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WAGE GAPS VS. OUTPUT GAPS: IS THERE A COMMON STORY FOR ALL OF EUROPE?

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ABSTRACT

This paper studies the relationship between real wages and unemployment in Europe. It finds no evidence that high real wages are responsible for the differing behavior of unemployment in Europe as contrasted with the U. S., and across European countries finds patterns of real wage behavior that are the opposite of what would be required to link high real wages and high unemployment. Among the specific results are:

(1) After adjustment for the income of the self-employed, there is no evidence of excessive real wages in Europe. "Wage gap" (i.e., labor's share) indexes on a 1972 base were almost identical in Europe and the U. S. in 1963 and 1984. The slight bulge in the European wage gap between 1974 and 1978 amounts to only about five percentage points over the U. S. values.

(2) There was indeed a real wage explosion between 1966 and 1975 in three small high-unemployment countries (Belgium, Denmark, Netherlands). But the wage gap barely moved in the four large high-unemployment countries (France, Germany, Italy, U. K.), and in fact increased substantially less than in low-unemployment Austria. Thus the wage gap concept is almost useless in providing an explanation of differences in unemployment experience <u>within</u> Europe.

(3) Further skepticism regarding the relevance of wage and price adjustment for the European unemployment problem is provided by aggregation tests. Tests for pooling of wage change equations across national boundaries in Europe are accepted universally. There are no significant differences in wage behavior within Europe, except for country-specific instances of wage push or incomes policies.

(4) The paper does not explain high unemployment in Europe, and it does not deny that the natural unemployment rate compatible with a constant inflation rate has increased substantially since 1972 in every European country. However, output gaps in Europe are not zero. The econometric estimates imply that the unemployment rate could be pushed down by three percentage points, particularly in France and Germany, without causing an acceleration of inflation.

(5) Some might argue that wage gaps in Europe in the 1980s have been pushed down by economic slack and would bounce back if unemployment fell substantially. However, the claim that wage gaps have been held down by high unemployment and low output in the 1980s amounts to an acceptance of one of the major conclusions of this paper: Europe has experienced a substantial Keynesian output gap in the 1980s, and not all of the increase in European unemployment is "structural" or "classical" in nature.

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I. *INTRODUCTION*

The Issues

Books and papers attempting to explain high European unemployment have become a growth industry of their own. For almost every country in Europe, estimates are available that decompose the post-1970 rise in unemployment between demand and supply factors. Several ambitious studies attempt such a decomposition for a large number of countries (especially Bean-Layard-Nickell (1986), Bruno-Sachs (1981, 1985), Sachs (1979, 1983), and Bruno (1986)). Many others (especially those assembled in Economica 1986) carry out this task for a single country. The consensus of this literature is that much of the rise in unemployment in Europe has been caused by supply factors, in the sense that the natural rate of unemployment or "NAIRU" has increased by half or more of the total percentage point rise in actual unemployment. There is much less consensus regarding the nature of the supply problem. Several papers by Bruno and Sachs blame an increase in the "wage gap", that is, an index of labor's income share, while other authors (especially Bean-Layard-Nickell) go beyond the endogenous wage gap to deeper structural factors, such as an increasing generosity of unemployment benefits, increasing skill and location mismatch in the labor market, "labor militancy" due to increased union power, an increasing tax "wedge," an absence of "corporatism", and other factors.

As its title suggests, this paper is about two aspects of the supply-demand dichotomy, wage gaps and output gaps, for eleven European countries both individually and collectively (for comparative purposes the U. S., Canada, and Japan are included as well). For each country we calculate new measures of the wage gap and ask whether, even if one is willing to waive the theoretical objections to the concept, there is any evidence that wage gaps in individual European countries have increased enough to explain higher unemployment. Further, we develop new measures of the output gap for each country, using econometric wage and price adjustment equations, and employing the two hypotheses that "natural output" evolves as a trend between benchmark years and alternatively according to the "hysteresis" hypothesis as a moving average of actual output.

The case for supply-side unemployment in Europe has often been based on alleged differences in the dynamics of wage and price adjustment between Europe and the U. S. Since Sachs (1979) and Branson-Rotemberg (1980), Europe has been said to exhibit "real wage rigidity", leading to an increase in the wage gap in the wake of a productivity growth slowdown, while the U. S. has been said to exhibit "nominal wage rigidity" that makes its aggregate supply curve relatively flat and opens the way for vigorously stimulative aggregate demand policies. The present paper builds on a companion study (Gordon, 1987) that rejected the transatlantic real vs. nominal rigidity distinction in light of econometric evidence that, for Europe as a whole (an aggregate of 11 countries), nominal wage and price adjustment coefficients are similar to those in the U. S. and that, furthermore, Europe's uniqueness consists not of real wage rigidity but rather too much real wage flexibility at the time of the famous wage "explosions" of the late 1960s.

The Research Agenda in this Paper

That study looked at the behavior of an 11-country aggregate called "Europe" but did not ask whether its bold aggregation was legitimate. This paper takes the next essential step and inquires into differences among the 11 countries. Does the apparent similarity of dynamic wage and price behavior in Europe and the U. S. extend to all 11 countries, or are there systematic differences between the four low-unemployment countries (Austria, Belgium, Sweden, and Switzerland) and the remaining high-unemployment nations? The common approach of other comparative studies is to estimate equations for each country, one at a time, without ever inquiring whether differences among countries are statistically significant. This paper makes a start at asking a new and interesting question: is it necessary to divide econometric wage and price equations into compartments corresponding to national boundaries, or rather can the 11 countries be aggregated into a small number of subsets or even into one grand European aggregate? And if there are subsets of countries that accept aggregation or, more formally, "pooling" in a statistical sense, do the pooled subsets have any common features along the dimensions of high unemployment, hysteresis, or corporatism?

The companion paper (1987) treated only a European aggregate in order to allow space to investigate differences in behavior between the manufacturing and nonmanufacturing sectors in the European aggregate, the U. S., and Japan. This paper goes further by treating the 11 European countries individually at the sacrifice of dropping the manufacturing-nonmanufacturing distinction, treating only the entire economy without any sectoral disaggregation. Like the other study, this paper not only estimates new wage and price equations but also, in light of the central role of productivity growth in the interpretation of wage gaps and real wage behavior, estimates new econometric productivity equations that decompose observed productivity behavior among cyclical effects, real-wage substitution effects, and underlying secular trend effects. The estimated secular trends, in turn, are not forced to be constant over the postwar period but rather are allowed to change both after 1972 and after 1979.

While wage, price, and productivity equations have been estimated by numerous authors, the research undertaken here is unique in its data base, econometric specification, and testing of aggregation across European national boundaries. Almost all previous studies in this area have used data that are inconsistent by sector, leading to regressions in which the wage rate in the manufacturing sector is related to employment or unemployment in the aggregate economy.[1] Yet in 1984 manufacturing value added was only 24 percent of total output in the U. S. and 29 percent in Europe. In contrast, this study is based on a consistent data base in which time series for 14 countries over the 1961–84 interval have been developed for the aggregate economy. The data series available for all 14 countries include such variables as real value added, the value added deflator, compensation per hour, employment, and hours per employee.[2]

A further innovation in the data base corrects an error in previous measures of the wage gap or "labor's share." While employment and person-hours data include not only employees but also the self-employed, the income of the self-employed is included in the official OECD national accounting system as part of capital's "operating surplus" rather than as part of the income of labor. When the income of the self-employed, which the OECD calls "household entrepreneurial income" is added to the compensation of employees and treated as part of labor's income share, the secular increase in labor's share in Europe and Japan, to which Bruno and Sachs have previously called attention, disappears almost entirely.[3] Rather than criticizing the concept of the wage gap upon which previous investigators have based their claim that much European unemployment is "classical," this paper shows that the properly measured wage gap shows little if any secular increase not just in the U. S., but also in Japan and in most European countries.

The econometric specification builds on my own past research for the U. S. and differs markedly from most other work on these issues. Since observed unemployment rates incorporate both cyclical demand fluctuations and a secular increase due to some variety of supply factors, raw unadjusted unemployment rates are an illegitimate measure of demand pressure. Or, stated another way, it is inconsistent to start out a study treating the raw unemployment rate as a measure of cyclical pressure, which implies that the natural rate of unemployment is constant, and finish up a study concluding that the natural rate of unemployment has risen substantially![4] Yet to impose some decomposition between the demand and supply components of unemployment ex ante in order to construct an unemployment-based cyclical measure presupposes an answer to the basic question that all such studies are attempting to address. To avoid this pitfall, in this paper the measure of cyclical variability that enters the productivity, wage, and price equations is not the level of unemployment but rather sectoral output detrended by the "trends-through-benchmarks" method (the "output gap"). All equations are estimated in first differences rather than levels in order to avoid spurious correlations among variables (especially productivity and the real wage) that display common changes in trend. Special attention is given to the response of real wage changes to the productivity growth slowdown that has occurred everywhere, an issue that is ignored in the majority of studies that include only a single constant term in equations explaining wage changes, and yet is essential in testing the hypothesis that real wage growth in Europe was too "rigid" to respond to the post-1973 productivity growth slowdown. Wage and price equations are based on the assumption of disequilibrium labor market adjustment, in contrast to some work (especially Newell-Symons 1985) based on a market-clearing interpretation.

This paper takes the "output gap" (the log ratio of actual real GDP to "natural" real GDP) as the basic measure of cyclical demand pressure and measures "natural" real GNP by trends through the benchmark years 1961, 1972, and 1979, with the 1972-79 rate of growth extrapolated to 1984. By taking 1979 as a benchmark year in which natural real GNP is assumed to be equal to actual real GNP (with a zero output gap), this paper accepts in advance the proposition that the natural rate of unemployment has increased and provides no explanation at all for this increase. This is evident in Table 1, which displays standardized unemployment rates for each country for the benchmark years 1961, 1972, and 1979.[5] Since we assume that cyclical demand pressure was zero for all countries in 1979, we assume that between 1972 and 1979 there were major unexplained increases in the natural unemployment rate for France, Germany, Belgium, Denmark, and the Netherlands. Lesser but nontrivial increases in the rate occurred in Canada, Japan, Italy, the U. K., and Austria. The natural rate assumed in 1984 cannot be read from this table; in the concluding section of the paper a calculation is provided that works backward from our measure of the output gap to arrive at a measure of the natural rate of unemployment for each country in 1984.

Themes That Emerge

The most interesting new result in this paper is that national boundaries within Europe are no longer relevant in studying wage behavior. In a step-by-step test of pooling across pairs of European countries, and then alternative pairs of country-groups, we find no single case in which a regression pooled across country boundaries fits worse (using the usual 5 percent significance criterion) than regressions estimated for separate members of each pair. These results raise serious doubts about a large segment of the literature on high European unemployment, particularly those papers which attribute low unemployment in some countries to "corporatist" wage-setting institutions, and those which blame excess real wage increases in some countries for their high unemployment.

Confirming my recent work, the results cast doubt on most of the contrasts between the U. S. and Europe that have received heavy emphasis in previous research, not only for the aggregate of 11 European countries studied in Gordon (1987), but also for most individual European countries. With the single exception of the U. K., there is no evidence to support Sachs' (1983) claim that productivity in Europe is "classical," varying countercylically. Further, there is remarkably little evidence of greater nominal wage flexibility in Europe than in the U. S., or of greater real-wage rigidity in Europe.

The apparent consensus that European real wages are excessive is simplistic; in 1984 the wage gap (an index of labor's share on a 1972 base) for an aggregate of 11 European countries was as low as the U. S. wage gap and lower in Germany, Italy, the Netherlands, and Norway. There is absolutely no relation across European countries between those that have high unemployment in the 1980s and those that exhibit high wage gaps. The highest wage gaps adjusted for estimated productivity trends are all in low-unemployment countries, Japan, Austria, and Switzerland.

The wage and price equations estimated in the paper address the common distinction between real wage rigidity in Europe and nominal wage rigidity in the U. S. (see especially Branson-Rotemberg 1980). We find that the bulge in the wage gaps of Europe and Japan in the 1970s is not due primarily to a failure of real wages to decelerate in response to the post-1973 productivity growth slowdown, but rather results in large part from episodes of autonomous "wage push" in Europe in the late 1960s and in Japan during 1973-74. In this sense, real wages in Europe and Japan were too flexible, rather than too rigid.

The paper also reveals an interesting dichotomy between large and small countries within Europe. There is little degenerate behavior evident in the statistical evidence for the large countries -- no countercyclical productivity behavior that would suggest a deterioration in productivity gains in reponse to a future output stimulus (except in the U. K.); no evidence of substantial excessive real wage changes between the mid-1960s and mid- or late-1970s; and no evidence of a substantially steeper aggregate supply curve that would inhibit policymakers from administering a demand stimulus. But several small countries exhibit signs of excessive real wage increases through the late 1970s, followed by a rapid readjustment since then. The paper points to, but does not solve, a puzzle in the high "wage gap" indexes of some small countries that have relatively low unemployment (especially Austria and Switzerland) in contrast to the relatively low level of wage gap indexes in other high-unemployment countries, especially Germany, Italy, and the Netherlands.

