

**The Equivalence of a Productivity-
geared Wage Policy and the
Scandinavian Model of Inflation**

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Österreichisches Institut für Wirtschaftsforschung
Austrian Institute of Economic Research

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1. Productivity guidelines for wage growth

The occurrence of high unemployment and low growth in Western economies has given rise to the perception among many economists that in important markets, businesses and unions have some degree of monopoly power; money wages and prices tend to increase at unacceptably high rates in the absence of excess demand. To combat this type of cost inflation, an incomes policy is often recommended as an alternative to macroeconomic control of the economy through fiscal or monetary policy, with the intent of improving the trade-off between inflation and unemployment.

The guidelines recommended for wage increases and adopted in many Western countries have taken the form of a productivity-geared wage policy. Such a policy has great intuitive appeal: with wage increases limited to the national trend of productivity growth, labor costs per unit of output remain constant, and there is no reason for businesses to raise the prices of their products; moreover, the relative shares of labor and non-labor incomes in total output remain unchanged.¹⁾ This kind of incomes policy has

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been implemented in many industrial countries. Dutch incomes policies, for example, followed productivity criteria for wage and price behavior with the goal of price stability (and external stability as well) in one form or another in the fifties and sixties (Ulman and Flanagan, 1971, pp.62-64; Pen, p.324). In Germany, this kind of wage and price restraint was proposed at the beginning of the sixties in a statement by the President of the Bundesbank, issued at the request of Chancellor Adenauer, which warned against wage increases in excess of expected gains in productivity (Flanagan et al., 1983, p.278). Perhaps the best known example of productivity guidelines are the celebrated U.S. Guideposts for noninflationary wage and price behavior (Economic Report of the President, 1962, pp.185-190). First formulated as a contribution to public discussion for appraising wage and price behavior, the 1964 Report of the Council of Economic Advisors described these guidelines as a standard for private wage and price decisions (Solow, 1966).

Similar policies were adopted in the United Kingdom. In 1962, a White Paper formulated a guideline for wage increases based on a trend in the rate of increase in national output (Ulman and Flanagan, 1971, p.17; Fallick and Elliot, 1981, p.266). In 1965, the government promulgated a general guideline for wage increases similar to those in the U.S. (Ulman and Flanagan, 1971, p.18). Austria provides another example of incomes policies. Advocated in the late

fifties (Streibler, 1960), variants of productivity guidelines have been followed over the last 30 years (Flanagan et al., 1983, pp.63-76; Pollan, 1984, pp.163-169).

Such guidelines generally permit exceptions to satisfy the need for allocational efficiency, but do not allow for cost-of-living adjustment in wages. Indeed, some of the British guidelines specifically rule out price increases as a reason for exceptions. This stance is reasonable when the rate of inflation is very low or when the wage norms are enacted after a period of wage and price freeze. But at times when the rate of inflation is non-negligible, rising beyond 1 or 2 percentage points, formulating a wage norm without regard to price increases will deprive the wage norm of its credibility, which is essential to its success. Furthermore, when inflation is already well entrenched in the economic fabric of a country, policy makers are more concerned with preventing a run-away inflation than with achieving a return to a non-inflationary climate, and the rate of inflation will be explicitly considered in the wage guidelines. In Germany, for example, the Council of Economic Experts formulated a wage norm for 1966 that called for maximum increases of 5,9 percent, with the room for pay increases consisting of an estimated rise in productivity of 4 percent and an increase in consumer prices of 2 percent (Ulman and Flanagan, 1971, p.187). A similar norm prevailed in Austria in the early seventies (Pollan, 1984, p.164).

This norm may be called a wage policy with full indexation on the basis of productivity and consumer prices, or simply a productivity-cum-inflation wage policy.

2. Incomes policies in an open economy

For a closed economy, incomes policy is often recommended as a way of attaining domestic price stability; in an open economy highly dependent on foreign trade, however, its objective may also be to keep cost developments stable in relation to those of its trading partners. This, it is claimed (Ulman and Flanagan, 1971, p.79), was indeed the task originally assigned to Dutch incomes policy.²⁾ This conflict between the goals of domestic price stability and external equilibrium has been succinctly characterized by Johnson: "A national incomes policy for a country maintaining a fixed exchange rate therefore makes no sense, if the policy is defined on the conventional lines of seeking to maintain price stability by confining wage increases to the growth of productivity. The only rational, and also feasible, policy in the long run would be a policy that sought to raise wages and prices in line with the general world inflationary trend, so as to keep the balance of payments balanced and avoid either unwanted resource transfers to other countries through balance-of-payments surpluses or politically embarrassing dependence on resource

transfers from other countries through balance-of-payments deficits". (Johnson, 1972, p.275)³⁾ The choice facing the policy maker in an open economy is further complicated by the fact that labor costs are not the only costs relevant for pricing decisions. Fluctuations in prices of internationally traded goods must invariably, unless fully offset by changes in the exchange rate, affect the domestic price level.

Concern with maintaining or improving international competitiveness and the growing role of foreign prices in the domestic price and wage formation process have led to the formulation of the Scandinavian model of inflation as an alternative to the traditional productivity-gearred wage model.⁴⁾ This inflation model, a variant of models of structural inflation (Frisch, 1983, p.153), by distinguishing between two sectors in the economy, provides a more complex analysis of the relationship between wage negotiations and price movement in the aggregate economy, but remains simple and transparent enough to be intuitively appealing to the economist and the policy maker. It has been described both as a positive model of inflation that fits the inflation process in open economies and as a normative model that sets out norms for incomes policy that improve on the rules emanating from the simplistic inflation models based on total aggregates (Edgren et al., 1973, p.15).

