in the summer of 1966 came apart with a large settlement following the dustmen's strike in the fall of 1969, and the general wage explosion followed.[16] In early 1970, the number of strikes and hours lost to strikes were nearly two-thirds higher than in the year-earlier period.[17] And this increased militancy over pay boosts continued throughout the year.

For other European countries, a search of *The Economist* produced evidence of growing labor militancy during the wage explosion and, in some cases, explicit acknowledgment that shares were a principal economic issue. Discussing Germany, the journal reported:

> His [Schiller's] main persuasive weapon so far has been the attractive concept of "social symmetry," which means that profits and wages should rise at the same pace, according to the guidelines provided by him and the bright young economists he brought into his ministry. The trouble so far is that his guidelines have been wrong. As a result, during 1967 and 1968 there was the amazing spectacle of unions asking for too little, so that profits enjoyed a growth rate several times that of wages.[18]

15. OECD, *Inflation: The Present Problem* (Paris: OECD, 1970), pp. 63–66.

16. I owe these observations to David Worswick of the National Institute of Economic and Social Research in London, although he is not responsible for my interpretations of our conversation. The last point is made in *Economist*, vol. 235 (April 25, 1970), p. 70, where the fear that private wages would follow the breakout in the public sector, including the nationalized industries, is expressed.

17. Ibid. (June 20, 1970), pp. 71–72.

18. Ibid. (January 10, 1970), p. xl.

And, later in the year:

The unions argue that their claims can be met without inflation, by a reduction in the share of industrial profits which grew unjustifiably far and fast between 1967 and 1969.[19]

The significance of labor and profit shares in Italy's "hot Autumn" (1969) of strikes and industrial strife was viewed thus:

Behind the rhetoric there is a genuine economic debate, whether the vastly higher wages the unions are demanding will cause an economic collapse, as some employers are maintaining, or whether Italy is merely in the process of moving its labour costs, and profits, into line with those of other common market countries.[20]

Despite such descriptions of the German and Italian situations, the journalistic accounts of the period hardly paint a picture of uniform causes in all countries. They stress political rather than economic considerations in describing the French riots of 1968 that led to that country's wage explosion. And any explanation for other countries must allow for possible imitation of or contagion from that French experience. It surely increased the probability of heightened militancy and even civil disorder by labor in other countries. While a battle over shares is thus not plausible as a sole explanation for each country's experience, there is evidence, presented in table 3, that it was important in several cases.

The first bank of columns in that table shows the average annual growth rates in W and in the ratio VLP/W for the three-year period preceding the wage explosions and for the three-year period before that. The second bank of columns shows growth rates in W and in VLP/W for the years after the wage explosions.

Because the price used in these calculations is the private nonfarm deflator, the growth rate of VLP/W is itself hard to interpret and the changes in it between the different periods must be compared. For all countries but Italy, the growth in VLP/W accelerated noticeably between the first and second periods shown. Thus, measured by changes in its share, labor did substantially worse in the years immediately preceding the wage explosions than it had been doing. Wage changes were somewhat faster in the first period, but not dramatically so. As the second group of columns shows, the VLP/W ratio then slowed dramatically in the post-explosion years for all

19. Ibid. (November 7, 1970), p. 69.
20. Ibid. (January 24, 1970), p. 60.

Table 3. Annual Rates of Change in the Battle over Shares before and after Wage Explosions, Seven Countries, Various Periods[a]

Percent

Date of wage explosion and country	*Changes before explosions*				*Changes after explosions*		*Changes in ratio of wage over price, W/P*		
	W	*VLP/W*	*W*	*VLP/W*	*W*	*VLP/W*	*Before explosions*		*After explosions*
1970	*1963–66*		*1966–69*		*1969–73*		*1963–66*	*1966–69*	*1969–73*
Belgium	11.6	−1.6	8.3	2.6	15.4	−2.1	7.2	5.0	9.3
Germany	8.9	0.2	6.9	1.9	13.5	−2.0	5.8	4.5	6.7
Italy	6.8	5.1	8.6	−0.5	18.7	−4.7	2.7	5.7	11.5
Sweden	9.2	1.8	8.7	2.8	11.9	−0.3	4.7	5.5	5.7
United Kingdom	8.3	−0.1	6.0	1.5	13.8	−0.4	4.5	2.6	4.2
1968	*1961–64*		*1964–67*		*1967–73*		*1961–64*	*1964–67*	*1967–73*
France	9.1	0.6	6.8	1.9	12.4	−0.5	4.4	4.1	6.3
Japan	12.7	0.1	11.6	3.0	18.0	−0.5	8.2	6.4	11.4

Source: Productivity data are from the BLS tabulation "Indexes of Output per Man-Hour, . . . , 1960–1974," cited for table 1, and unpublished data provided by BLS; other data are from the relevant sources cited in tables 1 and 2.

a. *W* is hourly earnings; *VLP* is the value of labor's product $= PQ/L$; Q/L is all worker productivity in manufacturing; and *P* is the private nonfarm deflator except for the United Kingdom and Japan, for which it represents the GDP deflator and the GNP deflator, respectively.

countries. Thus, in this interval, faster wage increases sharply improved the incremental share of production going to labor. The slowdowns in the growth of VLP/W rates following the wage explosions ranged from 1.9 percentage points for the United Kingdom to 4.2 percentage points for Italy.

These slowdowns in growth rates of VLP/W do not simply reflect short-run productivity slowdowns. The last three columns show that, in most countries, the better part arose from sharp increases in the growth rates of the wage-price ratio, W/P.

Some additional points must be considered in interpreting the table 3 calculations. For one thing, some acceleration in the W/P ratios might be expected because wages are not all of the nonprofit part of value added. Whatever the cause of wage acceleration, it would raise the labor share if prices did not respond with an elasticity of 1.0 or more to their acceleration. In the short run, one would not predict an elasticity that high. However, for five of the seven countries, the W/P ratio accelerated by more than one would expect from short-run price responses to wage changes. If a price acceleration of 75 percent of the wage acceleration were predicted, then over the post-explosion periods, actual price increases fell short of this predicted amount by 3.0 percent a year in Belgium, 0.9 percent a year in Germany, 1.3 percent a year in France, 3.3 percent a year in Italy, and 3.6 percent a year in Japan.

A more basic point is that labor need not succeed in raising its share even if shares were the issue that led to the wage explosion. It is labor's attempt to get more that is crucial, not the realization of that aim. But its success does increase the presumption that there was room between prices and wages for labor's share to improve. Measured by the changes in growth rates of VLP/W after the wage explosions, labor succeeded in all countries. Measured by the changes in W/P, labor succeeded everywhere but Sweden. And making an allowance for an expected short-run elasticity of prices to wages of 0.75, W/P rose more than predicted everywhere but Sweden and the United Kingdom. In Sweden the incomes policy that held down the 1971 wage increase by 6.9 percent, according to the table 2 estimate of its effect, may account for this behavior of W/P. And presumably in the United Kingdom, the margins of industry had too little fat to absorb very much and prices had to rise to the detriment of Britain's competitive position.

