

International Small Business Journal

<http://isb.sagepub.com>

Degree of Affiliation and Retail Labour Productivity in France, The Netherlands and the UK

A. R. Thurik and J. A. C. Vollebregt
International Small Business Journal 1985; 3; 65
DOI: 10.1177/026624268500300405

The online version of this article can be found at:
<http://isb.sagepub.com/cgi/content/abstract/3/4/65>

Published by:

 SAGE Publications

<http://www.sagepublications.com>

Additional services and information for *International Small Business Journal* can be found at:

Email Alerts: <http://isb.sagepub.com/cgi/alerts>

Subscriptions: <http://isb.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

RESEARCH NOTE

DEGREE OF AFFILIATION AND RETAIL LABOUR PRODUCTIVITY IN FRANCE, THE NETHERLANDS AND THE UK

by A. R. Thurik and J. A. C. Vollebregt

Both authors work for the Department of Basic Research, Research Institute for Small and Medium Sized Business, Zoetermeer, The Netherlands. Labour productivity differences between large and small retail businesses are here studied within the framework of a model which also allows for productivity differences based on differences in average shop size and product differences. French, Dutch and British data are used. There is reason to believe that large retail businesses have a higher labour productivity than small businesses.

In this paper a report is given of our study on the influence of business size on labour productivity in retailing. In the retail trade there is a distinction between businesses and shops (=outlets). A business consists of one or several shops. A business consisting of a large number of shops is called a chain. Both shops and businesses can vary in size. Hence, scale economies are to be studied on two levels: on the level of shop size and on that of business size. This study investigates scale economies regarding labour productivity on the level of business size within a framework allowing for economies on both business and shop size.

It is a well-known phenomenon that labour productivity per shop within a certain shop type grows with increasing shop size. See Nootboom (1982) or Ingene (1983) for literature references. Nootboom (1982) modelled this phenomenon using queuing theory and the concept of threshold labour. Threshold labour is the minimum capacity of labour which must be at hand during all opening hours, and its occurrence is the main cause of scale economy, because its relative weight disappears with increasing shop size. Vast empirical evidence in the context of Nootboom's labour cost curve is provided by Nootboom (1982), Thurik (1984) and Thurik and Van der Wijst (1984). Scale economy among shop types is investigated by Thurik and Van Schaik (1984) and Thurik and Vollebregt (1984). They use an aggregate form of Nootboom's labour cost curve called generalised labour cost relation bringing the sales values of the various shop types under the same denominator using certain variables describing the level of own production and the degree of self-service.

Scale economy is established on the level of the average shop size also among shop types: average labour productivity increases with the average size of the shop types' outlets expressed in yearly sales value and brought appropriately under the same denominator. These results are obtained using 1981-data involving some 1,800 (mainly small) shops in the Netherlands and 1978-data involving some 400,000 shops in the French retail trade. These analyses do not take different business sizes among shop types into account. It is certainly not straightforward to assume that all differences in labour productivity among shop types are to be attributed to differences in average shop size. Differences in average business size should be considered, because retailers are clearly not all single/outlet retailers. French, Dutch and British data are used to deal with this matter. Estimations do not yield conclusive results. Further considerations suggest that the hypothesis that labour productivity rises with business size should not be rejected.

Model

$$(1) L_j = \alpha_0 N_j + \alpha_{ij} Q_j,$$

where

- L_j = average labour volume per shop (in number of full-time equivalents) in shop type j ;
- Q_j = average annual sales value per shop (in France, Guilders or Pounds) in shop type j ;
- N_j = average number of independently staffed departments in shop type j ;
- α_0 = annual opening time (in full-time equivalents) assumed uniform for all shop types per country. See Nooteboom (1982) for a justification of threshold costs being equal to $\alpha_0 N_j$;
- α_{ij} = scale adjusted labour intensity (SALI). The hyperbolic scale economy implied by equation (1) consists of a scale independent and a scale dependent part: $L_j/Q_j = \alpha_{ij} + \alpha_0 N_j/Q_j$.

Our first hypothesis now becomes:

- H1 :economy of scale occurs on the level of the average shop size, $\alpha_0 > 0$.
Theoretically, $1 < \alpha_0 < 1.5$, because annual opening time usually exceeds annual working time per full-time equivalent.

Differences in SALI among shop types can be explained, using the wage rate, share of part-time labour, share of shopkeepers' and their family members' labour, type of product, service level, labour market tightness, autonomous trend, etc. See Nooteboom (1983), Thurik and Van Schaik (1984), and Thurik and Vollebregt (1984). Unfortunately, not all these variables are available in the data files of the three countries considered, so that we have to restrict ourselves to the influence of wage rate, percentage gross margin (sales minus purchase value as a percentage of sales) as a proxy for type of product and service level, and time.

