AN EMPIRICAL STUDY OF WORLD MARKET INFLUENCES ON PRICE FORMATION IN WEST GERMANY

by

Colette Morel and Alfred Steinherr

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INSTITUT DE RECHERCHES ECONOMIQUES

INSTITUT DES SCIENCES ECONOMIQUES

29, rue des Wallons B-1348 LOUVAIN-LA-NEUVE (Belgique)

Abstract

In this paper price and wage determination is analyzed for 35 industries in West-Germany. Tests are made to classify industries as being competitive, discriminatory or sheltered. The chosen approach is related to the "Scandinavian" model.

It is shown that about a third of the industries in the sample are not price takers in spite of the occurence of international trade. Wages are strongly influenced by world market and exchange rate developments. As to the effectiveness of revaluations the results imply that, first, revaluations do provide a protection against imported inflation. Second, revaluations can be expected to produce real effects since they affect the relative price between competitively and non-competitively produced commodities and the terms of trade.

0. Introduction

In this paper, some first results of an analysis of sectoral price determination in West Germany from 1954 to 1975 are reported. Particular focus is directed to world-market influences on German prices and, therefore, to some extent, the transmission of exchange-rate variations.

Instead of developing a large, general equilibrium model of the German economy, a simpler, partial-equilibrium approach in the "Scandinavian" mold[1] is preferred. That is, a distinction is made between industries that can be considered as price-makers, and those that are price-takers. Various approaches to balance-of-payments theory emphasize the importance of the distinction between traded and non-traded commodities. For traded commodities, the law of one market holds ; hence, national producers are price-takers. One can then write :

$$P_T^* = P_T.e \tag{1}$$

where P_T^* are foreign currency prices for traded goods, P_T prices in DM; and e the exchange rate. In contrast, prices for non-traded commodities can be different from country to country. Moreover, in protected domestic markets, competition could be quite low. Such a situation can of course only be maintained in the long run if there are some barriers to factor flows into these industries.

This general characterization is adequate for small, open economies. To be applicable to West Germany, some modifications must be made. Even if the law of one market holds, it is quite possible that a large exporting country has an influence on world-market prices. Similarly, in a large domestic market for non-tradeables, the conditions for competitive behavior may be given. We find it, therefore, more useful for the present analysis to distinguish between *competitive* industries (that may include non-tradeables) and *non-competitive* (for short : "sheltered") industries (that may include traded commodities). Moreover, an industry may behave competitively in foreign markets but not in a protected domestic market. We call such an industry *discriminatory*. By a competitive industry is meant a price-taker; by a non-competitive industry a price-maker in a particular market.

An additional reason for giving preference to this distinction lies in the conceptual difficulty of defining tradeables and non-tradeables. What is a non-tradeable commodity ? In principle, most non-traded commodities are tradeable. Trade is not observed due to transport or information costs, or to trade barriers erected by policy. But in such situations domestic markets are most likely non-competitive so that the distinction suggested in this paper applies.

The fuzziness in the distinction between tradeable and traded goods also poses problem for identifying industries. International trade occurs in virtually all industries, but lower or zero levels of trade cannot necessarily be interpreted as implying less international competition.

This paper is then structured as follows. In section 1, the model to be analyzed is discussed. In Section 2, tests are proposed for a classification of the industries in the sample before the price, wage and factor share equations are estimated in Section 3. In Section 4 our main results are summarized.

I. The Framework

From the definition of labor's share in value-added, one obtains

$$\hat{s}_L \equiv \hat{w} - \hat{p} - \hat{q} \tag{2}$$

where s_L = share of labor in value-added, w = average wage rate, p = unit price of value-added, q = productivity measured as value-added per unit of labor ; "^" denotes a percentage change per unit of time, e.g., $\hat{x} = \frac{1}{x}\,\frac{dx}{dt}$.

In the short run, world-market price changes might be reflected in variations of s_L; but in the long run, s_L tends to be fairly constant. The fact of empirical long-run stability of s_L can be understood either as the result of technology[2], or as the target of social bargaining processes. With productivity growth exogenous, definition (2) can now be turned into a short-run theory of income distribution explaining $\hat{s}_L$ or into a long-run theory of wages or prices by imposing $\hat{s}_L = 0$.

If one imposes $\hat{s}_L = 0$ as a long-run equilibrium condition in the competitive sector, then one obtains

$$\hat{w} = \hat{p}_c + \hat{q}_c = \hat{p}_c^{*} - \hat{e} + \hat{q}_c. \tag{3}$$

In the short-run wages are not perfectly flexible so that the share of labor in value-added adjusts :

$$\hat{s}_L = \hat{w} - \hat{p}_c - \hat{q}_c \tag{4a}$$

$$= -\hat{p}_c - \hat{q}_c \quad (\text{if } \hat{w} = o). \tag{4b}$$

Firms in sheltered sectors are assumed to add a profit margin to costs implying constancy of the distributive share of capital in that sector. If wages are determined within the competitive sector and then transmitted to sheltered sectors, prices in the latter are determined as follows :

$$\hat{p}_s = \hat{w} - \hat{q}_s \tag{5a}$$

$$= (\hat{p}^*_c - \hat{e}) + (\hat{q}_c - \hat{q}_s). \tag{5b}$$

Thus, in the short run changes in factor shares in competitive industries and changes in prices in sheltered industries are determined by (4b) and (5a). In the long run, factor shares are constant in all industries, and equations (3) and (5b) yield long run wage and sheltered price changes.

Variations in the general price level can be written

$$\hat{p} = \theta\ \hat{p}_c + (1 - \theta)\ \hat{p}_s \tag{6}$$

where θ and $(1 - \theta)$ are the weights of each sector. Equations (5) and (6) show that (i) inflation can be imported in the absence of revaluation ; (ii) domestic inflation exceeds foreign inflation if the hypothesis $\hat{q}_c - \hat{q}_s > o$ holds ; and (iii) if appreciation of the domestic currency equals foreign-price inflation, there can still be some positive domestic inflation due to the productivity differential[3]. In the latter case there would be deviations from purchasing-power parity.

As already mentioned in the introduction industries are classified into three groups : price-takers on all markets, price-makers on all markets, or price-takers on foreign and price-makers on domestic markets. Most authors - working with a two sector classification - test their models on the aggregated data for two sectors. Since individual industries are competitive or sheltered at varying degrees, it seems more natural to test industry data and aggregate afterwards, if necessary.[4]

Data

We use data for 35 industries from the *Systematische Warenverzeichnis dür die Industriestatistik.* All these industries trade to some extent in international markets. What is usually considered as nontradeables (government services, construction, etc.) is left out of our analysis. Prices are taken from the publication of the *Statistische Bundesamt,* Fachserie M. Wages and productivities are computed for total employment (workers plus employees), using data from the *Statistisches Jahrbuch für die Bundesrepublik Deutschland.* Average wages by industry are obtained by weighting worker and employee compensations with their corresponding employments. Salaries of employees are divided by duration of work to arrive at an hourly compensation. Unemployment rates are contained in the OECD series *Principal Economic Indicators.* Input-prices are obtained using the input-output data for 1972, the unpublished import matrix for 1972, both from the DIW, Berlin, and the prices from the Statistische Bundesamt. For every year, each price is weighted by the corresponding input coefficient to obtain one index of input prices.

Average variables for the three sectors are computed by weighting the price indeces of the industries in each sector by value-added, and wage and productivity indeces by employment. For time series, annual data from 1954 to 1975 are used.

