MARKET STRUCTURE AND ENTRY IN FAST FOOD

Joanne Sault,

Otto Toivanen

and

Michael Waterson

No 661

WARWICK ECONOMIC RESEARCH PAPERS

DEPARTMENT OF ECONOMICS

THE UNIVERSITY OF WARWICK

Market Structure and Entry in Fast Food

JOANNE SAULT, OTTO TOIVANEN, and MICHAEL WATERSON*

January 2003

One of the phenomena of the twentieth century, chainstores, are remarkably little studied by economists. Amongst open questions are the following: What factors influence the pattern of their openings? Does the spread of one constrain others having broadly the same retail offer? Do they locate close to competitors? To answer such questions, one must examine a time path of development- put simply one must observe actual entry. This is precisely what is done in a series of papers (Toivanen and Waterson, 2000; 2001; Sault, Toivanen and Waterson -hereafter STW, 2002; forthcoming) we are working on concerning the spread of restaurant outlets in the UK.

Why chain restaurants in the UK? The major reason is pragmatic. They have spread rapidly and they are fairly straightforward objects of study. In several cases, e.g. McDonalds, development is largely through organic growth. Choice of outlet size is generally of second order importance compared with the choice of outlet location. Until recently, the picture in many cases is one of significant entry without substantial exit. Finally, market structures are commonly straightforward. Thus, patterns may be relatively easily observed. A key feature of our data is that we have complete histories of entry over the relevant period.

Our unit of observation is the UK Local Authority District (LAD) in a given year. We view these as approximating to local markets for the relevant products, though we also test this assumption. Importantly, comparable data on key variables are available for long periods.[1] The LAD is administratively relevant, since they are charged with implementing planning. In order to open a fast food outlet, that outlet/ location must be designated as "A3" (food and drink) usage.[2] Moreover, LADs differ in their core characteristics. Our identification strategy is a development from papers such as Timothy Bresnahan and Peter Reiss (1991)- we identify conduct using the variation in characteristics across space and time faced by the same decision-maker(s). This paper sketches the main elements of our program, then examines a particular issue, the micro-geography of location, in detail.

I Analytical Strands

One branch of our work involves exploring the expansion paths of individual chains over time (STW, 2002). We find that the factors determining the inter-temporal geographical spread of outlets are in part as expected- locations with greater population and greater population density get outlets first. However, distances from Head Office also matter- more distant districts are slower to get outlets. We are currently examining whether those outlets a chain decides to franchise are subject to the same forces as those it operates itself, using a competing hazards approach. Another important factor is whether outlets have already been set up in neighboring areas. We find that if a chain develops in a particular direction initially, this influence is amplified over time. These findings, although tentative, point to the fascinating implication that chance factors can have a significant influence on chain development, and therefore potentially on the regional provision of outlet types.

Another strand of our work examines interaction between chains. Conventional wisdom (expressed e.g. in Avner Shaked and John Sutton, 1990) is that the presence of one player in a market constrains others from entering. Thus, one of our most surprising and controversial findings to date (Toivanen and Waterson, 2001) relates to the counter service burger market, which in the UK is arguably a duopoly over the period we examine: The development of one chain appears not to constrain the other from opening in the same district. In fact, where one locates, the other is more likely to do so also, consistent with one chain learning from another. In the remainder of the paper, we examine this learning hypothesis in a new way, based upon the micro-geography of districts.

II A Micro- Geographic Approach

We wish to test the hypothesis that the outlet of the following duopoly player (McDonalds or Burger King) locates in a position suggestive of learning from the first player to enter that district.

The theory is as follows. In a two-stage location/ differentiation then price model (see e.g. Richard Schmalensee, 1978), suppose outlets locate without regard to label (a maintained assumption in much of the relevant literature) and the degree of price competition is known. Take an example with three outlets. There will be a tendency for the outlets to be located some distance apart; otherwise an outlet will not experience enough trade to make it profitable. There may be agglomeration[3], which means that outlets are not evenly spread, but this does not imply anything about which two outlets are closer than which other pair.

Suppose now that identity matters. Other things equal, anticipated price competition between the outlets of different firms will cause them to be located further apart than the outlets of the same firm[4]. Similarly, if an existing player employs a pre-emptive locational strategy, this will also move outlets from different labels apart. On the other hand, if there is *significant* product differentiation between the firms, and (virtually) no inter-firm price competition, then the outlets of different firms may be somewhat nearer to each other than the outlets of the same firm- e.g., people choosing which food to purchase go to a certain part of town, choosing pizza or Chinese once there. A crucial element in this argument is that firms with multi-characteristic goods may want to maximize differentiation in the main characteristic while minimizing the distance in other characteristics (Andreas Irmen and Jacques-Francois Thisse, 1998). We consider the main differentiating characteristic between McDonalds and Burger King to be distance[5]. E.g. Raphael Thomadsen (2000) calculates that US consumers are willing to travel 1/3 mile to save one dollar on their meals; given the prices of meals, this suggests to us that distance is a major characteristic differentiating outlets. Proceeding under this assumption, we re-examine it at the end of the section.

