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Linking Wages to Changing Output Prices

An Empirical Study of 13 Industrial Countries

Menahem Prywes

In many countries, wages are indexed to consumer prices, protecting the real income of workers in the short run. To protect employment against external shocks that lower profits, developing countries with outward-oriented development strategies should consider linking wages to the value-added output price.

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A shock that lowers profits depresses employment less when wages are flexible in terms of the value-added output price. This kind of flexibility allows a country to remain competitive in world markets when a shock to profits lowers its value-added output price.

In many countries, wages are indexed to consumer prices, thus protecting the real income of workers in the short run. Some industrial countries link wages more closely to the value-added output price. In Japan, for example, bonus schemes link wages to profits. The value-added output price is built from data on wages and profits, so the bonus scheme links wages implicitly to the value-added output price.

Estimates of the elasticity of wages in terms of the value-added output price are high, significant, and of a theoretically plausible magnitude in three industrial countries that perform well in world markets: Japan, Germany, and Switzerland. This suggests that developing countries with outward-oriented development strategies should promote this kind of wage flexibility.

The output price elasticity of wages also appears to be high in two industrial countries that produce primary products: Canada and Australia (although estimates for these countries are lower in quality). This may reflect the difficulty of passing wage increases on to higher commodity prices. Wage flexibility may be particularly important for developing countries exporting primary products.

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by
Menahem Prywes

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I thank Mr. David Coe for his contribution to the specification of the wage equations; and I thank Messrs. Steven Englander, Peter Jarrett, Shahrokh Fardoust, Desmond McCarthy and Paul Armington for many helpful discussions.

Flexibility of wages with respect to the value-added output price promotes adjustment to a shock. Such flexibility is especially helpful to small open economies which suffer from swings in the price of their exports of primary commodities -- a category which includes many developing countries. Yet, wage agreements often stress indexation to the consumer price, thus protecting the real income of employed workers in the short-run. Some industrial countries have nevertheless dealt with this problem by linking wages more closely to the value-added output price: In Japan bonus schemes link wages to profits; the value-added output price is built from data on wages and profits; so the bonus scheme links wages implicitly to the value-added output price. This paper examines the evidence, across a broad range of countries for which data are relatively good, to see if, and where, wages do respond to the value-added output price as opposed to the consumer price.

Bruno and Sachs (1985) demonstrate the relacionship between this sort of wage flexibility and adjustment to a shock. They focus on the reaction of employment to an oil price increase in an oil importing country. An increase in the price of oil decreases the marginal productivity of labor and capital. This lowers profits, so the value-added price falls. If the wage rate falls to the value of its marginal product (evaluated at the value-added output price) labor will be fully employed. Marston and Turnovsky (1985) show that changing wages to accommodate changes in the value-added output price assures full employment. But if nominal wages are rigid or rise with the consumer price capital becomes relatively cheap and the optimal capital-labor ratio rises. Since capital is fixed in the short-run, employment must fall.

This study sketches an appropriate methodology for modeling the relationship between wages and the value-added price which can be applied to the developing countries. The method is to estimate the output price elasticities from aggregate wage equations to control for the contributions of other variables to wage inflation. The wage equations are estimated from the OECD national accounts and employment data. This is the most coherent and internationally comparable available data set. Elasticities are estimated for the seven major industrial countries and six smaller industrial countries, producing an international comparison of the value-added output price elasticity of wages.

The specification of the wage equations was developed for the OECD's InterLink Model, although that specification only includes the prices of consumption. These equations are Phillips Curves which relate wage inflation to unemployment and expected inflation of consumer prices -- these expectations are considered to be adaptive. Other variables such as productivity growth or the minimum wage appear when they are statistically significant. Coe (1985) and Chan-Lee, Coe, and Prywes (1987) report the specification search and the stability tests which support those equations. These well researched and well tested equations provide a strong foundation for the estimation of output price elasticities.

These elasticities are estimated by introducing the value-added output price into these wage equations. Inflation of the value-added output price often differs from inflation of the consumer price because of

changes in the prices of internationally traded goods and services. An alternative specification of the wage equation permits the estimation of the elasticity of wages with respect to the international terms of trade.