The industries in the sample are listed in TAble A-I, where A refers to the Appendix.

2. Classification of Industries

The more traditional distinction between traded and non-traded sectors is usually made on the basis of the exported part of domestic production and the share of imports in domestic consumption. These criteria are clearly unsatisfactory since a higher export share is not an indication of higher competition. In some cases (e.g. 216) a high import share, however, may indicate that prices of that industry are fixed on world markets. Import and export shares are reproduced in Table A-I.

There are two possible approaches to the intended classification. One is to use some *a priori* information about the industries in the sample such as concentration ratios. However, measures of concentration are scarce for Germany, and are non-existent for our sample. But even if such measures existed, their informational value would be doubtful, precisely because there is foreign competition. More useful would be "world market" concentration ratios, related to the weight of German producers. A proxy variable is the share of German exports in world markets. Unfortunately, the usefulness of that mesure is also limited : first, it neglects the structure of German industry itself ; and second, market power cannot be properly assessed at that level of aggregation. But, as an additional informational source this variable is calculated and shown in Table A-I as well.

A second possible approach consists in testing the behavioral hypotheses that characterize each sector. Three different tests were carried out.[5] The first is embodied in the equation :

$$\hat{p}_d = a_o + a_1 \hat{p}_x + a_2 \hat{p}_m + a_3 \hat{w} + a_4 \hat{q} \qquad (7)$$

where p_m is the price index for imports in competition with similar domestic products, and p_d is the price index for domestic production sold on domestic markets[6]. All price indeces including the one of exported commodities p_x are true price indeces, and not unit values. Different evolutions of these prices are, of course, due to both differences in weights, and to differences in individual price developments within each industry. To keep the analysis manageable, the first aspect is neglected. Since p_x and p_m are in DM, the effects of exchange-rate alterations are incorporated in these prices.

An industry is considered as competitive if export or import prices have a strong influence on domestic prices in equation (7). In the opposite case, with costs significant, an industry is considered as non-competitive.

This test (not reproduced here) is not conclusive for a variety of reasons. First, according to equations (3) and (5a), export prices and wages are functionally related. For a large number of industries, the coefficients of both variables are indeed significant, so that one cannot discriminate. Second, export prices are significant for virtually all industries. Multicollinearity may be one reason, as explained above. Moreover, annual data being used, the direction of causality cannot be tested. Another reason lies in the fact that a non-discriminatory dominating industry would impose equal prices in all markets. Finally, an industry that acts as price-maker according to equation (7) may be a price-taker on world markets.

The second test is based on the following consideration. In competitive industries fluctuations in exogenous variables (world-market prices, wages, productivity) should be reflected in short-run variations of factor shares :

$$\hat{s}_L = a_o + a_1\hat{p}_x + a_2\hat{q} + a_3\hat{w} + a_4U. \tag{8}$$

To take out the influence of cyclical variations in activity the overall unemployment rate is added to the set of independent variables.

An optional further hypothesis is that, if wages are rigid in the short run, then competitive industries will attempt to increase productivity in the face of falling export prices :

$$\hat{q}_i = b_o + b_1\hat{p}_x \tag{9}$$

with $\qquad b_o > o,\ b_1 < o.$

Equation (8) can then be tested as :

$$\hat{s}_L = a_o + a_1\hat{p}_x + a_2\hat{w} + a_3U. \tag{10}$$

The test of equation (9) revealed that only in three industries (211, 25, 621) is productivity responsive to decreases in export prices. This result may be interpreted in several ways. One possibility is that industries find it difficult to increase productivity above trend. Another interpretation is that while price decreases exert pressure on productivity, price increases on world market do not. Equation (8) was therefore tested, instead of (10).

This test (not reproduced here), once more, does not allow sharp discrimination since prices and productivity are significant here for virtually all industries. The major difficulty lies here in the assumed behavior. A non-competitive industry may behave in ways that do not imply constant profit shares, at least in the short run. For example, the U.S. steel industry is a well studied case of an oligopolistic industry whose prices have been rising less in economic upswings, and falling less during downturns, than prices in competitive industries. And even if the firm (and not necessarily the industry) adds a profit margin to costs, the latter may correspond to "normal" costs. To short-run deviations of costs from normal costs correspond then fluctuations in factor shares. (See Godley and Nordhaus, 1972).

Nevertheless, in the long-run average variations of profit-shares should be smaller in sheltered industries than in competitive industries. In Table A-II average labor shares and their standard errors are shown for all industries.

The final test, on which our classification of industries is based, builds on the hypothesis that an industry, able to roll over costs to prices in a particular market, must be a price-maker in that market.

In order to incorporate costs of purchased inputs, value-added prices are used as dependent variables. Hence we test :

$$(p_x - \hat{\Sigma} a_j p_{vj}) = a_o + a_1\hat{w} + a_2\hat{q} \tag{11a}$$

$$(p_d - \hat{\Sigma} a_j p_{vj}) = a_o' + a_1'\hat{w} + a_2'\hat{q} \tag{11b}$$

where $\Sigma a_j p_{vj}$ are the costs of purchased inputs. If the wage coefficients in (11a) and (11b) are statistically significant the industry is considered as non-competitive. Industries, for which only the coefficients in (11b) are significant are taken as discriminatory. All others, for which neither the coefficients in (11a) nor in (11b) are significant, are classified as competitive. The coefficient of the productivity variable can be expected not to be significant in most cases, since non-competitive industries are more likely to pass cost increases on to prices than to lower prices when productivity increases.

This time there is no multicollinearity problem and the underlying behavioral assumptions seem to be fairly robust. Since wage adjustments according to equation (3) are realized in the long run only, the risk of a causality, reverse to the one postulated in equation (11), is also minimal. Moreover, since wage increases are fairly uniform across industries, it is not possible for each industry in the competitive sector to determine wages. These tests ideally would be run with commodity data. Firms may act competitively in the market for certain goods and not in those for others. At the chosen level of aggregation there is surely much washing-out. Also, as was pointed out already, tests are carried out without the use of world market prices, for lack of suitable data.

The results in Table I indicate that of the 35 industries in the sample 10 can be considered as competitive, 10 as non-competitive and 15 as price-takers abroad and price makers at home.

In the group of industries considered as price-takers wages do not appear statistically significant in any of the equations for domestic or export prices. Low F-values support the view that the chosen independent variables offer no explanation for variations in prices. In the set of discriminatory industries wages are significant in the equation for domestic prices and F values are high with some exceptions : industries 22 (mineral oil refining), 55 (paper and cellulose), 58 (plastic manufacture), and 625 (shoes). These are limit cases and they also could have been classified among competitive industries. In some other cases the Durbin-Watson statisticssuggests that important explanatory variables are missing in the equation (industries 291 and 57). In sheltered industries the coefficients of the wage variable are significant for domestic and export prices and F values are generally high. Only in the export price equation of industries 302 and 51 are the Durbin-Watson statistics unsatisfactory. It is also reassuring that the results of Table I are consistent with those of Table A-I.

Exports of the non-competitive industries represent 46.84 % (1975) of total exports, 50 % of exports and 29.7 % of imports of the 35 industries in our sample. The industries in our sample represent 93.2 % of total exports, and 81.9 % of total imports in 1975. The competitive sector exports only 33.59 % of the total and its parts in the exports and imports of the 35 industries are respectively 36 and 47.8 %.