Alternatively to product differentiation, if there is learning from the other player's location about whether and why that is a good location, we may expect the follower to locate relatively close to an outlet of the leading firm. It should also more likely locate near an early outlet than a recently opened outlet of the other player, and the distance from that should not be too great- it should be in the same shopping area, for example.

In order to operationalize testing, we selected all the local authority districts in Great Britain[6] for which the following hold:

1.Both key players (McDonalds and Burger King) are in the market at the end of our period.

2.We can date order which player was first into the market, and determine the timing of outlets up to the point at which the other player entered.

3.There are at least three outlets in total.

From the set of 57 districts fitting these criteria, we stopped recording outlet details regarding location (i.e. their postcode) once the second player had entered for the first time. Our set of districts is divided into two subsets. In the first, there are three or more outlets (up to 6), of which only the most recent is the outlet of a different firm than all previous entries. In the second set, there are three outlets, with the chronological order of outlet openings by firms A and B being A, B, A or A, B, B[7]. Using the facility on http://www.streetmap.co.uk/ for converting postcodes to Ordnance Survey grid co-ordinates, each was mapped to a co-ordinate[8] and the Euclidean distance between outlets calculated.

With the first subset, comprising 34 districts, we test whether the distance between the outlet of the following firm and any of the leader's outlets is greater or less than the distance between any of the leaders' outlets. The Null is that there is no difference on average. Hence, under the Null, if the entry pattern is A, A, B, the probability of the distance between

B and one of the A's being less than the distance between the two A's is 2/3. Similarly, if the pattern is A, A, A, A, A, B, then the equivalent probability is only 1/3 (5 ways out of 15). Our test uses a series of simulations to take into account that the probability under the Null varies across observations[9]. The districts, entry patterns and probabilities are listed in Table 1.

For each observation in the sample, a simulation round involved a random draw of a zero-one variable, where the indicator function takes the value

1 iff mindist (A, B) < mindist (A, A'), for all A, A'

for a market with n "A" outlets and one "B" outlet and the probability of this happening comes from the above calculations. We then weight these draws by the relative frequency of the different market structures that we observe, and calculate the distribution of the sum of "1" answers we have generated, which is a sufficient statistic for the test. The 99^{th} percentile of that generated distribution, 28, is compared to what we observe in the data. This figure, 29, easily allows us to reject the Null at better than 1% level. This is evidence in favor of either the product differentiation or learning stories and against the pre-emption story. However, subset 1 is not geared to distinguishing between the first two possibilities.

The second subset enables us to distinguish more clearly between the learning and product differentiation hypotheses. Thus, learning must come from the first outlet in each case, but product differentiation affects the distance between either outlet pair. In this second subset, with form A_1, B_1, A_2, or A_1, B_1, B_2, (or in four cases, a tie between A_1, B_1, B_2 and A_1, A_2, B_1) we test whether the distance between the first outlet of the follower (B_1) and the initial outlet (A_1) is less than the distance between the other pairs, follower and third outlet and initial outlet and third outlet. Under the Null, the probability of this is 1/3. If product differentiation is important, we expect a greater distance between the two outlets of the same firm than between either of the other pairs, whereas under the learning alternative we expect the least distance between the outlets B_1 and A_1.

Twenty of the 23 districts, listed in Table 2, across which this test can be performed, satisfy the alternative hypothesis that is consistent with learning. With a t-value of -7.64, this allows us to reject the Null at better than 1% level. We can alternatively test the difference between mean distances across the three pairs. As seen in Table 2, there are large numerical differences between these mean values. Again, the alternative consistent with learning is accepted over the Null and the product differentiation alternative, with the t-value related to the lesser difference being -3.57 and the difference between the other two mean distances being insignificant.

A potential problem with our interpretation is that distance may not be the main differentiating characteristic of these firms and that we may merely have documented the effects of the early leader outlets being in the best locations[10]. After all, we do not control for within-market variation in demand in the above experiments. However, in ongoing work we are developing proxies for unobserved outlet profitability, one being the rank of the outlet in the opening order of the firm. This control is based on the idea that both within *and between* markets, the firms open first in the most profitable location. If it is unobserved location-specific demand that drives the documented behavior, we should see the follower locate closer to those outlets that were opened earlier. So far, we have found no evidence of this.