The estimates suggest that private sector wages in Japan, Germany, Austria, Sweden, Switzerland, and (to a lesser extent) Canada are quite sensitive to the price of output -- and to the terms of trade. This suggests that employment in these countries is less vulnerable to an external shock that lowers profits. The results for Australia are not significant but do suggest some sensitivity. In contrast, wages in the United States, France, the United Kingdom, Italy, Finland, and The Netherlands appear insensitive to the price of value-added output.

The elasticity estimates provide some evidence that economies capable of fast adjustment (such as Japan) have developed wage flexibility with respect to the value-added output price, as have economies which are particularly exposed to competitive international markets because of the importance of exported primary products in their GDP (such as Canada and Australia). Apparently Canada and Australia must maintain wage flexibility to remain competitive on world markets for primary products. This suggests that primary product producing developing countries need to maintain wage flexibility with respect to the output price in order to remain competitive in their export markets.

The first section of this study explains how the price of output is introduced into the wage equation. The second section discusses the role of the exchange rate in determining wages. The third section presents

elasticity estimates. The fourth section looks for a pattern in the elasticity estimates. A statistical appendix presents the wage equations from which the elasticities were estimated.

I. THE PRICE OF VALUE-ADDED OUTPUT IN THE WAGE EQUATION

The first step in estimation of the output price elasticity is to introduce the output price into the wage equation. A reduced form aggregate wage equation which is derived from supply and demand equations should include both output and consumer prices. The labor supply equation includes the consumer price because the labor-leisure choice depends on the purchasing power of wages. The labor demand equation includes the output price because the value to an employer of an additional unit of labor depends on the market price of output. So a reduced form wage equation should have the form:

$$\underline{W} = a + b*\underline{U} + (1 - c)*\underline{PCP} + c*\underline{PGDPB} + d*\underline{X} \qquad (1)$$

Underlined variables are percentage point changes. W is annual wages and salaries per employee, U is the civilian unemployment rate, and X is labor productivity (defined as real GDP per employee). PCP is the consumer expenditure deflator and PGDPB is the private sector GDP deflator. The coefficients of PCP and PGDPB must sum to one to insure that the equation is homothetic: a doubling of all prices levels will double wages. If the coefficients sum to less (more) than one a one time increase of inflation

of all prices would steadily lower (raise) real wages. This would only be possible if workers suffered from money illusion. Equation 1 can be rewritten in a form that avoids a colinearity problem in estimation:

$$W = a + b*U + PCP \cdot c \cdot (PCP - PGDPB) + d*X \qquad (2)$$

The gap between the inflation of the consumer and output prices appears as a separate variable.[1]

To highlight the role of the terms of trades the gap between the growth of PCP and PGDPB is broken down into its components. By definition:

$$PGDPB = wc*PCP + wi*PI + wx*PX - wm*PM \qquad (3)$$

where PI is the private investment deflator, PX is the exports deflator and PM is the imports deflator. wc, wi, wx, and wm are moving real weights. The price deflator for the government sector is excluded from (3) because PGDPB excludes the sector. So the price gap can be written as:

1/ This gap could also enter the wage equation if labor's share of income is constant, as Jager and Pichelmann (1987) observed in a recent paper on Austria. This would mean that:

(W*L)/(GDPBV*PGDPB)=constant

where L is employment and GDPBV is the real GDP of the private sector. Some algebra shows that:

$$W = PCP + (GDPBV - L) - (PCP - PGDPB)$$

In this special case, the coefficient of the price gap is negative one.

$$\underline{PCP} - \underline{PGDPB} = [(1-wc)*\underline{PCP} - wi*\underline{PI}] - [wx*\underline{PX} - wm*\underline{PM}] \quad (4)$$

The first component is the weighted growth of the price of consumption relative to the price of investment. The second component is the terms of trade: the weighted growth of the price of exports relative to the price of imports.

The change in the terms of trade is sometimes defined as PX-PM -- without weights. However a definition of the terms of trade which includes weights is desirable for use in a wage equation. A shift in the terms of trade changes wages by changing profits if wages are sensitive to the value-added output price (which is partly calculated from data on profits). The impact of export and import prices on profits depends on the share of exports and imports in GDP. In an industrial country, a 10 percent increase in the export price of salt would usually have little effect on profits while a 10 percent increase in the export price of machines might have a substantial effect.

