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PROCYCLICAL RETAIL LABOUR PRODUCTIVITY*

A. R. Thurik and A. J. M. Kleijweg

ABSTRACT

The influence of lagged adjustment and consumer spending on retail labour productivity is investigated. Both influences result in a procyclical productivity pattern.

1. INTRODUCTION

The procyclical movement in average labour productivity is often reported in studies of the relation between employment and aggregate demand. This movement means that as output expands in the recovery phase of the business cycle, labour productivity rises, and that, conversely, labour productivity falls as output falls in the declining phase.

In the present paper we investigate whether this procyclical pattern results from the lagged adjustment between actual and desired average employment per shop and/or the growth rate of consumer spending. Estimation results are presented for a wide range of Dutch shop types for a recent period (1976–1983).

2. PROCYCLICAL EFFECTS

Output changes do not have an immediate effect on employment. Possible reasons boil down to the occurrence of adjustment costs, irreversibility of decisions taken and lack of control and information. The adjustment between desired and actual employment will be modelled so that actual employment is a function of lagged and desired employment.

*This paper is a revised version of a comprehensive presentation using an alternative model specification and providing many literature references in Thurik and Kleijweg (1985). We would like to thank J. D. Hey, editor of this Bulletin, for some useful hints.

Apart from the adjustment mechanism, further procyclical effects are assumed to result from consumer spending fluctuations. They are caused by effort hoarding, service level variations and the stochastic nature of retail labour demand.

- The normal pace of work is considerably less than the maximum pace. This effort hoarding implies that the work force is capable of a temporary productivity increase in times of consumer spending growth.
- Temporary shifts of the retail service level (proxied by number of attendants per unit of sales) are easily applied. This enables shopkeepers to lower service level (and increase measured productivity) during the boom and to increase service level (and lower measured productivity) during the slump.
- Uncertainty of labour demand in time impels retailers to maintain some excess labour; hence measured productivity grows in periods of growing demand.

The influence of the consumer spending growth rate will be modelled directly within the framework of the labour demand relation to be elaborated in the next section.

The distinction between the two procyclical elements is made for the following reason. Consumer spending fluctuations have a direct (first order) influence on productivity. At least this is our assumption. If the growth rate of consumer spending influences average firm scale, an additional (second order) effect may occur.

3. LABOUR DEMAND RELATION

The following labour demand relation is used in this study:

$$\bar{L}_{jt} = \alpha_0 N_j + \alpha_{1jt} Q_{jt}, \tag{1}$$

where j refers to shop type[1]; t refers to year; $\bar{L}_{jt}$, desired average labour volume per establishment (in full-time equivalents); N_j, average number of independently staffed departments; Q_{jt}, average annual sales value per establishment (in 10^5 Dutch guilders of 1976), α_0, annual opening time (in full-time equivalents) assumed not to vary among the shop types nor over the years; α_{1jt}, scale adjusted labour intensity. The hyperbolic scale economy implied by equation (1) consists of a scale independent and a scale dependent part: $L_{jt}/Q_{jt} = \alpha_{1jt} + \alpha_0 N_j/Q_{jt}$.

[1] A shop type is a class of shops that are similar with respect to assortment of products sold, service level, extent of own production (packaging, meat cutting, bread bakery, repairs etc.) and type of ownership (independent, chain store, cooperative).

Equation (1) is an aggregate form of a relation between annual labour volume per shop and shop size in retailing developed by Nooteboom (1982). See Nooteboom (1984) for a survey of applications of both relations, but particularly Thurik and Vollebregt (1984), who use equation (1) for their productivity analysis of the entire French retail trade. Equation (1) partitions average labour volume into threshold labour, $\alpha_0 N_j$, viz., the minimum labour capacity which must be at hand during all opening hours, and sales dependent labour, $\alpha_{1jt} Q_{jt}$, where α_{1jt} is used to denominate the yearly sales values of various shop types. Scale adjusted labour intensity, α_{1jt} is posited to

- decrease if the wage rate, WR_{jt}, increases. The wage rate is an indicator of labour quality and shopkeepers' urge for its efficient use;
- decrease if the selling area as a percentage of total floor space, PSA_{jt}, increases;
- decrease if the share of entrepreneurial labour (including family labour), PEL_{jt}, increases. Labour intensity drops with increasing degree of motivation;
- be lower for food shop types, $DFO_j = 1$, than for non-food shop types $DFO_j = 0$. See Thurik and Vollebregt (1984);
- decrease with time, T, due to technological and organisational progress;
- decrease if real consumer spending, PC_{jt}, increases, where PC refers to the annual fractional (one per cent in 0.01) growth rate of consumer spending in volume.

The above theoretical considerations and some empirical experimentation led to the choice of the following specification:

$$\alpha_{1jt} = \alpha_1 \left(\frac{WR_{jt}}{WR_t}\right)^{\alpha_2} \left(\frac{PSA_{jt}}{PSA_t}\right)^{\alpha_3} \left(\frac{PEL_{jt}}{PEL_t}\right)^{\alpha_4} \times \exp(\alpha_5 DFO_j + \alpha_6 T + \alpha_7 PC_{jt}), \tag{2}$$

where variables WR_{jt}, PSA_{jt} and PEL_{jt} are divided by their yearly sample means, WR_t, etc., for technical reasons and easy interpretation of α_1. α_1 is the 'average' scale adjusted labour intensity for a non-food shop type ($DFO = 0$) in 1976 ($T = 0$) with an assortment composition for which consumer spending growth is zero ($PC = 0$) and for which the variables WR_{jt}/WR_t, PSA_{jt}/PSA_t and PEL_{jt}/PEL_t equal unity.

