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Explaining Environmental Heterogeneity

Abstract
Accounting for the nature of environmental heterogeneity should be of great importance to entrepreneurship researchers who are concerned with the acquisition and exploitation of valuable resources by firms. This paper contributes to the literature by providing increased clarity over what is environmental heterogeneity and how it can be incorporated into firm survival studies. Too often environmental heterogeneity, while acknowledged, is merely controlled for rather than explained. With reference to empirical evidence, this paper offers an explanation of a process capable of accessing and explaining the nature and significance of environmental heterogeneity. Drawing on Brandon's widely accepted biological definition of the environment; this paper offers a new view of how environmental heterogeneity can be explained in organizational studies. The conclusion drawn is that we need to remain curious as to how our collective thinking can be further advanced via greater inter-disciplinary collaboration.

Introduction

Accounting for the nature of environmental heterogeneity should be of great importance to entrepreneurship researchers who are concerned with the acquisition and exploitation of valuable resources by firms. This paper is motivated by a distinct lack of clarity over what is environmental heterogeneity and how it can be incorporated into firm survival studies. Typically, environmental heterogeneity is referred to as either unobserved heterogeneity (Saridakis. Mole and Storey, 2008) or unmeasured heterogeneity (Carroll and Hannan, 2000), and tends to be a factor that is 'controlled for'. In mainstream ecology, environmental heterogeneity is a fundamental principle of ecological thinking (see Scheimer and Willig, 2011), the inclusion of which ensures access to numerous underlying mechanisms related to entity-environment interaction. Therefore, whereas organizational study researchers seek to control (statistically) for any such heterogeneity, mainstream ecologists seek to actively 'explain' any such variance.

The position adopted within this paper is that accurately defining all aspects of the environment firms operate within ensures the processes directly and indirectly related to resource acquisition and exploitation is explainable. This paper, in adopting an ecological approach, aims to highlight an alternative process to identify, quantify, and explain environmental heterogeneity. Central to this discussion is devising a method to accurately describe the dimensions of any specific firm's environment and to account for energy flows between the environment and firms. Despite much historical discussion as to what constitutes an environment (Chein, 1943; Hawley, 1950; Penrose, 1959; Emery and Trist, 1965; Hannan and Freeman, 1977; Aldrich, 1979; Weick, 1979; Aldrich and Whetten, 1981; McKelvey, 1982; Meyer and Scott, 1983; Scott, 1987; Aldrich, 1999), little agreement has emerged due to frequent scholarly turf fighting (Baum and Rowley, 2002). Rather than takes sides with any specific position in this ongoing debate, this research advances an alternative position from outside the traditions of organizational studies. This will be achieved by building on the past work of Jones (2008; 2009a; 2009b) that investigated the survival of Pizza restaurants in North Yorkshire/East Riding in the UK.

Investigating the Survival of Pizza Firms in North Yorkshire

An investigation of firm survival in the Pizza industry in Australia and the UK was conducted in two phases. First, the Australian phase of the research was focused only on Pizza firms to enable

the development of a model of firm survival. Second, the North Yorkshire-East Riding phase accommodated all forms of restaurant and fast food providers (e.g. Chinese, Indian, Burgers, Sandwiches sub-populations) to accommodate intra-firm comparisons whilst seeking to confirm/disconfirm the developed model of firm survival (developed from the Australian phase of the study). In the UK phase, a data set comprising 2,440 North Yorkshire firms across the time period 1975 to 2004 was developed. In all, 24 separate sub-populations occurring in 23 discrete towns were examined. Consequently, the survival of independent Pizza shops was compared within and between towns, and against all other sub-populations. A metapopulation (Giplin and Hanski, 1991) approach was used to ensure the firms weren't aggregated into one large population; thus protecting the ecological value (or uniqueness) of each individual town.

Research Method

The research process proceeded on the basis of combining data received from semi-structured interviews, analysis of archival phone listing records and observational data related to specific niche dimensions of each firm (i.e. time, space and customer type) (see Pianka, 1969). This approach has enabled both accurate and codable data to be used in conjunction with data representative of the views of the operators across the life course of the industry. The phone listings record particularly valuable insights (Usher & Evans 1996) into the goals, boundaries and activities of each firm over time. The statistical software package SPSS 14.0 was used to provide an initial analysis of the data using its survival analysis program and subsequent analysis using regression and correlation procedures. The propositions under consideration in this paper relied primarily upon quantitative forms of data analysis. All four propositions used data from the Yellow Pages phone directory and regional statistics, with proposition 4 also using data from semi-structured interviews with nine local restaurateurs and the researcher's own observations.

