

Unemployment and the Rate of Change in Money Wage Rates in Switzerland *

By Rajindar K. Koshal and Lowell E. Gallaway, Athens (Ohio)

I.

In the past decade a great volume of work has been done along the lines suggested by A. W. Phillips' article dealing with the relationship between the rate of change in money wage rates and unemployment levels in the United Kingdom¹. This phenomenon has been explored for a number of countries, generally with the objective of answering the question of whether this relationship, commonly called a Phillips curve, exists for the country involved². Two different approaches have been taken; one which is consistent with the original formulation of the Phillips curve by Phillips himself, and its modification by Lipsey, and another which deviates from this path by either incorporating a number of other variables in the Phillips curve relationship or completely revising it³.

Thus far, there has been at least one attempt to test the applicability of Phillips' hypothesis to the economy of Switzerland, by Rossi and Thomas⁴, and it is in the

* The authors are, respectively, Associate Professor and Professor of Economics at Ohio University. All computations were conducted at the Ohio University Computer Center.

¹ Phillips, A. W., "The Relation Between Unemployment and the Rate of Change in Money Wage Rates in the United Kingdom, 1861-1957", *Economica*, November 1958, pp. 283-299.

² See, e.g., Kaliski, S. F., "The Relation Between Unemployment and the Rate of Change in Money Wages in Canada", *International Economic Review*, January 1964, pp. 1-33; Zaidi, M. A., "The Determinants of Money Wage Rate Changes and Unemployment-Inflation 'Trade-offs' in Canada", *International Economic Review*, June 1969, pp. 207-219; Hofmann, W., "Die Philips-Kurve in Deutschland", *Kyklos*, No. 2, 1969, pp. 219-231; Jacobsson, L. and Lindbeck, A., "Labor Market Conditions, Wages and Inflation - Swedish Experiences, 1955-1967", *Swedish Journal of Economics*, No. 2, 1969, pp. 64-103; Lipsey, R., "The Relation Between Unemployment and the Rate of Change of Money Wage Rates in the U. K., 1862-1957; A Further Analysis", *Economica*, February 1960, pp. 1-31; Phillips, *op. cit.*, and Bowen, W. and Berry R., "Unemployment Conditions and Movements of the Money Wage Level", *Review of Economics and Statistics*, May 1963, pp. 163-172.

³ For examples of the latter approach, see Brechling, F., "The Trade-off Between Inflation and Unemployment", *Journal of Political Economy*, July/August 1968, Part II, pp. 712-737; Eckstein, Otto, "Money Wage Determination Revisited", *The Review of Economic Studies*, April 1968, pp. 133-143; Eckstein, Otto and Wilson, T. A., "The Determination of Money Wages in American Industry", *Quarterly Journal of Economics*, August 1962, pp. 379-414; Kuh, Edwin, "A Productivity Theory of Wage Levels - An Alternative to the Phillips Curve", *The Review of Economic Studies*, October 1967, pp. 333-360; Perry, G. L., *Unemployment, Money Wage Rates, and Inflation*, Cambridge, Massachusetts, 1966; and Phelps, E. S., "Money Wage Dynamics and Labor-Market Equilibrium", *Journal of Political Economy*, July/August 1968, Part II, pp. 678-711.

⁴ Rossi, Angelo A. and Thomas, R. Leighton, "Inflation in the Post-war Swiss Economy - An Econometric Study of the Interaction between Immigration and the Labour Market", *Schweizerische Zeitschrift für Volkswirtschaft und Statistik*, December 1971, pp. 761-790.

vein of the modified Phillips curve approach. Actually, in the Rossi and Thomas work the Phillips curve formulation they use (i. e., their equation to explain the rate of change in money wage rates) is embedded in a larger model of the inflationary process for the Swiss economy. What we propose to do in this article is present an alternative version of the Phillips curve relationship for Switzerland, one, incidentally, that is more in the tradition of Phillips' original version of a Phillips curve. Thus, we call it a "pure" Phillips curve. By this, we mean that we will confine ourselves to examining only the relationship between rates of change in money wage rates and unemployment rates.

II.

As we have indicated, our objective is to estimate a "pure" Phillips curve for the Swiss economy. In previous work dealing with this relationship for other countries, we have argued that the appropriate specification of the Phillips curve equation is⁵

$$(W_{t+1} - W_t)/W_t = a + b U_{t-1} + c U_t + d U_{t+1} + e \quad (1)$$

where W denotes money wage rates, U is the unemployment rate, the subscripts $t-1$, t , and $t+1$ indicate different time periods, and e is a random error term⁶. The rationale of this specification is that approaches to estimating a Phillips curve that attempt to align the data by averaging or centering the unemployment rates frequently employ unemployment rates from three consecutive years. This is particularly true of formulations that employ both the unemployment rate and changes in unemployment rates as independent variables⁷. Combining unemployment rates through some sort of averaging or centering technique (1) implicitly assumes a particular lag structure among the variables and (2) assigns arbitrary weights to the various unemployment rates. Expression (1) avoids these problems by allowing the regression coefficients to determine the appropriate lags and the weights to be assigned to the various unemployment rates.

For data describing unemployment rates for Switzerland, we have divided the number of registered unemployed in the years 1950–1967 by the population. This implicitly assumes that the aggregate labor force participation rate in Switzerland is stable over time⁸. Using data from the *United Nations Yearbook*, this procedure yields an unemployment rate that varies between 0.01 and 0.45 percent. From the

⁵ For a summary of this work, see our "The Phillips Curve: An International Phenomenon", *Rivista Internazionale di Scienze Economiche e Commerciali*, July, 1973, pp. 669–80.