The following brief presentation of the Scandinavian model is taken from Assar Lindbeck (1979, pp.13-40). The Scandinavian model is then compared with a model of productivity-gearred wage growth.

- (1) $p_T = p_W + e,$
- (2) $w_T = p_T + q_T,$
- (3) $w_N = w_T,$
- (4) $p_N = w_N - q_N,$
- (5) $p = ap_T + (1-a)p_N,$
- (6) $q_T > q_N.$

The symbols are:

- a = constant weight (share of tradable sector in output).
- p_W = world market prices for tradables.
- e = exchange rate,
- p_T, p_N = domestic price level for tradables and nontradables,
- p = aggregate price level,
- w_T, w_N = wage rate in the tradable and nontradable sector,
- q_T, q_N = labor productivity in the tradable and nontradable sector

All variables are in relative rates of change.⁵⁾

The Scandinavian model distinguishes between two sectors of the economy, the open sector and the sheltered sector. The rate of growth of labor productivity is greater in the open sector (eq.(6)). Prices in the open sector are equal to world prices plus the rate of exchange rate depreciation (perfect commodity arbitrage, (eq. (1)).⁶⁾ Factor income shares in the tradable sector remain stable if money wage inflation in this sector equals the rate of world market prices for tradables plus the rate of growth of labor productivity (eq.(2)). Money wage increases in the open sector are transmitted to the sheltered sector through a homogenous labor market or a solidaristic wage policy on the part of unions (eq.(3)). Price inflation in the sheltered sector is based on the increase in labor cost in this sector (eq.(4)). The domestic rate of inflation is equal to a weighted average of inflation in the open and sheltered sector (eq.(5)), with the weights being the sector shares of output.

Solving for the domestic rate of inflation yields

$$(7) \quad p = (p_w + e) + (1-a)(q_T - q_N).$$

The rate of inflation is equal to the rate of growth of world prices plus the rate of exchange rate depreciation,

plus the weighted difference in the rate of productivity between the tradable sector and the nontradable sector (Lindbeck, 1979, p.15). The term p_w represents imported inflation, while the factor $(1-a)(q_T - q_N)$ reflects the structural element in inflation: the higher the differential in productivity growth, the higher the rate of inflation. The term e may be said to reflect 'exchange rate induced inflation' (Lindbeck, 1979, p.16).

The Scandinavian model has formed the basis for policy recommendations. Under collective bargaining, the principal components of compensation, negotiated rates, wage drift, and social charges, are largely determined independent of each other; therefore, labor cost increases in the open sector may not be limited to the room provided by increases in labor productivity and world prices (Flanagan et al., 1983, pp.36-37). In this model then, the role of an incomes policy is to contain compensation increases to the rate consistent with maintaining international price competitiveness, and therefore w_T may be viewed as a target.

3. A comparison of the productivity-cum-inflation model with the Scandinavian model

First define average productivity growth as a weighted sum of productivity growth in the open and in the sheltered sector; the weights are the same as in the definition of the domestic rate of inflation:

$$(8) \quad q = aq_T + (1-a)q_N.$$

Both in the Scandinavian and the productivity-gearred wage model, wages in the open and sheltered sector grow at the same rate.⁷⁾ Call this growth rate w :

$$(9) \quad w = w_T = w_N.$$

In the wage model with full indexation on aggregate productivity and on the aggregate price level, wages grow at the rate given by the sum of productivity growth in the whole economy and of the rate of inflation in the whole economy.⁸⁾

$$(10) \quad w = q + p \\ = aq_T + (1-a)q_N + p.$$

To complete the model for the open economy, the equation describing the price setting mechanism in the sheltered sector (eq. (4)) and the equation defining the domestic rate of inflation (eq. (5)) must be added. To make the model more compact, the expression for p_T (eq. (1)) is substituted into the definition of the general rate of inflation. e , the rate of depreciation, is considered as fixed in this and the following two sections, and $(p_w + e)$ can be treated as one

variable. (p_w+e) is the price rise on world markets in domestic currency.

The complete model with the productivity-cum-inflation wage rule may then be written as follows:

$$(10) \quad w = aq_T + (1-a)q_N + p,$$

$$(4) \quad p_N = w - q_N,$$

$$(5) \quad p = a(p_w+e) + (1-a)p_N.$$

The endogenous variables in this model are w , p , and p_N ; the exogenous variables are q_T , q_N , and (p_w+e) .