All this strikes me as plausible evidence that shares were an important

factor in the wage explosions. But it is not possible to test the hypothesis more formally by introducing the evidence of table 3 directly into wage equations. An attempt to introduce lagged *VLP* or *VLP/W* as an explanatory variable for wages fails for two reasons: first, because wages did erupt rather than accelerate gradually; and more important, because once they did, labor succeeded. After the explosions, changes in the ratio *VLP/W* became negative. Yet, the habitual rate of wage increase, while still presumably subject to other influences, varied around a higher plateau, kept there by the inertia in rates of wage inflation.

EQUATIONS WITH SHARES DUMMY

Because it cannot be modeled by a continuous variable, I have integrated the shares hypothesis of the wage explosions into wage equations by introducing a dummy variable for the year of the explosion in each of the seven countries. Obviously, this procedure in no way verifies that income shares were the issue. Rather, if one finds the income-shares argument plausible, it justifies the use of the dummies. The new equations for the seven countries are presented in table 4. All other explanatory variables were chosen as before.

For all countries but Belgium, the new equations improve the fits considerably and generally raise the *t*-statistics on the other explanatory variables. In a few cases, the variables entering the equations change. A Phillips curve creeps into the Swedish equation and lagged export prices are in the equation for Japan, although with a *t*-statistic of only 0.7.

The biggest change comes in the equation for the United Kingdom. Lagged wages, with a reasonable coefficient, replace consumer prices, which had an implausibly large coefficient in table 2. This shift eliminates the only case among the ten countries in which the cost of living had shown a dominant effect on wages. The labor-market variable in the new equation is weaker, while the coefficient on lagged export prices is unaffected.

The specification for the seven countries in table 4 with the income-shares dummy seems superior to that in table 2 for all the countries but Belgium. For these six countries, the income-shares dummy is retained in subsequent regressions; together with the table 2 regressions for the other four countries, these are referred to as "conventional equations" in subsequent discussion.

Table 4. Conventional Wage Equations with Battle over Shares, Seven Countries[a]

Date of wage explosion, country, and period	Constant	Labor market[b]	Lagged prices[c]			Lagged wages[d]	Income-shares dummy[e]	Summary statistic		
			Nonfarm deflator	Export prices	Import prices			$\bar{R}^2$	Durbin-Watson	Standard error
1970										
Belgium	0.008	0.187	0.733	...	0.733	...	−0.001	0.485	1.5	0.0186
1963–72	(0.2)	(1.8)	(1.0)		(1.1)		(−0.03)			
Italy	−0.150	0.807[f]	...	0.750	...	...	0.075	0.557	1.6	0.0374
1962–72	(−1.8)	(3.0)		(1.3)			(1.8)			
Germany	0.020	0.038	0.664	...	0.262	...	0.027	0.973	[g]	0.0073
1963–72	(1.1)	(5.2)	(2.9)		(1.4)		(4.4)			
Sweden	0.004	0.023[f]	...	0.373	...	0.813	0.042	0.967	[h]	0.0079
1963–72	(0.2)	(0.9)		(3.0)		(7.0)	(7.7)			
United Kingdom	0.000	0.059[f]	...	0.827	...	0.446	0.047	0.898	2.2	0.0114
1962–72	(0.02)	(1.0)		(3.2)		(3.3)	(5.6)			
1968										
France	0.026	...	0.394	...	...	0.582	0.029	0.833	2.5	0.0104
1963–72	(1.8)		(0.4)			(1.5)	(3.8)			
Japan	0.019	0.120[i]	...	0.185	...	0.641	0.024	0.676	2.5	0.0140
1962–72	(0.7)	(1.9)		(0.7)		(3.3)	(1.4)			

Sources: Same as tables 1 and 2.

a. The numbers in parentheses are *t*-statistics.

b. Inverse of unemployment rate for males.

c. Variables are lagged using the following weights: $0.2\,(t) + 0.6\,(t-1) + 0.2\,(t-2)$.

d. Variable is lagged one year, except Swedish wages which are lagged two years.

e. Dummy variable is +1 in the year of the wage explosion. In addition, for France, Sweden, and the United Kingdom, this includes incomes-policy dummy described in table 2, with sign reversed.

f. Inverse of total unemployment rate.

g. This equation was corrected for first-order serial correlation with a value of rho = 0.91.

h. This equation was corrected for first-order serial correlation with a value of rho = 0.43.

i. Inverse of output gap.

Consumer Price Escalators

The verdict against consumer prices as a structural variable is quite severe on the basis of the wage equations presented thus far. However, cost-of-living escalators are known to exist. Although, as noted earlier, this fact does not assure the consumer price index a role in wage equations, it seemed useful to try a constrained specification that included it.

In the constrained specifications, wages were assumed to have a current-year escalator of 20 percent of the CPI rise. Thus, a new dependent variable was defined as ($\Delta \ln W_t - 0.2\,\Delta \ln CPI_t$). Consumer prices were no longer used as a potential explanatory variable; otherwise, the procedure for selecting variables was the same as before. Table 5 shows the CPI-escalated wage equations. Although some coefficient estimates change, the same explanatory variables appear as in the conventional equations. A comparison of the predictive ability of the two sets of equations is made below.

Wage Inertia

The conventional equations for five countries—Belgium, Canada, France, Germany, and the United States—use private nonfarm deflators as explanatory variables, although in the case of France the *t*-statistic on the coefficient is only 0.4. The equations in table 6 substitute lagged wages for these deflators, in order to explore the possibility that the deflators serve only as a proxy for wages chasing wages. For convenience, table 6 also repeats the conventional equations from table 4 for Sweden and the United Kingdom, which already contained lagged wages and not the private nonfarm deflator. The conventional equation for Japan was also in this category. Since the coefficient on lagged exports in that equation had a *t*-statistic of only 0.7, I took the opportunity to show the Japanese equation omitting lagged exports in table 6. Only eight countries are represented in table 6, as lagged wages did not appear with the correct sign in equations for Italy and the Netherlands.

For the five countries in which lagged wages were substituted for the deflator, the equation fit, as measured by the standard error, is little changed for Belgium and France and worsened noticeably for Canada, Germany, and the United States. The comparisons are not exact for two reasons.