Thus, an important part of German exports is carried out by industries with market power. Similarly, international trade does not eliminate domestic discretionary pricing behavior via imports in many markets.

It is also of interest to note that the non-competitive sector exported in 1975 39.7 % of its production, and imported 22.1 % of domestic consumption ; whereas the competitive sector exported only 27.4 % of its production, and imported 26.8 % of domestic consumption. The percentages for the discriminatory sector are 15.2 % and 17.7 %. For individual industries see Table A-I.

Also in 1975, production of the non-competitive sector represents 35.7 % of total industrial production, and production of the competitive sector 37.0 %. For the thirty-five industries under analysis, production of the non-competitive and competitive sectors amount to 39.7 % and 27.4 %, resp. ; the remainder goes to discriminatory industries. For value-added the corresponding shares are 47.5 % and 27.4 %, resp.

TABLE I

Classification of industries according to equations (11)*

	a) $\widehat{(p_d - \Sigma a_j p_v)} = a_o + a_1\hat{w} + a_2\hat{q}$						b) $\widehat{(p_x - \Sigma a_j p_v)} = a'_o + a'_1\hat{w} + a'_2\hat{q}$					
	a_o	a_1	a_2	R^2	D-W	F	a'_o	a'_1	a'_2	R^2	D-W	F
A. Competitive industries												
215	$.096^{+}$	$-.598^{-}$	$-.506^{+}$	.26	1.96	3.12	$.190^{-}$	$-.727^{---}$	-1.545^{+}	.26	.83	3.17
216	$.453^{\circ}$	.031	-2.743^{+++}	.41	1.99	6.26	$.042^{---}$	.124	$-.171^{---}$	.03	2.33	.32
28	-.168	-.186	3.83°	.16	1.53	1.76	$.315^{---}$	-3.823^{--}	2.197	.11	1.98	1.12
33	$-.033^{--}$	$.677^{\circ}$	$-.352^{-}$	.27	1.47	3.36	0.245^{---}	-.046	-.100	.01	1.07	.10
39	-.155	1.968	.157	.48	1.84	8.28	$-.057^{---}$	$.877^{--}$	$.366^{---}$	.07	1.10	.67
40	$-.083^{--}$	1.234^{-}	$-.491^{--}$	.23	2.24	2.69	$-.255^{--}$	2.513^{-}	.132	.12	2.15	1.25
53	$-.169^{-}$	1.594°	.348	.16	1.85	1.76	$-.119^{---}$	1.321^{--}	$.525^{---}$	.07	1.01	.67
56	$.041^{---}$	$.679^{-}$	-1.037°	.23	2.36	2.64	-.004	$.312^{--}$	-.079	.06	1.21	.58
61	$.107^{--}$	$-.761^{---}$	$-.406^{---}$	.08	2.13	.74	$.177^{-}$	-1.694^{--}	.048	.09	2.01	.88
68	$-.063^{-}$	$.563^{-}$	.258	.14	1.61	1.51	-.027	.090	.626	.02	1.41	.14

* +++ means significant at level .995
++ " " " " .99
+ " " " " .975
° " " " " .95
– " " " " .90
–– " " " " .80
––– " " " " .70

TABLE I (continued)

	a_o	a_1	a_2	R^2	D-W	F	a'_o	a'_1	a'_2	R^2	D-W	F
B. Discriminatory industries												
22	$-.059^{---}$	1.075^{--}	$-.270^{---}$	.14	1.84	1.46	$-.322^{--}$	5.02^{+}	$-.991^{--}$	.32	1.76	4.17
25	$-.146^{+++}$	1.396^{+++}	$.644^{+}$	.64	2.26	15.77	.021	$.465^{--}$	$-.653^{-}$	.27	1.11	3.26
291	$-.060^{-}$	1.353^{+++}	$-.047$	.36	1.22	5.13	$-.037^{--}$	$.515^{-}$	$.100^{---}$	.13	1.05	1.31
295	$-.169^{+}$	2.566^{+++}	$-.044$	.42	1.75	6.49	$-.107^{--}$	1.252^{--}	.261	.07	1.54	.64
31	$-.106^{\circ}$	1.596^{++}	$.371^{--}$	.45	1.46	7.48	$.066^{--}$	$-.198$	.162	.01	2.06	.12
38	$-.092^{+++}$	1.663^{+++}	$-.397^{\circ}$	.62	2.12	14.66	$-.025$	$.923^{-}$	$-.253^{---}$	.12	.83	1.18
52	$-.020^{---}$	$.822^{+++}$	$-.345^{\circ}$	.46	1.38	7.69	$-.002$	$-.059$	$.389^{-}$	.15	1.98	1.56
54	$-.041^{-}$	$.956^{+++}$	$-.134^{---}$	.54	1.56	10.57	$-.029$	.212	$.536^{--}$	.07	1.36	.64
55	$-.149^{\circ}$	1.994^{+}	$-.336^{---}$	.24	1.89	2.82	$-.093^{--}$	1.221^{--}	$-.020$	.09	1.69	.88
57	.009	$.717^{+++}$	$-.564^{++}$	.50	.99	8.82	$.013^{+}$	$.367^{---}$	$-.245^{---}$	.06	1.60	.57
58	$-.146^{-}$	1.597^{+}	$-.409^{---}$	.26	2.46	3.16	$-.139^{-}$	1.219^{-}	$-.045$	.13	1.59	1.34
59	$-.212^{+}$	2.341^{++}	$.774^{--}$	.31	1.80	4.02	$-.010$	.146	$-.120$	.01	1.68	.13
621	$-.105^{+}$	2.227^{+++}	$-.827^{++}$	.60	2.41	13.75	$.040^{--}$	$.528^{--}$	$-.860^{+++}$	.40	2.17	6.10
625	.014	$.698^{\circ}$	$-.914^{++}$	.38	1.86	5.51	$-.025^{---}$	$.966^{\circ}$	$-.227^{---}$	.21	2.32	2.35
64	$-.091^{+++}$	1.287^{+++}	$-.082$	.64	2.34	15.99	$.038^{--}$	$-.065$	.049	.00	2.00	.03

TABLE I (continued)

	a_o	a_1	a_2	R^2	D-W	F	a'_o	a'_1	a'_2	R^2	D-W	F
C. Sheltered industries												
211	$-.016$	1.700^{+++}	-1.238^{+++}	.77	1.72	29.60	$-.023$	1.856^{++}	-1.313^{++}	.59	1.69	13.18
213	$-.094^{-}$	1.169^{+++}	.101	.39	1.40	5.68	$.015^{-}$	$.289^{+++}$	$-.229^{+++}$	.71	1.54	22.17
27	$-.175^{+++}$	2.127^{+++}	$.166^{---}$	.45	2.14	7.43	$-.449^{+++}$	5.008^{+++}	1.827^{+++}	.71	1.95	21.93
301	$-.297^{+++}$	3.753^{+++}	.038	.55	2.18	10.82	$-.352^{+++}$	4.006^{+++}	1.185^{+++}	.51	1.88	9.29
302	$-.108^{\circ}$	1.754^{+++}	$-.161$	.34	1.37	4.68	$-.098^{\circ}$	1.312^{+}	$.525^{-}$	.29	1.13	3.76
32	$-.082^{+++}$	1.418^{+++}	$.143^{---}$	.58	2.61	12.67	$-.029^{--}$	$.904^{+++}$	.058	.37	1.43	5.30
36	$-.071^{+++}$	$.900^{+++}$	$-.167^{--}$	.73	2.18	24.19	$-.068^{++}$	$.713^{+++}$	$.229^{--}$	.41	1.79	6.27
37	$-.057^{++}$	1.064^{+++}	$-.090$	.69	2.66	20.07	$-.053^{+}$	$.811^{+++}$	$.315^{-}$	.46	2.37	7.78
51	$-.084^{+++}$	1.351^{+++}	$-.286^{\circ}$	.78	1.64	31.93	$-.057^{-}$	$.825^{++}$	$.395^{-}$	.29	.93	3.71
63	$-.137^{+}$	1.500^{+++}	$-.034$	.34	1.67	4.59	$-.087^{++}$	$.757^{++}$	.096	.30	2.09	3.89

3. Prices, Wages, and Factor Shares

3.1 Wage determination

Prices in competitive industries are determined exogenously on world markets.[7] Such exogenous price variations are either reflected in changes in productivity, factor shares, or wages. The first possibility was not confirmed by the tests in section 2 so that one can concentrate on the other two.