The following specification is chosen for the lagged adjustment mechanism:

$$L_{jt} = \beta \bar{L}_{jt} + (1-\beta) L_{jt-1}, \tag{3}$$

where, L_{jt}, actual average labour volume per establishment; $\bar{L}_{jt}$, desired average labour volume per establishment; β, yearly adjustment rate.

4. DATA

Our data source is an ongoing panel of independent Dutch retailers called 'Bedrijfssingnaleringssysteem' (Inter-firm comparison system), which is operated by the Research Institute for Small and Medium-Sized Business in the Netherlands. The number of participating firms per year is approximately 1,000. These firms are partitioned into 31 shop types according to scale and products sold. Our computations are carried out with the averages per shop type (cell). Data are available for a period of eight years (1976–1983), yielding a total of 248 cells. See Nooteboom and Thurik (1985) for further information on the data used.

5. RESULTS

Equations (1) and (2) are substituted into (3) to obtain our final specification and a vector of independently distributed error terms is added with zero expectation and variance σ^2/S_{jt}, where S_{jt} is the number of shops in cell j in year t. Estimates of the coefficients are produced by a non-linear least squares fit using Marquardt's algorithm. Obviously, we 'lose' one year due to the lagged adjustment, so that 217 observations remain.

The estimation results tell us that the adjustment rate (β) is about 73 per cent with a standard error of three per cent. Adjustment rates in manufacturing industries usually do not exceed 50 per cent. Presumable the relatively rapid adjustment in retailing is due to extensive use of part-time labour and shopkeepers' willingness to absorb demand changes themselves. Furthermore, there is a direct (first order) procyclical productivity effect (α_7): during a one per cent growth (decline) of consumer spending scale adjusted labour intensity is, *ceteris paribus,* 0.55 per cent lower (higher) than during zero growth of spending (standard error is 0.19 per cent). Simultaneous, *ceteris paribus* including zero trend, influences of consumer spending growth and average sales size growth on average labour volume growth can best be investigated using the following expression:

$$\frac{L_t^* - L_{t-1}^*}{L_{t-1}^*} = \beta\left(\left\{\frac{Q_t - Q_{t-1}}{Q_{t-1}} + 1\right\} \exp\{\alpha_7 (PC_t - PC_{t-1})\} - 1\right), \quad (4)$$

TABLE 1

Estimates of the Coefficients of Equation (3) After Substitution of (1) and (2) for Small Dutch Retailing Firms

Coefficient	α_0	α_1	α_2	α_3	α_4	α_5	α_6	α_7	β
Estimate	1.09	0.56	−0.99	−0.20	−0.27	−0.64	−0.05	−0.55	0.73
Standard error	0.09	0.03	0.09	0.06	0.03	0.03	0.01	0.19	0.03
Hypothesis	1.25	>0	<0	<0	<0	<0	<0	<0	$0<\beta\leqslant 1$

where L_t^* refers to average threshold adjusted labour volume: $L^* = L - \alpha_0 N$ and where $L_{t-1} = L_{t-2}$ (single-period shock in average size). Since $\alpha_7 = -0.55$ and $\beta = 0.73$, we see that moderate deviations from a constant growth speed of spending hardly affect the influence from average sales growth on average labour volume growth.

The remaining coefficients show values that are in accordance with our hypotheses. Moreover, small standard errors occur. Goodness of fit is 0.992 when expressed as the square of the correlation coefficient between the vectors of the dependent variable and its estimation. We shall not discuss the coefficients here, because their evaluation is not the main purpose of this paper. See Thurik and Vollebregt (1984), for instance. However, it is worth noting that there is an autonomous yearly labour intensity decrease (a_6) of about five per cent. Probably, this high percentage is due to the considerable rise in real wages in the period considered.

6. CONSUMER SPENDING AND RETAIL PROFITS

Nooteboom and Thurik (1985) studied the effect of the growth rate of consumer spending on the profit mark-up on average percentage operating costs in retailing. They used approximately the same data as we did in our present study. Their hypothesis is that this mark-up (expressed as a percentage of average sales value per shop) depends on the growth rate of real consumer spending. Its rationale is that price competition is more intense in a contracting market due to efforts to obtain a larger market share to sustain sales volume. They report asymmetries: a profit squeeze in recessions, but no profit inflation during growth. In the retail industry it is reasonable to approximate total operating costs with total labour costs. The results of the present study show that there is an alternative hypothesis for this profit squeeze: percentage operating costs rise in recessions and retailers have to drop their margins to maintain their previous price level. The profit mark-up does not seem to react to increasing rates of consumer spending with its declining percentage average operating costs. This advantage of the boom is passed on to customers stimulating further growth.

Research Institute for
Small and Medium-Sized Business
PO Box 7001,
2701 AA Zoetemeer, The Netherlands

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REFERENCES

Nooteboom, B. (1982). 'A New Theory of Retailing Costs', *European Economic Review*, Vol. 17, pp. 163-86.

Nooteboom, B. (1984). 'Estimation of Threshold Costs in Services Industries', Research Paper 8404, Research Institute for Small and Medium-Sized Business, Zoetermeer, The Netherlands.

Nooteboom, B and Thurik, A. R. (1985). 'Retail Margins during Recession and Growth', *Economics Letters*, Vol. 17, pp. 281-4.

Thurik, A. R. and Kleijweg, A. J. M. (1985). 'Cyclical Effects in Retail Labour Productivity', Report 8516/A, Econometric Institute, Erasmus University Rotterdam, The Netherlands.

Thurik, A. R. and Vollebregt, J. A. C. (1984). 'A Generalized Labour Cost Relation for French Retailing', *Annales de l'Insee*, Vol. 53, pp. 93-106.