⁶ This may be specified with the variables transformed into logarithms.

⁷ For example, see *Bowen and Berry, op. cit.*

⁸ The ratio between the labour force and population has been approximately 0.46.

same source, we also obtain our data for the rate of change in money wage rates. Using these data, the result of estimating the relationship shown in (1) is⁹:

$$\Delta W_t = 7.6867 + 5.8076 U_{t-1} - 25.5342 U_t - 10.0108 U_{t+1}, \quad (2)$$

(1.75) (4.68) (1.45)

$$R^2 = 0.8985, D-W = 0.8212$$

where ΔW_t is the rate of change in money/wage rates, the values in parentheses are t-values, R^2 is the coefficient of determination (adjusted for degrees of freedom), and D-W is the Durbin-Watson statistic for testing for the presence of serial correlation¹⁰.

Interestingly, the results shown in regression (2) explain a larger proportion of the variance in ΔW_t than any of the wage adjustment equations reported by Rossi and Thomas. Further, the signs of the unemployment coefficients are reasonably consistent with previous formulations of Phillips curves. The negative sign associated with the U_{t+1} variable argues that, *ceteris paribus*, the higher the unemployment rate in time $t + 1$, the lower will be the rate of change in money wage rates between times t and $t + 1$. In effect, all this says is that if the change in unemployment is positive, the change in money wage rates will be negative. Similarly, the positive sign for the U_{t-1} variable implies that, *ceteris paribus*, the greater the unemployment level in time $t-1$, the greater the change in money wage rates from t to $t + 1$. Again, this argues that if the unemployment rate is falling, the change in money wage rates will be positive. The expected relationship between ΔW_t and U_t is more difficult to determine since it combines both the effects described for the variables U_{t+1} and U_{t-1} . Therefore, we do not have any *a priori* expectations as to its sign.

The relationships shown in equation (2) can be further refined. First, an examination of the data and the residuals of the regression suggests that there was a shift in the Swiss Phillips curve after 1961¹¹. Consequently, we have added to the model a dummy variable which takes the value one for 1950–1960 and two for later years. Second, an interesting question with respect to any Phillips curve is whether it is stable. We raise this question for two reasons: (1) for policy purposes this stability is quite important and (2) other studies we have done with this specification of a Phillips curve have, on occasion, shown signs of instability. For example, our examination of the Phillips curve for the United States revealed a tendency for

⁹ We estimated the regression with a logarithmic transformation of the variables. This yields decidedly inferior results.

¹⁰ Durbin-Watson statistics are reported throughout. All of them are of either sufficient value to indicate an absence of serial correlation or are in the indeterminant range. Thus, problems of serial correlation do not appear to be of major importance.

¹¹ A possible source of this shift might be the impact of world-wide recovery from the recession of 1958–1959.

that relationship to shift negatively over time¹². To test for this possibility with respect to Switzerland, we have included a time drift variable, T , in the regression. It takes the value one for 1950, two for 1951, etc., through eighteen for 1967. With the shift dummy and the time drift variables included, the regression results are:

$$\begin{aligned} \Delta W_t = & 11.3909 + 1.4432 U_{t-1} - 31.3577 U_t - 14.4091 U_{t+1} & (3) \\ & (0.50) & (5.53) & (2.67) \\ & + 1.3325 D - 0.3915 T, \\ & (2.27) & (3.10) \\ R^2 = & .9439, D-W = 2.1186. \end{aligned}$$

Statistically, these results represent a substantial improvement over those reported initially. Both the shift dummy and time drift variables are statistically significant with the time drift being negative. Thus, there seems to be a consistent tendency for the Swiss Phillips curve to shift in what is usually interpreted as a favorable fashion.

III.

To summarize our findings, we would argue that a Phillips curve that is meaningful statistically does exist for post-World War II Switzerland provided the specification of the Phillips curve is not unduly restrictive with respect to the relationship between the rate of change in money wage rates and unemployment levels. Further, this curve is somewhat unstable, as indicated by the shift dummy and time drift variables. Under these circumstances, variations in unemployment levels in Switzerland will explain almost ninety-five percent of the variation in the rate of change in money wage rates.

In order to assess the public policy implications of this, we have used expression (3) to determine what steady unemployment rate over a three year period would be consistent with a zero change in the level of money wage rates between times t and $t + 1$. Roughly, a 0.15 percent unemployment rate would yield this result¹³. Further, approximately a 2.5 percent increase in wage levels would be required to accomplish a one-tenth of one percentage point reduction in the unemployment rate. Consequently, we would conclude that for Switzerland, which has a very low unemployment rate, the trade-off between unemployment levels and wage rate increases is probably relatively favorable.

¹² See Gallaway, Lowell E. and Koshal, Rajindar K., "The Phillips Curve for the United States", Research Paper No. 57, Department of Economics, Ohio University. These results are also reported in Gallaway, Lowell E., *Manpower Economics*, Homewood, Illinois, 1971, Chapter Six.

¹³ This is calculated by taking the algebraic sum of the three unemployment rate coefficients and dividing it into the constant term, holding the dummy and time drift variables at their 1967 levels, and reversing the sign. The result is the unemployment rate which would just be sufficient to produce wage stability.