Equation (3) was tested in a variety of ways for competitive industries. The most general form is :

$$\hat{w} = a_o + a_1\hat{p}_x + a_2\hat{p}_v + a_3\hat{q} + a_4U \qquad (12)$$

with

$$a_1 > o, \; a_2 < o, \; a_3 > o, \; a_4 < o.$$

All right hand variables are assumed to be exogenous to each sector.

The unemployment rate is introduced in (12) in order to take into account labor-market conditions. One would expect that increases in world-market prices are more easily transmitted to wages rather than profits, when the overall domestic labor market is tight.

The regression results of equation (12) yield high R^2's but the signs of the export price and of the input price variables are always wrong. This may be due to some collinearity between these two variables. We then constructed a value-added variable but without obtaining better results in the equations. The best results were obtained when the price variable for inputs was dropped. They are reproduced in Table II. The coefficient of the export price variable is generally smaller than one and has the right sign although it is frequently not significant. This means that, as was argued before, in the short-run, increases in international prices are only partly reflected in wages and partly in a decrease of labor's share in value-added of competitive industries. The explanatory power of the equations is fairly low, particularly so for industries 216 and 28. The constant term is always highly significant, implying an upward trend of wages not explained by the model. Thus, in the short run this model cannot explain wage determination.

Since the Scandinavian model aims at a long-run explanation of wage formation rather than an explanation of variations around trend, we have reestimated these equations, dropping the constant term. The results in Table II (b) show indeed that export prices and productivity are highly significant for long run wage determination in competitive sectors. Variations in unemployment play, of course, a less important role in the long-run. An alternative estimation, using moving averages of the explanatory variables improved also some of the results in Table II. Hence, even if wages are determined by processes that are not specified by the model (e.g., union wage bargaining), the long run evolution of wages seem to be strongly influenced by factor shares in the competitive sector.

A further hypothesis to be verified is the transmission of wage increases from the competitive to the non-competitive sector. In the Scandinavian model it is assumed that wages, determined in the competitive sector, are transmitted to the sheltered sector.

This raises the question which competitive wage is being transmitted since equation (12) determines a wage rate for each competitive industry. There are different answers to this question.

On the one hand, the variance of world-market prices for manufactured commodities is much lower than the one of raw material prices. Since the former have a much greater weight in (12) than the latter, it follows that the variance of wage increases for competitive industries is also not large. Moreover, the effects of exchange-rate variations are transmitted to sectoral prices fairly evenly. In this case, it is reasonable to assume that an average of competitive wages is being transmitted to the non-competitive sector.

On the other hand, the joint effect of differences in sectoral unemployment, productivity growth and world-market price developments could quite possibly produce substantial differences in wage increases by industry. One may then witness a process of wage diffusion also within the competitive sector : wages being determined through social bargaining, or market forces, in some important leading industries according to equation (12), and then being transmitted to all others.

The two hypotheses were tested. One assumes that the *average wage increase* in the competitive sectors is being transmitted. Alternatively, *increases* in a *key-sector* are assumed to play a pivotal role. Since wages in industry 40 (chemicals) are well explained by the Scandinavian model and since that industry plays a central role in collective bargaining this industry was retained. The regressions with an average wage rate turn out to be slightly superior and they alone are reproduced in Table A-III. The results indicate a strong correlation. The constant term is never significant ; the average wage increase in the competitive sector is always highly significant and its coefficient close to 1.

These results imply that wage determination is oriented to a large extend to the competitive sector of the economy. But in opposition to the implications of the Scandinavian model, the share of labor in individual industries may increase or decrease since wage increases correspond to an average of the sector, or to those of a key sector.

3.2 Factor shares

The following equation was tested for competitive and discriminatory industries (see Table III) :

$$\hat{s}_L = a_o + a_1\hat{p}_x + a_2\hat{p}_v + a_3\hat{q} + a_4U. \qquad (13)$$

A priori, one expects significant coefficients for competitive and discriminatory industries. The results are entirely in agreement with this expectation. For competitive industries the coefficients of the export price and of productivity have the right sign and are generally significant. For discriminatory industries the coefficients of the productivity variable are significant but, since export prices affect only part of total sales, these coefficient are generally statistically not significant. The result for industry 28 shows that in the short run changes in prices or productivity are nearly entirely absorbed by fluctuations in factor shares. The result for industry 216 cannot be compared to the others since no relevant export price can be used. The highly significant negative coefficients of productivity in all equations indicate that, at least in the short run, productivity increases benefit profits and not wages.

3.3 Price determination in sheltered industries

Equation (5) was also tested in various ways. First, we have used output prices instead of prices of value-added. This allowed us to test one of the hypotheses of the model, i.e., that sheltered industries can transmit cost increases to output prices. The results in Table IV confirm this hypothesis. Wage costs have positive and highly significant coefficients ; productivity however is rarely statistically significant. When the time trend is removed by dropping the constant term (Table IVb), the coefficients of the productivity variable become significant for most industries. Prices remain strongly influenced by wage increases but the coefficients decrease.

In a second test we have added input prices p_V (domestic and imported) as an additional explanatory variable (Table A-IV). This more complete specification makes it possible to investigate the separate effect of input prices on output prices. The input price coefficients have the expected sign and are everywhere significant. In the long run wages are again more significant than in the short run and the hypothesis of the long run constancy of distributive shares is not contradicted by our results. However, in the short run, distributive shares seem to fluctuate substantially in some industry. (The constant term a_o is significant more often than not).

In a third test we have taken the trend of all independent variables and alternatively, moving averages for three years. By this procedure we hoped to find out whether cost-plus pricing is based on actual or on normal costs. The results were rather mediocre so that the normal cost-plus hypothesis is rejected. In a final experiment the unemployment rate was added to the set of explanatory variables. A significant coefficient of that variable would be interpreted to mean that prices are not only determined by costs but also by demand conditions. In this case industries may still be price-makers but the cost-plus hypothesis would have to be abandonned. With moving averages the unemployment rate is significant in four industries (211, 213, 22, 25), and, when annual variations are taken, only in three (22, 302, 51). Thus, for most non-competitive industries the cost-plus pricing hypothesis is not contradicted. This result is, of course, only tentative since the overall unemployment rate is a very crude measure of demand for particular industries.