Many of the methods used to analyse the data were quite novel in the organizational studies domain. First, several diversity indices were used to determine the degree of 'ecological' diversity within and between each town. Having determined the levels of diversity (and other ecological measures, e.g. abundance etc) the data was organised so that the process of Canonical Discriminant Analysis could be used to address proposition 1. Next, Pianka's (1973) Community Similarity Index was used to allow the external environment (i.e. proposition 2) of each town to be compared across the time period of the study. When considering the issue of the ecological environment (i.e. proposition 3), again the actual degree of potential average spending in each town was calculated using regional statistics and the Yellow Pages data. Then using Paired Samples T-Tests, comparisons were made of the potential resource availability across both time and space. Finally, proposition 4 required the development of an Advertising Efficiency Index to enable a more accurate comparison of how firm survival differed across towns according to the degree of actual spending upon advertising. Semi-structured interviews with 9 restaurateurs also help to provide insights into differences in the selective environments of the firms investigated. This remainder of the paper proceeds as follows. First, a discussion of what is an environment is provided. Then, each of the four research propositions are considered in terms of the evidence collected and analysed by Jones (2009a). Finally, a discussion of the findings is presented with concluding comments on the research implications that arise from this paper. The first issue to address is determining what is an environment.

Redefining the Environment?

How can we study resource exchange relationships and understand the movement of resources if we operate with varied interpretations what is an environment? Past and current literatures continues to provide credence to environments as being enacted (Weick, 1979), a dispenser of blind selection and/or a source of new variation (Hannan and Freeman, 1977), that may either be related to organizations strongly or weakly (McKelvey, 1982). Given the centrality of the concept of environment (as a form of indiscriminant selection or as a habitat of various benign shades), it is important that its composition and influence is clearly understood by researchers. While the textural nature of the environment (Emery and Trist, 1965) has been proposed acknowledging its dynamic nature, this typically has led to 'types' of environments being labeled. Others have focused more on the environment's technical and institutional aspects (Meyer and Scott, 1983) to provide guidance to managers as to specific prerequisite behaviours required to increase fitness. However for the purposes of this paper, we require a more precise explanation of what constitutes an environment. Baum and Rowley, 2002, pp. 9-10) note that current attempts to define the environment appear far from certain on how firms relate to the environment given that the literature accepts that "environments may not only be *observed* and *(mis)interpreted*" they may also be *enacted* by individual firms.

However, a succinct way to define what is an environment is provided by Brandon (1990). Brandon advocates three specific environmental dimensions through which the process of evolution occurs via natural selection. First, the *external* environment refers to the sum total of all factors external to the firm germane to its survival. This overarching view of the environment however, does little to inform which factors are of most importance to any one particular firm. Rather, it acknowledges the general factors that all firms in all industries are exposed to (e.g. high interest rates).

Next, Brandon (1990) identifies the *ecological* environment, thereby narrowing focus. Now we are only concerned with those factors that specifically affect a firm's ability to contribute to the growth of its industry (e.g. the increasing availability of specific vital resources). The third dimension is the *selective* environment. The selective environment relates to those factors of the external environment that specifically determine the differential fitness of the firm's interacting elements (e.g. consumer taste). Under such a proposal, the *external* environment can exist independently of any particular firm.