Table 5. CPI-Escalated Wage Equations, Ten Countries[a]

Country and period	Constant	Labor market	Lagged prices: Nonfarm deflator	Lagged prices: Export prices	Lagged prices: Import prices	Lagged wages	Lagged U.S. wages	Income-shares dummy	Summary statistic: $\bar{R}^2$	Summary statistic: Durbin-Watson	Summary statistic: Standard error
Belgium	0.009	0.176	0.603	...	0.715	...	...	...	0.551	1.5	0.0164
1963–72	(0.2)	(1.9)	(1.0)		(1.4)						
Canada	−0.039	0.209	0.834	...	...	...	0.567	...	0.809	2.3	0.0056
1964–72	(−1.6)	(3.1)	(1.8)				(1.7)				
France	0.027	...	0.262	...	...	0.600	...	0.026	0.830	2.4	0.0094
1963–72	(2.0)		(0.3)			(1.5)		(3.7)			
Germany	0.019	0.035	0.599	...	0.289	...	...	0.027	0.971	[b]	0.0070
1963–72	(1.2)	(4.9)	(2.8)		(1.6)			(4.5)			
Italy	−0.139	0.749	...	0.685	...	...	...	0.075	0.536	1.5	0.0366
1962–72	(−1.7)	(2.8)		(1.2)				(1.9)			
Japan	0.020	0.124	...	0.219	...	0.598	...	0.021	0.679	2.2	0.0136
1962–72	(0.8)	(2.0)		(0.9)		(3.1)		(1.3)			
Netherlands	0.067	0.147	...	1.011	...	...	...	...	0.577	2.2	0.0163
1962–72	(3.3)	(1.4)		(2.3)							
Sweden	0.014	...	...	0.228	...	0.854	...	0.043	0.959	[c]	0.0081
1963–72	(1.2)			(1.9)		(7.0)		(9.1)			
United Kingdom	0.002	0.052	...	0.735	...	0.426	...	0.045	0.895	1.9	0.0105
1962–72	(0.1)	(1.0)		(3.1)		(3.2)		(5.8)			
United States[d]	0.012	0.033	0.831	...	...	...	...	...	0.949	2.2	0.0028
1960–72	(3.8)	(2.8)	(11.7)								

Sources: Same as tables 1 and 2.

a. The dependent variable is ($\Delta \ln W_t - 0.2 \Delta \ln CPI_t$), where W is wages and CPI is the consumer price index. This is also the form used for lagged wages. All other variables are defined in tables 2 and 4. The numbers in parentheses are t-statistics.

b. This equation was corrected for first-order serial correlation with a value of rho = 0.88.

c. This equation was corrected for first-order serial correlation with a value of rho = 0.40.

d. The U.S. equation also included the incomes-policy dummy for 1964–66 with a trivial coefficient of −0.001 and a t-statistic of −0.4.

Table 6. Wage-Inertia Equations, Eight Countries, Various Periods, 1960–72[a]

Country and period	Constant	Labor market	Lagged prices		Lagged wages	Lagged U.S. wages	Income-shares dummy	Summary statistic		
			Export prices	Import prices				$\bar{R}^2$	Durbin-Watson	Standard error
Belgium	0.007	0.157	...	0.689	0.368	...	...	0.583	2.0	0.0172
1962–72	(0.2)	(1.7)		(1.4)	(1.5)					
Canada	−0.024	0.160	...	...	0.290	0.664	...	0.840	1.9	0.0078
1960–72	(−2.1)	(3.6)			(1.1)	(2.0)				
France	0.032	...	...	...	0.705	...	0.028	0.839	2.3	0.0097
1962–72	(2.7)				(5.6)		(4.9)			
Germany	0.024	0.041	...	0.335	0.210	...	0.024	0.959	[b]	0.0090
1963–72	(0.8)	(4.6)		(1.4)	(2.0)		(3.3)			
Japan	0.022	0.180	...	...	0.548	...	0.015	0.649	1.9	0.0143
1961–72	(0.9)	(3.5)			(3.3)		(1.0)			
Sweden	0.004	0.023	0.373	...	0.813	...	0.042	0.967	[c]	0.0079
1963–72	(0.2)	(0.9)	(3.0)		(7.0)		(7.7)			
United Kingdom	0.000	0.059	0.827	...	0.446	...	0.047	0.898	2.2	0.0114
1962–72	(0.02)	(1.0)	(3.2)		(3.3)		(5.6)			
United States[d]	−0.007	0.053	...	...	0.892	...	...	0.909	2.8	0.0046
1960–72	(−1.2)	(2.8)			(8.3)					

Sources: Same as tables 1 and 2.

a. See tables 1, 2, and 4 for a description of the lags and variables used. The numbers in parentheses are *t*-statistics.

b. This equation was corrected for first-order serial correlation with a value of rho = 0.94.

c. This equation was corrected for first-order serial correlation with a value of rho = 0.43.

d. The U.S. equation also included the incomes-policy dummy for 1964–66 with a trivial coefficient of −0.001 and a *t*-statistic of −0.3.

First, lags were not varied to find best fits. Wages lagged more than one year were tried in addition to one-year lags; but wrong signs, or trivially significant coefficients, appeared and only one-year wage lags are reported (except, as noted earlier, for Sweden, where a two-year wage cycle exists). Second, the lagged wage corresponds to the sector for which the dependent variable is defined but, for all except the United States, the deflator in the conventional equation does not. One would expect this imperfect correspondence to bias comparisons in favor of the wage-inertia equations.

Phillips Curves

Both the conventional and wage-inertia equations display very flat short-run Phillips curves for several countries. In table 7, the change in wage inflation predicted from a 25 percent rise in unemployment is calculated from both sets of equations. The 25 percent rise is meant to approximate a one-point rise in weighted unemployment for the United States from its mean value for the period. It represents different absolute changes in unemployment rates for the other countries.

The first-year wage deceleration associated with this unemployment rise is especially small for Sweden, the United Kingdom, and the United States. For the first two, the labor-market coefficient is poorly determined by the equation, having a *t*-statistic around 1.0. For the United States, the estimate deserves to be taken more seriously.

If the new unemployment level is maintained, the effect on wage changes grows considerably in some countries as the wage-wage or deflator-wage spiral operates. These long-run effects were calculated by assuming that private nonfarm deflators have an elasticity of 0.75 with respect to wages, which is meant to approximate the proportion of value added that would be affected by wage changes in all but the very long run. This procedure implies that other wages move with manufacturing wages and that export and import prices are completely exogenous. Export prices should respond somewhat to domestic wages, even in very open economies. And in a worldwide general equilibrium, some additional impacts would be felt through import prices. So the table understates the long-run estimates for the economies whose wages feel a significant impact from export and import prices.

