

More on the ‘Problem’ of Procyclical Wages

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A brief summary of the procyclical real wages controversy and macro evidence are presented in Tatom [*JPE*, Vol. 88]. He shows that a “correct specification” of the production function salvages the neoclassical interpretation of labor demand, while dismissing the problem of aggregation bias.

Using annual observations on the U.S. brewing industry (1950-1975), the authors have undertaken to replicate the Tatom investigation. A Cobb-Douglas production function was estimated, with and without utilization rate adjustment of the capital stock. Using a Cochrane-Orcutt routine, the following results were obtained:

$$\ln \hat{Y} = 13.66 + .35 \ln K + .11 \ln H + .02 T; \quad (1)$$

(4.5) (.8) (3.5)

$$\bar{R}^2 = .99 \quad \hat{\rho} = .73$$

$$\ln \hat{Y} = 14.36 + .30 \ln(\mu K) + .11 \ln H + .01 T. \quad (2)$$

(6.9) (1.2) (4.1)

$$\bar{R}^2 = .99 \quad \hat{\rho} = .91$$

where: Y is barrel output; K is the value of plant and equipment deflated by the wholesale price of beer; H is manhours; T is time; and μ is capacity utilization.

Unlike the aggregate private business sector, the brewing industry is characterized by decreasing returns to scale. The marginal products of capital and labor are positive, regardless of correcting for capacity utilization, using different deflators or omitting the time trend. The hypothesis that the capital stock and the utilization rate have equal coefficients cannot be rejected.

Because of decreasing returns to scale, the demands for factor inputs were specified as functions of input and output prices. Using Zellner’s SUR technique, the following results were obtained:

$$\ln \hat{H} = 9.08 - .71 \ln P_L - .23 \ln P_K - .22 \ln P_B; \quad (3)$$

(29.2) (-10.6) (-.5) (-1.3)

$$\ln(\mu \hat{K}) = 13.93 + 1.35 \ln P_L - 2.24 \ln P_K \quad (4)$$

(13.7) (6.1) (-1.7)

$$- .33 \ln P_B.$$

(-.6)

The price of capital was constructed as the tax and depreciation adjusted interest rate on industry debt. P_L and P_K were deflated by the wholesale price of beer, P_B was deflated by the producer price index. The time trend was dropped because of multicollinearity. Equations (3) and (4) were not estimated subject to the implied Cobb-Douglas restrictions because there are omitted input equations [Nadiri and Rosen, *AER*, Vol. 59]. This accounts for the inconsistency in parameter sizes between equations (1), (2), (3), and (4). Important are the negative and significant coefficients on P_L and P_K in their “own” demand equations. This result was also found using the unadjusted capital stock.

To check the robustness of this result, a labor demand equation was estimated, constrained to constant returns to scale. The relationship between wages and manhours was again negative, with and without a time trend or capacity utilization.

To summarize, real wages in the brewing industry are not procyclical. This result is robust to different model specifications. One might ask why this relationship is not found more frequently with macro-data. Tatom and Sargent and Wallace [*AER*, Vol. 64] argue that mis-specification is the problem. The present work suggests that aggregation to the private business sector compounds the mis-specification error. That aggregation is an essential problem is also born out by Nadiri and Rosen [“A Disequilibrium Model of Demand for Factors of Production,” *NBER*, 1973].