ANOTHER TWIST ON THE AUSTRIAN PHILLIPS CURVE*

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Abstract

It is often claimed that the Austrian system of Social-Partnership rests heavily on a tacit agreement to hold the functional income distribution unchanged (at least if the labour market is broadly in equilibrium). The paper demonstrates that a stabilization of labour's share in national income necessarily implies the consideration of a "wedge" term - namely the ratio between producer and consumer prices - in a wage equation of the Phillips curve type and incorporates this idea into an empirical analysis of wage formation in Austria. In summary, the empirical findings seem to suggest an interpretation of the Austrian Phillips-curve as a real product-wage equation.

Content

1. Introduction

The 1980s have seen a prolonged period of sustained wage and price disinflation in most OECD countries. In the majority of countries, however, unemployment has continued to rise or has remained stubbornly high. Recent research on the nature of the observed labour market imbalances has put a large deal of emphasis on wage flexibility issues, partly to explain differing developments in unemployment, especially between Europe and the United States, partly to investigate whether the recent wage moderation can be attributed to increased real-wage flexibility (see e.g. Grubb, Jackman, Layard (1982); Sachs (1983); Grubb (1986); OECD (1986)).

In the last few years a considerable body of empirical evidence on the degree of wage flexibility in different countries has been produced (see e.g. Grubb, Jackman, Layard (1983); Coe (1985); Klau, Mittelstädt (1986)). A conventionally adopted measure of wage-rigidity has been the ratio between the short-run elasticity of nominal wages with respect to inflation and the short-run semi-elasticity of wages with respect to the unemployment rate, both of which are usually derived within an augmented Phillips-curve framework. Real wage flexibility will become lower the more rapidly nominal wages respond to a price shock and the less responsive they are to the unemployment rate.

Most empirical evidence based on this approach suggests a grouping of Austria among the countries with the most flexible wages in Europe (e.g. Coe (1985); Klau, Mittelstädt (1986); OECD (1986)). This is mainly attributed to the relatively high responsiveness of nominal wages to movements in both productivity and unemployment. Earlier empirical studies also found nominal inertia in the wage formation process in Austria in so far as a general increase in prices was associated with a less than unity increase in wages (e.g. Breuss (1980)). More recent estimates, however, seem to suggest that the observation by Sachs that "in Europe the link between changes in wages and consumer prices is virtually instantaneous" (Sachs (1983), 275) may well be appropriate for Austria, too (Seidel (1985); Pichelmann, Wagner (1986); Biffl, Guger, Pollan (1986)).

Following an approach by Newell and Symons (1986) it is this proposition that we want to tackle in our paper. They point out that most of the evidence for the nominal rigidity proposition may be due to the omission of relevant variables in the wage determination equation, namely the producer prices; the traditional Phillips-curve approach usually considers just consumer prices and may therefore not account properly for different natures of possible price-shocks.[1)]

There are several justifications for the inclusion of both producer and consumer prices in a wage equation. In principle, any bargaining interpretation of the wage formation process should incorporate the fact that the two sides of the market pursue different real objectives with regard to wages. Workers are interested in their real consumption wages, whereas for the producers real product wages matter. In practice it is the ratio between these two prices that should enter the wage equation; the inclusion of this "wedge" term, which is - by construction - to a large extent shaped by movements in the Terms-of-Trade, helps to clarify whether wages react to external price shocks in a different way than to domestically produced price increases.

In this paper we therefore take another look at the wage formation process in Austria with a special focus on the adaptability of wages to different types of price shocks. The paper is organized as follows: Section 2 sets the stage for the analysis. It is often claimed that the Austrian system of Social-Partnership rests heavily on a tacit agreement to hold the functional income distribution unchanged (at least if the labor market is broadly in equilibrium). We demonstrate that a stabilization of labour's share in national income necessarily implies the consideration of a "wedge" term in the wage equation. In section 3 we present our empirical findings and put the derived parameter restrictions to a test. The final section simply summarizes our results.