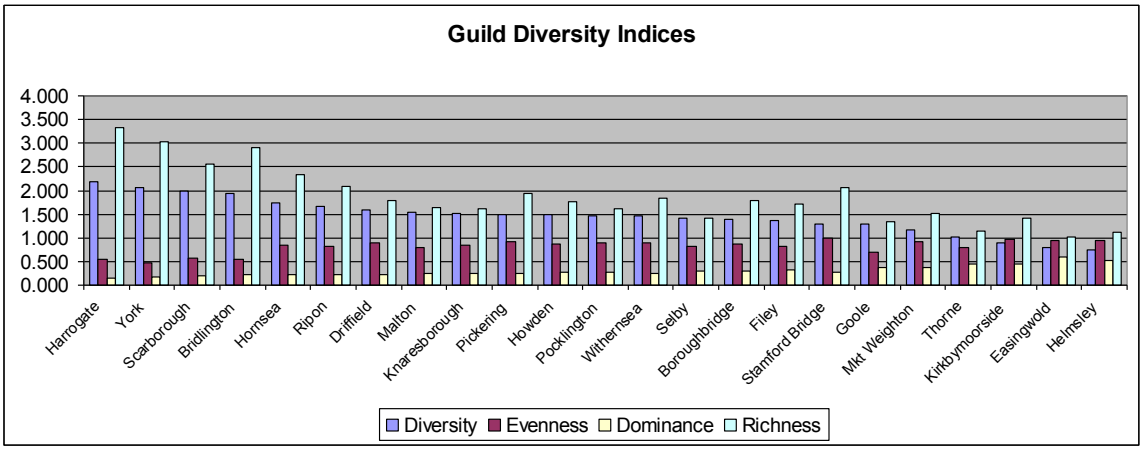
What is most important is the relationship between the firm and its *selective* environment. The *selective* environment has no existence independent of a specific firm; it represents the actual *niche* of the firm. Therefore, selective environmental heterogeneity is the main issue that must be determined. Brandon notes that sometimes this heterogeneity can be accounted for due to the discrete nature of the environment (i.e. town boundaries) or through the development of selective environmental neighborhoods around arbitrarily chosen entities. In summary, the environment can be viewed from three different forms, the external, ecological and selective. The ecological environment contains those factors that influence potential growth and the selective environment relates to those factors specifically associated with differential selection. There are likely to be unequal degrees of selection pressure spread across time and space, that may relate specifically to discrete spaces or arbitrarily determined selective neighborhoods within which similar types of firms will not be selected for or against equally. Brandon's (1990) conception of the environment as three interrelated dimensions provides a means to account for the sources of energy (or

resources) available to firms (i.e. the ecological environment), the constraints encountered (i.e. the selective environment) and all manner of other factors external to the firm that may influence its survival (i.e. the external environment). Therefore:

Proposition 1: Identifying the external, ecological and selective environments would enable researchers to gain a more precise understanding of resource acquisition between firms and/or the environs they operate within.

The degree to which firms experience different external, ecological and selective environments should be evidenced by identifiable variance across the 23 North Yorkshire towns under investigation. Support for this proposition should involve the identification of specific factors that are reconcilable to the general conditions experienced (i.e. the external environment), factors of growth (i.e. the ecological environment), and factors that impinge directly on firm survival (i.e. the selective environment). The first task therefore is to determine what degree of variance[1] exists across the 23 towns investigated. Figure 1 below highlights the variance across the 23 identified towns with respect to differences in diversity, evenness, dominance, and richness indices.

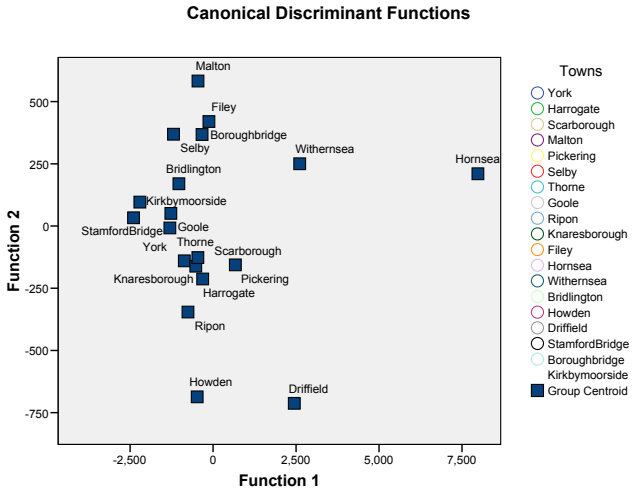
Figure 1 – Diversity, Evenness, Dominance, and Richness Indices



The use of diversity indices (above) provides a means to observe a snap short of the actual nature of ecological difference between the individual towns. Organized from the most diverse town (Harrogate) down to least diverse (Helmsley), there are noticeable differences between the towns vis-à-vis their composition and sub-population balance. It is revealed that the larger towns have higher levels of diversity and firm richness, whereas the smaller towns are more likely to have an even guild structure, that may nevertheless be dominated by one particular sub-population.