II. THE DATA BASE, THE PRODUCTIVITY TREND, AND THE WAGE GAP

The Data Base for 14 Countries

Most comparative econometric studies of wage and employment equations have indiscriminately mixed data on the hourly wage rate for the manufacturing sector with economy-wide data on unemployment and/or output.[6] The work of Artus (1984) is almost unique in developing a consistent data base for manufacturing, and this paper builds on his research by developing an analogous data base for the aggregate economy. The aim of the data compilation is to develop consistent series on value added, the value added deflator, compensation, employment, and hours per employee. These series allow the calculation of all of the variables that matter for a study of productivity, wage, and price behavior. Average labor productivity is real value added per labor hour, the wage rate is compensation per labor hour, and the wage gap is the nominal wage rate, divided by the value added deflator, divided in turn by average labor productivity. Because the real product wage relevant for the hiring decisions of business firms is expressed at factor cost, i.e., net of indirect taxes, special care has been taken to achieve a consistent set of net-of-tax product price deflators at factor cost.

The aggregate data are developed here from published OECD series, together with a crucial unpublished series on aggregate hours per employee.[7] A unique feature of the data base is the explicit treatment of self-employment income. Previous studies have included in indexes of labor's income share and the "wage gap" only the compensation of employees. But the income of the self-employed consists mainly of labor income and should also be included rather than being hidden, as at present, in the OECD's umbrella capital income measure called "the operating surplus." This is particularly important in this study, which measures the wage rate as compensation per hour. Since measures of employment and total hours include the self-employed, so should the measure of compensation. Thus our measure of total compensation adds the OECD measure of "household entrepreneurial income" to employee compensation.

Potential defects in these procedures may be enumerated briefly. The use of compensation per hour to represent the wage rate has the advantage that separate wage rate series can be developed for the aggregate, manufacturing, and nonmanufacturing sectors, but has the disadvantage that any compensation per hour series displays cyclical fluctuations created not by changes in the "pure" wage itself, but also by changes in the fraction of hours paying overtime rates, and by changes in the interindustry mix between high and low wage activities. While my past work on U. S. wage behavior has been based on an hourly earnings index adjusted for shifts in overtime and the interindustry employment mix, such indexes are not available for other countries, and thus the need for consistency requires use of an unadjusted compensation per hour series for each country and each sector. The addition of self-employment income to employee compensation also raises issues that require further research, including the separation of the labor and capital components of entrepreneurial income.

Untangling the Productivity Trend

We need to identify secular trends in productivity growth for five purposes. First, measures of the "wage gap" should be corrected for cyclical variations in productivity, relating the level of real wages to the secular trend in productivity. Second, identifying the concept of "real wage rigidity" in a dynamic wage-change regression cannot be accomplished without some measure of "rigid relative to what?" Third, most evidence for the U. S. suggests that prices are set relative to "trend unit labor cost," that is, wages divided by the trend in labor's average product, rather than relative to actual unit labor cost. Fourth, the cyclical productivity regressions developed in this section also allow us to assess the effect of real wage movements on the demand for labor and on labor's average product. Fifth, our equations allow us to assess the claim by Sachs that "in Europe (but not in Japan) the overall effect of a sustained rise in unemployment is to raise productivity relative to trend" (1983, p. 281). His claim that labor productivity varies countercyclically in Europe contrasts with the standard assumption in the U. S. that productivity varies procyclically.

Specification of the Productivity Equations

The basic specification relates the log ratio of hours to trend output ($N_t - Q^*_t$) to the log output ratio ($Q_t - Q^*_t$), representing the cyclical effect of output on hiring decisions; to the real wage rate defined relative to the underlying productivity trend [$(W_t - P_t) - \Theta^*t$], which could differ from zero as a result of excess growth in the real wage; and to the productivity trend itself (Θ^*_t). Defining all upper-case letters as logs of levels, we can write:

$$(1) \qquad (N_t - Q^*_t) = A + \phi(Q_t - Q^*_t) - \sigma(W_t - P_t - \Theta^*_t) - \Theta^*t,$$

where A is a constant. Note that (1) adds a cyclical effect to a standard static labor demand function in which labor hours depend on the real wage and labor-augmenting technical progress. The trend in (1) picks up the effects of growth in the capital-labor ratio and of changes in other inputs.

When (1) is rewritten as an equation for the average product of labor (Q/N), we can interpret the parameter ϕ as indicating the effect of cyclical movements in the output ratio on labor productivity:

$$(2) \qquad (Q_t - N_t) = -A + (1-\phi)(Q_t - Q^*_t) + \sigma(W_t - P_t - \theta^*t) + \theta^*t,$$

If the parameter ϕ is unity, then a permanent increase in the output ratio has no impact on actual labor productivity, whereas a value of ϕ below unity implies a permanent productivity gain ("short-run increasing returns") and a value of ϕ above unity implies a permanent productivity loss ("short-run diminishing returns"). Thus the Sachs phenomenon of countercyclical productivity movements in Europe requires an estimated value of $\phi > 1.0$.

Theoretical and Actual Wage Gap Indexes

We note that (1) allows us to define a wage gap concept adjusted not just for cyclical effects but for the endogenous reponse of productivity growth to excess growth in the real wage. Defining θ as the log level of labor's actual average product and θ^* as the growth rate of the trend in labor's average product, we can write the actual wage gap index (WG_t) as $W_t - P_t - \theta_t$ and the adjusted wage gap index (WG^*_t) as $W_t - P_t - \theta^*t$. Using these definitions, we can rearrange (2) to obtain:

$$(3) \qquad WG_t = A - (1-\phi)(Q_t - Q^*_t) + (1-\sigma)(WG^*_t).$$

This expression places an interesting perspective on the interrelationships between real wage behavior, productivity growth, and the wage gap index. If the elasticity of labor input with respect to the excess real wage (σ) in (1) is unity, then (3) shows that the excess real wage growth "pays for itself" by boosting actual productivity enough to keep the actual wage gap index ($WG_t = W_t - P_t - \Theta_t$) unaffected. Only if the elasticity (σ) is less than unity is excess real wage growth manifested in an increase in the observed actual wage gap index.

Estimation of the Labor Input Equations

(1) could be estimated either in levels or in growth rates. Initial testing indicated that the growth rate specification is superior, avoiding the serial correlation that occurs with the level specification for some countries. Allowing for lags and a post-1972 break in the productivity growth trend, (1) becomes:

$$(4) \qquad (n - q^*)_t = \sum_{j=0}^{1} \phi_j (q - q_*)_{t-j} - \sum_{k=0}^{1} \alpha_k (w - p - \sum_{i=0}^{1} \Theta^*_i)_{t-k} - \sum_{i=0}^{1} \Theta^*_i ,$$

where Θ^*_0 is the 1964-72 productivity trend and Θ^*_1 is the 1973-84 productivity trend. To unscramble the productivity trends from the estimated regression, run:

$$(5) \qquad (n - q^*)_t = \sum_{j=0}^{1} \phi_j (q - q_*)_{t-j} - \sum_{k=0}^{1} \alpha_k (w - p)_{t-k} - \sum_{i=0}^{1} \alpha_i + \varepsilon_t ,$$

where α_0 is the constant term (=1.0 1964-84) and α_1 is a dummy variable (=0 1964-72 and =1.0 1973-84). Then the productivity trend terms are defined as:

$$(6) \qquad \Theta^*_0 = \frac{-\alpha_0}{1 - \sum_k \alpha_k} ; \qquad \Theta^*_1 = \frac{-(\alpha_0 - \alpha_1)}{1 - \sum_k \alpha_k}$$

In preliminary tests an additional productivity term (α_2 = 1.0 during 1980-84) was entered to test for the significance of a second growth slowdown after

1979, but this term was uniformly insignificant in the presence of the real wage variable. With the real wage variable omitted, α_2 was significant for several countries, as discussed below in connection with Table 4.

Estimated Productivity Equations

Results for the productivity regression equations are presented in Table 2 for the fourteen countries, with countries listed in the same order as Table 1 (North America and Japan at the top, followed by the four large European countries and then the seven small European countries). All sums of coefficients on the output ratio are between zero and unity except for the U. K., indicating almost uniformly procyclical behavior of productivity. Only the U. K. exhibits a countercyclical effect; the U. S., Canada, France, Germany, and Switzerland exhibit a mildly procyclical effect; and there are strongly procyclical effects in Japan, Italy, and all of the small European countries except Switzerland. The bottom line for a GNP-weighted aggregate of all 11 European countries displays the interesting result that the labor hoarding (or procyclical productivity) phenomenon is somewhat more important in Europe than in the U. S., directly contradicting Sachs' (1983) results.

The real wage elasticities have the correct negative sign and are statistically significant in all the countries but the U. S., U. K., Norway, and Sweden. Most of the elasticities are in the vicinity of -0.5, indicating that an increase in wages relative to the productivity trend, for whatever reason, boosts productivity by enough to offset about half but not all of the resulting upward pressure on the wage gap (recall that an elasticity of -1.0 would be required for the wage gap to be unaffected by an acceleration of wage growth relative to trend productivity growth). It seems ironic, in light of the emphasis placed on real-wage substitution in the labor market by British authors, including Bean-Layard-Nickell (1986) and Newell-Symons (1985), that the country with the least evidence of a real wage effect is the U. K. There seems to be no connection between the real wage elasticity and the post-1970 rise in unemployment. Relatively high elasticities are found for countries with high unemployment rates in the 1980s (France, Germany, Italy, Belgium, Denmark) and low unemployment rates in the 1980s (Japan, Austria, Switzerland). Interestingly, the elasticity for Europe as a whole is almost identical to that in Japan.

The productivity trend terms displayed in Table 2 are the α coefficients that must be unscrambled, using equation (6), to reveal the underlying structural productivity trends (θ^*). As displayed in Table 2, the productivity coefficients are useful mainly as an indication of the statistical significance of the post-1972 slowdown in productivity growth. Somewhat surprisingly, the slowdown terms in column (4) of Table 2 are significant only for Japan, Austria, Sweden, and Switzerland. For all the other countries but Norway, the slowdown terms have the correct positive sign but are insignificant at the 5 percent level.

Table 3 presents an extremely interesting decomposition of the fitted values of actual growth rate of productivity in three periods (1964-72, 1972-79, and 1979-84), subdividing the growth rate that the Table 2 equations explain into three sources, (a) underlying trend, (b) contribution of real wage changes (the $w-p - \Sigma\, \theta^*_i$ term in equation (4)), and (c) the contribution of changes in the output ratio. The total shown in columns (4), (8), and (12) is for the fitted value of the equations from Table 2. Recall that the post-1972 trend effect is the sum of columns (3) and (4) in Table 2, with the signs reversed, as written out in equation (6).

The countries can be divided into groups, according to the main sources of changes in observed productivity growth. The first group consists of those countries in which the observed slowdown in productivity growth after 1972 is mainly explained by the underlying trend term: the U. S., Japan, the U. K., Austria, Sweden, and Switzerland. For the second group of countries the 1972-79 slowdown is mainly explained by the trend term, but a further large slowdown in 1979-84 is explained by a slowdown in real wage growth (Canada, France, Germany, Italy, Belgium, Denmark, the Netherlands, Norway, and Sweden). Further large contributions of the output ratio after 1979 occur in Italy, Austria, the Netherlands, and Norway.

For Europe as a whole, all of the slowdown in productivity growth after 1979 is attributed to the real wage and cyclical effects. The U. S. has less of a real-wage effect after 1979, both because the coefficient on real wages is smaller in Table 2, and because the slowdown in real wage growth was less dramatic than in Europe. For Japan the dominant fact is the slower post-1972 trend, and the real-wage effect is relatively minor, contributing a positive half percentage point in 1972-79 which was reversed in 1979-84.

Trends in Output, Productivity, and Hours

Table 4 brings together the assumed trend growth rates of output (based on the benchmark years 1961, 1972, and 1979, as explained on p. 6 above) with estimated trend growth rates of productivity. Unlike those displayed in Table 3, the productivity trends in Table 4 are obtained from estimates of equation (4) in which the real wage effects are omitted. These trends can be interpreted as incorporating a cyclical adjustment but no decomposition of the portion of the productivity trend attributable to real wage movements. When (4) is reestimated without the real wage variable, the third dummy variable representing the post-1979 slowdown becomes significant only for Germany, the Netherlands, Switzerland, and the aggregate of 11 European countries. (Tables showing these regression results with the third dummy variable are omitted to save space).

The purpose of Table 4 is to shed some light on the sources of the divergent movements of European unemployment rate from the unemployment rates of the U. S. and Japan. The counterpart of rising unemployment is, of course, slow or negative growth in labor hours. Obviously some part of the European unemployment problem results from output falling below trend, with log output ratios in Europe for 1984 of -8.8 percent, as compared with -5.3 percent in the U. S. and an assumed ratio of zero for Japan. Within Europe, the largest negative output ratios were for the Netherlands (-13.2 percent) and France (-11.5 percent).

Leaving aside questions of utilization, however, it is also possible to look at the implications for labor hours of the underlying trends in output and productivity. Taken together, the output and productivity growth trends imply trends for labor input, shown in columns (3), (6), and (9) of Table 4. Aggegate European trend hours fell in both periods before 1979 and actually rose slightly in the 1980s, but at a much slower rate than in the U. S. and a slightly slower rate than in Japan. However, the European aggregate disguises divergent hours trends among the 11 countries for 1979-84, ranging from +1.68 percent in the Netherlands to -1.43 percent in neighboring Belgium. In the four large European countries, the hours trend after 1979 was close to zero --not far from the Japanese trend in Germany and Italy, and somewhat less in France and the U. K.

Table 4 places an interesting perspective on the U. S. phenomenon of rapid hours growth. Part of the U. S. difference from Europe stems from a lower decline in hours per employee (at a rate of about -0.25 percent per year as contrasted with -0.9 percent per year since 1972). However, most stems from faster employment growth. One can view the U. S. success in achieving rapid employment growth, however, as the counterpart of its dismal productivity record. One can calculate that if the U. S. had achieved the existing growth rate of output in 1979-84 but had combined it with European trend productivity growth, the U. S. would have had 8 percent fewer hours of labor input, or 9 million additional unemployed (ignoring effects on labor force participation and hours per employee).