III Concluding Remarks

These results on micro-geography point sharply to the hypothesis that firms learn from the outlet decisions of the other player, in practice far more commonly that Burger King learns from the outlet decisions of McDonalds than vice versa. This is consistent with the continuing development we observe in STW (2002). But it is not only the relative magnitudes that are strongly confirmatory of learning. Across our 57-market sample, the median of the minimum (Euclidian) distance between the qualifying outlet pairs (A_1, B_1) is only 260 meters, clear evidence of a tendency towards closeness and strong circumstantial evidence in favor of learning!

References

Bresnahan, T.F. and Reiss, Peter C. "Entry and Competition in Concentrated Markets", Journal of Political Economy, 1991, 99, pp.977-1009.

Irmen, Andreas and Thisse, Jacques-François. "Competition in multi-characteristics spaces: Hotelling was almost right", Journal of Economic Theory, 1998, 78, pp.76-102.

Kalnins, Arturs and Chung, Wilbur. "Firm heterogeneity, market heterogeneity and agglomeration", Mimeo, Marshall School of Business, University of Southern California, 2001.

Sault, Joanne; Toivanen, Otto, and Waterson, Michael. "Fast Food - the early years: Geography and the growth of a chain-store in the UK", University of Warwick Working Paper 655, September 2002.

Sault, Joanne; Toivanen, Otto, and Waterson, Michael. "The choice between franchising and managing outlets- a competing risks model" University of Warwick Working Paper. Forthcoming.

Schmalensee, Richard, "Entry deterrence in the ready-to-eat breakfast cereal industry", Bell Journal of Economics, 1978, 9, pp.305-327.

Shaked, Avner and Sutton, John. "Multiproduct Firms and Market Structure", RAND Journal of Economics, 1990, 21, pp.45-62.

Thomadsen, Raphael. "Price Competition in Industries with Geographic Differentiation: The Case of Fast Food", mimeo, Columbia Business School, 2000.

Toivanen, Otto, and Waterson, Michael. "Empirical Research on Discrete Choice Game Theory Models of Entry: An Illustration", European Economic Review, 2000, 44, pp.985-992.

Toivanen, Otto and Waterson, Michael. "Market Structure and Entry: Where's the Beef?", University of Warwick Working Paper no. 593, January 2001.

Table 1: Pattern of entry up till the arrival of the second firm.

District	**Entry pattern**	**hypothesis**	**nearest to**	**prob y**	**prob y1**
4	mmb	L/PD	2	2/3	1/3
26	mmb	L/PD	1	2/3	1/3
50	mmmb	L/PD	1	1/2	1/6
53	mmb	L/PD	2	2/3	1/3
59	mmmmmb	L/PD	1	1/3	1/15
89	mmb	P		2/3	1/3
94	mmmb	L/PD	1	1/2	1/6
100	mmb	L/PD	1	2/3	1/3
117	mmb	L/PD	2	2/3	1/3
180	mmb	P		2/3	1/3
181	mmb	P		2/3	1/3
231	bbm	L/PD	1	2/3	1/3
275	mmb	L/PD	1	2/3	1/3
283	mmb	L/PD	1	2/3	1/3
291	mmmb	L/PD	1	1/2	1/6
292	mmmmb	L/PD	2	2/5	1/10
296	mmb	L/PD	1	2/3	1/3
309	mmb	L/PD	2	2/3	1/3
314	mmmb	L/PD	1	1/2	1/6
315	mmb	L/PD	2	2/3	1/3
316	mmmb	L/PD	1	1/2	1/6
323	mmb	L/PD	2	2/3	1/3
331	mmmmmb	L/PD	2	1/3	1/15
333	mmmb	L/PD	2	1/2	1/6
370	mmb	L/PD	1	2/3	1/3
422	mmb	P		2/3	1/3
437	mmmb	L/PD	3	1/2	1/6
438	mmmb	L/PD	3	1/2	1/6
444	mmmmb	L/PD	1	2/5	1/10
448	mmmb	L/PD	3	1/2	1/6
451	mmmb	L/PD	1	1/2	1/6
453	mmmb	L/PD	1	1/2	1/6
455	mmmmb	P		2/5	1/10
456	mmb	L/PD	2	2/3	1/3
	Score	29/34	16/34		

Notes: Column 1 is the district reference # in *Regional Trends*. Column 2 refers to the date order in which outlets enter a district (m= McD, b = BK). Column 3 refers to the hypothesis that is supported by the observation in question- the pre-emption/ lack of price competition hypothesis (P) or the learning/ product differentiation hypothesis (L/PD)- see text. Column 4 concerns the rank order of the nearest of the existing outlets to which the follower firm locates. The final two columns refer to probabilities of the closest proximity being between follower and leader and between follower and first lead outlet under the null.