The long-run impacts are noticeably greater in all countries but Italy, which has no lagged wage or deflator in its wage equation. As already

Table 7. First-Year and Long-Run Effects on Wage Inflation of a 25 Percent Rise in the Unemployment Rate, Nine Countries[a]

Country and equation	*Change in wage inflation (percentage points)*	
	First year	*Long run*
Belgium		
Conventional	−1.7	−3.8
Wage-inertia	−1.4	−2.2
Canada		
Conventional	−1.5	−4.9
Wage-inertia	−0.9	−1.3
Germany		
Conventional	−1.0	−2.0
Wage-inertia	−1.1	−1.4
Italy		
Conventional	−6.2	−6.2
Wage-inertia	n.a.	n.a.
Japan		
Conventional	−0.6	−1.7
Wage-inertia	−1.0	−2.2
Netherlands		
Conventional	−0.8	−1.2
Wage-inertia	n.a.	n.a.
Sweden		
Conventional	−0.3	−1.6
Wage-inertia	[b]	[b]
United Kingdom		
Conventional	−0.5	−0.9
Wage-inertia	[b]	[b]
United States		
Conventional	−0.3	−1.2
Wage-inertia	−0.4	−3.7

Sources: The conventional wage equation refers to that in table 4 for all countries shown there but Belgium, and that in table 2 for all others. The wage-inertia equations are from table 6.

a. This change in labor-market tightness is meant to approximate a 1.0 point rise in the U.S. unemployment rate. The 25 percent rise is applied to the measure of labor-market tightness used in the equation for each country; for Japan and the Netherlands, this was the GNP gap rather than a direct measure of unemployment.

b. The conventional wage equation and the wage-inertia equation were the same for this country; therefore the changes in wage inflation were the same.

n.a. Not available.

noted, this equation is not satisfactory. The difference between short-run and long-run effects is most striking for the United States, particularly in the estimates from the wage-inertia equation. The inflationary or deflationary impact of any change in unemployment in the United States builds for a long time.

Tracking 1973 and 1974

With world inflation exacerbated, first by rising prices of food and industrial raw materials in 1973 and then by soaring energy costs in 1974, the past two years offer an unusually interesting period for projecting the wage equations fitted through 1972. Table 8 shows recent rates of wage increase and the post-sample prediction errors for the conventional equations (error I), the CPI-escalated equations (error II), and the wage-inertia equations (error III).

One surprise in table 8 is how well the wage inflations in many countries were tracked in 1973 and 1974. Prediction errors from the conventional equations were small for both years for Canada, Germany, the Netherlands, the United Kingdom, and the United States. In the case of Germany and the United States, the wage acceleration by 1974 was modest and might appear "easy" to predict. But with many prices soaring over this period, some views of the wage-inflation process would have implied much more acceleration. For instance, the consumer price index was rising 2.0 percentage points faster in Germany and 6.1 percentage points faster in the United States in 1974 than it had been in the 1970–72 interval. A related surprise is that the conventional equations *overpredicted* 1974 wage increases as often as they underpredicted them.

The post-sample errors shed no added light on the poor Italian and French equations. The underprediction for France reflects the fact that the unsatisfactory element in its equation is its unresponsiveness to anything but its own inertia. Prices of exports or imports must have some importance although they could not be detected in the regressions that were tried. The Italian equation was not considered satisfactory as estimated and, since they offset each other for two years, the prediction errors offer few hints for improving the specification. The large overprediction for 1974 suggests that the equation is too sensitive to recent export prices. They rose 1.2 percent in 1972, 12.7 percent in 1973, and 36.3 percent in 1974, leading to a weighted average of 15.1 percent with the fixed lagged pattern used in all the re-

Table 8. Prediction Errors from Wage Equations, Ten Countries, 1973 and 1974, and Wage Acceleration, 1974 over 1970–72

Percentage points

Country	*Equation error*[a]	*Prediction error*[b]		*Standard error of equation* ($\times 10^2$)	*Actual wage acceleration for the country*
		1973	*1974*		*1974 growth in wages less average 1970–72 growth*
Belgium	I	4.2	−0.8	1.7	4.5
	II	3.8	−1.8	1.6	
	III	4.0	0.5	1.7	
Canada	I	−0.9	−0.2	0.6	4.7
	II	−2.5	−0.9	0.6	
	III	0.6	3.6	0.8	
France	I	1.5	4.7	1.0	6.1
	II	1.4	3.7	0.9	
	III	1.9	5.4	1.0	
Germany	I	1.6	0.8	0.7	1.0
	II	1.2	0.4	0.7	
	III	1.3	0.1	0.9	
Italy	I	7.9	−6.7	3.7	1.8
	II	6.9	−8.3	3.7	
	III	n.a.	n.a.	n.a.	
Japan	I	8.6	10.3	1.4	13.2
	II	7.4	7.9	1.4	
	III	8.6	13.7	1.4	
United Kingdom	I	−0.6	0.0	1.1	4.8
	II	−0.6	−0.8	1.0	
	III	[c]	[c]	[c]	
Netherlands	I	0.3	0.3	1.8	3.0
	II	0.8	−0.6	1.6	
	III	n.a.	n.a.	n.a.	
Sweden	I	1.7	−3.4	0.8	4.3
	II	2.0	−3.3	0.8	
	III	[c]	[c]	[c]	
United States	I	0.6	0.6	0.2	1.3
	II	0.2	−0.4	0.3	
	III	−0.2	1.8	0.5	

Sources: Error I comes from the conventional wage equations—from table 4 for France, Germany, Italy, Japan, Sweden, and the United Kingdom; from table 2 for the others. Error II comes from the CPI-escalated wage equations shown in table 5. Error III comes from the wage-inertia equations shown in table 6.

a. I, conventional equations; II, CPI-escalated equations; III, wage-inertia equations.

b. Prediction errors are actual minus fitted values in percentage points.

c. The conventional wage equation and the wage-inertia equation were the same for this country; therefore the changes in prediction errors were the same.

n.a. Not available because wage-inertia equations were not successfully estimated for these countries.

gressions. But allowing for longer lags would worsen the large underprediction for 1973.

Among the big errors in the table, Japan's cries out for an explanation in terms of heightened labor militancy, a new round in the battle over shares, or something equivalent. In 1972, the year just preceding the new explosion of wages, neither export prices nor the deflator had accelerated and consumer prices had risen only 4.8 percent, less than in any year since 1967. My calculated GNP gap was stable at about the level of the previous two years. In 1973, both the gap and unemployment declined moderately, which may have helped a new labor initiative on wages to succeed. But those developments can hardly be thought to have caused it.

The CPI-escalator equations are neither a great success nor a dismal failure. Compared with those of the conventional equations, their predictions are worse about as often as they are better. For 1974, they overpredict wage changes for seven out of the ten countries. The escalator equation produces a large 1973 error for Canada, for which the error had been small using the conventional equation. It improves the error for Japan in 1974 noticeably, but still leaves it very large.[21] Since consumer prices will follow wages, the pure wage errors should be considered somewhat larger (up to 20 percent larger) than the errors shown in the table. In view of this, the escalator specification does not have much to recommend it.