2. Framework of Analysis

A general formulation of the Phillips curve relates the growth rate of nominal wages w to a measure of excess demand in the labour market (in most cases a function of the deviation of the unemployment rate U from a "natural rate" U*) and a vector of variables X to be specified according to the institutional arrangements prevalent in the country considered.

(1) $w = a_1 f(U-U^*) + a'_2 X$

In the case of Austria many observers have emphasized the peculiar importance of the political and organizational framework of neo-corporatist income policies, which has served Austria so well in fighting inflation (see Arndt (1982)). In that respect it is often claimed that one superior quality of the Social-Partnership system arises from the avoidance of inflationary struggles for labour and profit shares in national income (Streissler (1976)). This idea can be used to specify the ingredients of the vector X in (1)[2)]. The share of labour in nominal output is defined by

(2) $s_L = \frac{W \cdot L}{P_y \cdot Y}$

where W denotes the wage rate, L employment, P_y the output price deflator and Y output. To achieve long run constancy of s_L, simple algebra establishes that the real consumer-wage must grow in the long run as follows:

(3) $w - pc = (y - l) + (py - pc)$

The small letters indicate the growth rates of their respective counterparts in levels and pc denotes consumer price inflation. Relation (3) reads as follows:
A stabilization of the functional income distribution requires that in the long run the increase in real consumer-wages must be equal to the growth rate of labour productivity plus the difference between output price inflation and consumer price inflation (effects of taxation are ignored). This hypothesis can now readily be incorporated into specification (1) and results in the following Phillips-curve type of wage equation

(4) $w = a_o + a_1 \cdot f(U) + a_2 pc + a_3 pr + a_4 (py - pc)$

where the constant term incorporates the equilibrium components of unemployment U* and pr denotes the rate of growth of labour productivity. The long run parameter restrictions to be tested are given by

(5) $a_2 = a_3 = a_4 = 1$

Obviously, equations (3) and (4) are only reconciled, if the labour maket is in equilibrium, i.e. U equals U*. Thus, any deviation of the unemployment rate from its "natural" level, gives rise to a shift in the functional distribution.

Another major implication of this specification is, that nominal wages respond in a different way to external and internal price shocks. If the restrictions (5) hold even rapid import price movements are easily absorbed within the wage-price system, stemming from the assumption that Terms-of-Trade effects are accounted for in the formulation of wage-guidelines[3].

The macroeconomic consequences of a wage-formation process characterized by eqs. (4) and (5) with regard to output and employment levels, however, are difficult to assess. It seems that in the Austrian setting of the attachment of goals and instruments of economic policy, exchange rate and incomes policies are primarily designed to keep inflation down and maintain the international competitiveness of the economy.

3. Empirical Results

Following Hendry's econometric methodology, we start with a fairly general dynamic specification (see Hendry (1980)) and estimate our basic relationship (4) with appropriate lags introduced as suggested by the data[4]. The dependent variable is the rate of change of nominal wages and salaries per employee in the whole economy (for a detailed description of data, definitions and sources see Appendix).

The estimation results are reported in Table 1. Column (1) shows the coefficient estimates using ordinary least squares (OLS). Since the contemporaneous value of the unemployment rate appears as a regressor, we reestimated the equation by an instrumental variable (IV) method. The results are presented in column (2). As there is practically no difference between the OLS- and the IV-results, we proceeded using the OLS-estimates of column (1). Various diagnostic checks were performed to test whether the necessary conditions for the appropriateness of the OLS-method are valid. None of the test reported in Table 1 resulted in a rejection of these assumptions.