Since the explanatory power of the equations for domestic prices in the second test is quite high (for all sheltered industries on the domestic market R^2 = .94) we have compared actual price increases with price increases predicted by these equations. For the total of all sheltered industries actual and predicted inflation for the period 1954-75 is 2.77 %. However, this fit is mostly due to the high correlation of input and output prices. Predictions based on $\hat{p}_d = \hat{w} - \hat{q}$ yield an average price increase of 4.45 %. This prediction is far inferior to the ones obtained by Branson and Myhrman for Sweden (1954-1970).[8]

Instead of reproducing actual values and predictions for individual years, a coefficient developed by Theil (1958, p.32) measuring the predictive power of these equations, is calculated in Table A-V. Theil's measure is :

$$TH = \frac{\left[\frac{1}{\Sigma VA_i} \Sigma VA_i (P_i - A_i)\right]^{1/2}}{\left[\frac{1}{\Sigma VA_i} \Sigma VA_i P_i^2\right]^{1/2} + \left[\frac{1}{\Sigma VA_i} \Sigma VA_i A_i^2\right]^{1/2}}$$

where VA_i = value-added of sector i

P_i = predicted price increases

A_i = actual price increases.

A value close to zero is a perfect prediction ; if TH approaches 1 the equations are useless for predictions.

Predictions are highly satisfactory for most years. However, this is again mainly due to the high collinearity with input prices. This may also explain why predictions for the years after 1968 are much better than those before 1968. After 1968 inflation has accelerated largely due to a commodity boom. An additional reason that suggests itself is increased international competition with a more flexible exchange rate system making the Scandinavian assumptions more pertinent.

3.4 Comparing competitive and sheltered sectors

One of the basic hypotheses of the Scandinavian model is that productivity increases faster in competitive than in sheltered industries. Together with the hypothesis of wage diffusion from competitive to sheltered industries one obtains equation (5b) showing that price inflation in the sheltered sector exceeds price inflation in the competitive sector by the productivity differential. In Table V, averages with their standard deviation are shown for the three sectors over the years 1954 to 1975. Average wages in the competitive sector increased per year on average by 0.73 percentage points more than in sheltered industries, suggesting, in view of our previous result of nearly perfect wage transmission, a difference in skill structure. Productivity increased per year on average by 1.43 percentage points more in competitive sectors, accounting for a large part of the higher average price increase in sheltered industries.

A last comparison relates to the long-run predictive power of the theory. For the competitive sector we compute from average export price and productivity increases in each industry an average annual wage increase :

$$\bar{\dot{w}}_i = \bar{\dot{p}}_{xi} + \bar{\dot{q}}_i$$

where a bar denotes an average value for the period 1954-1975.

The Theil-coefficient for these predictions, using employment as weights for each industry, is TH = 0.1408.

Similarly, average price increases in sheltered sectors can be computed with the equation

$$\bar{\dot{p}}_{dj} = \bar{\dot{w}}_j - \bar{\dot{q}}_j.$$

The Theil-coefficient is 0.252, using value-added as weights.

Long-run predictions in both sectors are thus very adequate. Even in the sheltered sector and without using input prices, the value of the Theil-coefficient is close to the average of yearly predictions in Table A-V. This shows once more the superior explanatory power of the model in the long run.

TABLE II

Wage determination in competitive industries

		a) $\hat{w} = a_o + a_1\hat{p}_x + a_2\hat{q} + a_3$ ($\hat{u}$ or u)						b) $\hat{w} = a_o\hat{p}_x + a_1\hat{q} + a_2\hat{u}$		
Industry	unemp-loyment variable used	a_o	a_1	a_2	a_3	R^2	D-W	a_o	a_1	a_2
215	$\hat{u}$	$.110^{+++}$	.035	$-.182^{-}$	$-.036^{++}$	.36	1.38	$.410^{+}$	$.854^{+++}$	$-.021^{---}$
216	u	$.136^{+++}$		$-.164^{--}$	$-.00004$	.08	1.38		$.474^{+++}$	$.036^{--}$
28	u	$.103^{+++}$	$-.020$	$-.122^{--}$	$-.00003^{--}$	.09	1.74	$-.005^{-}$	$.565^{+++}$	.0002
33	u	$.081^{+++}$	$.611^{o}$	.025	$-.012^{---}$	.21	2.32	1.463^{+++}	$.691^{+++}$	.0003
39	$\hat{u}$	$.087^{+++}$	$.279^{+}$	$-.098^{o}$	$-.014$	.41	1.48	$.750^{+++}$	$-.129^{--}$	$.0002^{+++}$
40	u	$.162^{+++}$	$.106^{++}$	$-.510^{+++}$	$-.0001^{+++}$	.73	1.73	$.191^{-}$	$.640^{+++}$	$.0001^{+++}$
53	u	$.145^{+++}$	$.160^{o}$	$-.475^{++}$	$-.0001^{+}$	.38	1.40	$.249^{--}$	1.030^{+++}	$-.010$
56	u	$.110^{+++}$	$.341^{-}$	$-.032$	$-.00007^{--}$	.18	2.56	$.772^{+}$	1.340^{+++}	$-.020^{---}$
61	u	$.100^{+++}$	$-.098^{--}$	$.140^{-}$	$-.00007^{o}$	.27	1.65	$.140^{---}$	$.629^{+++}$	.006
68	u	$.089^{+++}$	$.145^{--}$	.005	.00005	.13	1.46	1.909^{--}	1.332^{+++}	$.0001^{++}$
Total	$\hat{u}$	$.119^{+++}$	$.179^{-}$	$-.419^{o}$	$-.011^{--}$	.34	1.89	$.499^{o}$	1.254^{+++}	.008

TABLE III

Short-run variations in factor shares ($\hat{s}_L$)

a) Competitive industries

$$\hat{s}_L = a_o + a_1\hat{p}_x + a_2\hat{p}_v + a_3\hat{q} + a_4(u \text{ or } \hat{u})$$

	a_o	a_1	a_2	a_3	a_4	R^2	D-W	F
215	$.068^{+++}$	$-.442^{+++}$	1.201^{++}	-1.061^{+++}	$-.049^{+++}$	.81	2.22	16.70
216	-.003		.296	-.292	-.056	.25	1.54	1.35
28	$.107^{+++}$	-1.006^{+++}	.197	-1.318^{+++}	$.051^{++}$	.94	2.07	58.67
33	$.074^{+++}$	$-.649^{+}$	.229	$-.804^{+++}$	-.00001	.75	3.09	11.92
39	$.099^{+++}$	$-.598^{+++}$	-.004	-1.02^{+++}	$-.00006^{+++}$	.93	2.15	56.49
40	$.127^{+++}$	$-.513^{+++}$	-.017	-1.159^{+++}	$-.0001^{+++}$	.92	1.90	47.49
53	$.168^{+++}$	.169	-1.73^{+}	-1.470^{+++}	-.00009	.69	1.87	9.10
56	$.066^{+++}$	.322	-1.153^{++}	-6.597^{+}	-.011	.65	2.76	7.39
61	$.073^{+++}$	$-.959^{+++}$	.258	$-.698^{+++}$	-.00002	.89	3.00	32.00
625	$.076^{+++}$	-.192	-.379	-1.005^{+++}	$-.0381^{++}$	.64	1.59	6.98
68	$.087^{+++}$	$-.526^{+}$	.575	-1.035^{+++}	-.018	.62	1.81	6.64
Total	$.071^{+++}$	-1.022^{+++}	$.770^{+}$	$-.726^{+++}$	$-.00004^{\circ}$	.86	1.98	10.55