Writing the exogenous variables on the right side, we have the following system of linear equations:

$$(10a) \quad w - p = aq_T + (1-a)q_N,$$

$$(I) \quad (4a) \quad w - p_N = q_N,$$

$$(5a) \quad p - (1-a)p_N = a(p_w+e).$$

or in matrix form:

$$(Ia) \quad \begin{bmatrix} 1 & -1 & 0 \\ 1 & 0 & -1 \\ 0 & 1 & -(1-a) \end{bmatrix} \begin{bmatrix} w \\ p \\ p_N \end{bmatrix} = \begin{bmatrix} aq_T + (1-a)q_N \\ q_N \\ a(p_w+e) \end{bmatrix}$$

Let us now write the Scandinavian model in the same compact form:

$$\begin{aligned}
 (2a) \quad w &= q_T + (p_w + e), \\
 (II) \quad (4a) \quad w - p_N &= q_N, \\
 (5a) \quad p - (1-a)p_N &= a(p_w + e).
 \end{aligned}$$

or

$$(IIa) \quad \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & -1 \\ 0 & 1 & -(1-a) \end{bmatrix} \begin{bmatrix} w \\ p \\ p_N \end{bmatrix} = \begin{bmatrix} q_T + p_w \\ q_N \\ a(p_w + e) \end{bmatrix}$$

It is now easy to see that model (I) is equivalent to model (II). Through a series of elementary row operations, the augmented matrix of each model can be brought into the same row-echelon normal form (reduced form) from which the solutions can be read off:⁹⁾

$$(III) \quad \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} w \\ p \\ p_N \end{bmatrix} = \begin{bmatrix} (p_w + e) + q_T \\ (p_w + e) + (1-a)(q_T - q_N) \\ (p_w + e) + q_T - q_N \end{bmatrix}$$

Here we see a most interesting result: the model in which wages are fully indexed on the basis of average productivity and of the domestic price level is equivalent to the Scandinavian model in which wages increase in accordance with the room provided by the productivity increase in the open sector and the price rise on world markets.¹⁰⁾

As a corollary it follows that gearing wage growth to the growth of aggregated productivity and the aggregate inflation rate satisfies the condition that the international price competitiveness, the essence of the Scandinavian model, is not jeopardized.

4. Mixed models with more than 100% or less than 100% inflation indexation

The equivalence of the Scandinavian and the productivity-cum-inflation models is based on the following feature: to each productivity indexation scheme there corresponds a certain inflation indexation scheme. A policy mix then, of linking wage growth to price increases of one model, but to productivity growth of another model, will bring about changes in international price competitiveness. Unions in the exposed sector, for example, might point to

high productivity gains in their own sector when demanding high wage increases, but at the same time ask for full cost of living adjustments based on the general inflation rate. Such wage demands, if granted, will cause a deterioration in international price competitiveness. This issue is further explored in this section.

In terms of the productivity-cum inflation model, wages are fully indexed on the basis of the domestic price level and of average productivity. Both of these restrictions are now lifted, and the question is asked under what configuration of indexation parameters will the equivalence to the Scandinavian model continue to hold.

The wage formation rule can now be written as follows:

$$(11) \quad w = cq_T + (1-c)q_N + dp.$$

c and d are coefficients indicating the degree of indexation.

$$(4) \quad p_N = w - q_N.$$

$$(5) \quad p = ap_T + (1-a)p_N.$$

The rule of price formation in the sheltered sector and the definition of the general inflation rate remain unchanged. On these equations we now impose the "competitiveness" condition of the Scandinavian model, namely, that the rate of wage increase is equal to the room provided by the sum of

the increase in prices of tradables and of productivity growth in the exposed sector:

$$(12) \quad w = q_T + (p_W + e) \cdot 11)$$

Writing equations (11), (4), (5), and (12) as a system of equations

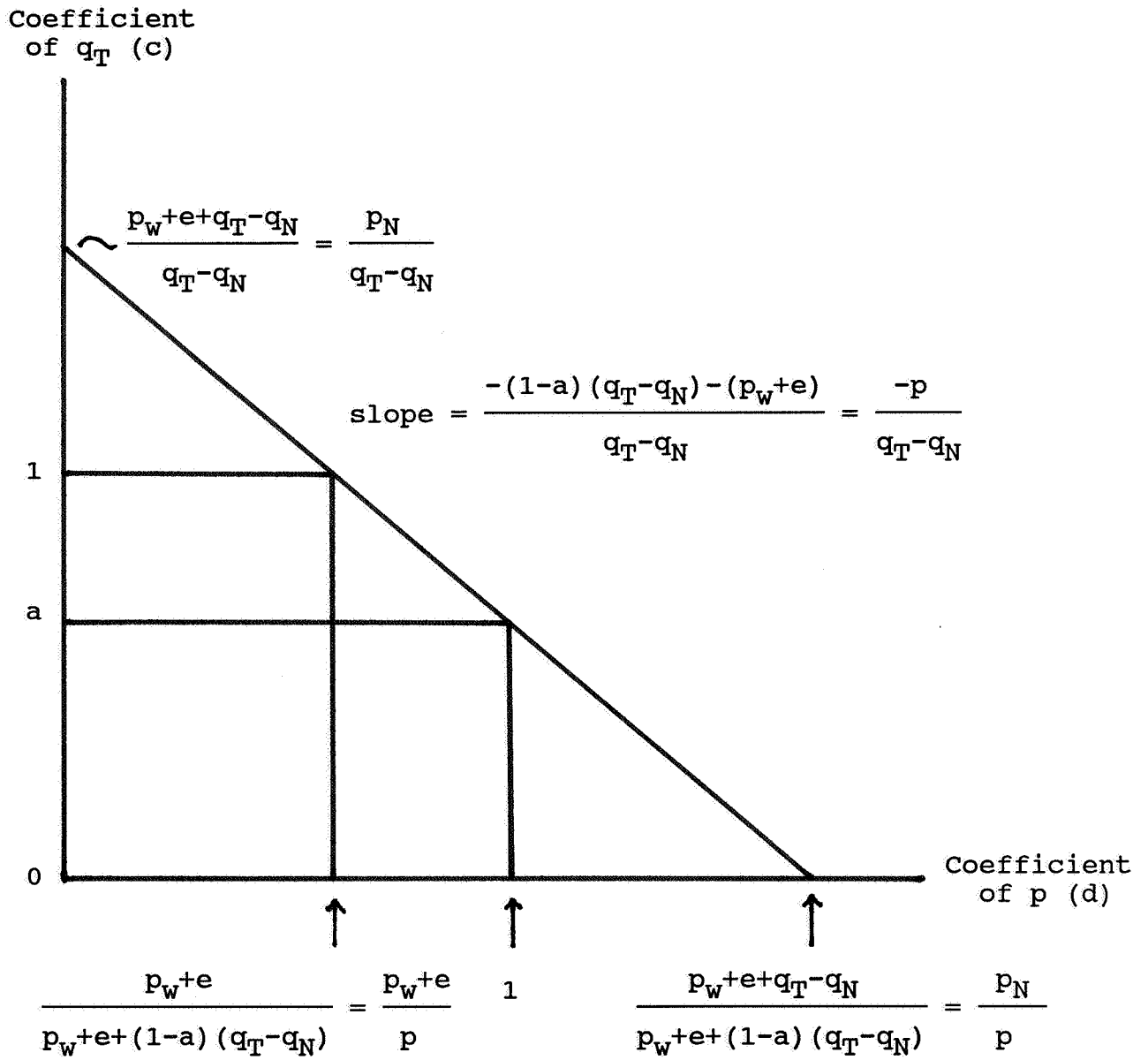
$$\begin{aligned} w - dp &= cq_T + (1-c)q_N, \\ w - p_N &= q_N, \\ (IV) \quad p - (1-a)p_N &= a(p_W + e), \\ w &= q_T + (p_W + e), \end{aligned}$$