Table 1: Wage Equations for Austria 1967-1985*

Independent Variables

	(1)	(2)**	(3)***	(4)
pc_t^e	-	-	-	.95 (.19)
pc_{t-1}	1.15 (.22)	1.18 (.24)	1.00	-
pr_{t-1}	.74 (.19)	.75 (.19)	.59 (.11)	.40 (.17)
pr_{t-2}	.52 (.16)	.53 (.16)	.41 (.11)	.50 (.16)
$(py-pc)_{t-1}$	1.39 (.36)	1.43 (.39)	1.00	.66 (.32)
$1/U_t$	9.62 (2.43)	8.99 (3.10)	11.06 (1.96)	9.45 (2.54)
constant	-5.43 (1.50)	-5.36 (1.51)	-4.54 (.87)	-3.3 (1.31)

Summary Statistics

	(1)	(2)	(3)	(4)
R^2	.90	.90	.87	.89
SE	1.11	1.11	1.09	1.14
T	19	19	19	19

Diagnostic Checks****

	(1)	(2)	(3)	(4)
LM (1)	1.13	-	-	1.60
LM (2)	.05	-	-	.29
GQ	1.34	-	-	3.56
NORMAL	.73	-	-	1.94
CUSUM	n.r.	-	-	n.r.

None of the test statistics is significant at the 5% level.

* Sources: see data appendix

** The instruments used are the unemployment rate with two lags and a trend variable.

*** Restricted wage equation estimated by a non-linear least squares procedure.

**** LM (1) and LM (2) are tests for first and second order autocorrelation. Both statistics are standard normally distributed under the null. GQ is the Goldfeld -Quandt test for heteroscedasticity with an F-distribution under the null NORMAL tests for normality of the disturbances and is distributed as X^2 with 2 degrees of freedom. CUSUM tests for the stability of the regression parameters as well as for the constancy of the variance of the regression disturbances. For details on the tests see Krämer and Sonnberger (1986).

n.r. = not rejected at the 5% significance level.
The figures in parentheses are the standard errors.