The wage-inertia equations give better predictions than the conventional equations for Belgium and Germany, and worse predictions for Canada, France, Japan, and the United States. The evidence is against the hypothesis that deflators reflect nothing more than wages chasing wages. But it is hardly strong evidence.

More important, the prominence of either lagged wages or deflators in the wage equations shows that once a rate of wage increase is established, there is a good deal of inertia acting to perpetuate it. This result must be viewed alongside the evidence of wage explosions, and does not contradict it. Indeed, the inertia in wage inflation may help explain why wages accelerated sharply—rather than gradually—responding in a discontinuous way to pressures that had built up over a longer period. And it helps explain why rates of wage increase stayed on a higher plateau after their year of explosion.

21. David Worswick has insisted to me that cost-of-living escalators played a prominent role in the recent escalation of wages in the United Kingdom, implying that the superiority of error I over error II in 1974 in table 8 is an accident.

Food and Fuel Prices

As much as they may have contributed to real income losses, worldwide recessions, and some disruption to international financial markets, the extraordinary rises in food and fuel prices of 1973 and 1974 have not added much, if anything, to the *underlying* world wage inflation as of 1974. Partly, the reason is that, in some countries, the wage inflation had been so rapid that the increment from food and fuel was relatively small. Only in Canada and the United States did real wages fall over the 1972–74 interval. But more important, the absence of substantial cost-of-living effects on wages prevented these exogenous price shocks from precipitating an accelerating price-wage-price spiral.

Cost-of-living effects on wages should not be ruled out entirely. In the equations for Canada and the United States, they were found to add a minor amount to wages. With good enough data and close enough scrutiny, I would expect to find some effects elsewhere as well. But to date, they do not seem to have played a large part, and certainly not a dominant part, in the wage determination of the countries studied.

Although the cost of living has not had significant effects on wages thus far, given strong enough union and political power it could. In 1973, consumer prices accelerated by more than 2 percentage points only in Canada, Italy, Japan, and the United States. In Italy and Japan, the increases are fully accounted for by wage accelerations. It was 1974 before consumer prices exploded in most countries. So the feared problem of fuel prices feeding into wages may still lie ahead. Only a change in the structure of wage determination would trigger this problem; but, in view of the wage histories analyzed here, such a change would not be unprecedented, and therefore policymakers should not be complacent.

Exchange Rates

With export prices or prices of import-competing goods significant determinants of domestic wage inflation, what will the new regime of floating exchange rates contribute to the world inflation problem? A standard argument in favor of floating rates is that they insulate domestic economic

management from foreign influences. The tail gets a life of its own and cannot be wagged by the dog. Is that always a good thing?

When the worry was that a country that wanted to do the right thing had no shield against an inflation originating abroad, flexible rates that provided such a shield were attractive. They were the vaccine that would keep the virus from spreading. Recently, Germany, the pacesetter, has been working hard, with some success, at slowing its inflation. But flexible rates have kept other European nations from benefiting directly from this improvement. Their relative depreciations shield their own export and import-competing industries from the competition. The vaccine that would have immunized them against the virus also immunizes them against the antibodies.

Some Implications

Individually, the wage equations from the several countries that have been presented here could all benefit from better data, further experimentation, and more detailed analysis over different periods of observation. But taken as a group, the equations point to several general findings with enough persistence to be taken seriously: (1) cost-of-living effects have not been important determinants of wage changes; (2) foreign prices or wages are significant wage determinants in open economies; (3) Phillips curves exist but are quite flat in most countries; (4) a great deal of inertia characterizes wage inflation in most countries; (5) conflict over income shares has been a source of wage inflation; and (6) institutions are important and can lead to wage behavior that would be unpredictable from equations one could normally fit. These findings have important implications for the present state of the world economy.

If, because of the absence of cost-of-living effects on wages, the underlying domestic inflations do not react to world prices for largely noncompeting goods, such as food, fuel, and other raw materials, the same cannot be said for other world prices. In the past, inflations and disinflations have been transmitted directly through the prices of competing exports and imports, and, at least in Canada and possibly elsewhere, through wage emulation as well. Thus, the nations of the world have been linked in an international inflation through these direct price connections even when they may have tried to pursue independent aggregate-demand policies. With the

rest of the world experiencing inflation, larger reductions in aggregate demand and larger increases in unemployment would have been required to achieve any given reduction in inflation in an individual country.

The recent move to flexible exchange rates ought to weaken these direct price links and enhance the ability of individual governments to chart their own courses on the price level. But having been introduced just when some of the dominant nations were emphasizing disinflation policies, flexible rates can now dampen the extent to which such disinflation will extend automatically to other countries.

The existence of Phillips curves, which were found for most economies, still offers ultimate control over inflation for individual countries. But because the tradeoff curves are very flat in the short run and because the inertia of inflation is strong, slowing inflation with higher unemployment will be very costly. Strong incomes policies, such as those implemented by Harold Wilson's government, may be the only feasible answer to world inflation.

Comments and Discussion

Gardner Ackley: Not for the first time, George Perry has given us a fascinating paper to discuss. I am sure there are many things wrong with it; and I will indicate a few myself. But we can only admire his boldness and imaginativeness in undertaking, single-handed, a venture that might well frighten a large research team with a substantial multiyear foundation grant. One reason I admire his paper, no doubt, is that Perry's basic preconceptions in this area are very much like my own. And, not surprisingly, those preconceptions are broadly supported by his results. (I don't mean to be snide: I regard the fortification of preconceptions as the nature of most useful economic research.)

One thing that I particularly like in the approach is Perry's understanding that empirical economics is not limited to discovering high degrees of regularity in economic affairs and is not a failure unless or until it finds them. Rather, in some areas—and I would presume wages and prices were among them—discontinuous structural changes may typically occur. And an apparent confirmation of this discontinuity can surely be a legitimate finding for an empirical research project.

One subject on which I found Perry's evidence impressive was the role of consumer prices in wage determination. I have always tended to believe that consumer prices were an important link in the wage-price spiral; and the evidence in this paper makes clear that product prices always dominate consumer prices. To be sure, I am a bit suspicious that, despite the fact that the price variables are lagged, the high serial correlation in both the wage and the price series causes the regression to pick up what is really the reverse dependence of product prices on wages. At least for the United States, the movements of Perry's lagged product-price variable are barely distinguishable from those of the nonlagged series—although considera-

bly different from the movement of consumer prices. Still, I find the evidence impressive, and have begun to revise my own verbal accounts of the nature of the wage-price spiral.