A different and more desirable measure of the terms of trade can be isolated so that it can be tested in the wage equations. The terms of trade can be approximated by PTDD-PGDP, where PTDD is the total domestic demand deflator and PGDP is the overall GDP deflator. This eliminates PCP,

PI, and the government price deflator PG to leave to more clearly isolate the terms of trade: -(wx*PX - wm*PM). However there is a residual term arising from the weights.[2]

II. EXCHANGE RATES AND WAGES

The estimated coefficient of the terms of trade may reflect developments in the foreign exchange market because movement of the exchange rate can shift the terms of trade. The effect of a change of the exchange rate on the terms of trade is, in principal, indeterminant. A depreciation can raise the domestic currency prices of both exports and imports and leave the terms of trade unchanged. But in practice, a depreciation usually worsens the terms of trade as domestic currency import prices rise more than export prices.

Suppliers of imports may initially delay passing a depreciation on to import prices. But a long period of reduced profits financially weakens suppliers of imports. So they raise import prices to reflect most of the depreciation. Domestic currency export prices usually rise by much less than the depreciation. Domestic firms compete with each other and with foreign firms in their export market. So domestic firms eventually must limit the increase in their export price to maintain their export volumes.

2/ PTDD=wc'*PCP+wi'*PI+wg"*PG where PG is the government expenditure deflator. PGDP=wc"*PCP+wi"*PI+wg"*PG+wx"*PX-wm"*PM. The full expression for PTDD-PGDP is (wc-wc")*PCP+(wi'-wi")*PI+(wg'-wg")*PG-(wx"*PX-wm*PM).

Therefore, the end result of a depreciation is a deterioration of the terms of trade and an increase of the consumer price relative to the output price. Wages rise, but they rise more slowly if they are relatively elastic with respect to the output price.

The Scandinavian model ties the exchange rate to the terms of trade and wages in a special way. This model emphasizes the role of export prices in a small, open, and unionized economy. A depreciation increases the domestic currency price of exports and raises the domestic currency price of imports, which protects the domestic market of trade-oriented industry. This raises profits in the tradeables sector (except for industries which have large input costs). Wages in this sector rise because unions and management are sensitive to profits in wage bargaining. Productivity growth is lower in the non-tradeables sector, but unions are powerful and demand equal wage increases across industries. So wages rise faster than productivity, pushing up the price of non-tradeables and leading to economy-wide inflation. The result is that export prices determine wages and the domestic price level. As export prices increase, profits fall in the non-tradeables sector and the profit's share of income falls.[3]

It seems curious that unions would be sensitive to rising profits in the tradeables sector and not to falling profits in the non-tradeables sector. Yet this model is widely believed to have operated in Sweden and

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3/ See Lundberg (1985) pp. 21-23 for a review of the Scandinavian Model.

other Scandinavian countries over a large part of the post-war period. If an economy does function like the Scandinavian Model, the terms of trade should be statistically important in the wage equation.

III. THE ESTIMATED ELASTICITIES

This section presents the estimated elasticities of wages with respect to:

- o The price of output (for the private sector)
- o The terms of trade (for the private sector)
- o The prices of exports and imports of manufactures (for the manufacturing sector)

The strategy is estimate these elasticities in semi-annual aggregate wage equations. The same lag distribution was imposed on all the price variables within a single equation to assure that the resulting equations have desirable dynamic properties.[4] The equations were then

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4/ If the lag distribution on PCP is long and the lag distribution on PCP-PGDPB is short a rise in PCP could lower wages. This cannot occur when the lag distributions on the PCP and the PCP-PGDPB terms are the same and the coefficient of PCP-PGDPB is less than negative one.

estimated using two stage least squares to reduce simultaneous equation bias. The price variables are treated as endogenous while the real variables (unemployment, productivity growth) are treated as exogenous.[5]

Table 1 presents the estimated coefficients of PCP-PGDPB for 13 countries along with their standard errors. The estimated elasticities of wages with respect to the price of output are the negative of these coefficients (as was shown in Section I). Appendix Table 1 presents the estimated wage equations with PCP-PGDPB. If wages have some sensitivity to the price of output the coefficient of PCP-PGDPB will be negative. This coefficient must not be greater than negative one. Otherwise, a ceteris paribus increase of PCP would lower wage growth.

Among the Major Seven Countries, Japan, Germany, and Canada show strong and significant sensitivity of wages to the price of output. The estimated coefficient for Japan is within less than one standard error of negative one: apparently, wages follow only the price of output in Japan. In Germany, the price of output has almost two-thirds of the weight while the price of consumption has only one third. The estimated elasticity for Canada is above, but within a standard error of, the theoretical limit of negative one. The estimated coefficient in the U.S. equation has the wrong sign, although it is insignificant, as are the estimates for France, the United Kingdom, and Italy.