we notice that the last three rows, which are identical to the Scandinavian model, determine the value of w , p , and p_N . Substituting the solutions for w , p , and p_N (see model (III)), into the first equation of (IV) yields the following relation between the indexation parameters c and d :

$$(13) \quad (1-c)(q_T - q_N) - d(1-a)(q_T - q_N) + (1-d)(p_W + e) = 0.$$

Eq.(13) describes all combinations of indexation parameters that are compatible with the maintenance of price competitiveness in the external sector for any given value of $(p_W + e)$. The relation between c and d is graphed in Figure 1 for positive values of $(q_T - q_N)$ and positive values of $(p_W + e)$.

Figure 1



We now select the most interesting cases:

Case 1: If $d=1$, $c=a$. Substitution of these values into eq.(11) yields the wage determination rule

$$(10) \quad w = aq_T + (1-a)q_N + p \\ = q + p.$$

This is the wage rule with full indexation on average productivity and on inflation.

Case 2: If productivity growth in the exposed sector is taken as the norm for the economy as a whole, i.e., if $c=1$, then

$$(14) \quad d = \frac{(p_w+e)}{(p_w+e) + (1-a)(q_T - q_N)} < 1.$$

The value of d is not a constant anymore but depends on (p_w+e) . To maintain international price competitiveness, the coefficient of the rate of inflation in the whole economy must be less than unity. Substituting the values of c and d into the wage formation rule leads to the Scandinavian rule for wage growth:

$$(15) \quad w = q_T + (p_w+e) = q_T + p_T.$$

Case 3: The case of $c=0$ takes productivity in the sheltered sector as the norm to which wages are to be geared. This value of c requires that

$$(16) \quad d = \frac{(p_w+e) + q_T - q_N}{(p_w+e) + (1-a)(q_T - q_N)} > 1.$$

In this case, the coefficient of overall inflation may be larger than unity without impairing the competitiveness of the open sector. Substituting the solutions for p and p_N into eq. (16) yields a simple expression for d .

$$(17) \quad d = p_N/p.$$

Then the wage formation rule can simply be written as

$$(18) \quad w = q_N + p_N.$$

Just as wages may be indexed on the basis of productivity in the exposed sector and on prices of tradables, they may be indexed on productivity in the sheltered sector and on prices in the sheltered sector without impairing the price competitiveness in the exposed sector.¹²⁾

Because of the structure of the model, any linear combination (with coefficients that sum up to unity) of sectoral productivity growth and sectoral price increases is also admissible. One such combination is the indexation of wages on average productivity and the general price level; this is the productivity-cum-inflation wage model, which is

treated under a slightly different perspective in the following section.

5. A different parametrization of the wage rule

Despite the insights provided by the Scandinavian model, some policy objectives, such as price stability and balance of payments, are still often formulated along the lines of the productivity-inflation rule. It is therefore instructive to carry out the exercise of the previous section in terms of average productivity growth and general inflation, and to investigate the role of an exchange rate policy in this model¹³).