Having said some nice things about the paper, I must turn to some problems. If one looks at any of the several sets of equations for different countries, one sees that R^2 is always very much higher, and standard error very much lower, for the U.S. equation than for that for any other country. That *could* mean (a) that wage determination is a more well-behaved phenomenon in the United States than anywhere else; or (b) that U.S. data are more accurate than data for other countries. But it also could mean (c) that the uniform specification for the standard equation was biased by what Perry already knows about the U.S. economy; or (d) that we know far better how to lay our hands on the relevant U.S. data sources that correspond to the concepts we seek to use than we do for other countries. I suspect that (c) and (d) both play some significant part.

And I am strengthened in this suspicion by what the equations tell about the one country whose inflationary experience I have just been studying intensively—namely, Japan.

Perry's standard equation for Japan found a modest labor-market effect on wages, no lagged-price effects, and a fairly high coefficient on lagged wages. Using his wage-explosion dummy, he gets a small and unreliable coefficient on lagged export prices. Let me offer a few comments on these results—I hope, not in the spirit of "I know more about Japan than he does," but simply as illustrative of the problems that arise in international comparative studies.

The problems start with data. Perry uses a BLS wage series whose movements resemble those of no Japanese wage series that I can find. Without knowing what Japanese wage numbers BLS got hold of and how they adjusted them, I cannot, of course, comment further.

Second, Perry correctly rejects unemployment data as a measure of labor-market tightness. Instead, he constructs the crude GNP gap calculation that he describes. There already exist two GNP gap series for Japan, both highly sophisticated in their construction—one done by the Japanese Economic Planning Agency, the other by OECD. But the two series disagree very substantially about fluctuations in the size of the gap. My guess is that Perry's crude series agrees with neither. In any case, for Japan, the GNP gap is probably not a relevant labor-market concept. In the United States it is not unreasonable to identify potential output with some con-

stant unemployment rate—preferably a standardized rate, à la Perry. But until the late 1960s, Japan still had large reserves of capable labor on farms and in small enterprises, ready to move into the advanced sectors as rapidly as capital goods could be provided there for them to use, with no significant loss of output where they came from, and without requiring an increase in prevailing wages in the advanced sectors.

There exists, however, a sensitive measure of labor-market looseness and tightness—the ratio of job offers to applicants other than new graduates. This ratio never exceeded 0.75 until 1964, broke 1.0 in mid-1967, and after peaking around 1.5 in early 1970, fell back to 1.0 in the subsequent recession, before rising nearly to 1.9 in late 1973.

A simple regression of Japanese wage increases on this vacancy measure produces an R^2 of 0.895. (Perry's highest R^2 for Japan, with several right-hand variables, is 0.68.)

For a wage equation that also includes a profits term and the lagged CPI, the R^2 rises to 0.923. (The t-ratios were 7.6 for the vacancy variable, 2.5 for profits, and 2.2 for the CPI.) Profits, of course, are not a bad proxy for Perry's value-added price variable. Indeed, his own discussion rather convinced me that profits might be a superior variable to specify.

Actually, the conclusion of my own study was that the rate of Japanese wage increase was explained largely by export prices—although in a manner that would be impossible to discover through regression analysis. Very briefly, Japanese economic policy in the 1950s and 1960s was unswervingly directed toward rapid economic growth; and the success of exports was seen (perhaps wrongly but nevertheless surely) as the key to the entire growth strategy. Stability of export prices was in turn judged the key to export expansion.

Japan has a highly effective direct control—which they call monetary policy—which clicked on whenever the trade balance turned, or threatened to turn, negative; and the threats clearly included any tendency for export prices to rise. Also, I am convinced, but cannot prove, that Japan's effective policy instrument called "administrative guidance" was operating more or less continuously to persuade employers in the main export lines not to agree to wage increases that would be inconsistent with stability of export prices. Productivity gains in export industries were, of course, big enough to allow for very large and, indeed, increasingly large wage gains—so large that Japan experienced a steady 5 to 6 percent annual inflation of consumer prices (and nearly that much in the GNP deflator). But no one

really cared. The export price index was 99.8 in 1955 and 100.0 in 1970. Since export prices varied hardly at all, their effects on wages could hardly be picked up in a regression.

Whether similar policy effects exist in other countries—and interfere with our discovering the correct structural relationships—I do not know. But I would guess that they do. For example, both France and Italy have very large nationalized-industry sectors. Even without a coherent or explicit wage policy, significant impacts of public policy on wage levels could well have occurred, in at least a few years; with only nine to thirteen data points, that can make considerable difference. Also the centralized wage bargaining in Sweden and the Netherlands—even though government does not participate—has sometimes been described as enforcing (in some years more successfully than in others) a private incomes policy designed to advance the national interest.

One way of putting this is to say that wage determination involves—at least from time to time—certain basically political elements in the broadest sense. At times the elements are quite visibly present—as a force for stability or as the reverse. And the reverse is part of the story of wage explosions.

We economists are the only ones to describe what happened in France in 1968 as a wage explosion. Others call it a violent political protest that came very close to bringing down the Gaullist Republic—and probably did bring down De Gaulle, a year later. With students occupying the universities and public buildings, street mobs attacking the Bourse, strikers seizing their factories, it came as close to a sociopolitical revolution as most of us ever want to see. The wage explosion of May 1968, in response to these economic, *and social and political*, dissatisfactions, was an agreement made by the government—not by employers—partly as a means of buying off the workers in order to divide them from other revolutionary forces. And there were other economic, social, and political concessions to various other groups. Why did it all occur? Because *VLP* had been rising faster than *W*? In part. But there was obviously a great deal more.

When I once described wage bargaining by large national unions as sometimes an outlet for the pure impulse to aggression, I was thinking of the joy that the unions of New York subway workers and of airline machinists took in destroying the government's wage guideposts—which they did. A better example, perhaps, was the British coal miners setting out to destroy a Tory government—which they did.

I don't know how we expect to model this kind of behavior successfully. But it is an essential part of wage determination. I doubt that one-year dummy variables are the best way to do it. And, in any case, I don't believe that the selection of years in which to use a dummy variable should be made by looking for what seem to be discontinuities in the dependent variable, although it seems even less appropriate to select on the basis of residuals in the equation without dummies. And, of course, if what I call political elements are always present but in varying degree, dummies are no answer at all. Hasn't econometric theory come up with something better? If not, don't we need to start looking for independent measures of "content-discontent" to use, however feeble a representation of the relevant elements they might be?

William Nordhaus: George Perry has written a paper of tremendous scope. In doing it, he had a great struggle with the data. He won a few points, the data won a few points, and I gather they are both exhausted. Perry reviewed several hypotheses about wage behavior in ten industrialized countries. He gave specific attention to the wage explosions of the 1968–70 period and to the wage response to commodity inflation of the last three years.