5/ The instruments are the lagged PCP term, current and lagged moving average growth of the money supply, current and lagged moving average growth of import prices, lagged moving average growth of the price of exports, the real variables, and the lag of the remaining price variables.

Table 1: ESTIMATED COEFFICIENTS OF PCP-PGDP: THE NEGATIVE OF THE OUTPUT PRICE ELASTICITY OF WAGES IN THE PRIVATE SECTOR a/

	Elasticities	Standard Error
United States	0.36	(0.58)
Japan	-0.88 b/	(0.20)
Germany	-0.64 b/	(0.21)
France	0.06	(0.24)
United Kingdom	-0.16	(0.33)
Italy	0.34	(1.54)
Canad	-1.48 b/	(0.54)
Australia	-0.98 d/	(0.61)
Austria	-1.24 b/	(0.42)
Finland	0.80	(0.97)
The Netherlands	0.35	(0.44)
Sweden	-2.26 c/	(1.10)
Switzerland	-0.75 b/	(0.19)

a/ See the aggregate wage equations which are presented in Appendix Table 1.
b/ Statistically significant at the 1 percent level.
c/ Statistically significant at the 5 percent level.
d/ Would be significant at the 13 percent level.

Among the small countries, Austria, Sweden, and Switzerland have large and significant coefficients. The estimated coefficient for Sweden is very large, while its estimated coefficient of the unemployment rate is small and insignificant. In Sweden the existence of government employment programs obscures the measurement of the unemployment rate: this may explain why the estimated coefficient is small. Increases in the price of

Swedish exports (and thus the output price) may be associated with increases in production and decreases in the underlying unemployment rate. As a result the estimated coefficient of the output price may be picking up some of the contribution of the underlying unemployment rate, leading to an oversize estimated coefficient.

Table 2 presents the estimated coefficients of PTDD-PGDP from the private sector wage equations. The elasticities of wages with respect to the terms of trade are the negative of these coefficients. Appendix Table 2 presents the wage equations with which the elasticities were estimated. Among the Major Seven, Japan, Germany, and Canada have large and significant elasticities. The estimated elasticity for the United States is correctly signed, but insignificant. Among the small countries, Austria and Switzerland have large and significant elasticities; the estimated elasticity for Sweden is insignificant. More generally, the test statistics for the equations with PTDD-PGDP are inferior to those for the equation with PCP-PGDPB.

Table 2: ESTIMATED COEFFICIENTS OF PTDD-PGDP: THE NEGATIVE OF THE TERMS OF TRADE ELASTICITY OF PRIVATE SECTOR WAGES a/

	Elasticities	Standard Error
United States	-0.20	(1.02)
Japan	-0.77[c]	(0.30)
Germany	-0.75[c]	(0.27)
France	0.04	(0.29)
United Kingdom	-0.19	(0.40)
Italy	-0.63	(0.50)
Canada	-1.86[c]	(0.89)
Australia	-0.44[b]	(0.85)
Austria	-1.22	(0.48)
Finland	0.72	(0.42)
The Netherlands	0.30	(0.40)
Sweden	-1.62	(1.76)
Switzerland	-0.91[b]	(0.32)

a/ See the aggregate wage equations which are presented in Appendix Table 2.
b/ Statistically significant at the 1 percent level.
c/ Statistically significant at the 5 percent level.

It was not possible to estimate a set of manufacturing wage equations with PCP-PGDPB or PTDD-PGDP because semi-annual data on the national product account deflators for the manufacturing sector are not generally available. Equations with the export and import prices of manufactures (PXM and PMM) should reveal whether the terms of trade influence wages. Table 3 presents estimated coefficients of PXM-PCP and/or

PMM-PCP for 4 countries. These are the elasticities of manufacturing wages with respect to manufacturing export and import prices. Appendix Table 3 presents the manufacturing wage equations.