Implied Measures of the Wage Gap

We now turn to the estimates of the wage gap. For this purpose we return to the productivity growth trends from equation (4), which includes changes in the real wage as a determinant of the growth rate of hours relative to output. In Table 5a we display the actual wage gap index (WG_t), or $W_t - P_t - \Theta_t$, which is simply a calculation from the data of an index of labor's share (including self-employment income) and which does not rely on any regression estimates. This is compared in Table 5b with the adjusted wage gap index (WG^*_t), or $W_t - P_t - \Theta^*_t$, that is, the real wage divided by the productivity trend estimated in Table 2 and displayed in Table 3.

The raw data in Table 5a will astonish readers of previous studies by Bruno-Sachs and others. Since the European unemployment problem emerged after 1972, the wage gap index is expressed as 1972 = 1.0 (as compared to a base of 1965-69 for Bruno-Sachs). Of the 112 wage gap indexes displayed in Table 5a, only two are greater than 1.10, and these are both for Austria, one of the low-unemployment countries. Such high-unemployment countries as the U. K., Belgium, Denmark, and the Netherlands display relatively small increases in the actual wage gap (WG_t) index in Table 5a. Of particular interest are the 1984 data: only three countries have 1984 wage gap indexes on a 1972 base equal to or greater than 1.01, and these are all low-unemployment countries, Japan, Austria, and Switzerland!

The adjusted wage gap (WG^*_t) in Table 5b displays the familiar "hump-shaped" time path, with a peak for most countries in 1976 or 1978, and a marked decline from 1978 to 1984. The only three countries with a 1984 wage gap index greater than 1.00 are the same three low-unemployment nations, Japan, Austria, and Switzerland. While the adjusted indexes support the previous research of Bruno and Sachs that has shown a substantial increase in wage gaps between the mid-1960s and mid-1970s, there are numerous interesting differences with the Bruno-Sachs estimates. These are summarized in the following in-text table, which compares the 1966-75 wage gap increases from Tables 5a and 5b with the most recent adjusted wage gaps published by Michael Bruno (1986, p. S40). The following table compares Bruno's adjusted wage gap indexes in 1976 with ours in 1975, both unadjusted and adjusted:

(see next page)

	Gordon Unadj. (1966 = 1.0)	Gordon Adjusted (1966 = 1.0)	Bruno Adjusted (1965 = 1.0)
United States	1.004	0.967	1.027
Canada	1.030	0.985	1.053
Japan	1.064	1.073	1.157
France	1.038	1.032	1.079
Germany	1.012	1.041	1.108
Italy	1.081	1.043	1.168
United Kingdom	1.091	1.067	1.132
Austria	1.061	1.105	-.---
Belgium	1.035	1.185	1.275
Denmark	1.079	1.210	1.157
Netherlands	1.085	1.273	0.908
Norway	1.109	1.135	1.168
Sweden	0.965	0.970	1.010
Switzerland	1.035	1.067	-.---
Europe Average	1.046	1.056	1.115

Looking first just at the comparison of the unadjusted and adjusted wage gap indexes from Tables 5a and 5b, we note that the productivity adjustment does not make much difference except for the three small European high-unemployment countries, Belgium, Denmark, and the Netherlands. Here there are huge increases in the wage gap during 1966-75 once the productivity adjustment is applied. We note in Table 2 that these countries all have relatively large elasticities of labor hours to excess growth in the real wage, and so the relatively small increases in the unadjusted wage gap (WG_t) occur because excess wage increases "pay for themselves," raising productivity enough to create only a minimal increase in the wage gap.

The differences between our adjusted wage gap indexes in Table 5b and Bruno's measures of the same concept display an important difference. For North America, Japan, and all the large European countries our 1966-75 increases are all lower than his 1965-76 differences. Our average index for North America and Japan is 1.008 compared to his 1.079; our average for the four large European countries is 1.046 compared to his 1.122. Only for the small European countries are his estimated 1965-76 differences larger; our average index of 1.155 can be compared to his of 1.104. This discrepancy is almost entirely due to the Netherlands. If our estimate for the Netherlands is substituted for his, his estimated 1965-76 index becomes 1.177.

It is beyond the scope of this paper to search in detail for the sources of the discrepancy between these estimates and Bruno's. I would speculate that the sources involve three areas: (1) Bruno and Sachs in the past have used data from a secondary source, the U. S. BLS, rather than creating their own series from primary national accounts data; (2) we include self-employment income as part of labor's share, and it is not clear than Bruno and Sachs do so;[8] and finally (3) our post-1972 estimated productivity growth rate trends may be more rapid than those used by Bruno.[9]

Table 5b raises difficult substantive questions for proponents of the hypothesis that European unemployment is classical, in the sense that real wages are excessive as measured by the adjusted wage gap index. None of the four large European countries seems to have experienced a marked increase in the real wage relative to the underlying productivity trend, yet all have experienced high unemployment in the 1980s. As early as 1981, before wage rates could have been held down substantially by negative demand pressure, all four large European countries exhibited adjusted wage gap indexes below 1.00 on a 1972 base.

The most promising evidence in Table 5b for the wage gap proponents is the very large 1966-75 increases exhibited by the three European countries which are both relatively small and which have experienced relatively high unemployment in the 1980s, Belgium, Denmark, and the Netherlands. But in itself this is puzzling. Why should high unemployment be caused by high real wages in small countries, when unemployment is almost as high in large European countries without excessive real wages?

Further questions are raised by the dramatic nose-dive of the wage gap indexes from 1978 to 1984 in every country, on both an adjusted and unadjusted basis. As our estimated wage equations suggest below in Table 7, there are positive effects of demand pressure on real wages, so that much of the decline in the wage gap in the 1980s can be attributed to negative output gaps (i.e., an actual unemployment rate above the natural unemployment rate). But then this interpretation is completely inconsistent with the "hysteresis" hypothesis recently advanced by Blanchard-Summers (1986) and others. If the natural unemployment rate has marched upward in tandem with the actual unemployment rate, as suggested by the hysteresis hypothesis, then there was <u>little or no output slack in 1984</u>, and hence <u>no explanation</u> for the rapid downward adjustment of real wages relative to productivity that has occurred in the 1980s. Our interpretation, developed more formally below, is that there has been plenty of slack, and that wage gaps have collapsed as a direct result of output gaps.

Looking just at the wage gap indexes for the U. S., Japan, and the aggregate of all 11 European countries, it is hard to see how the minor differences in these indexes could be responsible for the substantial differences among the three economies in the evolution of unemployment rates since the 1960s. Comparing 1963 and 1984, the U. S. and European adjusted wage gap indexes in Table 5b are basically identical, and the 1979-84 decline of 6.3

percentage points in the U. S. was actually less than the 9.6 percentage-point decline in Europe. The Japanese story seems to have been one of a jump in the wage gap index as a result of the 1973-74 wage push, followed by moderation that returned the index almost to its 1972 value by 1984.

III. WAGE AND PRICE EQUATIONS

Developing an Econometric Specification

In previous research (Gordon 1985, 1987) I have shown how a dynamic disequilibrium wage adjustment equation of the expectational Phillips curve type can be derived from static labor supply and demand equations, together with the hypothesis that wages adjust to eliminate any gap between labor demand and supply at a speed that is proportional to the size of the gap.[10] The wage change equation based on this formulation is joined by a price mark-up equation that sets the level of the product price equal to a weighted average of trend unit labor cost and import prices, with an allowance for a cyclically sensitive mark-up. A third equation, called the "reduced-form", is specified as the solution when the wage change equation is substituted into the first-difference form of the mark-up equation. The model is specified without any lagged wage terms in the wage equation, and so the rate of wage change is "solved out" in the reduced-form, which includes lagged price change terms as well as all the other variables that appear in either the wage change or mark-up equations.

Rather than repeat that theoretical analysis, this paper moves directly to the econometric specification, based on a dynamic theoretical equation that relates the change in wages relative to trend productivity to (a) the expected rate of product price inflation, (b) the log output ratio, (c) the change in import prices relative to the domestic GNP deflator, (d) the total rate of change in three tax rates (indirect, income, and payroll), and (e) a "wage push" factor defined in the theoretical analysis as the difference between the rate of change of the "aspiration" wage demanded by workers and the growth rate of productivity relevant for price-setting (the θ^* term estimated in Table 2 above). The following section sets out the main decisions that are made in converting the theoretical model into an econometric specification.

1. Basic format. All equations express every variable (other than the log output ratio variable) as first differences of logs.

2. Expected price change. The expected inflation term is proxied by two lags on the annual change in the value-added deflator. Two lags appear to be sufficient to explain the wage changes without including a third or further lags, while the "zero" lag (current price change) is excluded to avoid simultaneity and identify the wage and price equations (i.e., the current change in unit labor cost is entered into the price mark-up equations, but the current change in price is not entered into the wage equations). This treatment reflects the (structural) assumption that wages can influence prices within the current year more than prices can influence wages, and the high degree of simultaneity between annual changes in wages and prices is attributed to the price-setting process.[11] The theoretical wage equation calls for the expected price change term to enter with a unitary coefficient; the wage equations are estimated below with the sum of coefficients on the two lagged price change terms both estimated freely and also constrained to equal unity.

3. Demand Pressure variables. It has been customary in previous studies to designate the unemployment rate or its inverse as the sole demand pressure

variable. However, in theory it is not the level of the unemployment rate that matters, but rather the excess demand for labor, which should be measured as the deviation of the actual from the natural unemployment rate. If the natural unemployment rate has risen, as seems to have occurred in most countries, the use of the unemployment rate to measure excess demand introduces measurement error. The procedure used here is to take advantage of the regular "Okun's Law" relationship observed in many countries (Gordon, 1984; Hamada-Kurosaka, 1983) in the form of a high negative correlation between the log ratio of actual to "natural" output (log Q - log Q^*) and the deviation of the actual from the natural unemployment rate. The required natural output series consists of exponential trends running between the benchmark years of 1961, 1972, and 1979, with the 1972-79 trend extended to 1984 on the assumption that most countries were operating below natural output after 1979 and hence that no benchmark year is available for the 1980s.[12]

4. Tax Rates. Three tax rates are available for each country, indirect, payroll, and income. There are insufficient degrees of freedom to include all three tax change terms in annual equations for the short 1964-84 interval. Instead, the rate of change of the total indirect, payroll, and personal tax rates is entered as a single variable. The change in the total tax rate (t^T) is calculated at an annual rate over two years, rather than one year, to allow for lags without using up an extra degree of freedom.

5. Wage Push or Real Wage Rigidity. The theoretical wage change equation allows for the possibility that the "aspiration" real wage rate rises more rapidly than the rate of productivity growth (θ^*) relevant for price setting; this could reflect either real wage stickiness in response to a slowdown in

productivity growth, or an autonomous episode of "wage push" that is not captured by the other terms in the wage equation.

The real-wage rigidity or wage push effect, which we can call the "excess change" in the real wage, is measured by a set of dummy variables. These appear in the specification of the wage equation below in (7), designated by the notation D_{it}. The first such dummy variables (D_{1t}) is simply a constant term for the full sample period. The theoretical specification contains no constant term (since the log output ratio is defined to be zero when there is no demand pressure that would make trend unit labor cost--the dependent variable--differ from expected product price inflation). Thus a significant positive value for the constant term would indicate that, on average over the sample period, the change in the real wage rate is larger than the trend growth rate of productivity, after taking account of the effect of the other variables in the equation (the log output ratio, the relative import price change, and tax changes). Additional dummy variables are also entered for the 1973-84 (D_{2t}) and 1980-84 (D_{3t}) periods to test for the excess change in the real wage during different intervals of the sample period. The sum of the constant and the 1973-84 dummy indicates for the 1973-79 period the excess change in the real wage (measured as an annual rate of change), while the sum of the constant, the 1973-84 dummy, and the 1980-84 dummy indicates the excess change for the 1980-84 interval. This interpretation of the excess change in the real wage requires that the sum of coefficients on the lagged product price change terms (p_{t-1} and p_{t-2}) is constrained to equal unity. The wage equations are estimated both with and without the set of constants and dummy variables.

In previous research on European wage setting behavior Nordhaus (1972) identified a "wage explosion" in the late 1960s, and this episode of autonomous wage push was confirmed later by Perry (1975) and Gordon (1977a). To isolate this episode, an additional dummy variable is included in the European wage equations, defined as 1.0 for the years 1968-70 and zero otherwise. While there have been no wage explosions in the U. S., the time paths of wages and prices were displaced by the Nixon wage and price controls period in 1971-72 and subsequent post-controls "rebound" in 1974-75. This displacement is captured by a single dummy variable defined as 1.0 in 1971-72, -1.0 in 1974-75, and zero otherwise. The fit of the Japanese wage equations is markedly improved when the period 1973-74 is treated as a period of wage explosion in that country, captured by a dummy variable equal to 1.0 for 1973-74 and zero otherwise.