Table 2: Entry patterns across the first three outlets where the second has a different identity from the first

1 **District**	2 **Location pattern**	3 **m1b1 dist.**	4 **m2b/mb2 dist.**	5 **“same” dist.**	6 **min diff**	7 **Hypothesis**	8 **First?**
12	mbm	152.47	2533.71	2555.77	152.47	Y	Y
46	mbb	140.76	356.81	217.83	140.76	Y	Y
55	mbm	436.24	1157.80	1591.71	436.24	Y	Y
65	mbm	1974.51	1176.67	1108.04	1176.67	N	N
96	bmb	409.64	981.07	779.93	409.64	Y	Y
107	mbm	147.87	1859.73	1776.09	147.87	Y	Y
111	mbm	177.92	1553.90	1506.13	177.92	Y	Y
116	mbm	311.24	1606.43	1388.46	311.24	Y	Y
128	mbm	113.18	4846.00	4778.35	113.18	Y	Y
148	mmb/mbm	62.97	319.83	331.22	62.97	Y	Y
166	mbm	440.24	3785.24	3662.42	440.24	Y	Y
168	bmm	242.50	8718.34	8592.80	242.50	Y	Y
178	mbm	252.74	8983.19	9235.59	252.74	Y	Y
219	mbm	112.06	2013.49	2013.61	112.06	Y	Y
248	mmb/mbm	1085.85	2336.91	3422.26	1085.85	Y	Y
297	mbm	138.44	1774.08	1689.09	138.44	Y	Y
306	mmb/mbm	241.21	5027.90	5009.34	241.21	Y	Y
310	mbb	789.85	580.08	1020.81	580.08	Y	N
365	mbm	275.05	3387.25	3161.18	275.05	Y	Y
385	mbb	324.03	376.18	640.07	324.03	Y	Y
410	bmb	1771.81	3151.34	2748.24	1771.81	Y	Y
419	bmm	3231.69	141.23	3092.29	141.23	Y	N
435	mmb/mbm	81.01	301.14	380.80	81.01	Y	Y
	Mean	**561.45**	**2476.88**	**2639.22**	**383.27**	22/23	20/23
	s.d.	774.50	2450.80	2393.17	417.93		
	median	252.74	1774.08	1776.09	242.50		

t test 1	Is prob of 20/23 chance?	$(1/3-20/3)/((20/23*3/23)/23)^{0.5}= -7.64$	No
t test 2	Diff between means	$(561.45-2476.88)/535.9= -3.57$	Yes

Notes: Columns 1-2 as for Table 1. Columns 3-5 refer to Euclidean distances (in meters) between different outlets- between follower and initial lead outlet (m1b1), between follower and second lead outlet (m2b or mb2) and between the same (m,m; b,b) outlets. Column 6 gives the minima of the distances between different outlet types. Columns 7 and 8 relate to whether the L/PD hypothesis is supported and whether the hypothesis that the second firm locates closest to the first outlet of the first firm is supported, respectively.

[*] Sault and Waterson- Department of Economics, University of Warwick, Coventry CV4 7AL, UK; Toivanen- Helsinki School of Economics, PO Box 1210, 00101 Helsinki, Finland. Email correspondence should be addressed to michael.waterson@warwick.ac.uk. We are grateful to the ESRC for funding this research (award #R000238402). We thank Michael Mazzeo (discussant), Peter Davis and Paul Walsh for helpful comments.

[1] By lucky chance, the last major re-organization of the structure of districts was completed in 1974, McDonalds' entry date into the UK, since which all changes have been minor. Basic demographic data is available since 1974. To these, we add data on distance of the district from the respective companies' Head Offices, in miles by road. Descriptive statistics regarding districts and information on the history of the industry are available in STW (2002), Tables 1 and 2 respectively; see also Toivanen and Waterson (2001).

[2] Prevailing planning guidance states that sufficient supply from existing outlets is not a criterion for refusing an A3 listing to a proposed new outlet.

[3] Arturs Kalnins and Wilbur Chung (2001) explore retail/ service agglomeration.

[4] In practice, little price competition takes place between outlets of the *same* chain in the UK.

[5] In a food court, we see several outlets providing food variety, but not two burger outlets.

[6] Excluding the three inner London boroughs and outlying islands.

[7] In four cases, we are unsure of characterisation since the second and third outlets open in quick succession, but this does not affect the hypotheses tested.

[8] Each UK postcode covers around 20 or fewer addresses, roughly a block or less.

[9] We are very grateful to Michael Pitt for his work on the details of this approach including providing the coding which enabled this test. We took a total of 40,000 simulations.

[10] A further potential constraint on location concerns contractual encroachment- the company may be reluctant to locate one franchisee near another because the first may take out an

action in respect of loss of market. This is not a significant legal issue in the UK, so far as we are aware. Moreover, of our 57 districts, in only four, where the first firm's first and second outlets are both franchised, could it be an issue. In one of these four, the two franchised outlets are themselves only 218 meters apart.

.