We formulate the following hypotheses:

- H2 :SALI increases when the average percentage gross margin increases. High margins correlate with a high degree of own production (bread-baking, butchering, repairs, deliveries, etc.) and a low degree of self-service (as opposed to counter-service) and, hence, induce a high SALI;
- H3 :SALI increases when the average wage rate decreases. First, it is assumed that the average wage rate is an indicator of the labour quality. Second, it is assumed that the motivation to use available labour efficiently is induced by the wage rate level;
- H4 :SALI decreases with time. Technological and organisational progress for which no specific variables are available, are assumed to account for a monotonous decrease of SALI.

The main purpose of this paper is incorporated in the following hypothesis:

H5 :SALI decreases when the degree of affiliation increases. The degree of affiliation is measured in average number of shops per business in a shop type. Economy of scale on the level of business size is assumed to have its cause in gains in the area of stockkeeping, administration, purchasing activities, marketing activities, personnel strategy, etc.

The following extension of equation (1) will be used for testing our hypotheses:

$$(2) L_{jt} = \alpha_0 N_j + \alpha_1 Q_{jt} M_{jt} \alpha_2 W_{jt} \alpha_3 A_{jt} \alpha_4 \exp(\alpha_5 T) + v_j;$$

where

t = time index. Relevant only for the Netherlands;

M_{jt} = average percentage gross margin in shop type j in year t;

W_{jt} = average wage rate per full-time equivalent in shop type j in year t;

A_{jt} = average degree of affiliation (number of shops divided by number of businesses) in shop type j in year t.

Variables M_{jt} , W_{jt} and A_{jt} are normed dividing them by the yearly sample averages. This is done to facilitate comparison between the countries;

T = time. T = 0 in 1978 through T = 5 in 1982. Relevant only for the Netherlands;

V_j = error term, viz. independently distributed stochastic variable with zero mean and constant variance;

α_1 = SALI for shop types where M_{jt} , W_{jt} and A_{jt} are unity (shop type value equals sample average), T = 0 and $v_j = 0$, henceforth called "average" SALI.

Data

The French data stem from the "Enquête annuelle d'entreprise dans le commerce, 1978" (1981) and refer to 1978. Average data for 38 groups of retail businesses are computed according to their principle activity. A total of 388,960 shops, covering practically the complete French retail trade, is involved to compute these averages. Three of the original 41 shop types given in the "Enquête" are deleted: "grands magasins" and "magasins populaires", because their average shop size exceeds by far that of the remaining shop types; "vente par correspondance", because, strictly, this is no retail activity. See also Thurik and Vollebregt (1984) for a listing of the 38 shop types.

The Dutch data stem from "Produktiestatistieken detailhandel in voedings- en genotmiddelen 1978" (1982), "1979 en 1980" (1984), "1981 en 1982" (1984), and refer to the period 1978-1982. The sample used for the "Produktiestatistieken" is said to be representative for the Dutch food retail trade. Four types of trade (milk and dairy products; meat and meat products; greengrocers; liquors and beverages) are partitioned according to whether businesses employ less or more than ten persons, and a fifth (grocers and general food) is partitioned according to whether businesses employ less than ten, between ten and hundred or more than hundred persons. Average data for the resulting eleven groups of food retail businesses are available for five years.

The English data stem from the "Business Monitor SDA 25 1978" (1980) and refer to 1978. The inquiry claims to cover approximately 90% of total retail turnover. Average data for 21 groups of retail businesses are computed. A total of 350,037 shops is involved to compute these averages. The 21 groups are constructed according to type of business and degree of organisation: seven types of trade are distinguished (grocers and general food retailers; other food retailers; confectioners, tobacconists and newsagents; clothing, footwear and textile retailers; household goods retailers; other non-food retailers; mixed retail business), partitioned into

three degrees of organisation (single/outlet retailers; small multiple retailers with two to nine outlets; large multiple retailers with more than nine outlets).

Average annual sales value per shop, Q , is measured excluding VAT and expressed in 10^6 French Francs of 1978, in 10^5 Dutch Guilders of 1979 or 10^4 English Pounds of 1978. Average labour volume per shop, L , is not available in terms of number of full-time equivalents for the UK, but in terms of persons engaged. A second drawback of the British data source is the absence of an indicator for the average wage rate. Average number of independently staffed departments, N , is not available in any of the data sources mentioned above.