For Europe, wage-push and controls dummy variables have been defined as follows. For Germany and Italy, there is a single dummy variable equal to 1.0 in 1970 and 0.0 otherwise, to take account of the wage push that occurred during the 1969-70 period (often described as the 1969 "hot autumn" in Italy). In France there is one dummy variable defined as 1.0 during 1968, the year of the general strike and the Grenelle Agreement (and 0.0 otherwise), and a second dummy variable defined as 1.0 during 1982, the year most affected by the Mitterand wage-push policies. The U. K. is by far the most complicated to handle, particularly in annual data. Following our previous work, we treat the 1970 wage explosion as a rebound from the previous period of "restraint" andn define a dummy variable equal to +1/3 in 1967-69 and -1 in 1970; the second U. K. dummy variable required at the time of the 1976-78 "social contract" is defined as +1/2 in 1976-77 and -1/2 in 1978-79.

<u>Summary of the Specification of the Wage and Price Equations</u>

The preceding discussion suggests the following wage equation, in which the dependent variable is the rate of change of trend unit labor cost:

$$(7) \qquad w_t - \theta^*_t = \alpha_{11}p_{t-1} + \alpha_{12}p_{t-2} + \alpha_{20}\hat{Q}_t + \alpha_{21}\hat{Q}_{t-1} + \alpha_3(p^F-p)_t + \alpha_4(t^T)_t + \alpha_5 D^{WP}_t + \delta_0 D_{0t} + \delta_1 D_{1t} + \delta_2 D_{2t}.$$

Here $\hat{Q}_t$ is the output ratio, t^T_t is the change in the total tax rate, D^{WP}_t is the wage push or controls dummies, and the dummy variables designated D_{it} measure the presence of excess real wage change for the periods 1964-84, 1972-84, and 1980-84. The inclusion of the lagged as well as current output ratio term allows the effect of aggregate demand to enter either as a level effect, rate of change effect, or both. In Table 7 below, this specification of the wage change equation is estimated first with the D_{it} terms omitted and with the coefficients on the lagged price terms freely estimated, and then a second time with the D_{it} terms included and the constraint imposed that $\alpha_{11} + \alpha_{12} = 1.0$.

The wage change equation is supplemented by an equation that explains changes in the value-added deflator, based on the mark-up hypothesis, which can be estimated in the straightforward form:

$$(8) \qquad p_t = \beta_{10}(w-\theta^*)_t + \beta_{11}(w-\theta^*)_{t-1} + \beta_{20}\hat{Q}_t + \beta_{21}\hat{Q}_{t-1} + \beta_3(p^F-p)_t + \beta_4 t^T_t + \beta_5 D^{WP}_t.$$

The wage-push/controls dummy variables are entered exactly as in the wage equations. In the case of Europe and Japan, the coefficient β_5 might be negative if an autonomous wage push squeezed profit margins, while in the U. S. that coefficient could have either sign since, since the 1971-72 controls program applied to price mark-ups as well as wage rates.

The final equation to be estimated is the reduced-form that results when the theoretical wage-change equation is substituted into the price-mark-up equation. To simplify the presentation of the reduced form, the complex set of lagged coefficients is relabelled (e.g., $\gamma_{11} = \beta_{10}\alpha_{11}$), and several lagged terms that are indicated by the substitution are dropped to save degrees of freedom:

$$(9) \qquad p_t = \gamma_{11}p_{t-1} + \gamma_{12}p_{t-2} + \gamma_{20}\hat{Q}_t + \gamma_{21}\hat{Q}_{t-1} + \gamma_3(p^F-p)_t + \gamma_4 t^T{}_t + \gamma_5 D^{WP}{}_t + \delta_0 D_{0t} + \delta_1 D_{1t} + \delta_2 D_{2t}.$$

Notice that the productivity trend term ($\theta^*{}_t$) drops out of the reduced-form, but included are the three dummy variables (D_{it}) that measure the presence of excess real wage change for the periods 1964-84, 1972-84, and 1980-84. The reduced-form price change equation (9) is estimated first with the D_{it} terms omitted and with the coefficients on the lagged price terms freely estimated, and then a second time with the D_{it} terms included and the constraint imposed that $\gamma_{11} + \gamma_{12} = 1.0$. If any of the three δ_i coefficients are significantly positive, this would indicate that excess real wage change created an acceleration of inflation, and indirectly an increase in the natural rate of unemployment.

Means and Standard Deviations

As a preliminary to presenting the estimates of the wage and price mark-up equations, Table 6 presents sample means and standard deviations of the main variables for the periods before and after 1972. Without describing all the figures in detail, several generalizations are evident from an inspection of the table. First, rates of change of trend unit labor cost and of the GNP deflator are relatively similar in each period for each country, reflecting the absence of any major change in the adjusted wage gap indexes. Second, both wage changes (net of productivity growth) and inflation rates are higher in the second period than the first, with the notable exceptions of Germany (for wage change), the Netherlands, and Switzerland (for inflation).

The third observation is that the log output ratio for most countries is positive in the first period and negative in the second (with a close similarity between the U. S. and the European aggregate). Fourth, the relative price of imports was strongly negative in the first period for all countries, helping to contribute to low inflation and low unemployment, while the reverse was true everywhere but in Austria, Norway, and Switzerland in the second period.

Equations for Wage Change

We now turn to estimates of the equation for wage change, specified as in (7) above. For variables where a string of lagged values is entered, only the sum of coefficients is exhibited in Table 7, as in Table 2 above. Asterisks designate the significance of coefficients or sums of coefficients.

Two estimates of the wage equation are presented in Table 7 for each country. The first omits the "excess real wage growth" dummy variables and freely estimates the coefficients on lagged price change. The second includes the dummy variables and constrains the sum of coefficients on lagged price change to be unity, so the dependent variable is in the form of real wage growth adjusted for the estimated productivity trend.

In the first unrestricted version of the wage equation, presented as the first line of each pair, some of the coefficients on lagged inflation are below unity and some are above. If "excess real wage growth" occurs but no dummies are included, then the excess growth in the nominal wage rate relative to price change is likely to be picked up by a coefficient of greater than unity on the price change variable. This occurs in the U. S., France, Austria, Belgium, Denmark, and the European aggregate.

The coefficients on the output ratio are generally positive and highly significant, supporting the Phillips curve hypothesis of a relation between the change in the wage rate and the level of a cyclical variable. Note that, because the current and one lagged output ratio term are included, the specification could reveal either a "level effect" (a positive sum of coefficients) or a "rate of change effect" (a positive current coefficient followed by an equal and negative lagged coefficient, with a zero sum of coefficients). The sum of coefficients on the output ratio is insignificant in both versions of the wage equation only in Canada, the Netherlands, Norway, and Switzerland. For all countries, however, the coefficient has the expected positive sign.

An important finding is that the slope of the Phillips curve for the U. S. is very similar to that for the European aggregate. The countries with the most flexible wages in response to business-cycle fluctuations in output (when one examines the average output ratio coefficient in the two lines of Table 7) are France, Italy, the U. K., Belgium, and Denmark. The theme in the literature supporting a greater degree of wage rigidity in the U. S. than in Europe or Japan is not supported here. The output response of wage rates is actually greater in the U. S. than in either Japan or Germany.

The wage equations also include the change in the real import price and in the total tax rate. The import price terms have the correct positive sign more often than not but are generally insignificant, except in Austria and the European aggregate. The tax terms often have the incorrect (negative) sign, with no significant positive coefficients. There are significant negative coefficients in France and in the restricted version for Belgium. Thus these results deny the existence of a significant "tax push" effect that is responsible for driving up real wage rates and in this sense conflict with the hypothesis advanced by Tullio (1987) and with results of Knoester and van der Windt (1985).

Column (8) of Table 7 displays the coefficients on the wage push, controls, and "incomes policy" dummy variables. Where blanks are shown, no such dummies are defined. Two dummies are defined for France and the U. K., as indicated in the footnotes to Table 7. The dummies are significant and have the correct sign for Japan, France (except first dummy in the restricted equation), Germany, and Europe. Only the second U. K. ("social contract") dummy is significant, and then only in the unrestricted version. To interpret these coefficients, they imply as an example in 1973-74 wage rates in Japan increased 14 percent more per year than can be explained by the other variables. The U. S. wage controls dummy variables have the right sign and magnintude suggested by previous research but are not significant.

The second line of each pair of results displays a version of the wage equation in which the sum of coefficients on lagged inflation is constrained to be unity, and the "excess real wage growth" dummy variables are included (see columns (5), (6), and (7)).[13] These coefficients are almost all insignificant, except for a large positive coefficient for 1964-84 in Austria and Belgium, and a large negative coefficient in Belgium for 1979-84. These results suggest that there is no statistical evidence to support any generalization that European real wage increases were excessive over the post-1972 period when unemployment increased, except for the isolated wage-push episodes isolated in column (8), most of which refer to the pre-1972 period. Also important for the interpretation of the European unemployment problem is the absence of a significantly positive coefficient for 1980-84, as would be required to confirm the hypothesis that high unemployment in Europe did not hold down wage changes as much as would have been predicted from pre-1980 behavior. The interpretation of the 1980-84 period receives more attention in our discussion of the "hysteresis" hypothesis below.

Aggregation Tests: Is Europe One Country?

Throughout its history, Europe has been plagued by national boundaries. The Common Market and the EMS have made important progress in knocking down national boundaries in the economic, if not the political, sphere. Table 8 suggests that national boundaries within Europe also play little role in one specific area of economics, the dynamics of wage behavior.

Each aggregation test consists of a comparison of the fit of separate wage equations (corresponding to the unrestricted wage equations displayed as the first line for each country in Table 7) for a pair of countries with a pooled wage equation containing all of the same observations for each country but forcing all coefficients in each country (except on country-specific wage-push variables) to be the same.[14] Each aggregation test results in a F-test which indicates whether there is any significant deterioration in fit when two countries are pooled.

24 lines are displayed in Table 8, the first 23 for various combinations of European countries and the 24th for a comparison of Europe and the U. S. For every combination within Europe, there is no significant deterioration in fit when two countries or groups of countries are pooled. We start by grouping the small European countries, Austria plus Switzerland ("AS"), Denmark plus Norway

("DN"), and Belgium plus the Netherlands ("BN"). Further groupings in lines 4 through 6 suggest that all seven countries can be aggregated into one country called "Small". Lines 7 through 9 achieve a grouping of the four large countries called "Large", and line 10 indicates that the two pseudo-nations "Small" and "Large" may be grouped together into "Europe."

Several alternative schemes for aggregating the countires are presented in the bottom section of the table. Lines 11 and 12 indicate that the four low-unemployment small countries (Austria, Norway, Sweden, and Switzerland) may be successfully aggregated into a country called "Low", and line 13 suggests that the three high-unemployment countries (Belgium, Denmark, and the Netherlands) may be aggregated into a country called "High." Further, "Low" and "High" may be aggregated together.

Alternative combinations of the large countries are presented in lines 15-19. Together with the combinations on line 7, all possible permutations of the four large countries pass the aggregation test. Similarly, the group of small countries can be aggregated with any one of the four large countries, as shown on lines 20-23, or with the group of large countries, as shown on line 10. Of all these tests, only that for France plus Germany (line 7) and for Italy plus the U. K. (line 19) come close to failing the aggregation test at the five percent significance level.

While these tests "knock down" national boundaries within Europe, they do not manage to span the Atlantic Ocean, for the final aggregation test of Western Europe and the U. S. fails at almost the one percent level. This occurs, despite the apparent similarity of the U. S. and Europe equations in Table 7, because of the higher import price coefficient for Europe and, more important, because of a different pattern of lag coefficients on inflation and the output ratio.

Unemployment as an Alternative Explanatory Variable

An unusual feature of this paper is the use of detrended output (the "log output ratio") as the only measure of demand pressure on wage and price changes. How would the wage equations be affected if the log output ratio were replaced by the unemployment rate? Since the definition of the output ratio involves defining the amount of demand pressure in a benchmark year as equal to zero, the specification of the wage equation requires excluding a constant term. The dummy variables in columns (5)-(7) of Table 7 test the explicit hypothesis that, relative to the output ratio, real wages increased faster during specified periods than is justified by productivity growth. However, when the unemployment rate replaces the log output ratio, the value of the unemployment rate is positive rather than zero in a benchmark year, requiring that a constant term be included.

Table 9 exhibits four columns of results for the wage equations of Table 7, estimated alternatively with the current and lagged value of the log output ratio and of the unemployment rate. For each version Table 9 displays the sum of coefficients on the demand variable, the significance level of the sum of coefficients, the significance level on a test that excludes the demand variable entirely from the equation, and the standard error of estimate of the overall wage equation. The specification of the wage equation used for these tests includes the three constants of Table 7, columns (5)-(7), but omits the restriction that the sum of the lagged price terms equals unity. The inclusion of three constants allows the natural unemployment rate to increase over time and thus satisfies the previously stated objection to the use of the "raw" unemployment rate as a measure of demand pressure. As shown in Table 9, for several countries the standard error of estimate of the wage equation is lower (i.e., better) with the unemployment variable than the log output ratio variable (Canada, France, Austria, Denmark, the Netherlands, Switzerland, and the European aggregate).

Interestingly, this test again reveals a difference between the large and small European countries. Overall, the large countries seem to exhibit a greater degree of significance for either demand variable than do the smaller countries, where none of the significance levels in columns (3) and (7) falls below (i.e., is better than) the 0.05 level. The very strong significance of both the output ratio and unemployment variables for the European aggregate suggests that the insignificance of either demand variable for the small European countries may reflect noisy data. Perhaps the most important result is that for the European aggregate, the coefficients and significance levels of both the output ratio and unemployment rate are basically identical to the equivalent figures for the U. S.