TABLE III (continued)

b) Discriminatory industries

	a_o	a_1	a_2	a_4	a_3	R^2	D-W	F
22	$.133^{+++}$	$-.232$	$-.185$	$-.0001$	-1.116^{+++}	.84	1.67	21.19
25	$.096^{+++}$	$.225$	$-.506^{+}$	$-.011^{\circ}$	-1.325^{+++}	.84	2.49	22.53
291	0.058^{+++}	-1.032^{+++}	$.218$	$-.019^{+}$	$-.976^{+++}$	.93	2.42	58.92
295	$.073^{+++}$	$-.412^{+++}$	$-.342^{+++}$	$-.011$	-1.08^{+++}	.92	2.41	51.10
31	$.077^{+++}$	$-.373$	$-.311$	$.016$	-1.053^{+++}	.86	1.48	24.96
38	$.073^{+++}$	$-.118$	$-.372^{++}$	$-.00004$	$-.842^{+++}$	.88	2.48	31.59
52	$.071^{+++}$	$-.078$	$-.322$	$-.02^{\circ}$	$-.925^{+++}$	.75	1.66	12.05
54	$.082^{+++}$	$-.301^{\circ}$	$-.001$	$-.00005^{+}$	$-.933^{+++}$	.76	2.03	13.24
55	$.119^{+++}$	$-.626^{+}$	$-.244$	$-.00009^{\circ}$	-1.087^{+++}	.90	1.32	36.11
57	$.061^{+++}$	$-.121$	$-.287^{\circ}$	$-.019$	$-.870^{+++}$	.63	1.64	6.92
58	$.116^{+++}$	$-.197$	$-.659$	$-.017$	-1.053^{+++}	.62	2.37	6.80
59	$.127^{+++}$	$-.358$	$-.815^{\circ}$	$-.00008^{\circ}$	-1.448^{+++}	.83	2.54	20.21
621	$.047^{++}$	$.099$	$-.744^{+}$	$.00002$	$-.649^{+++}$	.62	2.47	6.68
64	$.080^{+++}$	$-.398^{+}$	$.007$	$-.0182^{+++}$	$-.941^{+++}$	.90	1.60	36.87
Total	$.075$	$-.111$	$-.357^{-}$	$-.015^{++}$	$-.970^{+++}$	.84	1.80	20.31

TABLE IV

Prices in sheltered and discriminatory industries

	a) $\hat{p}_d = a_o + a_1 \hat{w} + a_2 \hat{q}$					b) $\hat{p}_d = a_1 \hat{w} + a_2 \hat{q}$	
Industry	a_o	a_1	a_2	R^2	D-W	a_1	a_2
211	$-.014^{---}$	1.322^{+++}	$-.896^{+++}$	.78	1.68	1.196^{+++}	$-.962^{+++}$
213	$-.031^{--}$	$.639^{+++}$	$-.082$	.47	1.43	$.480^{+++}$	$-.258^{o}$
22	$-.091^{--}$	1.458^{+}	$-.337^{--}$	.34	1.66	$.787^{+++}$	$-.523^{+}$
25	$-.078^{+++}$	$.974^{+++}$	$.186^{--}$	.66	2.49	$.469^{+++}$	$-.344^{+}$
27	$-.100^{+++}$	1.467^{+++}	$-.021$	.56	2.53	$.388^{++}$	$-.0417$
291	$-.056^{o}$	1.127^{+++}	$.028$	.42	1.28	$.569^{+++}$	$-.085^{---}$
295	$-.044^{-}$	$.969^{+++}$	$-.175^{--}$	.50	1.27	$.538^{+++}$	$-.287^{+}$
301	$-.152^{+++}$	1.996^{+++}	$.076$	.61	2.34	$.540^{+++}$	$-.295^{-}$
302	$-.065^{o}$	1.129^{+++}	$-.034$	.34	1.44	$.471^{+++}$	$-.114^{---}$
31	$-.072^{+}$	1.151^{+++}	$.114^{---}$	.52	1.60	$.388^{+++}$	$.254^{--}$
32	$-.058^{+++}$	1.055^{+++}	$.079$	.64	1.95	$.463^{+++}$	$.051$
36	$-.019^{--}$	$.453^{+++}$	$-.133^{--}$	.44	1.78	$.817^{+++}$	$-.234^{+}$
37	$.001$	$.429^{+++}$	$-.22^{+}$	.64	2.38	$.440^{+++}$	$-.217^{++}$
38	$-.052^{+++}$	1.044^{+++}	$-.197^{-}$	.57	1.81	$.491^{+++}$	$-.197^{--}$
51	$-.060^{+++}$	1.040^{+++}	$-.164^{--}$	.74	1.71	$.538^{+++}$	$-.417^{+++}$
52	$-.011$	$.598^{++}$	$-.240^{-}$	.40	1.23	$.514^{+++}$	$-.277^{+}$
54	$-.026^{-}$	$.739^{+++}$	$-.231^{-}$	.61	1.81	$.556^{+++}$	$-.350^{++}$
55	$-.086^{-}$	1.311^{+}	$-.236^{---}$	.26	1.54	$.577^{o}$	$-.431^{--}$
57	$-.0002$	$.625^{++}$	$-.445^{o}$	.40	.98	$.623^{+++}$	$-.446^{+}$
58	$-.078^{--}$	1.098^{+}	$-.370^{--}$	.28	2.20	$.548^{+}$	$-.664^{+}$
59	$-.117^{+}$	1.416^{+++}	$.334^{--}$	.34	1.47	$.395^{o}$	$-.062$
621	$-.020^{--}$	$.877^{+++}$	$-.529^{+++}$	.61	2.06	$.681^{+++}$	$-.563^{+++}$
625	$.002$	$.470^{o}$	$-.390^{o}$	.32	1.65	$.496^{+++}$	$-.382^{+}$
63	$-.090^{++}$	1.068^{+++}	$-.002$	.44	1.53	$.374^{+}$	$-.279^{--}$
64	$-.039^{++}$	$.724^{+++}$	$-.152^{-}$	.60	1.58	$.385^{+++}$	$-.245^{+}$
Tot. shel.	$-.060^{+++}$	1.077^{+++}	$-.177^{--}$	.73	1.76	$.578^{+++}$	$-.455^{++}$
Tot. dis.	$-.055^{+}$	1.094^{+++}	$-.310$	$.62^{--}$	1.51	$.677^{+++}$	$-.619^{+++}$

TABLE V

Performances of the three sectors

	Competitive industries		Discriminatory industries		Sheltered industries	
	Yearly increases (means) in perc.	Standard error	Yearly increases (means) in perc.	Standard error	Yearly increases (means) in perc.	Standard error
$\hat{w}$	9.63	.0232	9.05	.0243	8.90	.0264
$\hat{q}$	5.88	.0247	5.05	.0220	4.45	.0275
$\hat{p}_x$	1.56	.0444	2.65	.0359	2.97	.0328
$\hat{p}_v$	2.37	.0328	2.45	.0355	2.74	.0307
$\hat{p}_d$	1.67	.0369	2.74	.0356	2.77	.0345

4. Conclusions

Some ideas of the Scandinavian model are used for an explanation of price and wage formation in Germany. Industries are classified as discriminatory, sheltered or competitive according to various tests of their degree of market power. A large part of German industry appears to enjoy some freedom in its price setting behavior on domestic as well as foreign markets.