[1] All indices calculated using the PAST software program (http://folk.uio.no/ohammer/past/diversity.html). **The Diversity Index** (Shannon index) takes into account the number of firms as well as number of sub-populations. Varies from 0 for communities with only a single sub-population to high values for communities with many sub-populations, each with few firms. **The Evenness Index** (Shannon index divided by the logarithm of number of sub-populations) measures the evenness with which individuals are divided among the sub-populations present. **The Dominance Index** (Berger-Parker index) is simply the number of firms in the dominant sub-population relative to the overall number of firms in total. **The Richness Index** (Margalef's index) or, $(S-1)/\ln(n)$, where S is the number of sub-populations, and n is the number of firms.

Figure 2 – Inter-Town Variance 1975



A useful method of analysis to tease out how the town environments might differ is Canonical Discriminant Analysis. Using the individual towns as a dependent categorical variable, we can test the relationship between each town and a diverse set of independent variables (e.g. the full range of diversity indices, the change in resources, the growth of the guild, and the relative abundance of resources). Figure 2, and Tables 1, 2 and 3 below present the results of using discriminant analysis for the year 1975.

Simply put, statistically, there is a highly significant difference between the examined towns across a combination (i.e. discriminant functions) of the following variables; Guild change, Resource abundance, Margalef index, FisherALPHA index, and Resource change. These variables (illustrated in the structure matrix) provide insights into the varied composition of the general, ecological, and selective environments across each town.

Table 1 – Structure Matrix

	Function				
	1	2	3	4	5
Guild Change	-.006	-.192	.080	.699*	.684
Resource Abundance	.005	-.076	-.329	-.233	.912*
Margalef	.017	-.037	.575	-.090	.812*
Exit Rate[a]	.017	-.037	.575	-.090	.812*
FisherALPHA	.295	-.077	.528	-.161	.776*
Resource Change	-.020	.608	.347	-.151	.698*

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions
Variables ordered by absolute size of correlation within function.

*. Largest absolute correlation between each variable and any discriminant function

a. This variable not used in the analysis.

Whilst nearly all of the variance of the model is explained by the first two discriminant functions (i.e. 1 and 2), the Wilks' Lambda values indicate that all five variables are useful within the

model. The association between the discriminant scores and the towns is strongly correlated, as evidenced by the Eigenvalues all equaling 1.

Table 2 – Eigenvalues Table

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	10081329[a]	97.3	97.3	1.000
2	227962.961[a]	2.2	99.5	1.000
3	27837.184[a]	.3	99.8	1.000
4	16796.263[a]	.2	100.0	1.000
5	3111.860[a]	.0	100.0	1.000

a. First 5 canonical discriminant functions were used in the analysis.

The very low value of the Wilks' Lambda indicates greater discriminatory ability of the function. The incorporated chi-square statistic tests the extent that the means of the functions used are equal across the towns investigated. The small significance value indicates that the discriminant function does better than chance at separating the towns.

Table 3 – Wilks' Lambda Table

Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 5	.000	1411.739	90	.000
2 through 5	.000	1008.584	68	.000
3 through 5	.000	700.161	48	.000
4 through 5	.000	444.307	30	.000
5	.000	201.082	14	.000

From the findings presented above for the year 1975 (which are very similar to results for all other years across the study period), we are able to discern several variables that collectively combine in various ways to explain the degree of environmental heterogeneity present in the North Yorkshire region. As such, we have areas of focus that link directly to an understanding of the composition of the external, ecological, and selective environments. Space limitations do not permit a fuller discussion of such factors, but they are explained elsewhere in detail (see Jones, 2009a). Now we can move forward to consideration of proposition 2.

> *Proposition 2:* The external environment experienced by a firm is an identifiable feature that can be reconciled to their existence.

The findings arising from proposition 1 suggest that any attempt to aggregate the data (within this study) to determine firm survival will mostly likely conflate possible results in a misleading way due to the lack of symmetry between the linear time of the study and the ecological time found within the study that varies from town to town. That is, aggregated analysis exposes the

researcher to committing an ecological fallacy (Babbie, 2005) whereby inferences about individual cases are drawn from a broader group to which they belong. As such, it is important to test both the similarity of towns in an alternative (and accepted manner) and to determine the degree to which variance is averaged away through aggregation of the data.