Mark-up Price Equations

To complete the estimation of the wage-price model, Table 10 reports estimates of the price mark-up equation in the form (8) above. To review, the mark-up equation is specified in first difference form. The inflation rate is regressed on the change in trend unit labor cost (current and one lag), the output ratio (current and one lag), the current rate of change of relative import prices, the two-year change in the total tax rate, and the single dummy variable for wage push or controls. To validate the theoretical specification for the price equation in levels of a procyclically sensitive mark-up in levels, in an equation for the first difference of prices as in Table 10 the output ratio should enter as a first difference, that is, the coefficient on the current output ratio should be positive and on the lagged output ratio should be equal in absolute value and negative in sign.

The results appear to contradict the hypothesis of a procyclical price mark-up. Of the 14 lines in Table 10, seven indicate a significantly negative sum of coefficients on the output ratio (plus an eighth, the European aggregate), indicating a perverse Phillips curve phenomenon that offsets part of the positive Phillips curve effect in the wage change equations. This result can be explained by some combination of measurement error and a substantive explanation. The measurement error, emphasized in part II above (p. 10), arises from the use of a wage index (compensation per hour) which reflects not just changes in wage rates but also the procyclical effects of overtime pay and of the changing mix of employment toward higher wage industries in boom times. If the measurement error is all that is involved, then the cyclical responsiveness of wages is overstated in Table 7 and of price markups is understated in Table 10. Only the reduced-form equations in Table 11 provide an accurate indication of cyclical responses.

The substantive explanation suggests that in an open economy in which competition from abroad limits the short-run flexibility of prices, a demand expansion that raises the output ratio and the rate of wage change is reflected only partly in price change, resulting in a positive growth rate of the real wage. Such a result implies procyclical rather than countercyclical real wage behavior, but refers to the rate of change of the real wage rather than its level. Seven sums of coefficients in column (2) of Table 10 are insignificantly different from zero, and in no case does this reflect any significant zig-zag from a positive to a negative coefficient, as would be implied by a rate-of-change effect of the business cycle on the change in the mark-up.

The other coefficients in Table 10 imply that the elasticity of price change to the change in trend unit labor cost is close to unity within the current and subsequent year. Import price changes are insignificant and/or have the wrong sign, except in Belgium. A positive and significant tax push effect occurs only for Japan and Belgium. Finally, the wage-push and controls dummies are uniformly insignificant, indicating that for Japan and Europe the wage-push episodes raised wages but did not squeeze profits, leaving the mark-up unaffected.

Reduced-form Inflation Equations

Together the wage and price mark-up equations imply the reduced-form equation for price change written above as (9). This relates the current inflation rate to two lags of the inflation rate, the current and lagged output ratio, the current change in the import price, the two-year change in the tax rate, and the same wage-push and control dummies discussed before. Table 11 presents the results of estimating (9).

The reduced-form equation is critical for determining its natural rate of unemployment, as well as the overall nominal flexibility of an economy. Upward "wage-push" pressure working through positive coefficients on the D_{it} or D^{WP}_t dummy variables in the wage equation do not create inflation or imply an increase in the natural rate if the equivalent coefficients on D_{it} or D^{WP}_t are negative in the price mark-up equation. What matters are the net coefficients in the reduced-form equation. We return to the issue of the natural rate of unemployment below.

The reduced-form also is the final arbiter of nominal flexibility, since flexibility in the form of a high positive coefficient on the output ratio in the wage change equation means little if it is offset by a high negative coefficient on the output ratio in the price mark-up equation. Column (2) of Table 11 indicates that there are significant Phillips curve effects of the level of the output ratio in the reduced-form inflation equation (for the either the first or second line of each pair) in eight of the 14 countries, plus the European aggregate. The only countries exhibiting wrongly-signed negative coefficients in either equation are Austria and Belgium. Comparing the U. S. with Japan and the European aggregate, the sum of coefficients in the U. S. is lower than in Japan and Europe for the unrestricted version, while both the U. S. and Japan have lower sums of coefficients than Europe in the restricted version. Thus these results support the view that inflation is more responsive to demand shocks in Europe than in the U. S., but provide only mixed support to the common view that inflation is more responsive to demand shocks in Japan than in the U. S. In light of current policy debates, it is interesting that the results provide <u>no support at all for the view that inflation is more reponsive to demand shocks in Germany than in the U. S.</u>

The other coefficients displayed in Table 11 can be compared with the parallel coefficients in Table 7 for the wage change equations. The coefficients on the relative import price change term are significantly positive only for the U. S., Belgium, and the European aggregate. The insignificance of the import price coefficients for Japan may reflect the much-discussed absence of manufactured imports.

The estimated controls coefficients in column (8) for the U. S. aggregate economy are similar to those in my recent paper (1985) on the behavior of the U. S. inflation rate in quarterly data, but in the present annual data are not significant. For Japan the 1973-74 wage-push phenomenon was mostly but not entirely reflected in faster inflation, leaving the rest to be absorbed by a profit squeeze. In Europe the only significant wage-push coefficient in Table 11 is in the unrestricted equation for Germany, suggesting that in the other countries the significant wage push effects caused a profit squeeze and did not cause faster inflation (when wages are solved out as in Table 11).

IV. "HYSTERESIS" AND THE NATURAL RATE OF UNEMPLOYMENT

The "Hysteresis" Hypothesis

The last set of regression results in the paper test the "hysteresis" hypothesis, which states that the natural rate of unemployment is "path dependent," that is, is not independent of the evolution of the actual unemployment rate but rather responds with a lag to the path of the actual unemployment rate. In this paper, which focusses on the equivalent concepts of the natural level of output and the log output ratio, the hysteresis hypothesis states that the natural level of output evolves not along a log-linear trend but with a lagged response to the actual path of output. If valid, this hypothesis would have the important policy implication that the output slump in Europe in the 1980s has reduced the natural level of output, gradually eliminating slack to the point that there is no longer any further downward pressure on wage changes.

Our test of the hysteresis approach can be illustrated in a simplified version of the wage equation included here for expository purposes only:

$$(10) \qquad w_t - p_{t-1} = \alpha_0 + \alpha_{11}(Q_t - Q^*_t) + \alpha_{12}(Q_{t-1} - Q^*_{t-1}),$$
$$= \alpha_0 + \alpha_{11}\Delta(Q_t - Q^*_t) + (\alpha_{11}+\alpha_{12})(Q_{t-1} - Q^*_{t-1})$$

where once again upper-case letters designate logs of levels, and both the current and one lagged value of the output ratio are included in the wage equation to accord with our basic specification reported in Table 7. The second line of (10) restates the role of the output ratio as entering through the current difference (Δ) and the lagged level.

Let us assume that the unobservable natural output level (Q^*_t) is some unknown weighted average of the linear trends of Table 4 (Q^T_t) and a hysteresis term (Q^H_t) equal to a four-year moving average of actual output:

$$(11) \qquad Q^*_t = \Psi Q^H_t + (1-\Psi)Q^T_t.$$

To identify the Ψ parameter, we substitute (11) into the lagged level term in (10), while assuming that in the difference term $Q^*_t = Q^T_t$. Rearranging, we obtain:

$$(12) \qquad w_t - p_{t-1} = \alpha_0 + \alpha_{11}\Delta(Q_t - Q^T_t) + (\alpha_{11}+\alpha_{12})(Q_{t-1} - Q^T_{t-1})$$
$$- (\alpha_{11}+\alpha_{12})\Psi(Q^H_{t-1} - Q^T_{t-1})$$

The hysteresis coefficients (Ψ) listed in columns (1) and (3) of Table 12 are obtained by running the wage change equations from Table 7 and the reduced-form price change equations from Table 11 again with the addition of the lagged ($Q^H_t - Q^T_t$) term. The term Q^H_t is defined as a trend-adjusted four-year moving average:

$$(13) \qquad Q^H_t = [Q_t + (1+q^T_{t-1})Q_{t-1} + (1+2q^T_{t-2})Q_{t-2}$$

$$+ \ (1+3q^{T}_{t-3})Q_{t-3}]/4,$$

where a lower-case q refers to the growth rate of the output trend for the year in question. The most important finding in Table 12 is that the hysteresis coefficients are insignificant at the five-percent level in the wage change equation in column (1), except for Austria, Belgium, and Switzerland, and in the reduced-form price change equation in column (3), except in Austria, Belgium, Sweden, and Switzerland. The fact that the hysteresis hypothesis is validated only for small European countries having both high unemployment (Belgium) and low unemployment (Austria, Sweden, Switzerland) seems to remove much of the "credibility" of the hysteresis hypothesis as an explanation of high European unemployment, particularly in the four large countries.

Another less formal test of the hysteresis hypothesis is implied by the dummy variables (D_{it}) in the reduced-form price equation. If the constant term for the 1980-84 period is significantly positive, this means that the existing trend-based measure of the log output ratio predicts too little inflation during that interval, and that the "true" output gap is smaller. The statistical significance of such a shift effect cannot be read from the coefficients reported in Table 11, since all three D_{it} terms cover the 1980-84. Instead, the identical equation was rerun with an alternative set of four dummy shift terms covering, respectively, 1963-69, 1970-74, 1975-79, and 1980-84.

The coefficients and t-ratios on these 1980-84 dummy shift variables are shown for each country in columns (5) and (6) of Table 12. Positive coefficients are significant at the 5-percent level only for Canada, Norway, and Sweden, and for no other country even at the 10-percent level. Only for Sweden do the two tests of hysteresis concur. We conclude that evidence supporting the hysteresis hypothesis is exceedingly weak, and that our trend-based output ratio series provides the most reliable basis on which to base an estimate of the natural rate of unemployment.

Alternative Estimates of the Natural Rate of Unemployment

The estimates of hysteresis effects in Table 12 should be viewed as testing a very special and limited version of the hysteresis hypothesis. A hysteresis coefficient equal to or close to unity means that wage and price behavior is best explained by assuming that natural output follows actual output with a short lag (i.e., the output gap disappears when actual output grows at its trend rate, regardless at how low or high a level). However, a hysteresis coefficient equal to or close to zero does not imply a constant natural unemployment rate. Instead, the null hypothesis of no hysteresis effect assumes that natural output grows after 1979 at its 1972-79 rate. Since the actual unemployment rate rose from 1972 to 1979, the null hypothesis of no hysteresis allows the natural unemployment rate to increase from 1972 to 1979 and, for most countries, from 1979 to 1984 as well.

Any output gap estimate for 1984 (or any other year) can be translated into an implied natural rate of unemployment by using Okun's Law, which states that there is a regular relationship between the log output gap ($Q_t - Q^*_t$) and the unemployment gap ($U_t - U^*_t$), where U_t and U^*_t are the usual percentage rates, not logs:

$$(14) \qquad U_t = \sum_{i=1}^{4} \eta_i + \sum_{j=0}^{2} \mu_j (Q-Q^*)_{t-i} + \varepsilon_t.$$

The first summation indicates that the level of the natural unemployment rate

(U^*_t) associated in a given time interval with the natural output level (that is, a situation in which $Q_t = Q^*_t$) is estimated by the value of one of four constants (η_i) applying to the intervals 1963-69, 1970-74, 1975-79, and 1980-84. The second summation allows deviations of the actual unemployment rate from the natural unemployment rate to be explained by the current and two lagged values of the log output ratio. The natural unemployment rate corresponding to a given value of Q^*_t (whether estimated by the trend or "hysteresis" moving-average method) can be calculated from (14) as:

$$(15) \qquad U^*_{it} = \eta_i.$$

Table 13 compares the actual 1984 unemployment rate with the two alternative definitions of the natural unemployment rate. The first, labelled "trend output," assumes that natural output grows from 1979 to 1984 at its 1972-79 trend. The second, "hysteresis output," assumes that natural output is a trend-adjusted four-year moving average of actual output. The 1984 output gap is translated into an unemployment gap by running the regression in (14) above and then by using (15) to calculate the natural unemployment rate (U^*_t).

The most important conclusion in Table 13 is that the trend unemployment gaps are relatively large in France, Germany, and the U. K. Combined with the low statistical significance of the hysteresis coefficient in Table 12 for these countries, this result suggests that there is substantial room for policymakers to stimulate aggregate demand without causing an accelerating inflation. The marginal significance of the U. K. hysteresis term in the reduced-form price equation suggests that some weight should be given to the U^*_t estimate based on hysteresis output (12.7 percent), which indicates virtually no slack, and no room for demand expansion.

Another interesting result is that for all the seven small European countries, with the exception of Denmark, the trend and hysteresis versions of the unemployment gap are close to zero. Thus the low unemployment countries (Austria, Norway, Sweden, and Switzerland) have low natural unemployment rates by either the trend or hysteresis definition, and the high unemployment countries (particularly Belgium and the Netherlands) have high natural unemployment rates by either definition. For the small countries, then, not only are the hysteresis oefficients of Table 12 strongly significant for several countries, but the hysteresis hypothesis is supported in the broader sense that the best estimate of the natural unemployment rate is whatever the actual unemployment rate happens to be.

Wage Gaps With Zero Output Gaps

An important conclusion of this paper is that wage gaps in Europe have declined substantially since 1978 and are no greater than in the U. S. Some readers may react, "yes, but the wage gaps are low only because unemployment is high and has held down wages; with lower unemployment the problem of excessive real wages would return." This view implicitly assumes that the actual unemployment rate has been sufficiently above the natural unemployment rate to exert downward pressure on wage changes. Its quantitative significance can be assessed by using the wage change equations of Table 7 (second line of each pair) to calculate counterfactual rates of wage change on the assumption that the trend-based output gap was zero in every year from 1980 to 1984. The difference between wage changes calculated with the actual output gap and with the counterfactual zero output gap can be cumulated and converted into a counterfactual wage gap, as in Table 14.

