

On the Measurement of Market Share Mobility and Entry

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This paper is circulated for discussion purposes only and its contents should be considered preliminary.

## Abstract

Static concentration measures neglect dynamic changes in market structure entirely, yet the expectation of lost market share, based on the past and current mobility of market shares in an industry, may be an important part of the competitive forces acting on the firm and affecting its behaviour. This note draws out the similarity between market share change and new entry and proposes new, linked measures of both, enabling these additional dimensions of market structure to be incorporated in empirical work.

## Introduction

In the course of a recent survey Curry and George (1983) noted the static limitations of industrial concentration measures: their neglect of the mobility of market shares, variations in which could indicate differences in the strength of competitive forces associated with a given, static index-value. The 'fairly high' correlations over time between firms' shares or rank positions that are to be found in the literature were given as grounds for not rejecting static indices out of hand, but the scope for further modifications was acknowledged. Only Grossack's tentative 'permanent concentration' concept (Grossack, 1972) was cited in this connection.

This note proposes an alternative measure of market share mobility that could readily be used to supplement static measures in empirical work where market share data is available over time. This D-index of the dynamics of market structure turns out to have some interesting properties, and in particular leads to a companion, E-measure of market entry. The recognition of entry as a special case of market share turnover suggests a possible line of future enquiry in both theoretical and empirical work.

## II Market Share Mobility: The D-index

The D-index for industry I over the interval  $t_0, t_n$  is defined as half the sum of (the absolute value of) each firm's market share change:

$$D_{t_0, t_n}^I = \frac{1}{2} \sum_{i \in I} |\Delta s_i|$$

where  $\Delta s_i = (x_{it_0}/X_{It_0}) - (x_{it_n}/X_{It_n})$  and  $x_{it_j}, X_{It_j}$  ( $j = 0, n$ ) are sales of the  $i$ 'th firm and of industry  $I$  respectively at time  $t_j$ . All firms classified in the industry at either  $t_0$  or  $t_n$  are included in the calculation, entrants and exits registering zero shares in  $t_0$  or  $t_n$  respectively.

The index simply catches the extent to which market shares change hands over the period. Its limit values are 0 and 1. If  $D=0$  all market shares are exactly the same in  $t_0$  and  $t_n$ . The case where  $D=1$  describes complete market turnover; all  $s_{it_0}$  go to zero and entrants take over the whole market in  $t_n$ . In this case  $\sum |\Delta s_i|$  is maximised at 2. The definition given above which ensures  $0 \leq D \leq 1$  is for ease of manipulation only. Table 1 gives some illustrative values for two hypothetical industries.

### III Market Entry: the E-measure

Like most static concentration measures the D-index disaggregates into additive subindices. For example it can readily be calculated for the leading  $m$  firms in an industry and for the remaining  $(n-m)$ .

A particular disaggregation leads to the companion measure of entry. Thus

$$D^I = D_P^I + D_N^I$$

where  $P$  is the set of all firms in existence at  $t_0$  and  $N$  is all entrants. By definition  $x_{it_0} > 0$  for all  $i \in P$  and zero otherwise, while  $\Delta S_{it_0} > 0$  for all entrants.  $D_P^I$  is a measure of the mobility of existing market shares and  $D_N^I$  is half the combined market share of new entrants. The E-measure of market entry converts the total market share acquired by entrants into a numbers-equivalent using the relevant Herfindahl concentration index for the industry:

$$E^I = \frac{\sum_{i \in N} \Delta s_i}{H_{t_0}^I} = \frac{2 D_N^I}{H_{t_0}^I}$$

Thus entry is measured as the number of entrants of 'numbers equivalent' size (i.e. the firm size which, if all firms were of equal size, would ensure that the number of firms in the industry would generate the observed level of concentration measured by  $H_{t_0}^I$ ). For example, where entrants take 20% of a market in which the Herfindahl index is initially 0.25, the E-measure states that 0.8 firms have entered what we know to be a 4-firm industry. Table 2 records the E-scores for the previous illustrative cases.

The E-measure clearly dominates a simple head-count of entrants, taking account of their significance as well as their numbers. At the same time it captures the difficulties entrants face, insofar as it relates the proportion of the market captured by them to the original market structure. Finally, as in the example given above and as with all numbers-equivalent indices, the E-measure lends itself to analytical purposes, where theoretical models are most readily susceptible to interpretation as dealing with an 'n-firm' industry.