The wage formation rule is now

$$(19) \quad w = h(aq_T + (1-a)q) + dp \\ = h + dp.$$

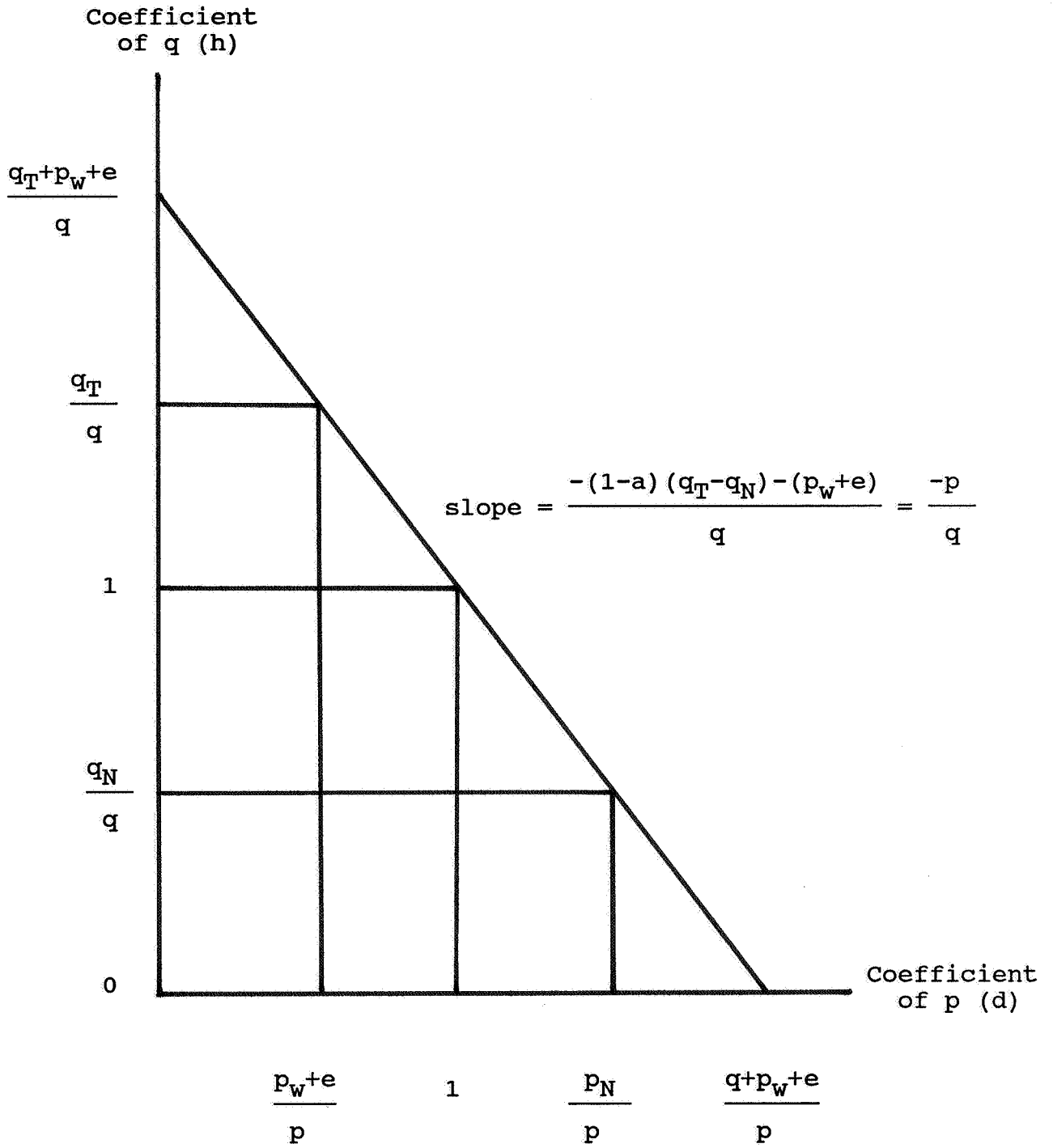
Substituting the solution for w and p (from model (III)) into eq. (19) yields

$$(20) \quad (1-d)(p_w + e) - d(1-a)(q_T - hq) + q_T - hq = 0.$$

The trade-off between h and d is graphed in Figure 2.

If wage growth is indexed on the basis of the rate of inflation with a coefficient of unity, the only productivity link compatible with international price competitiveness growth is one which provides full indexation on average productivity (i.e., the coefficient of productivity growth is

Figure 2



also unity). For no other point on the trade-off line is the coefficient of the general inflation rate a constant; instead it varies positively with the rate of increase of tradable prices in domestic currency.¹⁴⁾

The slope of the trade-off line between the coefficient of q and p varies negatively with $(p_w + e)$. The trade-off line pivots around the point $(1,1)$. The case where the slope is zero of special interest. Then

$$(21) \quad p_w + e = -(1-a)(q_T - q_N),$$

and

$$w = q,$$

$$(V) \quad p = 0,$$

$$p_N = a(q_T - q_N).$$

In this case, wages increase at the rate of productivity growth in the whole economy, the rate of inflation is zero, and the rate of inflation in the sheltered sector is positive. This is the case in which Lindbeck (1979,p.17) first observed the equivalence between the Scandinavian model and the average productivity model. But as was noted before, this equivalence holds in general and therefore does not depend on any special value of $(p_w + e)$.