For every country but Switzerland, the counterfactual wage gap is substantially higher than the actual wage gap in 1984. For Europe as a whole, the wage gap is raised from 0.94 to 1.06. The difference is greatest for Italy, amounting to 28 percentage points. However, the calculation does not serve to reveal a "real wage problem" in Europe as contrasted with the United States. The counterfactual 1984 wage gap in the U. S. of 1.10 is actually higher than the figure of 1.06 for Europe. Further, within Europe there is little relation between the counterfactual wage gaps and 1984 unemployment rates. Low-unemployment Austria's counterfactual wage gap of 1.15 contrasts with high-unemployment Netherland's counterfactual wage gap of 0.81.

IV. CONCLUSION

This paper provides no explanation of high European unemployment. Instead, its results throw cold water on explanations in the previous literature based on high real wages in Europe, or on alleged differences in cyclical productivity, wage and price adjustment between Europe and the U. S. This dose of cold water comes in seven containers:

(1) There is no evidence of countercyclical productivity movements in Europe, except in the U. K. Actual productivity would temporarily increase faster than the underlying trend rate, rather than increasing slower than trend, in response to a demand expansion.

(2) After adjustment for the income of the self-employed, there is no evidence of excessive real wages in Europe. "Wage gap" indexes on a 1972 base computed with either actual productivity or estimated trend

productivity were almost identical in Europe to the values for the U. S. in 1963 and 1984. The slight bulge in the European wage gap that occurred between 1974 and 1978 amounts to only about five percentage points over the U. S. values.

(3) There was indeed a real wage explosion between 1966 and 1975 in three small high-unemployment countries (Belgium, Denmark, Netherlands). But the wage gap barely moved in the four large high-unemployment countries (France, Germany, Italy, U. K.), and in fact increased substantially less than in low-unemployment Austria. Thus the wage gap concept is almost useless in providing an explanation of differences in unemployment experience within Europe.

(4) Further skepticism regarding the relevance of wage and price adjustment for the European unemployment problem is provided by aggregation tests. Tests for pooling of wage change equations across national boundaries in Europe are accepted universally. There are no significant differences in wage behavior within Europe, except for country-specific instances of wage push or incomes policies. Of 24 aggregation tests that are run and reported in Table 8, there is one single failure: the U. S. wage equation cannot be aggregated with the pooled Western European equation. This result supports the view that the Atlantic Ocean is a valid boundary for comparative macroeconomic analysis while national borders within Europe are not, at least for dynamic wage behavior.

(5) While the U. S. and European wage equations cannot be aggregated, most coefficients in the European wage equation are quite close to their counterparts in the U. S. wage equation. In particular, there is no

support for the proposition that the U. S. is characterized by nominal wage rigidity and Europe by real wage rigidity. The degree of nominal wage flexibility in Europe is about the same as in the U. S., and far from being too rigid, real wages in Europe were too flexible, jumping at the time of autonomous wage push episodes in the late 1960s in France, Germany, and Italy.

(6) Just as the paper does not explain high unemployment in Europe, it does not deny that the natural unemployment rate compatible with a constant inflation rate has increased substantially since 1972 in every European country. However, output gaps in Europe are not zero. The econometric estimates imply that the unemployment rate could be pushed down by three percentage points, particularly in France and Germany, without causing an acceleration of inflation (holding constant real import prices). With falling real import prices in Europe, as has occurred and will continue to occur with a falling U. S. dollar, there is even less reason to be concerned that an inflationary spiral would follow a stimulus to aggregate demand.

(7) Some might argue that wage gaps in Europe in the 1980s have been pushed down by high unemployment and would bounce back if unemployment fell substantially. Indeed, we show that for Europe as a whole the wage gap index would be 12 percentage points higher if output had continued to grow at its 1972-79 trend rate. However, the claim that wage gaps have been held down by high unemployment and low output in the 1980s amounts to an acceptance of one of the major conclusions of this paper, as emphasized in the previous paragraph: Europe has experienced a

substantial Keynesian output gap in the 1980s, and not all of the increase in European unemployment is "structural" or "classical" in nature.

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FOOTNOTES

1. All studies using the LSE Center for Labour Economics data bank, including Newell-Symons (1985), Grubb (1986), and Bean-Layard-Nickell (1986), are guilty of mixing manufacturing wage data with data on aggregate employment or unemployment. That data bank contains no data at all on wages for the aggregate economy, only for the manufacturing sector.

2. The 14 countries are (in the order listed in Table 1 below) U. S., Canada, Japan, France, Germany, Italy, the U. K., Austria, Belgium, Denmark, Netherlands, Norway, Sweden, and Switzerland. Countries included in the L.S.E. Centre for Labour Economics data bank, but excluded here, are Australia, Finland, Ireland, New Zealand, and Spain.

3. As far as I can tell, only Sachs (1979) makes an explicit adjustment for self-employment income. Since he does not present estimates of labor's share with and without the adjustment, it is not clear whether his adjustments are larger or smaller than mine.

4. The studies that erroneously treat unadulterated unemployment rates as cyclical variables in wage or productivity equations include Sachs (1983), Bruno-Sachs (1985), Blanchard-Summers (1986), and Bean-Layard-Nickell (1986).

5. Because of recessions in the U. S. and Canada in 1961, and a dip in French output in the early 1960s, 1964 is chosen as the benchmark year for these three countries.

6. The LSE data base, as described by Grubb (1986), contains hourly earnings only for manufacturing, and not always on a consistent base. Data for Australia and Norway are for males only, data for the U. S. include production workers only, data for Austria, Belgium, Denmark, and Sweden include mining, data for Belgium includes transport, and data for Spain include all industries.

7. This unpublished series was provided by John Martin of the OECD. All other series for the aggregate sector were obtained from an OECD PC data diskette. The manufacturing data were transcribed manually from printouts provided by the IMF in May, 1985 and include manufacturing value-added deflators, output, compensation, employment, and hours for the fourteen countries identified in footnote 2. The compilation of the manufacturing data is described in the data appendix of Artus (1984). A critical step in the development of the data base was the location of data on the absolute value of each variable (particularly nominal output, nominal compensation, and labor hours) for the aggregate economy in 1972, in order to allow subtraction of manufacturing values from aggregate values to obtain the needed residual values.

8. As noted above, there is a reference to the issue of self-employment income in Sachs (1979), but the description is too vague to determine whether his procedures are comparable to ours. The topic is not addressed in Bruno (1986).

9. My published comments on Sachs (1983) contain a critique of the methods used to estimate cyclical productivity effects and productivity trends.

10. For an alternative formulation that derives a Phillips-curve wage equation based on the hypothesis that the rate of change of wages is a linear function of the gap between lagged labor demand and supply, see McCallum (1974a, 1974b).

11. For a discussion of alternative methods of imposing structure on wage and price equations within this context, see Blanchard (1986). In some of his quarterly wage equations Blanchard imposes the structural assumption that the coefficient on the current price change in the wage equation cannot be higher than a specified amount, e.g., 0.3.

12. Exceptions to this procedure are that 1984 is used as a benchmark year for Japan to take account of highly different growth rates of output during 1979-84 in manufacturing versus nonmanufacturing. Also, since 1961 was a recession year in North America, the first benchmark is 1964 in Canada and the U. S., and also in France. The 1961-64 growth rate of natural output for these countries is assumed to be equal to the observed 1964-72 growth rate.

13. In the wage equation with the constant terms of columns (5)-(7) excluded, the restriction is accepted by a conventional significance test at the 5 percent level for all countries but Japan and Denmark. In the reduced-form equations presented in Table 11, the restriction is accepted for all countries but Japan.

14. If there are 21 observations for Austria and 21 observations for Switzerland, then the pooled regression contains 42 observations. However, care is taken to make sure that lagged values for observation 22, Switzerland in 1964, refer to Switzerland in 1963 and not Austria in 1984! Note that the D_{it} dummy variables are not included, since the wage equation used in the aggregation tests is the unrestricted version from Table 7, while the D_{it} dummy variables are meaningful only in the restricted version.

TABLE 1

Standardized Unemployment Rates
Selected Years

	1961	1972	1979	1984
United States	6.4	5.5	5.8	7.4
Canada	6.5	6.2	7.4	11.2
Japan	1.2	1.4	2.1	2.7
France	1.4	2.7	6.0	9.7
Germany	0.3	0.8	3.2	8.6
Italy	5.1	6.3	7.5	10.2
United Kingdom	2.2	4.3	5.6	13.2
Austria	1.9	1.2	2.1	4.1
Belgium	2.1	2.7	8.2	14.0
Denmark	2.0	0.9	6.1	10.1
Netherlands	0.5	2.2	5.4	14.0
Norway	1.8	1.7	2.0	3.0
Sweden	1.4	2.7	2.1	3.1
Switzerland	0.0	0.0	0.4	1.1
Eleven European Countries	1.7	2.7	4.9	9.6

Source: Switzerland and Denmark, 1972 and 1979 from OECD Labor Force Statistics. 1984: OECD Economic Outlook, December 1985, p. 28.

Other countries for 1972, 1979, and 1984: OECD Economic Outlook, June 1985, Table R12.

All countries for 1961: Yearbook of Labor Statistics, 1971, Table 10, linked to OECD Series in 1964.

TABLE 2

Equations Explaining Annual Change in Hours Relative to Trend Output Growth ($h_t - q^*_t$)
1964 - 84

(* indicates significant at 5 percent, ** at 1 percent)

	Sum of Coefficients on Current and One Lagged Change in		Constant (trend) terms				
	Output Ratio	Real Wage	1963 -1984	1973 -1984	$\bar{R}^2$	S.E.E.	D.-W.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
United States	0.86**	-0.22	-1.70*	0.92	0.82	0.78	2.17
Canada	0.86**	-0.62**	-1.33*	0.51	0.84	0.84	2.50
Japan	0.36*	-0.46**	-4.98**	3.11**	0.91	0.78	2.36
France	0.86**	-0.68**	-1.71**	0.42	0.92	0.53	1.33
Germany	0.91**	-0.53**	-2.31*	0.51	0.81	0.78	2.47
Italy	0.58**	-0.47**	-3.10*	1.37	0.81	0.92	2.06
United Kingdom	1.13**	-0.01	-3.39**	1.11	0.71	1.29	2.66
Austria	0.71**	-0.41*	-3.62**	1.75**	0.75	0.94	2.25
Belgium	0.79**	-0.63**	-1.79**	0.34	0.87	0.80	1.81
Denmark	0.75*	-0.77**	-0.73	0.095	0.60	1.60	2.05
Netherlands	0.60*	-0.51**	-2.17	0.23	0.68	1.04	2.15
Norway	0.40	-0.22	-3.31**	-0.13	0.02	1.50	1.83
Sweden	0.69**	-0.24	-3.76**	2.36**	0.79	0.89	2.11
Switzerland	0.89**	-0.59**	-1.81**	1.28**	0.95	0.55	2.33
Eleven European Countries	0.78**	-0.44**	-2.81**	0.99**	0.92	0.37	2.20

TABLE 3

Contribution to Fitted Values of Productivity Growth
of Trends, Real Wage Effect, and Cyclical Output Ratio Effect,
Selected Intervals, 1964-84

	1964 - 72				1972 - 79				1979 - 84			
	Trend	Real Wage	Output Ratio	Total	Trend	Real Wage	Output Ratio	Total	Trend	Real Wage	Output Ratio	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
United States	2.18	0.04	0.00	2.22	1.00	-0.05	-0.03	0.92	1.00	-0.27	-0.06	0.66
Canada	3.52	0.19	-0.01	3.69	2.18	-0.81	-0.02	1.34	2.18	-0.72	-0.23	1.22
Japan	9.25	-0.56	-0.39	8.29	3.47	0.48	-0.03	3.92	3.47	-0.54	-0.01	2.91
France	5.40	-0.04	-0.01	5.35	4.08	0.19	-0.02	4.25	4.08	-0.87	-0.39	2.82
Germany	4.91	0.17	-0.04	5.04	3.66	0.10	0.02	3.78	3.66	-1.36	-0.18	2.11
Italy	5.81	0.32	-0.10	6.02	3.23	-0.08	0.03	3.18	3.23	-1.09	-0.89	1.26
United Kingdon	3.76	0.08	-0.08	3.76	2.53	-0.05	0.02	2.50	2.53	-0.07	0.19	2.65
Austria	6.09	0.06	0.06	6.20	3.14	0.76	0.00	3.90	3.14	-0.78	-0.55	1.80
Belgium	4.90	0.55	-0.04	5.41	3.97	0.57	0.50	4.55	3.97	-1.24	-0.34	2.40
Denmark	3.11	1.70	-0.26	4.55	2.70	0.82	0.02	3.54	2.70	-1.63	-0.15	0.93
Netherlands	4.46	0.92	-0.04	5.34	3.99	0.43	0.01	4.43	3.99	-3.08	-1.07	-0.16
Norway	4.27	0.35	-0.05	4.58	4.43	-0.13	0.00	4.30	4.43	-1.06	-1.25	2.13
Sweden	4.96	-0.27	-0.39	4.30	1.85	0.16	0.17	2.17	1.85	-0.78	-0.23	0.84
Switzerland	4.39	-0.14	-0.08	4.17	1.29	0.89	0.43	2.22	1.29	0.20	0.15	1.64
Eleven European Countries	4.98	0.17	-0.06	5.08	3.22	0.14	0.01	3.38	3.22	-0.77	-0.41	2.04

TABLE 4

Growth Rates in Trend Output, Output per Hour, and Hours
Selected Intervals, 1960-84