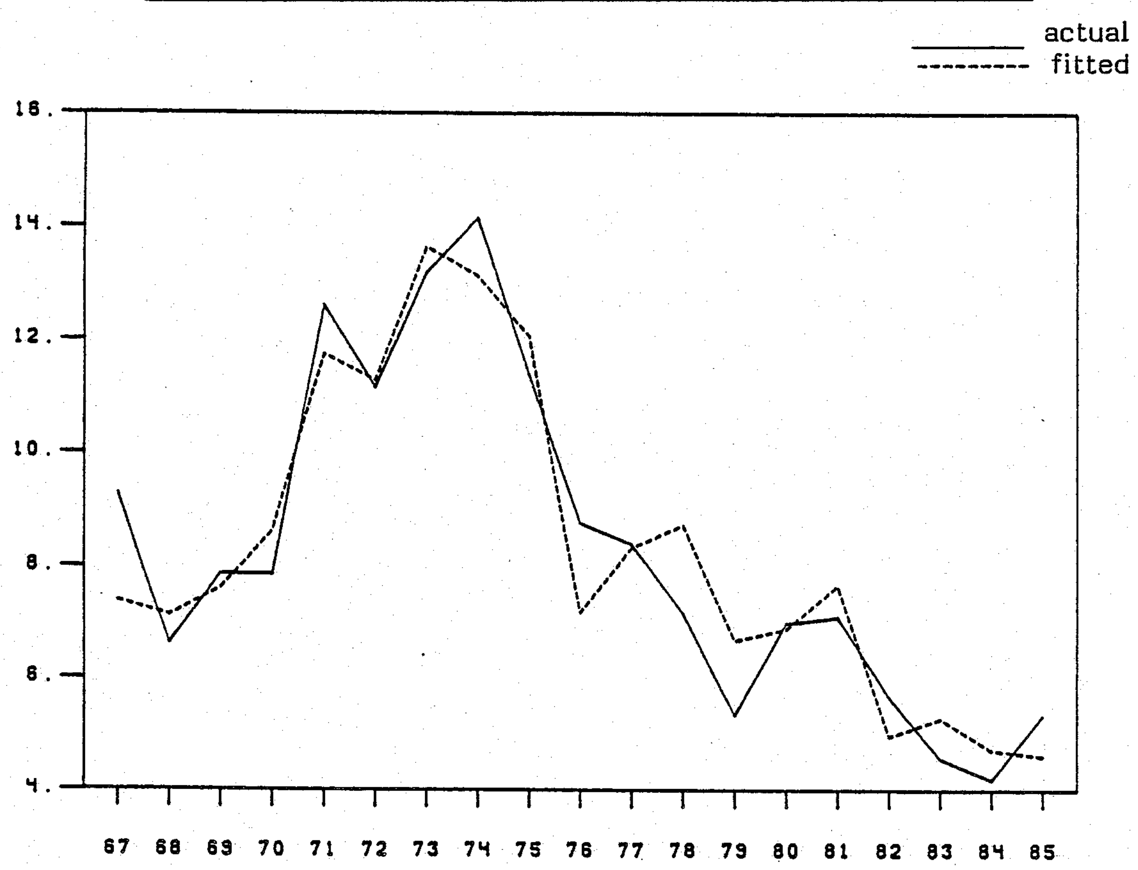
Table 2: Tests for Restrictions

	Test Statistic	Marginal Significance Level*
"Nominal Inertia" (a_2=1)	F(1.13)= .458	51.06 %
"Productivity Effect" (a_3=1)	F(1.13)= .106	32.23 %
"Wedge-Term Effect" (a_4=1)	F(1.13)= 1.17	29.87 %
"All Restrictions"	F(3.13)= .898	46.84 %

* Marginal significance level is the probability of getting the indicated coefficient if the null hypothesis is valid.

Then we proceeded to test the restrictions implied by the theoretical derivation of the wage equation. Table 2 reports the test statistics for each of the restrictions and all restrictions taken together. The high marginal significance levels of the test statistics indicate that the restrictions hold by a wide margin. Column (3) of Table 1 contains NLS-estimates of the constrained version of equation (4), where the restrictions (5) were put on the equation. For a visual impression of the tracking performance of the equation we reproduce fitted and actual values of the money wage growth variable in figure 1.

Figure 1: Actual and fitted values of wage equation in column (1), table 1



The story on wage-formation in Austria derivable from our empirical results reads as follows:

(1) The coefficient on consumer prices takes the value 1, thus Unions do not suffer from money-wage illusion. But this proposition only holds true for home-made inflationary spurts; any gap that emerges between producer price inflation and consumer price increases, e.g. as a result of external price shocks, is fully corrected by the rate of wage growth. This correction mechanism is captured by the "wedge" term, revealing the explicit consideration of Austria's competitive position on the world markets in the wage formation process. In the stylized version of the equation (column 3 in Table 1) the consumer price inflation term cancels out leaving the domestic inflation term as determining wage growth with a unitary coefficient. This, obviously, implies that we find no nominal inertia with respect to domestic inflation.

(2) Former estimates of Phillips-curves for Austria may suffer from an omitted-variables bias since they left out the "wedge" term (py-pc). The bias caused by the omission of this variable probably gives a clue to the finding of a "stable" Phillips-curve implying the existence of a long run trade-off between inflation and unemployment. We do not find such a trade-off.

(3) Wage formation in Austria exhibits an impressive amount of real wage flexibility. Ceteris paribus, wage increases are tied to productivity growth, which serves as a guideline for the fair division of the social product between wages and profits. Additionally, the degree of labour utilization has a considerable impact on wage increases; on the basis of the average rate of unemployment over the estimation period the equation (column (1) in Table 1) yields a semi-elasticity of nominal wages with respect to the unemployment rate of 1.3. This value compares well with the findings of other studies and puts Austria once more in the top league of OECD-countries.

A number of specification issues remain to be discussed in somewhat more detail:

(i) Labour market equilibrium and disequilibrium terms: One key point is that the equation contains the inverse of the unemployment rate. This specification appears to be more robust, but it carries serious implications. It suggests that the additional dampening effect of unemployment on wages decreases when unemployment goes up. One possible explanation might be that with increasing unemployment the proportion of outsiders, e.g. long-term unemployed, exerting little influence on wage formation rises (see Lindbeck, Snower (1986)). In fact, when calculated at the 1985 value, the semi-elasticity of wages with respect to unemployment drops to 0.39. The inclusion of both the level and the inverse of the unemployment rate, however, did not yield sensible results. We also investigated into the effects of lagged unemployment on wage formation to test whether the natural rate exhibits hysteresis properties (see e.g. Blanchard, Summers (1986)). Since these attempts have not (yet?) proven notably successful, we tend to stick to a constant natural rate specification[5)]; the natural rate estimates vary between 1.7 and 2.8.