This number is assumed to be either one, three or five. Essentially, small shops are considered to consist of one department. In larger shops, several independently run departments can be distinguished, such as the butcher's department and the greengrocer's department in a supermarket or the various departments in a department store. We arrive at the following assumptions concerning the number of independently staffed departments: three in the case of "supermarchés", "hypermarchés" and "superettes succursalistes" in France, of grocers and general food retailers employing between ten and hundred persons in the Netherlands and of single/outlet mixed retail businesses and large multiple grocers in the UK. Five in the case of "grandes surfaces semi-spécialisées" and "autres grandes surfaces non-spécialisées" in France, of grocers and general food retailers employing more than hundred persons in the Netherlands and of small multiple and large multiple mixed retail businesses in the UK. The average number of independently staffed departments is assumed to be one in all remaining 95 cases.

We shall not go into the details of the above assumptions. By and large, they are based on our practical knowledge of store layout, the average labour volume per shop given in our data sources and earlier estimation results given by Nootboom (1982), Thurik (1984), Thurik and Vollebregt (1984) and Thurik and Van der Wijst (1984).

Estimation Results

The results of the estimation of equation (2) using the data described in the previous section are given in Table 1. From these results we see that the basic hypothesis of this paper, H_5 , is supported only by the Dutch data and rejected by the British, whereas no statistical conclusion can be drawn on basis of the French data. Before discussing this result in more detail, we shall first examine the remaining estimation results briefly.

TABLE 1
ESTIMATION RESULTS FOR FRANCE (FR), THE NETHERLANDS (NL)
AND UK

	α_0	α_1	α_2	α_3	α_4	α_5	J
FR	.48 (.12)	2.97 (.13)	1.08 (.05)	-.94 (.08)	.005 (.010)		38
NL	.95 (.09)	.40 (.05)	1.26 (.05)	-.98 (.12)	-.011 (.004)	-.017 (.004)	55
UK	2.83 (.32)	.11 (.02)	.26 (.09)		.061 (.024)		21
Hypothesis	> 0 (H1)	> 0	> 0 (H2)	< 0 (H3)	< 0 (H5)	< 0 (H4)	

Estimation results are produced by a non-linear least squares fit, using Marquardt's algorithm (see Marquardt (1963)). Standard errors are given between brackets beneath the coefficients. J is the number of observations.

α_0 is significantly greater than zero in all three cases, implying that positive threshold labour occurs indeed, which again implies that scale economy exists on the level of the average shop size. Theoretically, α_0 should range between 1 and 1.5. In France, α_0 is found to be significantly less than 1, whereas in the UK α_0 is significantly in excess of 1.5. The high value found for the UK can be explained by the fact that the variable to be explained, L, is expressed in persons engaged, which is an overestimation of the desired variable, viz: expressed in full-time equivalents.

As expected, the elasticity of average percentage gross margin with respect to SALI is significantly greater than zero for all three countries (H2). As expected, the elasticity of average wage rate with respect to SALI is significantly less than zero for both countries for which the wage rate is available (H3). Moreover, SALI appears to decrease with time for The Netherlands (H4) at an annual pace of 1.7% in the period 1978-1982.

The statistical explanation expressed in the square of the correlation coefficient between the vectors of L and its estimated value, r^2 , is high: $r^2 = .99$ for all three countries. This high value is not surprising in view of the fact that our equation to be estimated is expressed in levels.

We now return to a discussion of the results concerning the basic hypothesis of this paper that SALI decreases when the degree of affiliation increases. On basis of the estimation results presented here no conclusion can be drawn. However, we tend not to reject this hypothesis (H5), because:

- shortcomings of the British data undermine the fact that H5 is being rejected: L is not available in full-time equivalents, and the wage rate is not available at all. The omission of the wage rate in the French and Dutch cases creates less robust estimation results;
- theoretically, H5 is attractive, viz: plausible and generally accepted. See references given by Leunis and Brams (1978);
- H5 is not rejected for France and supported for the Netherlands.

Conclusion

Concentration is the contraction of economic activities in large economic units. Such contraction is expected to yield power on the various markets on which a unit operates (purchasing market, selling market, market of production factors). Economic power of an economic agent can be associated with the degree of its independence of other agents. This power has many shapes, but these shapes are all destined to lower costs, to increase selling price and to decrease purchasing price.

Concentration in retailing has various faces. Spatial concentration is the concentration of various retail activities (shops) on a limited area (shopping precincts, city centres, market places). Establishment concentration is the contraction of various retail activities within one shop. The emergence of "grands magasins" in Paris in the last century is a famous example of such concentration. There are two types of business concentration: horizontal and vertical. Horizontal concentration is associated with the multiplication of identical activities: the foundation of branch-establishments, the creation of multiple shop enterprises. Vertical concentration is associated with the involvement in successive production stages: a retailer can go into wholesaling or even into production. We refer to Akehurst (1984) for measurement of concentration in retailing and its references.