	1960 - 72			1972 - 79			1979 -84		
	Output	Output Per Hour	Hours	Output	Output Per Hour	Hours	Output	Output Per	Hours
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
United States	3.66	2.11	1.55	3.00	0.88	2.12	3.00	1.73	1.27
Canada	5.28	3.49	1.78	3.89	1.35	2.54	3.89	3.44	0.44
Japan	4.34	8.91	0.43	4.11	3.82	0.29	3.92	3.06	0.86
France	5.23	5.30	-0.07	3.37	4.16	-0.79	3.37	5.24	-1.87
Germany	4.26	5.16	-0.90	2.62	4.04	-1.43	2.62	3.55	-0.93
Italy	5.02	6.41	-1.39	3.17	3.07	0.10	3.17	3.26	0.10
United Kingdom	2.73	3.75	-1.02	2.31	2.22	0.09	2.31	4.39	-2.08
Australia	4.75	6.03	-1.28	3.16	3.62	-0.46	3.16	3.41	-0.25
Belgium	4.73	5.13	-0.40	2.68	4.40	-1.72	2.68	4.22	-1.54
Denmark	4.29	4.32	-0.03	2.11	3.13	-1.01	2.11	2.32	-0.20
Netherlands	4.73	5.33	-0.60	2.92	4.50	-1.58	2.92	2.28	0.64
Norway	4.21	4.41	-0.20	4.67	4.30	0.37	4.67	4.21	0.45
Sweden	4.05	4.59	-0.55	2.07	2.09	-0.02	2.07	1.53	0.54
Switzerland	4.44	4.12	0.32	0.11	2.21	-2.10	0.11	0.25	-0.15
Eleven European Countries	4.35	5.09	-0.73	2.74	3.39	-0.65	2.74	3.74	-1.00

TABLE 5a

Wage Gap Based on Actual Productivity
1972 = 1.0

	1963	1966	1969	1972	1975	1978	1981	1984
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
United States	0.979	0.983	1.009	1.000	0.987	0.987	0.963	0.948
Canada	0.996	0.987	1.003	1.000	1.017	0.984	0.971	0.954
Japan	1.040	1.016	0.974	1.000	1.081	1.050	1.008	1.010
France	1.008	0.990	0.991	1.000	1.028	1.024	1.024	1.007
Germany	0.981	0.991	0.974	1.000	1.003	0.999	0.990	0.949
Italy	0.960	0.957	0.964	1.000	1.035	0.999	0.990	0.983
United Kingdom	0.976	0.980	0.966	1.000	1.069	0.990	0.974	0.950
Austria	1.006	1.020	1.011	1.000	1.082	1.116	1.115	1.066
Belgium	0.982	0.996	0.975	1.000	1.031	1.041	1.037	1.005
Denmark	0.950	0.988	0.993	1.000	1.066	1.043	1.060	0.990
Netherlands	0.936	0.972	0.984	1.000	1.055	1.015	1.000	0.943
Norway	0.927	0.934	0.970	1.000	1.036	1.040	0.896	0.860
Sweden	1.025	1.029	1.018	1.000	0.993	1.061	0.991	0.915
Switzerland	1.012	1.003	0.985	1.000	1.038	1.033	1.037	1.041
Eleven European Countries	0.985	0.987	0.979	1.000	1.032	1.018	1.011	0.985

TABLE 5b

Wage Gap Based on Trend Productivity
1972 = 1.0

	1963	1966	1969	1972	1975	1978	1981	1984
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
United States	0.976	1.015	1.024	1.000	0.981	0.989	0.959	0.926
Canada	1.001	0.997	0.998	1.000	0.982	0.949	0.885	0.861
Japan	1.107	1.044	1.029	1.000	1.120	1.079	1.033	1.014
France	1.018	1.016	1.001	1.000	1.049	1.041	0.978	0.957
Germany	0.957	0.976	0.980	1.000	1.016	1.026	0.973	0.891
Italy	0.958	0.965	0.979	1.000	1.007	0.980	0.952	0.879
United Kingdom	0.959	0.955	0.936	1.000	1.019	0.982	0.964	0.935
Austria	0.998	1.000	1.000	1.000	1.105	1.130	1.128	1.035
Belgium	0.913	0.936	0.921	1.000	1.110	1.098	1.073	0.996
Denmark	0.826	0.870	0.964	1.000	1.053	1.103	1.069	0.969
Netherland	0.836	0.876	0.942	1.000	1.115	1.057	0.916	0.786
Norway	0.909	0.911	1.007	1.000	1.034	1.024	0.840	0.759
Sweden	1.070	1.051	1.051	1.000	1.019	1.067	0.988	0.891
Switzerland	1.039	1.012	0.982	1.000	1.080	1.086	1.126	1.130
Eleven European Countries	0.972	0.978	0.976	1.000	1.033	1.032	0.995	0.936

TABLE 6

Sample Means and (Standard Deviations) for
Selected Series and Periods

	1962 - 72				1973 - 84			
	Trend Unit Labor Cost	Infla- tion	Output Ratio	Import Defl	Trend Unit Labor Cost	Infla- tion	Output Ratio	Import Defl
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
United States	3.65 (1.38)	3.43 (1.51)	1.06 (2.34)	-0.85 (2.08)	6.16 (1.69)	6.81 (1.89)	-3.20 (3.60)	3.65 (11.19)
Canada	3.38 (1.90)	3.35 (1.16)	0.24 (1.30)	-1.83 (1.34)	7.49 (3.40)	8.74 (2.99)	-2.50 (5.72)	0.48 (5.70)
Japan	4.37 (1.44)	5.14 (1.00)	3.10 (2.36)	-5.02 (3.17)	5.86 (7.11)	5.73 (5.25)	1.82 (1.82)	3.49 (17.92)
France	4.61 (1.96)	4.65 (1.37)	-0.83 (0.68)	-2.55 (3.14)	9.51 (2.76)	9.86 (1.74)	-2.78 (4.45)	1.69 (10.07)
Germany	4.44 (2.53)	4.04 (1.98)	0.13 (1.68)	-4.15 (2.50)	3.41 (2.55)	4.35 (1.37)	-3.08 (3.40)	2.15 (7.14)
Italy	6.19 (3.43)	4.95 (2.12)	2.80 (1.90)	-3.12 (1.74)	14.06 (2.70)	15.17 (2.65)	-2.02 (4.60)	3.56 (13.81)
United Kingdom	5.15 (3.59)	4.93 (2.17)	0.93 (1.10)	-1.53 (3.31)	11.26 (5.69)	11.81 (5.67)	-2.87 (4.80)	2.22 (9.84)
Austria	4.10 (1.72)	4.16 (1.52)	-2.60 (1.51)	-3.81 (3.78)	5.99 (3.89)	5.73 (1.49)	-1.74 (3.33)	-0.61 (4.99)
Belgium	4.53 (3.51)	3.99 (1.31)	-0.20 (1.24)	-3.52 (2.29)	6.44 (5.09)	6.69 (2.62)	-0.82 (3.96)	2.97 (6.87)
Denmark	8.25 (3.09)	6.74 (1.15)	1.76 (1.78)	-4.61 (2.52)	8.86 (4.22)	9.18 (1.89)	-2.33 (2.27)	1.68 (8.14)
Netherlands	7.79 (2.67)	5.69 (2.30)	-0.56 (1.81)	-4.54 (2.67)	4.04 (6.10)	6.02 (2.56)	-2.98 (5.75)	2.05 (8.20)
Norway	6.26 (2.40)	5.08 (2.48)	0.61 (1.12)	-3.83 (1.51)	6.86 (3.34)	8.81 (2.50)	-2.87 (4.24)	-1.18 (5.59)
Sweden	4.05 (1.69)	4.76 (1.58)	2.83 (1.65)	-2.77 (1.97)	8.44 (3.27)	1.86 (1.86)	-0.53 (2.61)	2.75 (7.65)
Switzerland	4.75 (2.76)	5.15 (2.13)	1.69 (1.91)	-2.71 (2.49)	5.38 (3.18)	4.37 (2.50)	1.70 (4.12)	-1.56 (9.54)
Eleven European Countries	5.02 (1.79)	4.67 (1.45)	0.54 (0.72)	-3.13 (1.23)	8.21 (2.70)	8.78 (1.97)	-2.44 (3.74)	2.07 (8.19)

TABLE 7
Equations for Annual Change in
Trend Unit Labor Cost ($w_t - O^*_t$), 1964-84
(* indicates significant at 5 percent, ** at 1 percent)

	Sum of Coefficients				Constant (trend) terms			Control & Wage Push Dummies	$\bar{R}^2$	S.E.E.	D.-W.
	Infla-tion	Output Ratio	p^F-p	t^T	1964-1984	1973-1984	1980 1984				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
United States	1.06**	0.50**	0.04	0.03	-.--	-.--	-.--	-2.47	0.77	0.93	2.59
	1.00(a)	0.59**	0.02	-0.29	0.28	0.63	0.42	-2.24	0.77	0.93	2.78
Canada	0.87**	0.25	-0.07	0.53	-.--	-.--	-.--	-.--	0.63	2.09	2.15
	1.00(a)	0.43	-0.09	0.37	-0.47	-0.68	1.85	-.--	0.56	2.27	2.15
Japan	0.70**	0.31**	-0.00	0.69	-.--	-.--	-.--	13.84**	0.95	1.17	2.56
	1.00(a)	0.40	-0.01	-0.31	-2.01	-0.93	-1.54	14.78**	0.92	1.49	2.37
France	1.16**	0.77**	-0.03	-1.13*	-.--	-.--	-.--	4.43*[b]	0.72	1.85	1.78
	1.00(a)	0.61*	0.03	-1.24*	-0.80	-1.32	-2.00	3.64[c]	0.76	1.74	1.86
Germany	0.91**	0.37**	0.00	0.35	-.--	-.--	-.--	5.52**	0.66	1.50	2.06
	1.00(a)	0.22	0.05	-0.04	0.11	0.01	-1.72	6.28**	0.64	1.55	2.26
Italy	1.01**	0.54*	0.60	-0.05	-.--	-.--	-.--	1.01	0.70	2.83	1.96
	1.00(a)	0.88	0.01	-0.12	-1.21	1.82	1.72	0.61	0.68	2.91	1.67
United Kingdom	0.90**	0.59*	0.10	0.29	-.--	-.--	-.--	-4.24[d]	0.63	3.39	1.94
	1.00(a)	0.77	0.10	-0.14	0.37	-0.72	1.46	-4.21[e]	0.56	3.74	1.93

TABLE 7 (continued)
Equations for Annual Change in
Trend Unit Labor Cost ($w_t - O^*_t$), 1964-84
(* indicates significant at 5 percent, ** at 1 percent)

	Sum of Coefficients				Constant (trend) terms			Control &			
	Infla- tion	Output Ratio	p^F-p	t^T	1964- 1984	1973- 1984	1980 1984	Wage Push Dummies	$\bar{R}^2$	S.E.E.	D.-W.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Austria	1.11**	0.37*	0.18	0.87	-.--	-.--	-.--	-.--	0.67	1.83	1.98
	1.00[a]	0.51	0.25*	0.48	2.19*	-1.32	-0.76	-.--	0.73	1.65	2.24
Belgium	1.17**	0.72**	-0.03	-1.06	-.--	-.--	-.--	-.--	0.67	2.46	1.76
	1.00[a]	0.59*	0.02	-4.58**	5.66**	-1.30	-5.37*	-.--	0.86	1.58	0.91
Denmark	1.22**	1.14**	0.06	-2.51	-.--	-.--	-.--	-.--	0.25	3.23	1.54
	1.00[a]	0.64	0.09	-2.72	2.70	-0.70	-2.75	-.--	0.19	3.35	1.60
Netherlands	0.78**	0.39	-0.08	1.48	-.--	-.--	-.--	-.--	0.53	3.55	1.24
	1.00[a]	-0.04	0.12	0.03	3.23	-3.25	-6.11	-.--	0.57	3.37	1.67
Norway	0.76**	0.21	0.08	1.37	-.--	-.--	-.--	-.--	0.27	2.51	1.53
	1.00[a]	0.31	0.08	0.99	-0.50	-0.48	-0.99	-.--	0.05	2.86	1.68
Sweden	0.75**	0.30	0.09	0.42	-.--	-.--	-.--	-.--	0.53	2.37	2.00
	1.00[a]	0.83*	-0.04	-0.20	-2.60	3.39	-1.45	-.--	0.65	2.05	2.96
Switzerland	0.89**	0.22	-0.07	0.02	-.--	-.--	-.--	-.--	0.05	2.93	1.53
	1.00[a]	0.36	-0.05	-2.07	0.44	2.56	-4.88	-.--	0.11	2.83	1.54
Eleven European Countries	1.10**	0.65**	0.10*	-0.84	-.--	-.--	-.--	2.61**	0.82	1.19	1.72
	1.00[a]	0.60*	0.09	-1.09	0.46	1.06	-0.94	2.80**	0.83	1.15	1.67

Notes: (a) Sum of coefficients constrained to equal unity
(b) Coefficient of second control dummy is 5.62*
(c) Coefficient of second control dummy is 6.14**
(d) Coefficient of second control dummy is -9.40*
(e) Coefficient of second control dummy is -8.68

TABLE 8

Chow Tests of Aggregating European Countries
Using Separate and Pooled Wage Equations