(ii) The inflation term: In our specification only lagged consumer price inflation enters the wage equation, suggesting some short-term inertia of wage-setting institutions, which probably reflects institutional features like the one-year bargaining cycle; current inflation has no significant impact. When the lagged inflation term is replaced by the one-year ahead inflation forecast published by the Austrian Institute of Economic Research in December (see column (4) in Table 1) there is little to choose between the alternatives. The coefficient on the inflation term remains close to unity, the coefficient on the "wedge" term drops to 0.67 but still satisfies the unitary restriction. Thus, in practice, it seems difficult to decide whether expected or past inflation should appear in the specification of the Austrian wage-formation process.

(iii) The "wedge" term: Relative import prices (and taxation) might introduce a "wedge" between employers' real labour cost (evaluated at producer prices) and workers' real take-home pay (evaluated at consumer prices). In our specification the difference between output price inflation and consumer price inflation enters the wage equation via the assumption of a more or less stable functional income distribution. This implies that increases in the "wedge" must be borne by labour. The empirical results tend to support this view, although a careful examination of taxation effects remains to be carried out.[6)]

With regard to the statistical quality of the estimates, the econometric results presented so far have established two points: The estimation results presented in Table 1 give a data coherent description of the data generation process, and the results are consistent with the long-run constraints derived from a priori considerations. Nevertheless, this type of evidence does not immediately lead to the conlusion that ours is a "good model" (see Hendry (1980) on this point).

In order to provide some more support to our empirical findings, we proceeded in the following way: First, the data sample was extended backwards to 1960. Although some doubts on the accuracy of the data published for the period before 1964 may be justified, evidence that the equation explains this extended data set well would be welcome. Second, an ex-ante forecasting test for the period 1981-85 was performed to check whether the parameters of the equation remain stable over this disinflation period.

The results for estimating the wage equation over the period 1960-1985 are as follows:

$$w_t = \underset{(.27)}{1.06}\, pc_{t-1} + \underset{(.2)}{.39}\, pr_t + \underset{(.19)}{.73}\, pr_{t-1} + \underset{(.15)}{.35}\, pr_{t-2} + \underset{(.35)}{1.32}\, (py-pc)_{t-1} + \underset{(2.71)}{9.62}(1/U_t) - \underset{(1.96)}{5.15}$$

R^2 = .81 DW = 1.67

SE = 1.3

T = 26

In this equation the current productivity term is marginally significant and therefore included in the equation. The tracking performance of the equation, as indicated by the R^2, deteriorates slightly. But an F-test for all the restrictions gives a statistic of $F(3,19) = 2.15$, so that the null hypothesis cannot be rejected at a significance level of 5%.

Basically, in the forecasting test the equation is reestimated over a shorter sample period (in our case 1967-1980). Then forecasts for the periods ahead (1981-1985) are generated using the parameters estimated on the shorter period and the realized values of the regressors. On the basis of the forecast errors a test statistic for parameter constancy can be calculated (see Hendry (1980)). The results of this exercise are shown in table 3.

Table 3

Parameter Constancy Test Based on 1-Step Forecasts for 1981:85

Year	Actual	Forecasted	Error
1981	7.10	7.3	-.2
1982	5.70	4.9	.8
1983	4.6	6.0	-1.4
1984	4.2	5.3	-1.1
1985	5.3	4.6	.7

Test of parameter constancy over 1981-1985

$\chi^2(5) / 5 = .55$

The index for the maintained parameter constancy hypothesis is well below the critical value. Thus the various tests applied give no indication that there has been a statistically important structural change in the wage-formation process.