To view this case in a general context, let us return to the basic model (II) and treat the exchange rate as an instrument variable.¹⁵⁾ We can then ask what rate of

reevaluation is required to make the rate of inflation equal to zero. By adding two equations, the first relating the price increase in tradables to world prices and changes in the exchange rate, the second, constraining on the rate of inflation to zero, we obtain the following system:

$$\begin{aligned} (2b) \quad w - p_T &= q_T, \\ (4a) \quad w - p_N &= q_N, \\ (IIb) \quad (5a) \quad p - (1-a)p_N - ap_T &= 0, \\ (1a) \quad p_T - e &= p_W, \\ (22) \quad p &= 0. \end{aligned}$$

The solution is as follows:

$$\begin{aligned} w &= aq_T + (1-a)q_N = q, \\ p &= 0, \\ (VI) \quad p_N &= a(q_T - q_N), \\ p_T &= -(1-a)(q_T - q_N), \\ e &= -(1-a)(q_T - q_N) - p_W. \end{aligned}$$

The achievement of price stability requires recurrent revaluations to compensate both for the structural element of inflation $(1-a)(q_T - q_N)$ and for the rate of price increase on world markets (p_W) .¹⁶⁾

6. The productivity model without 100-percent indexation on prices in the presence of world inflation

In model (IIb), considered as a normative model, there is scope for an exchange rate and a wage policy: the exchange rate policy revalues the domestic currency according to the rule spelled out by the last equation in (VI), and wage policy keeps wage growth in line with productivity increases. In other words, the economy is guided by a comprehensive incomes policy: a wage policy and a price policy in the form of an exchange rate policy.

Let us now consider an incomes policy which does not include an exchange rate policy designed to keep the price level stable. In the early variants of productivity-gearred wage policies, wages were to rise by average productivity growth, with no account taken of exogenous price rises. This prescription made sense during most of the fifties and early part of the sixties, when world market prices for trade goods were nearly constant; at other times, however, when changes in prices of tradables were not negligible, disregard for these price increases jeopardized the effectiveness of incomes policies.

To investigate the case in which wages increase only by the rate of growth in average productivity, and are not linked to the rate of inflation, we must modify model (I) only slightly. The wage formation rule is then

$$(23) \quad w=q.$$

For the time being, the exchange e is not treated as an instrument, but its value is fixed.

The solution of this model is as follows:

$$w = aq_T + (1-a)q_N = q,$$

$$p = a((p_w+e) + (1-a)(q_T-q_N)),$$

$$(VII) \quad p_N = a(q_T-q_N),$$

$$p_T = p_w + e.$$

As in the solution to model (VI), money wages increase by the rate of average productivity growth, but, even though there is no wage indexation on the basis of prices, the rate of inflation is in general not zero: there remains the influence of the external rate of inflation and the structural element $(q_T - q_N)$.

Only if

$$(21) \quad p_w + e = -(1-a)(q_T-q_N)$$

is the rate of inflation equal to zero.

Equation (21) provides also the critical value for the change in the price of tradables in evaluating the development of factor shares and of price competitiveness of the exposed sector. If the price of tradables, (p_w+e) , falls by less than $-(1-a)(q_T-q_N)$, real wages grow by less than average productivity.¹⁷⁾ This implies a shift in factor shares, and one of the main attractions of the productivity-gearred wage norms is lost. Such a shift in factor shares cannot, of course, be acceptable to trade unions over an extended period of time.¹⁸⁾ In an economy in which the direct control of prices through administrative measures is ineffective, only recurrent revaluations, which reduce the rate of inflation to zero, can lead the way out of this dilemma. Here, price control is exerted through an appropriate exchange rate policy.¹⁹⁾

There are indeed several examples of trade unions favoring a hard currency stance. In the sixties the German Council of Economic Advisors anticipated a characteristic wage push in response to the "imported" inflation as the 1964-1965 boom peaked. Urging "concerted action", the Council "met with unions and management leaders; and the unions agreed to accept a productivity guideline for wages, provided that the government take effective steps to restrain demand by appropriate fiscal policy and also to counter inflationary forces of external origin." (Ulman and Flanagan, 1971, p.186)

There are also indications that wage restraint in the following years was made contingent on the revaluation of the currency (which did occur in 1969 and 1971) with the argument that a revaluation serves the goal of price stability without upsetting the concern for distributional equity.²⁰⁾ Thus currency revaluations are complementary rather than supplementary to wage policy (Ulman and Flanagan, 1971, pp.191-192; and Flanagan et al. pp.280-282).

Another example is offered by incomes policy in Austria in the seventies, when the labor unions agreed to link the Austrian currency to the German mark. Labor union support of the hard-currency option may appear strange, for it implies considerable self-restraint on the part of the trade union (Flanagan et al., 1983, p.47), but if the goal of price stability is high on the list of priorities, then, as the model with no wage indexation on prices shows, it is quite rational for unions to ask for revaluations: in the face of external cost inflation (imported inflation), a policy of pure wage moderation will not achieve price stability and will entail a shift in factor shares toward capital. Lacking an effective mechanism of price control, the only recourse is to a policy of recurrent revaluations.²¹⁾

7. Summary

In the fifties and sixties a productivity-g geared wage policy was advocated in many countries. With wage increases not exceeding average productivity growth, unit labor costs are constant and so are prices. As inflation increased and the concern of policy makers shifted to preventing an acceleration in inflation, the productivity norm was amended to index wages not only on the basis of productivity, but also on the basis of prices.

Later on, the increasing openness and the sharp rise in world market prices posed a more fundamental challenge to the productivity-g geared wage model, and the Scandinavian wage model emerged in response to the changing economic environment. It distinguishes two sectors, one sector, open to the world economy, produces tradables, the other sector, the sheltered sector, produces non-tradables. According to the new wage norm proposed, wage increases should be contained within the room given by the sum of productivity growth in the open sector and the rise in prices of tradables in domestic currency. The present paper demonstrates that the Scandinavian model, with its wage indexation on productivity and prices in the exposed sector, and the productivity-cum-inflation model are equivalent. It

also shows that other indexation schemes are possible without impairing the price competitiveness of the exposed sector.