The main conclusion that I come away with is simply that, try as we may to find one, there is just no good theory of wage determination to draw upon to explain wage movements across time and space. This conclusion is obvious in the wide variety of explanations used for ten countries in Perry's paper or in my original paper. It is also apparent in the way structural change destroys good specifications; for example, the original Phillips curve was chewed up in the late sixties; and the new vintage, the extended Phillips curve, is moribund in the best of cases. Just as casual evidence, I cite what Perry and I found. Three years ago, I found that extended Phillips curves worked well in the United States and Canada, poorly in West Germany, Japan, and Sweden, and perversely in France and the United Kingdom. Perry's results are similar for the United States, France, and Canada, but differ either a little or a lot for the other countries. Phillips curves may be alive, but they are not well.

Two slightly new theories that appear in Perry's paper are inertial and contagion theories. Inertial theories suggest that wage inflation is best seen as a random walk, or a damped autoregressive equation. This shows up as an equation in which the lagged wage inflation is the chief explanatory vari-

able. If the coefficient is unity, then it really is a random walk, but Perry does find that it seems to be damped. A cousin of inertial theories is a contagion theory—a theory that suggests unstable behavior over time or space. Casual evidence suggests that the only way one can explain the dynamics of the rise and fall of riots and student unrest or drug use since 1870 is by a contagion model—essentially an unstable difference equation. Was the French revolution of 1968 as contagious as that of 1848, the only difference being that it showed up in wages? In the United Kingdom, as well, it has often been hypothesized that after the nurses or dustmen went out and won a strike, other units were likely to do the same, leading to what Perry terms the battle over shares. The nature of contagion systems, however, makes them difficult to estimate, so that even if there is something to these theories, I am not surprised that it is hard to find.

Perry's paper gives a lot of attention to Phillips curves, and concludes that they are probably getting flatter. Is it possible that Okun's customer markets are spreading in the labor market and that because of their growing weight in the total, Phillips curves are becoming flatter? Perhaps the United Kingdom is an extreme version of this. Many economists have found that the United Kingdom has a positively sloped, or perverse, Phillips curve. I would like to present an hypothesis, not to be taken too seriously, to explain this perverse result. Consider the Eckstein and Wyss studies on industry behavior, which show that the automobile and tobacco industries behave as target-return industries. In these cases, when demand goes down, prices go up. Perhaps the same effect obtains in the United Kingdom during recessions, with very strong labor unions attempting to have "target return" on wage bills. Nineteen-seventy, the year in which Perry places the wage explosion in the United Kingdom, was also a very weak year for economic activity, so maybe the behavior I am describing helps explain that case.

Another striking result in Perry's paper is the influence of value-added prices on wages, which leads me to two comments. First, in seven of the ten countries, the sum of the coefficients on domestic and world prices is greater than unity, although not by statistically significant margins. Whether this implies instability is a complicated issue because the important prices are often external ones, and of course the rest of the system has to be closed. Assume for the moment that wages eventually feed through to prices with unitary coefficients. Only the United Kingdom is internally unstable; it can generate hyperinflation without any help from the rest of the

world. I think, however, that when the whole system is solved, it is likely to be globally unstable. I don't know that for a fact, because there are two definitely stable countries, besides the United States, whose price coefficients are dangerously close to unity. Also, the result is different with specification changes that Perry makes.

Second, I am concerned with Perry's finding that the deflator chases the CPI out of almost every wage equation. I have the same reaction to this that I do toward monetarists' equations of the determinants of GNP. In these, I am not surprised at the good fit of what I interpret as the demand-for-money equation "standing on its head." Just as I have strong beliefs in that case, I also have strong a priori beliefs in Perry's case. The fact that value-added prices are closely related to wages makes me wonder if I am seeing a price equation standing on its head. Furthermore, the Phillips hypothesis makes wage increases on the supply side a function of real wages—that is, wages minus taxes and deflated by consumer prices. I looked forward to the last few years as a test of whether wage equations had the CPI as a determinant or whether they were really price equations turned upside down. I am afraid that Perry's results have not convinced me that we are dealing with genuine wage equations. Also, I feel that Perry is a little sloppy in letting a Phillips curve stand for everything that is on the demand side of wage changes. It is possible to have distinct effects on wages through product and labor markets, as his remark about tenured professors shows.

I thought I knew the reason why the United Kingdom was the only country that had CPI terms that were significant and very large. But then I realized that my explanation fell after Perry's sample period. In the first few days of October 1973, the British government bet that commodity prices were going to go down because they had just gone up. They introduced a threshold clause to wage agreements that essentially added CPI changes to wages with a small lag. By the next week, they had lost the bet. I have been told that this caused about eight or nine points of wage acceleration in the United Kingdom.

The novel theory in Perry's paper is the battle-over-shares argument. He bases this argument on the uncertainty existing in the various countries about the trend of productivity growth. This uncertainty is greater in countries with high productivity growth than in those with low productivity growth. For a couple of reasons, I do not find this argument convincing. First, I don't see why uncertainty over productivity caused wages to explode in 1968 or 1970; it existed in 1960 and 1965 as well, and caused no

explosion. Second, I feel that Perry's argument on shares rests on data that are too weak to support it. I examined the United Kingdom, for which I have better data than his. The structural hypothesis that Perry is testing is that when your share goes down, you try to make it up. The facts appear to be that labor's share was rising rather than falling before the 1970 explosion. In the manufacturing sector for the United Kingdom, profit shares were roughly constant from 1955 to 1961 and in 1961 they began to decline. They plunged in 1966 and again in 1968. In addition, for all the countries, value-added taxes are in Perry's price measure. The fiscal harmonization of Western Europe took place essentially before 1970 except for the United Kingdom, and it may be that Perry's battle over shares is only a transition to a fiscal regime with high indirect taxes.

One further point about the shares theory: If there is a battle over shares, what is the role of management? If one postulates such a battle, one would search for structural evidence of it. For example, strikes did occur during the late 1960s in the United States when wages accelerated. I feel that more of this type of extraneous evidence is needed to buttress the hypothesis of a real battle over shares.

Aside from these minor quibbles, I think this is a very nice paper. The big surprise was that food and fuel costs failed to touch off a major wage inflation and that Perry found this failure to be consistent with pre-1972 evidence. It was also nice to see real live Phillips curves again even if, in the process of intellectual evolution, they are only cousins of the ones we knew in the old days.

George Perry: Gardner Ackley made several important points regarding the Japanese data. I should have used the labor-market measure that he suggests. The gap that I calculated was an attempt to measure demand pressures on wages without relying on the notoriously useless Japanese unemployment statistics. But the excess of vacancies over entrants would be a better structural variable. Specialists from other countries might suggest similar data improvements. I am puzzled by the differences in wage statistics. The ones I got were compiled on a uniform basis for all countries by the BLS, although their quality doubtless varies from country to country. They differ from many statistics in that they include all fringes and all workers, and those elements probably account for much of the discrepancy.