4. Conclusions

The main conclusions from our analysis are that wage formation in Austria exhibits in fact no nominal inertia with regard to home-made price increases. Nevertheless there is a considerable amount of real wage flexibility in Austria, mainly due to labour's willingness to quickly accept reductions in real consumption-wages enforced either by Terms-of-Trade losses or by lower productivity gains. We also find a significant responsiveness of wages to unemployment, but could not detect hysteresis properties in the natural rate. The estimated wage-equation has proven to be stable over the entire estimation period. In summary, we are inclined to suggest an interpretation of the Austrian Phillips-curve as a real product-wage equation.

Notes

1) There are a few exceptions to be found in the literature. In the study by Coe (1985), the difference between the growth of the private consumption deflator and the growth of the GDP deflator is included in the wage equation for Switzerland; this variable also appears in the wage-equations for Switzerland and Austria provided by the OECD (1986).

2) A quite similar line of argument has been employed by Wörgötter (1983) to rationalize the then prevalent notion of a "stable Phillips curve" for Austria.

3) These lines of thought have already been pursued in several studies on wage-formation in Austria, in which variables characterizing the external sector of the economy have been included in wage equations (see e.g. Breuss (1980), Biffl, Guger, Pollan (1986)).

4) The general dynamic specification included one lag of the dependent variable, one lag for the two inflation terms and two lags for the productivity term.

5) Coen and Hickman (1986) also find only very small variation in their natural rate estimates for Austria. For a different view see Stiassny (1985).

6) Effects of indirect as well as direct taxation are ignored in this study. Empirically, we experimented with various proxies for direct and indirect tax effects, but did not find them important. The question of tax effects, however, has to be examined more thoroughly in future research. For a theoretical framework on this point see Gordon (1985).

Data Appendix:

The following data were used to estimate the wage equations in this paper

Year	w	pc	pcf	py	pr	U
1958	3.1	2.300	.	-.500	2.844	5.141
1959	4.6	1.100	.	3.500	1.310	4.626
1960	7.2	1.900	.	3.100	6.067	3.516
1961	9.8	3.500	.	4.900	3.723	2.688
1962	8.5	4.400	.	3.700	1.817	2.715
1963	7.9	2.700	.	3.500	4.081	2.957
1964	9.0	3.900	3.000	3.200	5.208	2.736
1965	8.975	4.753	3.500	5.536	2.248	2.704
1966	10.031	2.355	3.000	3.618	4.910	2.535
1967	9.273	3.955	5.000	3.420	4.016	2.691
1968	6.622	2.542	3.500	3.194	5.012	2.967
1969	7.870	3.578	2.800	3.523	4.645	2.796
1970	7.859	4.476	4.200	5.424	5.027	2.412
1971	12.611	4.982	5.100	6.207	2.301	2.096
1972	11.149	6.485	4.700	7.598	3.764	1.937
1973	13.182	6.582	7.500	8.048	1.043	1.575
1974	14.153	10.013	8.500	9.502	2.042	1.546
1975	11.376	7.885	9.500	6.457	-.344	2.066
1976	8.761	6.543	7.500	5.626	3.431	2.036
1977	8.393	5.372	6.300	5.269	2.404	1.853
1978	7.167	4.325	4.500	5.249	-.231	2.100
1979	5.344	4.376	3.000	4.145	3.561	2.014
1980	6.998	6.402	4.800	5.129	2.298	1.877
1981	7.109	7.570	6.000	6.318	-.501	2.424
1982	5.670	5.948	5.800	6.165	2.293	3.681
1983	4.565	2.990	4.200	3.905	2.883	4.450
1984	4.184	5.765	5.300	4.847	1.612	4.538
1985	5.340	3.417	4.300	3.262	2.414	4.810

w: Growth rate of average effective wage per employee
pc: Growth rate of implicit consumption deflator
pcf: Forecast of consumers price inflation for year t by the Austrian Institute for Economic Research published in December of year t-1
py: Growth rate of GDP-deflator
pr: Growth rate of labour productivity per employee
U: Unemployment Rate

Sources

pcf was kindly made available by K.Aiginger. The growth rates of the remaining variables for 1965-1985 were taken from the data base of the Austrian Institute for Economic Research. The growth rates of these variables for 1958-64 were calculated from the figures given in the data appendix of: Handbuch der österreichischen Wirtschaftspolitik, 2. Auflage, Tabelle II.1 and Table IV. The unemployment rate was also taken from the data base mentioned above.