The Scandinavian model, by focusing on the exposed sector, introduces a new policy instrument, the exchange rate, and thus comes to grips with the conflict between price stability and external equilibrium, a problem that was never adequately solved in the productivity model. In the simple productivity model (without indexation on the basis of prices), the rate of change of tradable prices is endogenously determined; it is negative because of higher productivity growth in this sector. In the Scandinavian model, the rate of change of tradable prices is exogenously determined, but can be made an endogenous variable through changes in the exchange rate. Thus, flexible exchange rates re-establish the original domestic productivity model and remove the structural element of inflation from the Scandinavian model. In this view then, wage moderation and revaluations are twins.

1) With neutral (purely labor augmenting) technical progress (and under certain further conditions) the wage corresponding to the productivity-g geared wage policy is also the marginal productivity market determined wage (Streißler, pp.302-312).

2) See also the OEEC's assessment of the Dutch experience more than 25 years ago: "(it is) completely naive (to assume) that a small country, highly dependent on foreign trade, can swim against the tide of inflation in the outside world. The Netherlands began the period with a relatively low wage-cost level and soon developed a balance-of-payments surplus. As the decision was made not to revalue the currency, it was understood that an attempt at price stability through smaller wage increases would have led to an increased payments disequilibrium. The role of wages policy, therefore, has been more important in determining the timing of wage increases rather than their size over the period as a whole. In this sense there is no doubt that wages policy has been effective and has considerably facilitated the task of maintaining high employment and growth without serious balance-of-payments difficulties - and this in the face of excess demand pressures for some time." (Fellner et al., 1961, p.61).

3) This dilemma is also evident in the following description of British incomes policy: "It has not been possible to

maintain a fixed set of criteria in British incomes policy. A specific norm for wages and salaries which is determined by a trend in productivity and around which only a few limited exceptions should occur has not, despite its general appeal, proved to be suitable for all circumstances. The balance-of-payments situation, changes in domestic economic conditions, have been important in bringing about revisions to the norm." Smith, 1972, pp.62-63.

4) The main references are Edgren et al., 1973; Aukrust, 1977; Lindbeck, 1979; and Frisch, 1983; some extensions of this model are treated in the contributions to the volume "Inflation and Employment in Open Economies," ed. by A.Lindbeck, 1979; see also Frisch, 1977; and Branson and Myhrman, 1976; a more recent contribution within the framework of the Scandinavian model is Marston, 1987. See Heitger, 1983, on the relation between the Scandinavian model and the productivity bias in the purchasing power parity.

5) A positive value of e indicates an exchange rate depreciation.

6) In this formulation no distinction is made between export and import prices.

- 7) With this assumption, only very high labor mobility assures equilibrium in the labor market (Lancaster, 1958, 1959).
- 8) The Scandinavian model, in contrast, may be said to have full wage indexation on the price of tradables and on productivity in the open sector.
- 9) For econometric work, one should note that both models have the same reduced form equations and in this sense are indistinguishable from each other.
- 10) Clearly, if the difference between productivity growth in the exposed sector and in the sheltered sector is zero, the aggregate price level and the price level in the sheltered sector rise at the rate of price increase in the exposed sector. Wages rise at the rate given by the sum of the productivity growth rate and the inflation rate. Moreover, if world prices (in domestic currency) are constant, the rate of inflation in the overall economy and in the sheltered sector is zero, and the plain productivity-gearred wage model re-emerges.
- 11) Of course, eq. (13) is none other than the wage determination rule in the Scandinavian model.

12) This symmetry in indexation between the exposed and the sheltered sector is limited, however, in the sense that (p_w+e) is an exogenous variable (given e) while p_N is an endogenous variable.

13) The value of the parameter a in the definition of p and q is now viewed as fixed.

14) Two of these cases have already been treated in section 4 (case 2 and 3). For example, if the coefficient of the rate of productivity is $q_T/q (>1)$, the coefficient of the general rate of inflation must be $(p_w+e)/p (<1)$ to maintain price competitiveness.

15) Clearly, we could also start out from model (I).

16) Instead of setting $p=0$, other conditions may be imposed. Wage stability, the other classic definition of a non-inflationary economy, for example, requires that $e = -q_T - p_w$; then prices change at the negative rate of productivity growth.

17) In all other models real wages grow at the same rate as average productivity.

18) To be sure, the slow growth of real wages sets in motion a corrective mechanism that tends to re-establish normal profits in the exposed sector (Aukrust, 1977, pp.114-115). If $(p_w+e) + (1-a)(q_T-q_N) > 0$, the exposed sector, but not the sheltered sector (where $p_N = w - q_N$), will experience a gain in profitability and in price competitiveness. This can be seen simply by comparing the wage rule of equ. (23) with the competitiveness condition (eq. (13)). The actual growth rate of wages (q) in model (VII) is less than the growth rate of wages required for maintenance of international price competitiveness:

$$p_w+e + q_T - q = p_w+e + (1-a)(q_T - q) > 0.$$

The improved competitiveness in the exposed sector leads to a shift in output and employment toward the exposed sector (see Frisch, 1980, pp.151-154, and Branson and Myhrman (1976)). As the exposed sector attempts to hire more labor, wage inflation accelerates, first through higher wage drift, then through higher wage settlements, possibly undoing the benefits of previous wage restraint. This situation may have been characteristic of the Dutch economy in the years leading up to the wage explosion of 1963-1965 (Aukrust, 1977, p.115) and of the West German economy at the end of the sixties (Sinn, 1988, pp.76-79).