The basic hypotheses of the Scandinavian model could be verified ; prices increase faster and productivity and wage less in sheltered than in competitive industries. A shift of resources into competitive industries or increased competition for sheltered industries could therefore be expected to lead to lower overall price inflation and faster growth rates.

Our results indicate that international price (or exchange rate) and productivity increases in competitive industries do influence wage increases. However, and in particular in the short run, distributive shares are not constant : profit shares tend to increase in those circumstances. Moreover, wage increases in the competitive sector are highly correlated with those of sheltered industries. And finally, sheltered in industries can and do pass on wage and other cost increases to their output prices.

The Scandinavian approach, based on a partial equilibrium model, cannot offer a satisfactory explanation of inflation. For some specific questions, however, such as the one of international transmission of inflation, the model is very useful. International price inflation is, with a fixed exchange rate, perfectly transmitted to the competitive sector. For one percent of inflation in competitive industries wages in that sector increases on average by .5 percentage points. These wage increases are then transmitted to sheltered sectors, where they lead to a price increase of 0.29 to 0.34 percentage points. To this one must add price increases of intermediary goods. The overall price inflation for industrial goods can be situated between 0.5 and 0.7 percent.

International price increases and exchange rate variations are perfectly symmetric in this model. Hence, a revaluation of one percent tends to lower price inflation in Germany (for industrial goods) by a rate between 0.5 and 0.7 percent. Since prices of sheltered industries adjust only partially to revaluation, the relative price of competitive goods changes. Moreover, we have shwon that the German export industry is not a price taker on world markets. A revaluation can therefore affect the terms of trade and, if the necessary elasticity conditions are satisfied, improve the latter. Revaluations therefore not only serve to reduce domestic price inflation in Germany, but appear to have real effects on the balance of payments.

Footnotes

[1]This approach originated with Aukrust (1970) and Edgren, Faxen, and Odhner (1973).

[2]E.g., if technology could be approximated with a Cobb-Douglas production function.

[3]We are not considering the Scandinavian model as fully adequate for explaining overall inflation, since it leaves monetary and domestic demand conditions completely aside. This was, however, the original purpose. A critical review is contained in Branson and Myhrman (1973). They compare the empirical results for Sweden with those obtained with other approaches, and obtain relatively poor results with the Scandinavian model. Also in the long run, the shares of the competitive and non-competitive sectors do not remain constant, and their evolution needs to be endogenized for an explanation of overall inflation.

[4]The need for disaggregation is also recognized by Calmfors and Herin (1977) and van Poeck (1977).

[5]In the early studies of Aukrust and Edgren-Faxen-Odhner industries were classified according to whether foreign trade was important or not. The distinction between trade and non-traded goods was assumed to be equivalent to the one between exposed or shielded sectors. Rigorous tests on these distinctions were only made recently. Van Poeck (1977a) regresses export unit values on domestic prices. A much superior test was performed by Calmfors and Herin (1977), regressing Swedish prices on either German export prices, or on Swedish import prices. Germany was chosen, first because it is a major trading partner and competitor of Sweden, and second, because true export prices exist for Germany.

[6]Ideally, one would wish to regress "world market prices" on German export prices. Unfortunately, such world-market prices do not exist it is virtually impossible to construct them due to (i) the absence of export-price indices for most countries, (ii) differences in the definition of industries ; and (iii) the degree of arbitrariness in choosing a weighting system.

[7]In the absence of foreign trade the competitive price would of course be determined endogenously.

[8]But even in their case a simple quantity-theory model yields better predictions.

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APPENDIX

TABLE A-I List of the industries in our sample with share of German exports in total OECD exports (S_i) and export/domestic production ($(X/Y)_i.100$) and import/domestic sales ($M_i.100/(Y+M-X)$) ratios for competitive, discriminatory, and sheltered industries (1973)*

		S_i	$\left(\frac{X}{Y}.100\right)_i$	$\left(\frac{M.100}{Y+M-X}\right)_i$
A.	Competitive industries			
215	Potash and rock salt mining	44.18	34.1	4.75
216	Mineral oil and natural gas extraction	1.06	.8	85.17
28	Non-ferrous metals	13.50	30.5	46.49
33	Road vehicles	19.49	49.0	20.29
39	Musical instruments, toys, sport articles	10.48	47.4	48.50
40	Chemicals	22.80	36.5	21.12
53	Saw mills and timber processing	3.12	10.8	27.91
56	Paper and cardboard manufactures	10.77	8.2	6.16
61	Leather	8.57	41.6	57.37
68	Food, beverages, tobacco	5.21	7.3	14.15
B.	Discriminatory industries			
22	Mineral oil refining	6.54	6.0	19.27
25	Stones, sand and gravel	17.93	6.4	9.87
291	Melting mills	21.14 (291, 295)	7.2	3.81
295	Foundries		3.1	2.39
31	Light metal construction	22.87 (31, 38)	9.0	3.95
38	Iron, plates and metal products		27.8	13.19
52	Glass	17.90	18.9	16.70
54	Timber manufactures	18.82	9.0	8.32
55	Paper and cellulose	1.36	21.0	39.65
57	Printing	18.52	10.4	4.61
58	Plastic manufactures	24.75	23.6	14.09
59	Rubber and asbestos	16.19	23.5	17.43
621	Leather products	24.28	13.7	21.16
625	Shoes	6.03	10.0	29.16
64	Clothing	13.55	11.3	23.55

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C. Sheltered industries		S_i	$\left(\frac{X}{Y}\cdot 100\right)_i$	$\left(\frac{M.100}{Y+M-X}\right)_i$
211	Coal mining	40.8	28.5	6.82
213	Iron ore mining	5.89	2.6	92.66
27	Iron and steel	21.14	28.5	20.78
301	Steel drawing and rolling mills		27.6	14.04
302	Steel forging	22.8	15.1	5.02
32	Machinery	24.72	48.0	16.66
36	Electrical engineering and electronics		25.7	14.05
37	Optics, watches, precision engineering	20.58	53.7	36.15
51	Fine ceramics	23.06	35.0	24.87
63	Textiles	16.67	23.7	30.51

*Industries are listed already according to our final classification. Export shares (S_i) are calculated matching OECD statistics on a SITC basis with our industry classification.

TABLE A-II

Average values and standard errors of labor's share

a) Competitive industries	$\bar{\hat{s}}_L$	σ	b) Discriminatory industries	$\bar{\hat{s}}_L$	σ	c) Sheltered industries	$\bar{\hat{s}}_L$	σ
215	.025	.085	22	-.013	.133	211	-.031	.058
216	-.110	.354	25	.020	.043	213	.009	.119
28	.025	.462	291	-.005	.079	27	.032	.127
33	.027	.062	295	-.000	.097	301	.013	.124
39	.008	.070	31	.013	.096	302	.015	.084
40	.023	.084	38	.004	.050	32	.012	.049
53	.033	.114	52	-.006	.042	36	.034	.037
56	-.007	.071	54	-.007	.036	37	.013	.049
61	.018	.164	55	.019	.117	51	.021	.031
68	.048	.046	57	-.002	.032	63	.026	.073
			58	.040	.082			
			59	.015	.119			
			621	-.012	.696			
			64	.023	.048			
			625	.010	.052			