Table 3: ESTIMATED ELASTICITIES OF PXM-PCP AND PMM-PCP FOR THE MANUFACTURING SECTOR[a]

	PXM-PCP	Standard Error	PMM-PCP	Standard Error
United States	--	--	0.22[b]	(0.04)
Canada	0.89[d]	(0.56)	-0.87[c]	(0.43)
Australia	--	--	-0.34[c]	(0.15)
Austria	0.54[c]	(0.24)	--	--

a/ See the aggregate wage equations which are presented in Appendix Table 3.
b/ Statistically significant at the 1 percent level.
c/ Statistically significant at the 5 percent level.
d/ Would be significant at the 13 percent level (in a two-tailed test).

The estimated coefficient of PMM-PCP for the United States is positive and very significant -- the only significant result for the US. The positive sign suggests that rising import prices of manufactures raise wages by allowing U.S. manufacturers to increase their prices and profits.[6]

6/ However, firms which depend on imported manufactures may experience increasing costs and falling profits.

In Canada, the estimated coefficients of PXM-PCP and PMM-PCP are about equal with opposite signs. The Australian equation has a significant and negative coefficient of PMM-PCP. This may suggest that changes in the price of imported capital goods have important effects on costs and profits in Australia. Finally, the Austrian equation has a large and significant coefficient of PXM-PCP.

IV. A PATTERN IN THE ELASTICITY ESTIMATES?

Some of the obvious hypotheses do not explain the elasticity estimates. A common hypothesis states that wages are more sensitive to the price of output in open and outward looking economies: competition from imports could reduce the profits of firms that do not control wage costs; at the same time competition in foreign markets could limit export prices and limit the ability to pay wage increases. The share of exports in real GDP is one indicator of a country's exposure to international competition (see Table 4). France, the United Kingdom, Italy, Austria, Finland, and the Netherlands all have high export shares, yet their output and trade price elasticities are low. Yet wages are sensitive to output price in Japan where the export share of GDP is relatively low.

While the evidence is modest, countries with important exports of non-oil primary commodities do appear to have more flexible wages. Commodity prices are usually determined in high volume markets, so that a small country cannot pass on wage increases. Furthermore, wide swings in commodity prices can depress profits, forcing adjustment of wages. Canada and Australia have relatively high shares of primary commodity exports in their GDP and output price sensitive wages (see Table 4). The Netherlands also has a high share, but this figure includes transshipment.

Japan, Germany, Sweden and Switzerland exhibit strong output price elasticities of wages. A full explanation of these estimates probably lies in their wage bargaining institutions. Japan, for instance, is well known for its bonus system and for the sensitivity of its unions to profits. The strong elasticity estimates for Sweden are consistent with the hypothesis that the Scandinavian model was in operation, at least for a large part of the data period.

Table 4: THE SHARE OF EXPORTS IN GDP: 1986[a]
(In Percentage Points)

	Exports of Goods and Services	Exports of Non-Oil Primary Commodities[b]
United States	8.7	0.8
Japan	15.9	0.3
Germany	31.0	2.7
France	22.5	4.7
United Kingdom	29.2	2.4
Italy	24.0	2.2
Canada	34.4	7.2
Australia	19.3	7.1
Austria	41.0	3.8
Finland	31.9	4.6
The Netherlands	58.6	16.0
Sweden	35.4	4.1
Switzerland	39.6	2.0

a/ Real GDP in 1980 prices.
b/ Real exports of SITC categories 0, 1, 2, and 4.

Sources: OECD National Accounts and United Nations trade data.

V. CONCLUSIONS

A shock which lowers profits depresses employment less when wages are flexible with respect to the value-added output price. This kind of flexibility allows a country to remain competitive in world markets when a shock to profits lowers its value-added output price. Estimates of the elasticity of wages with respect to the value-added output price are high, significant, and of a theoretically plausible magnitude in several industrial countries which perform well in world markets: Japan, Germany,

and Switzerland. This suggests that developing countries with outward-oriented development strategies should promote this kind of wage flexibility. The output price elasticity of wages also appear to be high in two primary product producing industrial countries: Canada and Australia (although these estimates are of lower quality). This may reflect the difficulty of passing on wage increases to higher commodity prices. This suggests that wage flexibility is particularly important for primary product exporting developing countries.