In this paper we are interested in the influence of horizontal concentration expressed in the number of shops per business on average labour productivity among shop types. Our basic hypothesis is that horizontal concentration favours labour productivity. If the number of shops appears to have a positive influence on labour productivity indeed, then one possible cause of the horizontal concentration

process which has already taken place is found, and (the prospective increase of) labour productivity will probably be the cause of further horizontal concentration.

Exercises using French, Dutch and British data within the context of the generalised labour cost relation give no decisive answer. Particularly in the UK the number of shops appears to yield a negative influence on labour productivity. This result, however, is undermined by serious shortcomings in the data material. Our basic hypothesis is supported for the Dutch food retail trade, and not rejected for the total French retail trade.

In view of its plausibility we are not inclined to reject our basic hypothesis. Its assumption implies that a further increase of the average business size yields an employment decrease on the one hand. On the other hand, however, the low labour productivity of new (and hence usually small) businesses is supposed to stimulate employment. The usual question for governmental policy is, how the decline of employment can be stopped by stimulating the foundation of new (small) businesses. Birch (1979) holds a very pessimistic view:

"It is no wonder that efforts to stem the tide of job-decline have been so frustrating — and largely unsuccessful. The firms that such efforts must reach, are the most difficult to identify and the most difficult to work with. They are small. They tend to be independent. They are volatile. The very spirit that gives them their vitality and job generating powers is the same spirit that makes them unpromising partners for the development administrator".

The results of this paper show that average shop size has a positive influence on labour productivity for all three countries. This finding is not surprising for students of the determinants of retail labour productivity.

Note

The authors are greatly indebted to Mr. Chris Moire of NEDO for his help in providing English data material and for his constructive comments on an earlier draft of this paper.

References

- Akehurst, Gary (1983), Concentration in Retail Distribution: Measurement and Significance, *The Service Industries Journal*, Vol. 3, No. 2 (July), pp161-179.
- Birch, D. L. (1979), *The Job Generation Process*. M.I.T.-program on neighbourhood and regional change, University of Cambridge, Massachusetts.
- Enquête annuelle d'entreprise dans le commerce 1978, 1981 LEs Collections de l'Insee, série E., No. 77, Paris.
- Ingene, Ch.A. (1983), "Are there scale economies in American retailing?", paper presented at the 1983 Macromarketing Conference, Kingston, RI.
- Inquiry into Retail Trading for 1978 (1980), *Business Monitor SDA* 25, 1978, Business Statistics Office, Newport.
- Leunis, J. and Brams, W. (1978), *Schaaleffecten in supermarkten*, Report 78.01, Department of Applied Economic Sciences, Catholic University, Leuven.
- Marquardt, D. W. (1963), An algorithm for least squares estimation of non-linear parameters, *Journal of the Society for Industrial and Applied Mathematics*, Vol. 11, pp431-441.
- Nooteboom, B. (1982), "A New Theory of Retailing Costs", *European Economic Review*, Vol. 17, pp163-186.
- Nooteboom, B. (1983), Productivity growth in the grocery trade, *Applied Economics*, Vol. 15, pp649-664.
- Produktiestatistieken Detailhandel in Voedings- en Genotmiddelen 1978 (1982), Centraal Bureau voor de Statistiek, Voorburg.
- Produktiestatistieken Detailhandel in Voedings- en Genotmiddelen 1979 en 1980 (1984), Centraal Bureau voor de Statistiek, Voorburg.

- Produktiestatistieken Detailhandel in Voedings- en Genotmiddelen 1981 en 1982 (1984), Centraal Bureau voor de Statistiek, Voorburg.
- Thurik, A. R. (1984), Labour productivity, economies of scale and opening time in large retail establishment, *The Service Industries Journal*, Vol. 4, No. 1 (March), pp19-29.
- Thurik, A. R., and Van Schaik, H. A. C. (1984), Generaliseerde kostenrelaties in de detailhandel, *Maandblad voor Accountancy en Bedrijfshuishoudkunde*, Vol. 58, (May), pp203-217.
- Thurik, A. R., and Vollebregt, J. A. C. (1974), A generalized labour cost relation for French retailing, *Annales de l'Insee*, Vol. 53, pp93-106.
- Thurik, A. R., and Van der Wijst, D. (1984), Part-time labour in retailing, *Journal of retailing*, Vol. 60, No. 3 (Fall), pp62-80.