I don't know how serious Nordhaus' suggestion was, but I find rather

wild the possibility of modeling a "target rate of return" on the wage bill analogous to a firm's pricing strategy. A firm is a single economic unit; a union is a collection of workers. What kind of utility function is involved in keeping the wage bill constant by doubling the wage of half the workers when the other half are out of work?

The question of instability is a difficult one. None of the preferred equations is explosive or accelerationist domestically. The United Kingdom is unstable only in the table 2 equation, which is rejected in favor of the table 4 equation that explicitly allows for the one-year wage explosion as a discrete and nonreproducible event.

If export and import prices are included in determining stability, the story is quite different. However, that seems to me the wrong calculation to make. The hypothesis embedded in the equations is that foreign-trade prices are exogenous for individual countries. The domestic wage (and price) increment generated by higher export prices does not lead to still higher export prices, so it should not be included in the calculation of long-run response and does not affect stability. This is a polar case I am describing, and I would have a hard time describing the global system that would go along with this polar case if I relaxed this assumption. But it is surely misleading, and, I would judge, far from the truth, to add the coefficients on export and import prices as if they were coefficients on internal value-added prices.

Finally, I do not understand why one would think the "genuine article" is a Phillips curve with consumer prices in it, or worse, with real after-tax wages in it. That is an hypothesis that one might entertain, but I know of no evidence on labor supply that would lead me to presume it must be true. And the data tell me it is not.

General Discussion

Franco Modigliani and others found it hard to accept the absence of consumer prices in the wage equations. Modigliani noted that he had never before seen an Italian wage equation that did not include the CPI. In general, he felt that employers would be willing to compensate their workers for an increase in the cost of living; and further, when the cost of living rose, people would tend to raise their reservation wage. George Perry and Arthur Okun questioned such real-wage arguments. They noted

that people would be less able to wait for higher-paying jobs if consumer prices were rising. And while employers might wish to compensate their workers for rising living costs, they might not be in a position to do so: the textile industry was not in a better position to pay higher wages because food and fuel prices drove up the CPI. Hendrik Houthakker proposed examining wages after income and payroll taxes, the latter being especially large in some European countries. These taxes could affect wage behavior to the extent that workers do not consider government services as part of their real income, or consider them inadequate relative to the taxes they pay. He suggested that such an after-tax wage concept might lead to the inclusion of the CPI in the equations. Modigliani also argued the importance of distinguishing between the cost of labor and labor's take-home pay, noting that the employer's and employee's payroll-tax contributions played significant roles in wage equations for the United States and other countries.

The presence of the lagged price deflator in Perry's wage equations stimulated considerable discussion. William Fellner asked if last year's deflator was meant to be a proxy for last year's profits. Robert Hall, by contrast, pointed out that, on average, 75 percent of the value-added price is wages. He reasoned that last year's deflator was basically a proxy for past wages. Perry maintained that deflators could simply reflect past wages or could, in addition, reflect past profits, as Fellner's question suggested. In open economies with prices significantly influenced by world markets, variations in profits were more likely to be an important part of variations in value-added prices. And even for economies such as the United States, while wage-wage spirals were doubtless important, profit variations reflected in value-added prices could not be dismissed as determinants of wage behavior. In any case, Perry noted, wage inertia is the message from the statistical results whether past wages or past value-added prices were the structurally appropriate explanatory variables. While agreeing with this message, Modigliani observed that lagged wages were an explanatory variable distinctly inferior to past value-added prices on his reading of Perry's empirical evidence. Thus, he found no support in the results for the view that a simple wage-wage spiral was the correct structural model.

R. A. Gordon pointed to the significant change in the vacancy-unemployment relationship in various European countries, which could be interpreted as a growing mismatch between workers and job slots that may be related to demographic changes or to worker immobility. He

agreed with Perry's reliance on institutional factors and discontinuities in explaining wages and suggested some further possibilities in this vein. He believed that more attention should be paid to the role of the government in wage developments. In the United Kingdom, for example, the government-owned sectors have led the wage accelerations in the last few years, and the government is a dominant employer and factor in wage settlements in France and Italy as well. Gordon also suggested a related but alternative explanation of the wage explosions: rising aspirations concerning real wages could finally reach an explosive point, generating the kind of discontinuous wage response that Perry identified and that he had associated with wage shares.

David Fand observed that there was a three-fold increase in global reserves and large increases in the monetary bases of industrialized countries since 1968, and suggested that a monetary variable might belong in the regression as a direct influence on prices, either in an expectational way or as a permissive factor in the battle over shares. Perry replied that once the structural variables representing real activity and past wages or prices were included, no additional explanatory power was supplied by a monetary variable. The money supply, he stated, helps determine nominal GNP but does not help explain how that GNP divides into real activity and the price level. He cited the recent article by Modigliani and Papademos (*BPEA, 1:1975*) as direct evidence, as well as Nordhaus' earlier work on industrialized economies (*BPEA, 2:1972*).

Houthakker reminded the panel of the labor mobility in the European Economic Community, and suspected that the residuals of wage equations would be correlated for various countries. Specifically, he noted that wages in the Netherlands and Italy would be related to wages in Germany, in much the same way as Canadian wages are related to U.S. wages.

Saul Hymans and Charles Holt suggested alternative ways to pin down the lag structure in the equations containing explosion-year dummies. Along with R. A. Gordon, Hymans noted that Perry's procedure assumed that the structure did not change after the explosion year. He suggested experimenting with the observation following the explosions to see whether the coefficient on lagged wages was unduly influenced by that one year. Holt suggested that instead of putting in a "single pulse" as a dummy variable, one could use a pulse shaped by the lagged decay rate on exogenous effects, which is estimated by the equation from the periods unaffected by explosions.

Marina Whitman questioned Perry's comments on flexible exchange rates. She noted that if economies are open, flexible rates insulate individual countries from world developments to some extent and so interfere with the spread of either an acceleration or deceleration of inflation. Perry agreed with the general proposition, but observed that, at this time, it operated against disinflation. Germany, the dominant open economy, has been throttling back aggregate demand in recent years and has at least avoided any acceleration of inflation. But the German mark has appreciated and, as a result, the German cure is not spreading to other countries as readily as it otherwise would have. Whitman also noted that the inclusion of import and export prices for estimates of a single open economy makes sense, but their inclusion posed problems in an aggregation over a large number of countries constituting a significant proportion of the world economy. If everybody is importing inflation, who is exporting it and what mechanism is at work?

Christopher Sims questioned whether it was really clear from the data that the explosions were wage, rather than price, explosions. He expressed interest in whether the explanatory power of all the price terms would greatly increase if one allowed for a free, contemporaneous effect of price and wage variables. Failing to impose a lag pattern would leave open the interpretation of the structure behind the equations, but might yield better estimates of the inflationary effect of shocks in real variables or other exogenous events.