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Appendix Table 1
AGGREGATE PRIVATE-SECTOR WAGE EQUATIONS WITH THE CONSUMPTION-OUTPUT PRICE INFLATION GAP (a)

	Constant	Unemployment rate (U)			Inflation (c)	Productivity (d)	PCP-PGDPB (e)	Other (f)	SEE	DW	Adj_R^2
		U [elasticity] (b)	lnU	1/U							
United States 1964II-86II	4.25 (0.35)	-0.63 (0.08)			1.03 (0.12)	0.30 (0.09)	0.36 (0.58)		0.53	2.05	0.76
Japan 1970II-85II	-3.15 (0.20)	[-1.93]		7.54 (1.01)	1.00 (--)	0.51 (0.15)	-0.88 (0.20)		0.82	2.09	0.81
Germany 1966I-86II	0.40 (0.30)	[-0.10]	-0.35 (0.14)		1.00 (--)	0.62 (0.11)	-0.64 (0.21)		0.72	2.25	0.84
France 1964II-86II	2.83 (0.28)	-0.27 (0.05)			0.93 (0.09)		0.06 (0.24)	0.11 (0.04)	0.71	1.34	0.36
United Kingdom (g) 1965I-86II	1.81 (0.40)	-0.47 (0.15)			1.00 (0.08)		-0.16 (0.33)		1.24	1.80	0.82
Italy 1971II-84II	-1.71 (1.64)	[-0.39]		19.06 (11.00)	1.00 (--)		0.34 (1.54)		1.58	1.84	0.24
Canada 1969I-86II	3.07 (1.15)	-0.33 (0.14)			1.00 (--)		-1.48 (0.54)		1.13	1.77	0.63
Australia 1971I-86II	2.37 (1.04)	-0.33 (0.17)			1.00 (--)		-0.98 (0.61)		1.99	1.81	0.46
Austria 1970II-86II	1.79 (0.32)	[-0.56]	-1.22 (0.38)		1.00 (--)		-1.24 (0.42)		0.93	2.31	0.70
Finland 1971I-85II	-0.50 (0.87)	-0.32 (0.14)			1.00 (--)	0.89 (0.50)	0.80 (0.97)		2.07	1.96	0.28
Netherlands 1971II-86II	3.68 (0.61)	[-0.18]	-1.47 (0.31)		1.00 (--)		0.35 (0.44)		0.94	1.51	0.53
Sweden 1972II-85II	-0.35 (2.68)	[-0.08]		0.20 [5.67]	1.00 (--)		-2.26 (1.10)		2.31	2.16	0.49
Switzerland (h) 1970II-84II	-28.40 (10.62)	0.29 (0.11)			1.07 (0.14)	0.35 (0.11)	-0.75 (0.19)		0.88	1.94	0.78

See the notes at the end of the appendix tables.

Appendix Table 2
AGGREGATE PRIVATE-SECTOR WAGE EQUATIONS WITH THE TERMS OF TRADE (a)

	Constant	Unemployment rate (U)			Inflation (c)	Productivity (d)	PTDD-PGDP (i)	Other (f)	SEE	DW	Adj_R^2
		U [elasticity] (b)	lnU	1/U							
United States 1964II-86II	4.15 (0.34)	-0.61 (0.08)			1.03 (0.17)	0.28 (0.09)	-0.20 (1.02)		0.53	2.03	0.76
Japan 1970II-85II	-3.85 (0.68)	[-2.14]		8.37 (1.18)	1.00 (—)	0.43 (0.18)	-0.77 (0.30)		0.97	1.62	0.74
Germany 1966I-86II	0.38 (0.34)	[-0.09]	-0.34 (0.16)		1.00 (—)	0.62 (0.13)	-0.75 (0.27)		0.82	2.00	0.80
France 1964II-86II	2.82 (0.29)	-0.28 (0.04)			0.95 (0.09)		0.04 (0.29)	0.11	0.71	1.35	0.86
United Kingdom (g) 1965I-86II	1.76 (0.40)	-0.49 (0.15)			1.02 (0.08)		-0.19 (0.40)		1.24	1.80	0.82
Italy 1971II-84II	2.46 (1.66)	[-0.52]		24.89 (11.18)	1.00 (—)		-0.63 (0.50)		1.52	2.13	0.30
Canada 1969I-86II	4.47 (0.93)	-0.50 (0.11)			1.00 (—)		-1.86 (0.89)		1.22	1.59	0.57
Australia 1971I-86II	2.77 (1.02)	-0.41 (0.17)			1.00 (—)		-0.44 (0.85)		2.02	1.73	0.45
Austria 1970II-86II	2.15 (0.34)	[-0.78]	-1.71 (0.40)		1.00 (—)		-1.22 (0.48)		0.93	2.30	0.70
Finland 1971I-85II	-0.81 (1.08)	-0.18 (0.11)			1.00 (—)	1.54 (0.60)	0.72 (0.42)		1.90	1.98	0.24
Netherlands 1971II-86II	3.63 (0.64)	[-0.21]	-1.44 (0.32)		1.00 (—)		0.30 (0.40)		0.95	1.65	0.52
Sweden 1972II-85II	-2.63 (2.53)	[-0.91]		5.15 (5.37)	1.00 (—)		-1.62 (1.76)		2.98	1.96	0.42
Switzerland (h) 1970II-84II	-40.3 (14.20)	0.41 (0.14)			1.05 (0.17)	0.33 (0.13)	-0.91 (0.32)		1.11	1.76	0.64