#### IV : Mobility as Quasi-Entry

Both market share mobility and entry lead to (some) firms losing their relative market positions. A competitive force is exerted if the expectation of this loss acts as a constraint on firm behaviour, which is then reflected in performance dimensions like excess profit or cost, X-efficiency, R and D expenditure, and so on. Our present theoretical understanding of this process is incomplete; in the absence of a comprehensive, dynamic theory of markets it is not clear whether it matters if the expected loss is to a new or an existing firm. With suitable measures we can, however, bring empirical evidence to bear.

A measure of market share mobility in terms equivalent to those describing entry - i.e. as 'quasi-entry' - follows naturally from the previous argument. Thus quasi-entry, or

$$Q = D_P^I \cdot \frac{1}{H_{t_0}^I}$$

is again expressed as a normalized number of entrants, in markets where no actual entry may have occurred. To test whether real and quasi entry exert the same competitive effect, E and Q may be embedded in an appropriate performance equation (in which the Herfindahl should also be included), and a restriction imposing identical coefficients may then be tested.

## Y Concluding Remarks

The D-, E- and Q- indices relate to aspects of market structure other than concentration and its change. In particular, there is no unique relationship between D and  $\Delta H$  (table 3). For example, any value of D could be consistent with  $\Delta H = 0$ . Essentially this is because offsetting gains and losses of individual firms' shares cancel in  $\Delta H$  but not D. However  $\Delta H \neq 0$  implies  $D \neq 0$  and more generally  $\Delta H$  determines a lower bound to possible D values.

The proposed new indices are additional market structural variables to be used in multivariate analysis alongside existing ones. Their value is really twofold. Firstly, their addition may help distinguish between market situations not fully separable with the aid of variables presently used (e.g. between Stackelberg disequilibrium (no entry) and Bain's case of dynamic instability with alternating entry-forestalling and entry-inducing prices). Secondly, their joint inclusion could mitigate problems of specification bias and measurement error in previous studies insofar as static concentration alone is an incomplete representation of market power. Whether there is any systematic relationship in practice between e.g. strong upward or downward trends in concentration and market share mobility is a matter for and deserving empirical study.

## References

- CURRY B. and K.D. GEORGE (1983) "Industrial Concentration: A Survey", Journal of Industrial Economics, 31, 3, 203-255.
- GROSSACK I.M. (1972) "The Concept and Measurement of Permanent Industrial Concentration", Journal of Political Economy, 80, pp 745-60.



Table 1 Illustrative D-index Values

Case	Firm	Market Share at time:				
		$t_0$	$t_n$			
			(i)	(ii)	(iii)	(iv)
A	1	.50	.60	.45	.25	0
	2	.30	.35	.25	.15	0
	3	.10	.03	.15	.05	0
	4	.10	.02	.15	.05	0
	5	0	0	0	.50	1.00
	D-index	-	0.15	0.10	0.50	1.00
B	1	.25	.35	.20	.125	0
	2	.25	.35	.20	.125	.25
	3	.25	.15	.20	.125	.25
	4	.25	.15	.20	.125	.25
	5	.0	0	.20	.50	.25
	D-index	0	0.2	0.2	0.50	0.25

Table 2 E-measure: Illustrative Values

	E index value at time			
	$t_{(i)}$	$t_{(ii)}$	$t_{(iii)}$	$t_{(iv)}$
Case A ( $H_{t_0} = 2.8$ )	0	0	1.4	2.8
Case B ( $H_{t_0} = 4.0$ )	0	0.8	2.0	1.0

Table 3 Dynamic Measures of Market Structure

Case	Index	Value at time:				
		$t_0$	$t_n$			
			(i)	(ii)	(iii)	(iv)
A	D-index	-	0.15	0.10	0.50	1.00
	E-index	-	0	0	1.40	2.80
	Q-index	-	0.40	0.31	1.40	2.80
	Herfindahl	0.36	0.48	0.31	0.34	1.00
	$\Delta H$	-	+0.12	-0.05	-0.02	+0.64
B	D-index	-	0.20	0.20	0.50	0.25
	E-index	-	0	0.80	2.00	1.00
	Q-index	-	0.80	0.80	2.00	1.00
	Herfindahl	0.25	0.29	0.20	0.31	0.25
	$\Delta H$	-	+0.04	-0.05	+0.06	0