This adjustment mechanism may work too slowly to be acceptable to trade unions. It also may be rejected by unions on other grounds: wage pull inflation with its high rate of wage drift tends to undermine the authority of the trade unions.

19) The same effect can also be achieved by tariff reductions. An example of such a policy was West Germany's decision to implement a 4 percent import subsidy and a 4 percent export tax (Sinn, 1988, p.77).

20) For a review of the discussion in West Germany on imported inflation and appropriate exchange rate policies see Sinn (1988) and Scheide (1988).

21) The rate of revaluation does not only depend on the rise in world prices (p_w), but also on the difference in productivity growth in the two sectors of the economy. In a two-country comparison, the standard for price stability and revaluation is, of course, provided by the larger country. Thus, if productivity differences are higher in the smaller country than in the reference country (as is the case for Austria in relation to West Germany) a policy prescription according to the Scandinavian model would call for faster revaluations in the country with higher differentials in

productivity growth, in order to maintain aggregate price stability vis-a-vis the reference country.

References

Aukrust, O., "Inflation in the Open Economy: A Norwegian Model," in *Worldwide Inflation: Theory and Recent Experience*, eds.: Lawrence B. Krause and Walter S. Salant. Washington D.C.: The Brookings Institution, 1977.

Branson, W.H., and Myrman, J., "Inflation in Open Economies, Supply-determined Versus Demand-determined Models," *European Economic Review*, January 1976, 7(1), 15-34.

Calmfors, Lars, and Viotti, Staffan, "Wage Indexation, the Scandinavian Model and Macroeconomic Stability in the Open Economy," *Oxford Economic Papers*, November 1982, 34(3), pp.547-566.

Edgren, Gösta, Faxén, Karl-Olof and Odhner, Blas-Erik, *Wage Formation and the Economy*, London: Allan & Unwin, 1973.

Fallick J.L., and Elliott, R.F., eds.: *Incomes Policies, Inflation and Relative Pay*, London: Allen & Unwin, 1981.

Fellner, William, Gilbert, Milton, Hansen, Bent, Kahn, Richard, Lutz, Friedrich, and de Wolff, Peter, *The Problem of Rising Prices*, Paris: OEEC, 1961.

Flanagan, Robert J., Soskice, David W., and Ulman, Lloyd, *Unionism, Economic Stabilization, and Incomes Policies*, Washington, D.C.: The Brookings Institution, 1983.

Frisch, Helmut, "The Scandinavian Model of Inflation: A Generalization and Empirical Evidence", *Atlantic Economic Journal*, December 1977, 5(3), 1-14.

--, *Theories of Inflation*, Cambridge: Cambridge University Press, 1983.

Gros, Daniel, "Wage Indexation and the Real Exchange Rate in Small Open Economies," *IMF Staff Papers*, March 1986, 33(1), 117-138.

Heitger, Bernhard, *Strukturwandel und realer Wechselkurs*, Kieler Studien, 183, Tübingen: Mohr, 1983.

Johnson, Harry G., "Notes on Incomes Policy and the Balance of Payments," in *Incomes Policy and Inflation*, eds.: Michael Parkin and Michael T. Sumner, Manchester: Manchester University Press, 1972.

Lancaster, Kelvin, "Productivity Geared Wage Policies,"
Economica, August 1958, NS 25, 199-212.

--, "A Further Note," Economica, May 1959, NS 26, 156-157.

Lindbeck, Assar, ed., Inflation and Employment in Open
Economies, Amsterdam: North-Holland, 1979.

Lindbeck, Assar, "Imported and Structural Inflation and
Aggregate Demand: The Scandinavian Model Reconstructed," in
Inflation and Employment in Open Economies, ed.: Assar
Lindbeck, Amsterdam: North-Holland, 1979.

Marston, Richard C., "Real Exchange Rates and Productivity
Growth in the United States and Japan," in Real-Financial
Linkages Among Open Economies, eds.: Sven W. Arndt and J.
David Richardson, Cambridge, Mass.: MIT Press, 1987.

Pollan, Wolfgang, "Lohnpolitik und Einkommensverteilung", in
Handbuch der österreichischen Wirtschaftspolitik, eds.:
Hanns Abele et al., Wien: Manz, 1984.

Scheide, Joachim, "Lehren aus dem Scheitern des
Bretton-Woods-Systems," Die Weltwirtschaft, 1988(1), 53-71,
Institut für Weltwirtschaft an der Universität Kiel.

Sinn, Stefan, "Zur Wechselkursdebatte in der Bundesrepublik Deutschland in den sechziger Jahren," die Weltwirtschaft, 1988(1), 72-86, Institut für Weltwirtschaft an der Universität Kiel.

Smith, David C., "Incomes policy", in Incomes Policy and Inflation, eds.: Michael Parkin and Michael T. Sumner, Manchester: Manchester University Press, 1972.

Streißler, Erich, Möglichkeiten und Grenzen einer produktivitätsorientierten Lohnpolitik, Wien: Österreichisches Institut für Wirtschaftsforschung, 1960.

Streissler, Erich and Streissler, Monika, Grundzüge der Volkswirtschaftslehre für Juristen, Vienna: Manz Verlag, 1984.

Ulman, LLOYD and Flanagan, Robert J., Wage Restraint: A Study of Incomes Policies in Western Europe, Berkeley: University of California Press, 1971.