See the notes at the end of the Appendix tables.

Appendix Table 3
MANUFACTURING WAGE EQUATIONS WITH THE GROWTH OF EXPORT AND IMPORT PRICES (a)

	Constant	Unemployment rate (U)		Inflation	PXM-PCP	PMM-PCP	SEE	DW	Adj_R^2
		U [elasticity] (b)	lnU	(c)	(j)	(k)			
United States 1967I-86II	2.67 (0.31)	-0.38 (0.05)		1.00 (--)	--	0.22 (0.04)	0.48	1.29	0.77
Canada 1971I-86I	5.42 (1.17)	-0.56 (0.17)		1.00 (--)	0.89 (0.56)	-0.87 (0.43)	1.10	1.79	0.63
Australia 1972II-86I	4.36 (1.34)	-0.58 (0.21)		1.00 (--)	--	-0.34 (0.15)	2.39	1.40	0.33
Austria 1971I-86I	3.21 (0.60)	[-1.00]	-2.19 (0.67)	1.00 (--)	0.54 (0.24)	--	1.57	2.40	0.57

See the notes at the end of the appendix tables.

Appendix Table 4

ESTIMATED COEFFICIENTS OF THE DUMMY VARIABLE

(Estimated errors in parentheses)

Country	Variable name	Equations with PCP-PGDPB (App.Table 1)		PTDD-PGDP (App. Table 2)		PXM-PCP (App. Table 3)	PMM-PCP (App. Table 3)
United States	D70IT72I	-0.89	(0.31)	-1.00	(0.27)	0.34	(0.23)
	D67	-1.98	(0.41)	-2.00	(0.42)	X	
Japan	D74T75X	0.76	(0.44)	0.99	(0.52)		
Germany	D69IIT70II	2.54	(0.58)	3.14	(0.57)		
	D71IIT74IS	1.74	(0.29)	1.78	(0.34)		
France	D68IIT69IX	1.29	(0.72)	1.27	(0.71)		
United Kingdom	D70I	2.48	(1.26)	2.46	(1.26)		
	D74IIT77IIX	3.85	(0.52)	3.86	(0.53)		
Italy	D73	2.85	(1.23)	3.24	(1.17)		
Canada	D70I	-3.54	(1.21)	-4.02	(1.27)	X	
Australia	D74	5.44	(1.54)	5.75	(1.60)	X	
Austria	D71I	4.75	(1.02)	5.72	(0.96)	4.93	(1.70)
	D73II	2.27	(1.01)	2.19	(1.03)	2.95	(1.68)
Netherlands	D80IIT81I	-2.18	(0.76)	-2.11	(0.74)		
Sweden	D737479S	3.78	(1.17)	3.53	(1.24)		
	D77S	-6.76	(1.99)	-6.83	(2.12)		
	D758081S	-3.06	(1.17)	-2.62	(1.22)		
Switzerland	D70II	2.80	(0.90)	3.37	(1.14)		

X dropped from the equation.