TABLE A-III

Correlation between wage increases in competitive and discriminatory and sheltered industries

$$\hat{w}_s = a_o + a_1 \hat{\hat{w}}_c$$

Industry	a_o	a_1	R^2	D-W
211	$-.036^{-}$	1.219^{+++}	.59	1.03
213	$-.077^{-}$	1.738^{+++}	.32	2.23
22	$-.006^{-}$	1.133^{+++}	.58	2.43
25	$-.004$	1.020^{+++}	.72	2.34
27	$.015^{---}$	$.695^{+++}$	.30	2.02
291	$-.007$	$.973^{+++}$	.62	1.48
295	$-.007$	$.979^{+++}$	.72	1.34
301	$-.007$	$.975^{+++}$	.62	1.44
302	$.006$	$.826^{+++}$	.48	1.75
31	$-.011^{--}$	1.080^{+++}	.82	2.19
32	$-.001$	$.951^{+++}$	.73	2.51
36	$.002$	$.919^{+++}$	.36	2.05
37	$-.007$	$.985^{+++}$	.28	2.15
38	$.004$	$.854^{+++}$	.50	1.75
51	$-.001$	$.975^{+++}$	.66	2.11
52	$.009$	$.873^{+++}$	.46	2.36
54	$.006$	$.940^{+++}$	.59	2.27
55	$-.006$	1.015^{+++}	.60	2.44
57	$.025^{--}$	$.704^{+++}$	.34	2.40
58	$.005$	$.928^{+++}$	.72	2.16
59	$.004$	$.888^{+++}$	.56	1.99
621	$.007$	$.860^{+++}$	.49	1.25
625	$.001$	$.898^{+++}$	.46	2.09
63	$.012^{--}$	$.843^{+++}$	.45	2.47
64	$-.0006$	$.979^{+++}$	.56	2.24
Total Sheltered	$.0002$	$.922^{+++}$	.65	1.97
Total discrim.	$.002$	$.911^{+++}$	.75	2.26

TABLE A-IV

Prices in sheltered and discriminatory industries

	a) $\hat{p}_d = a_o + a_1\hat{w} + a_2\hat{q} + a_3\hat{p}_v$					b) $\hat{p}_d = a_1\hat{w} + a_2\hat{q} + a_3\hat{p}_v$		
Industry	a_o	a_1	a_2	a_3	R^2	a_1	a_2	a_3
211	$-.0009$	$.431^{-}$	$-.513^{++}$	1.463^{+++}	.88	$.420^{o}$	$-.516^{+++}$	1.467^{+++}
213	$-.058^{++}$	$.105^{---}$	$.340^{o}$	1.848^{+++}	.71	$-.0315$	$-.051$	1.407^{+++}
22	$-.033^{---}$	$.455^{--}$	$-.065$	$.574^{+++}$	.81	$.198^{--}$	$-.123^{--}$	$.587^{++}$
25	$-.067^{++}$	$.586^{+++}$	$.339^{+}$	$.660^{+++}$	.84	$.110^{--}$	$-.086^{---}$	$.748^{+++}$
27	$-.053^{+}$	$.502^{-}$	$.119^{--}$	$.925^{+++}$	.75	$-.227^{-}$	$.159^{-}$	1.236^{+++}
291	$.012^{---}$	$-.027$	$-.095^{--}$	1.285^{+++}	.81	$.123^{-}$	$-.071^{--}$	1.215^{+++}
295	$-.047^{+}$	$.829^{+++}$	$-.068^{---}$	$.417^{+++}$	.79	$.374^{+++}$	$-.203^{+}$	$.424^{+++}$
301	$-.030^{--}$	$.293$	$-.055$	1.356^{+++}	.88	$-.056^{---}$	$-.113^{-}$	1.501^{+++}
302	$-.036^{-}$	$.517^{o}$	$-.109^{---}$	1.016^{+++}	.72	$.125^{--}$	$-.156^{--}$	1.100^{+++}
31	$-.034^{-}$	$.486^{-}$	$.179^{--}$	$.783^{+++}$	.72	$.073^{---}$	$.245^{o}$	$.920^{+++}$
32	$-.031^{+}$	$.525^{+++}$	$.061$	$.692^{+++}$	.84	$.154^{o}$	$.045$	$.847^{+++}$
36	$-.038^{+++}$	$.484^{+++}$	$-.075^{---}$	$.478^{+++}$	.87	$.234^{+++}$	$-.267^{+++}$	$.395^{+++}$
37	$-.016^{-}$	$.480^{+++}$	$-.113^{--}$	$.318^{+++}$	.77	$.376^{+++}$	$-.203^{+++}$	$.236^{++}$
38	$-.038^{+++}$	$.685^{+++}$	$-.164^{o}$	$.602^{+++}$	.83	$.253^{++}$	$-.158^{-}$	$.692^{+++}$
51	$-.048^{+++}$	$.768^{+++}$	$-.173^{o}$	$.469^{+++}$	.87	$.332^{+++}$	$-.365^{+++}$	$.567^{+++}$
52	$-.007^{---}$	$.260^{+}$	$-.122^{-}$	$.775^{+++}$	.88	$.205^{+++}$	$-.146^{+}$	$.778^{+++}$
54	$-.020^{-}$	$.410^{+++}$	$-.027$	$.591^{+++}$	.83	$.258^{+++}$	$-.110^{--}$	$.612^{+++}$
55	$-.024^{o}$	$-.009$	$.044$	1.577^{+++}	.95	$-.239^{++}$	$.002$	1.624^{+++}
57	$.008^{---}$	$.300^{+}$	$-.275^{+}$	$.583^{+++}$	.83	$.370^{+++}$	$-.244^{+}$	$.578^{+++}$
58	$-.062^{-}$	$.329^{--}$	$.068$	1.165^{+++}	.71	$-.125^{---}$	$-.139^{---}$	1.191^{+++}
59	$-.041^{-}$	$.250^{---}$	$.267^{--}$	1.539^{+++}	.80	$-.159^{--}$	$.143^{---}$	1.676^{+++}
621	$-.031^{o}$	$.683^{+++}$	$-.305^{+}$	$.783^{+++}$	.79	$.414^{+++}$	$-.369^{+++}$	$.728^{+++}$
625	$.004$	$.197^{--}$	$-.327^{++}$	$.865^{+++}$	.73	$.240^{+++}$	$-.314^{++}$	$.864^{+++}$
63	$-.045^{o}$	$.423^{-}$	$-.004$	$.915^{+++}$	.71	$.011$	$-.121^{---}$	1.087^{+++}
64	$-.035^{+++}$	$.518^{+++}$	$-.049^{---}$	$.543^{+++}$	.84	$.202^{+++}$	$-.126^{-}$	$.572^{+++}$
Tot. shel.	$-.046^{+++}$	$.652^{+++}$	$-.040^{---}$	$.663^{+++}$	.95	$.222^{++}$	$-.228^{+}$	$.754^{+++}$
Tot. dis.	$-.034^{+++}$	$.554^{+++}$	$-.093^{--}$	$.691^{+++}$	.93	$.263^{+++}$	$-.259^{+}$	$.747^{+++}$

TABLE A-V

Theil coefficients for predictions of the average prices (weighted by value added)of sheltered industries

Predictions are based on : $\hat{p}_d = a + b\hat{w} + c\hat{q} + d\hat{p}_v$

Year	Theil
1955	.2711
1956	.1681
1957	.1863
1958	.4283
1959	.2586
1960	.2906
1961	.1965
1962	.1849
1963	.3316
1964	.3142
1965	.1628
1966	.2169
1967	.2850
1968	.1739
1969	.1792
1970	.1601
1971	.1055
1972	.2110
1973	.1990
1974	.0640
1975	.2392