References

ARNDT, S. (ed.) (1982): The Political Economy of Austria. American Enterprise Institute for Public Policy Research. Washington, London.

BIFFL, G., A. GUGER, W. POLLAN (1986): Some Reasons for Low Unemployment in Austria. WIFO Working Paper 19, Austrian Institute for Economic Research, September 1986

BLANCHARD, O.J., L.H. SUMMERS (1986): Hysteresis and the European Unemployment Problem. Fisher, S. (ed.) Macroeconomics Annual 1986; Vol. 1. National Bureau of Economic Research, 15-89.

BREUSS, F. (1980): Gibt es eine stabile Phillips-Kurve in Österreich? Monatsberichte des Österreichischen Instituts für Wirtschaftsforschung 53, 210-222.

COE, D.T. (1985): Nominal Wages, the NAIRU and Wage Flexibility. OECD, Economic Studies No. 5, Autumn 1985, 87-126.

COEN, R.M., HICKMAN, B.G.(1986): Unemployment, Real Wages, and Economic Growth in Austria, Germany, and the United States. Mimeo.

GORDON, R.J. (1985): Understanding Inflation in the 1980s. Brookings Papers on Economic Activity (1), pp.263-300.

GRUBB, D., R. JACKMAN, R. LAYARD (1982): Causes of the Current Stagflation. Review of Economic Studies 49, 707-730.

GRUBB, D., R. JACKMAN, R. LAYARD (1983): Wage Rigidity and Unemployment in OECD Countries. European Economic Review 21, 11-40.

GRUBB, D. (1986): Topics in the OECD Phillips Curve. Economic Journal 96, 55-79.

HENDRY, D.F. (1980): Predictive failure and econometric modelling in macroeconomics: The transactions demand for money. In: Economic Modelling. Ed.: P. Ormerod, pp.217-242, London.

KLAU, F., A. MITTELSTÄDT (1986): Labour Market Flexibility. OECD, Economic Studies No. 6, Spring 1986, 7-45.

KRÄMER, W., SONNBERGER, H. (1986): The Linear Regression Model under Test. Heidelberg.

LINDBECK, A., D.J. SNOWER (1986): Wage Setting, Unemployment and Insider-Outsider Relations. American Economic Review 76.

NEWELL, A., J. SYMONS (1986): The Phillips Curve is a Real Wage Equation. Discussion Paper No. 246. Centre for Labour Economics, London School of Economics.

OECD (1986): Wage Moderations and Labour Market Imbalances. Working Party No. 1 of the Economic Policy Committee, CPE/WP1 (86) 3, Paris.

PICHELMANN, K., M. WAGNER (1986): Labour Surplus as a Signal for Real-Wage Adjustment: Austria 1968-1984. Economica 53, Special Issue on Unemployment, 75-87.

SACHS, J.D. (1983): Real Wages and Unemployment in the OECD Countries. Brookings Papers on Economic Activity 1983, 225-289.

SEIDEL, H. (1985): Flexibilität der Reallöhne in Österreich. Wirtschaftspolitische Blätter 32, 564-573.

STIASSNY, A. (1985): The Austrian Phillips Curve Reconsidered. Empirica 12, 43-66.

STREISSLER, E. (1976): Sozialpartnerschaft und Gewinne. Wirtschaftspolitische Blätter 23/4, 40-50.

WÖRGÖTTER, A. (1975): Lohn- und Preisgleichungen für Österreich. Empirica 2, 57-77.

WÖRGÖTTER, A. (1983): A Note on The Stable Phillips Curve in Austria. Empirica 10, 29-40.