Appendix: Table 5

EXPLANATION OF COUNTRY-SPECIFIC DUMMY VARIABLES

	Description	Non-zero values for dummy variables	Name
United States	Dummy variable for wage/price controls	1.0 from 70I to 72I	D70IT72I
	Dummy variable for the effect of an increase in the military or civilian wages	1.0 in 67I and 67II	D67
Japan	Dummy variable for unusual seasonal pattern	1.0 in 74I and 75I, and -1.0 in 74II and 75II	D74T75X
Germany	Dummy variable for the events of 1969 and 1970	1.0 from 69II to 70II	D69IIT70II
	Dummy variable for an unusual seasonal variable	Alternates from 1 to -1 from 71II to 74	D71IIT74IS
France	Dummy variable for the events of 1968	1.0 in 68II and -1.0 in 69I	D68IIT69IX
United Kingdom	Dummy variable for unusually large wage increases, perhaps in anticipation of the imposition of wage controls	1.0 in 70I	D70I
	Dummy variable for unusually large wage increases, perhaps associated with the newly- elected Labour government and the contract policy	1.0 from 74II to 75I, and -1.0 from 75II to 77II	DD74IIT77IIX
Italy	Dummy variable for unusually large wage increases	1.0 from 73I to 73II	D73
Canada	Dummy variable for unusually small wage increases	1.0 in 70I	D70I
Australia	Dummy for unusually large wage increases, possibly reflecting an award in the National Wage Case by the Arbitration Commission	1.0 from 74I to 74II	D74
Austria	Dummy variable for unusually large wage increase, perhaps reflecting buoyant profits and unusually strong demand	1.0 in 71I	D71I
	Dummy variable for an unusually large wage increase, perhaps reflecting an unusually large price increase	1.0 in 73II	D73II
Netherlands	Dummy variable for a reduction in indexing and bonuses	1.0 in 80II to 81I	D80IIT81I
Sweden	Dummy variables for unusual seasonal patterns	1.0, -1.0 in 73,74 and 79 1.0, 1.0 in 1977 1.0 -1.0 in 75, 80, 81	D737479S D77S D758081S
Switzerland	Dummy variable for exceptionally large wage increases in the construction sector during a period of strong excess demand for labour, which spread rapidly to other sectors of the economy	1.0 in 70II	D70II

Notes to the Appendix tables

a) The dependent variable is the growth of wages and salaries per head in the private sector, except for the manufacturing equations, where the dependent variable is growth of the hourly wage in manufacturing. The equations were estimated with growth minus the inflation term as the dependent variable. All equations are estimated by two-stage least squares on seasonally-adjusted semi-annual data; per cent changes refer to semi-annual changes. The standard error of the estimate (SEE), the Durbin-Watson statistic (DW) and the adjusted proportion of explained variation (R^2) are calculated using the actual values of the independent variables; R^2 is based on the error sum of squares. Standard errors appear in parentheses below the coefficient estimates. Estimated elasticities of the dummy variables are reported in Appendix Table 5.

b) For those countries where a non-linear specification of the unemployment rate is used, the figures in square brackets give the elasticity of wages with respect to the unemployment rate evaluated at the mean unemployment rate for the sample period. These bracketed figures are comparable to the coefficient estimates in the countries with a linear specification.

c) Inflation is defined as a moving average of current and past growth of the personal consumption deflator for all countries. For Japan, Germany, Italy, Canada, Australia, Austria, Finland, the Netherlands

and Sweden the coefficient of inflation was constrained to one. A two-period weighted moving average is used for Japan (weights of 0.67, 0.33), Germany (0.75, 0.25) and Italy (0.6, 0.4). For the other countries, the inflation term is a simple moving average of either two semesters (France, Australia, the Netherlands, Switzerland), three semesters (the U.K., Austria, Finland), four semesters (Sweden), five semesters (Canada) or seven semesters (the U.S.).

d) Productivity growth is specified as a two-period moving average for the U.S. (weights 0.67, 0.33), Japan (0.67, 0.33) and Germany (0.5, 0.5); and for Finland, it is a simple three-period moving average; for Switzerland it is unlagged.

e) Growth of the consumer expenditure deflator minus the growth of the private sector GDP deflator, with the same weights as in note C.

f) The equation for France include the growth of the minimum wage relative to the lagged growth of aggregate wages.

g) In the U.K. equation, the unemployment rate is entered as the difference from a lagged eight-period moving average of unemployment.

h) The activity variable for Switzerland is a measure of the employment rate defined as total employment divided by a lagged two-period moving average of the labour force, multiplied by 100.

i) A moving average of the growth of the total domestic demand deflator (PTDD) minus the growth of the GDP deflator (PGDP), with the same weights as in note C.

j) A moving average of the growth of the price of manufactured exports (PXM) minus the growth of PCP, with the same weights as in note C.

k) A moving average of the growth of the price of manufactured imports (PMM) minus the growth of PCP, with the same weights as in note C.

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