Countries or Aggregated Groups compared in tests		Resulting Aggregation	F-test	(degrees of fdm.)	Significance Level
1. Austria + Switzerland	=>	AS	1.13	(6,32)	0.37
2. Denmark + Norway	=>	DN	1.88	(6,32)	0.11
3. Belgium + Netherlands	=>	BN	1.88	(6,32)	0.12
4. DN + SD	=>	SC	1.20	(6,32)	0.33
5. AS + BN	=>	TT	0.44	(6,32)	0.84
6. TT + SC	=>	Small	2.02	(6,32)	0.09
7. France + Germany	=>	FG	2.33	(6,29)	0.06
8. FG + Italy	=>	CE	0.75	(6,28)	0.61
9. CE + United Kingdom	=>	Large	0.96	(6,28)	0.47
10. Small + Large	=>	West Europe	1.86	(6,29)	0.12
11. AS + NO	=>	L1	1.03	(6,32)	0.43
12. L1 + SD	=>	Low	1.99	(6,32)	0.10
13. BN + DK	=>	High	1.96	(6,32)	0.10
14. Low + High	=>	Small	2.07	(6,32)	0.08
15. France + Italy	=>	FI	1.87	(6,29)	0.12
16. France + United Kingdom	=>	FU	0.77	(6,28)	0.60
17. Germany + Italy	=>	GI	0.50	(6,30)	0.80
18. Germany + United Kingdom	=>	GU	1.89	(6,29)	0.12
19. Italy + United Kingdom	=>	IU	2.35	(6,29)	0.06
20. Small + France	=>	SF	2.08	(6,30)	0.09
21. Small + Italy	=>	SI	0.38	(6,31)	0.88
22. Small + Germany	=>	SG	1.39	(6,31)	0.25
23. Small + United Kingdom	=>	SU	1.56	(6,30)	0.19
24. West Europe + US	=>	NA	3.11	(6,30)	0.017

TABLE 9

Comparison of using Output Ratio vs.
Unemployment in Wage Equations
1963 - 84

(* indicates significant at 5 percent, ** at 1 percent)

	Output Ratio				Unemployment			
	Sum of Coeffs	Sig level Sum	Sig level Exclude	S.E.E.	Sum of Coeffs	Sig Level Sum	Sig Level Exclude	S.E.E.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
United States	0.55	0.00	0.00	0.83	-1.43	0.00	0.00	0.91
Canada	0.50	0.09	0.17	2.09	-1.57	0.05	0.13	2.05
Japan	0.28	0.26	0.35	1.30	0.12	0.98	0.86	1.40
France	0.46	0.05	0.01	1.39	-2.02	0.00	0.00	1.09
Germany	0.29	0.18	0.21	1.46	-0.48	0.18	0.30	1.50
Italy	0.77	0.06	0.07	2.68	-2.52	0.08	0.11	2.77
United Kingdom	0.50	0.35	0.01	2.76	-1.06	0.14	0.26	3.78
Austria	0.51	0.10	0.24	1.71	-1.90	0.07	0.17	1.66
Belgium	0.58	0.03	0.09	1.61	-0.63	0.09	0.13	1.65
Denmark	0.27	0.77	0.85	3.44	-0.59	0.30	0.07	2.84
Netherlands	0.04	0.91	0.97	3.16	-0.27	0.58	0.71	3.07
Norway	-0.02	0.94	0.97	2.54	-0.44	0.85	0.96	2.54
Sweden	0.61	0.19	0.40	2.07	-0.41	0.78	0.89	2.20
Switzerland	0.67	0.08	0.17	2.68	-6.33	0.10	0.10	2.57
Eleven European Countries	0.57	0.01	0.01	1.03	-1.23	0.00	0.01	1.01

TABLE 10

Mark-up Equations for Annual
Change in Prices (p_t)
(* indicates significant at 5 percent, ** at 1 percent)

	Sum of Coefficients on Current and One Lagged Change in							
	Trend Unit Labor Cost	Output Ratio	p^F-p	t^T	Control Wage Push Dummies	$\bar{R}^2$	S.E.E.	D.-W.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
United States	1.01**	-0.15**	0.04	-0.06	0.45	0.94	0.58	2.29
Canada	1.11**	-0.05	0.18	-0.22	-.--	0.75	1.76	2.00
Japan	0.79**	0.22	-0.02	1.48**	0.63	0.86	1.45	2.05
France	0.98**	-0.09	0.04	0.29	-1.67[a]	0.79	1.42	1.20
Germany	0.93**	-0.27**	0.05	-0.08	1.61	0.63	1.02	1.17
Italy	1.00**	-0.26**	0.06	0.18	1.11	0.95	1.34	0.94
United Kingdom	1.00**	-0.05	-0.04	0.03	2.46[b]	0.89	1.84	2.03
Austria	0.80**	-0.38**	-0.03	-0.05	-.--	0.39	1.33	1.50
Belgium	0.67**	-0.40**	0.23**	1.74**	-.--	0.83	1.00	2.00
Denmark	0.84**	-0.47**	0.02	0.72	-.--	0.42	1.53	0.91
Netherlands	0.81**	-0.30*	0.03	0.10	-.--	0.29	1.82	1.63
Norway	0.93**	-0.19	-0.01	-0.26	-.--	-0.16	3.36	1.42
Sweden	1.34**	-0.02	-0.11	-0.83	-.--	0.47	2.10	0.96
Switzerland	0.83**	0.09	-0.12*	-0.20	-.--	0.80	1.06	1.07
Eleven European Countries	0.97**	-0.22**	0.01	0.07	-.--	0.94	0.67	1.69

Notes: (a) Coefficient of second control dummy is -1.52.
(b) Coefficient of second control dummy is 1.67.

TABLE 11

Equations for Annual Change in
Value-Added Deflator (p_t), 1963-84
(* indicates significant at 5 percent, ** at 1 percent)

	Sum of Coefficients				Constant (trend) terms			Control &			
	Infla- tion	Output Ratio	$p^F - p$	t^T	1964- 1984	1973- 1984	1980 1984	Wage Push Dummies	$\bar{R}^2$	S.E.E.	D.-W.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
United States	1.04**	0.26*	0.08*	-0.06	-.--	-.--	-.--	-1.49	0.86	0.88	2.50
	1.00a	0.33*	0.07	-0.28	0.30	0.22	0.54	-1.55	0.85	0.90	2.68
Canada	0.98**	0.21	0.09	0.27	-.--	-.--	-.--	-.--	0.54	2.36	2.00
	1.00a	0.51	0.04	-0.43	0.79	-0.76	2.59	-.--	0.52	2.43	2.02
Japan	0.63**	0.45**	0.00	0.53	-.--	-.--	-.--	10.24**	0.88	1.32	2.56
	1.00a	0.32	0.00	0.96	-1.38	-2.67	2.25	11.91**	0.77	1.86	2.05
France	1.08**	0.38*	0.02	-0.48	-.--	-.--	-.--	1.20[b]	0.74	1.57	2.11
	1.00a	0.44	0.01	-0.67	0.90	0.22	0.36	0.58[c]	0.75	1.55	2.12
Germany	0.93**	0.09	0.01	0.15	-.--	-.--	-.--	3.18*	0.52	1.18	2.37
	1.00a	0.27	-0.02	0.64	-0.27	0.39	1.15	2.75	0.48	1.22	2.14
Italy	1.01**	0.27	0.12	0.18	-.--	-.--	-.--	1.79	0.87	2.04	2.44
	1.00a	0.75*	0.07	0.23	-2.10*	2.91*	1.55	1.90	0.90	1.82	2.15
United Kingdom	0.91**	0.55*	0.04	0.04	-.--	-.--	-.--	-1.52[d]	0.58	3.57	2.11
	1.00a	0.95	-0.01	0.08	-0.47	0.62	2.75	-1.66[e]	0.50	3.89	1.90

TABLE 11 (continued)

Equations for Annual Change in
Value-Added Deflator (p_t), 1963-84
(* indicates significant at 5 percent, ** at 1 percent)

	Sum of Coefficients				Constant (trend) terms			Control &			
	Infla-tion	Output Ratio	p^F-p	t^T	1964-1984	1973-1984	1980 1984	Wage Push Dummies	$\bar{R}^2$	S.E.E.	D.-W.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Austria	0.93**	-0.55	0.08	0.41	-.--	-.--	-.--	-.--	0.29	1.42	2.06
	1.00a	0.33	0.05	0.40	1.16	-2.20*	2.42	-.--	0.42	1.29	2.22
Belgium	0.85**	0.09	0.18*	0.87	-.--	-.--	-.--	-.--	0.49	1.70	1.88
	1.00a	-0.05	0.25*	-1.57	2.72*	-1.51	-3.58	-.--	0.63	1.46	2.34
Denmark	1.04**	0.33*	0.00	-1.15	-.--	-.--	-.--	-.--	0.55	1.34	1.75
	1.00a	0.41	-0.01	-1.21	0.14	0.38	0.29	-.--	0.51	1.41	1.77
Netherlands	0.84**	0.04	0.00	0.67	-.--	-.--	-.--	-.--	0.13	2.01	1.56
	1.00a	0.21	0.01	-0.15	1.32	-2.23	2.36	-.--	0.11	2.04	1.80
Norway	0.93**	0.35	0.09	0.33	-.--	-.--	-.--	-.--	0.03	3.07	2.03
	1.00a	0.88*	0.17	0.07	0.10	-0.03	4.42	-.--	0.05	3.04	1.99
Sweden	1.18**	0.48*	-0.03	-0.69	-.--	-.--	-.--	-.--	0.61	1.80	2.03
	1.00a	0.93**	-0.09	-0.68	-1.16	2.93*	1.38	-.--	0.70	1.58	2.13
Switzerland	0.85**	0.18	-0.14	-0.49	-.--	-.--	-.--	-.--	0.25	2.04	1.30
	1.00a	0.07	-0.12	-1.79	0.86	-0.15	-1.29	-.--	0.20	2.11	1.38
Eleven Europenean Countries	1.06**	0.38**	0.09*	-0.58	-.--	-.--	-.--	2.12*	0.83	1.11	2.33
	1.00a	0.51*	0.06	-0.71	0.07	0.82	0.63	2.25*	0.83	1.10	2.12

Notes: (a) Sum of coefficients constrained to equal unity
(b) Coefficient of second control dummy is 1.96
(c) Coefficient of second control dummy is 1.91
(d) Coefficient of second control dummy is -6.74
(e) Coefficient of second control dummy is -5.61

TABLE 12

"Hysteresis" Effects in
Reduced-Form Price Equation and
in Wage Equation

	Hysteresis Coefficient (Ψ)				Coefficient on 1980-84 Dummy [t ratio]	
	Wage Equation		Reduced-form Price Equation			
	Ψ Coefficient	[t ratio]	Ψ Coefficient	[t ratio]		
	(1)	(2)	(3)	(4)	(5)	(6)
United States	0.48	[1.57]	0.57	[1.13]	1.32	[1.32]
Canada	0.94	[0.98]	1.12	[1.97]	3.98	[2.22]
Japan	0.24	[0.32]	0.36	[0.70]	-1.83	[-1.27]
France	0.58	[0.94]	0.86	[1.32]	3.56	[1.50]
Germany	0.23	[0.20]	1.16	[1.44]	1.06	[0.94]
Italy	-0.66	[0.31]	0.36	[0.26]	2.14	[1.39]
United Kingdom	0.84	[1.37]	0.94	[1.81]	2.83	[0.45]
Austria	0.94	[3.36]	1.28	[3.02]	0.08	[0.09]
Belgium	0.99	[2.57]	1.35	[2.52]	-1.53	[-1.07]
Denmark	-32.11	[1.55]	-1.50	[0.59]	0.64	[0.40]
Netherlands	1.00	[1.41]	1.19	[0.78]	1.95	[0.78]
Norway	1.19	[1.85]	1.02	[0.97]	6.21	[2.36]
Sweden	0.17	[0.08]	0.81	[2.50]	3.43	[3.48]
Switzerland	1.34	[4.60]	1.28	[3.74]	0.21	[0.12]
Eleven European Countries	0.58	[0.98]	0.94	[1.78]	2.04	[1.26]

TABLE 13

Alternative Unemployment
Concepts for 1984

	Actual	Natural Rate of Unemployment: Based on Trend Output	Natural Rate of Unemployment: Based on Hysteresis Output
United States	7.4	4.0	6.8
Canada	11.2	7.5	9.7
Japan	2.7	2.7	2.8
France	9.7	6.7	8.6
Germany	8.5	4.5	7.3
Italy	10.2	9.3	10.1
United Kingdom	13.0	8.2	12.7
Austria	3.8	3.3	3.5
Belgium	14.0	14.1	12.9
Denmark	10.5	7.0	9.7
Netherlands	14.0	14.9	11.4
Norway	3.0	2.8	2.9
Sweden	3.1	2.8	3.5
Switzerland	1.2	1.5	1.2
Eleven European Countries	9.9	6.2	8.9

TABLE 14

Alternative Wage Gaps in 1984, with Actual Output Gap and with Counterfactual Zero Output Gap

	Wage Gap based on Trend Productivity with Actual Output[a] (1972 = 1.0)	Wage Gap based on Trend Productivity with Q/Q^N = 0.0 for 1980-84
United States	0.93	1.10
Canada	0.86	1.03
Japan	1.01	1.02
France	0.96	1.05
Germany	0.89	1.08
Italy	0.88	1.16
United Kingdom	0.94	1.12
Austria	1.04	1.15
Belgium	1.00	1.10
Denmark	0.97	1.11
Netherlands	0.79	0.81
Norway	0.76	0.83
Sweden	0.89	1.00
Switzerland	1.13	1.01
Eleven European Countries	0.94	1.06

(a) Taken from Table 5b, column 8