The use of Canonical Discriminant Analysis has revealed significant inter-town differences related to spatial heterogeneity that has existed throughout the study period. To further explore (and confirm) the extent of such difference, Pianka's (1973) Community Similarity Index[2] was used to measure the extent to which the towns within the guild differ, and to also compare any such difference across time (see Figure 3 below for an example of a complete Community Structure Matrix [for 1975]). Consistent with the results of the Canonical Discriminant Regression, Community Similarity values for the North Yorkshire / East Riding guild are low and relatively consistent across time. At the beginning of the study time, the value is lowest ($\overline{X}$ = .39, *S.E.* = .015, *s* = .248, *N* = 253), increasing by the studies mid point (i.e. 1990) ($\overline{X}$ = .47, *S.E.* = .012, *s* = .187, *N* = 253) and essentially holding that degree of similarity at the end of the study period ($\overline{X}$ = .48, *S.E.* = .012, *s* = .185, *N* = 253).

Figure 3 – Inter-Town Variance in 1975

	York	Harr	Scar	Thorne	Kaare	Goole	Brid	Malton	Selby	Helmsley	Ripon	Driffield	Pock	Withern	Picker	Kirkby	Filey	Mkt W	Horsea	Easing	Stam.	Howden	Boroegh
York		0.60	0.77	0.18	0.36	0.27	0.50	0.45	0.27	0.09	0.36	0.36	0.00	0.36	0.27	0.18	0.36	0.09	0.27	0.09	0.27	0.27	0.27
Harrogate	0.60		0.50	0.17	0.31	0.25	0.50	0.31	0.25	0.08	0.33	0.33	0.00	0.33	0.25	0.17	0.33	0.08	0.29	0.08	0.25	0.25	0.25
Scarboroegh	0.77	0.50		0.17	0.31	0.25	0.46	0.41	0.25	0.08	0.33	0.33	0.00	0.33	0.25	0.17	0.33	0.08	0.46	0.08	0.25	0.25	0.25
Thorne	0.18	0.17	0.17		0.40	0.66	0.33	0.40	0.66	0.50	0.50	0.50	0.00	0.50	0.66	0.33	0.50	0.00	0.33	0.00	0.66	0.25	0.25
Kaaresboroegh	0.36	0.31	0.31	0.40		0.60	0.33	0.43	0.60	0.20	0.50	0.50	0.00	0.50	0.33	0.40	0.50	0.00	0.57	0.20	0.33	0.33	0.33
Goole	0.27	0.25	0.25	0.66	0.60		0.50	0.60	1.00	0.33	0.75	0.75	0.00	0.75	0.50	0.66	0.75	0.00	0.50	0.33	0.50	0.50	0.50
Bridlington	0.50	0.50	0.46	0.33	0.33	0.50		0.57	0.50	0.17	0.66	0.66	0.00	0.66	0.50	0.33	0.66	0.17	0.50	0.17	0.50	0.50	0.50
Malton	0.45	0.31	0.41	0.40	0.43	0.60	0.57		0.60	0.20	0.80	0.80	0.00	0.80	0.60	0.40	0.66	0.20	0.57	0.20	0.60	0.60	0.60
Selby	0.27	0.25	0.25	0.66	0.60	1.00	0.50	0.60		0.33	0.75	0.75	0.00	0.75	0.50	0.66	0.75	0.00	0.50	0.33	0.50	0.50	0.50
Helmsley	0.09	0.08	0.08	0.50	0.20	0.33	0.17	0.20	0.33		0.25	0.25	0.00	0.25	0.33	0.50	0.25	0.00	0.17	0.00	0.33	0.33	0.33
Ripon	0.36	0.33	0.33	0.50	0.50	0.75	0.66	0.80	0.75	0.25		1.00	0.00	1.00	0.75	0.50	0.60	0.25	0.66	0.25	0.75	0.75	0.75
Driffield	0.36	0.33	0.33	0.50	0.50	0.75	0.66	0.80	0.75	0.25	1.00		0.00	1.00	0.75	0.50	0.66	0.20	0.66	0.20	0.75	0.75	0.75
Pocklington	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Withernsea	0.36	0.33	0.33	0.50	0.50	0.75	0.66	0.80	0.75	0.25	1.00	1.00	0.00		0.75	0.50	0.66	0.25	0.66	0.25	0.75	0.75	0.75
Pickering	0.27	0.25	0.25	0.66	0.33	0.50	0.50	0.60	0.50	0.33	0.75	0.75	0.00	0.75		0.25	0.40	0.33	0.50	0.00	1.00	0.75	0.50
Kirkbymoorside	0.18	0.17	0.17	0.33	0.40	0.66	0.33	0.40	0.66	0.50	0.50	0.50	0.00	0.50	0.25		0.50	0.00	0.33	0.50	0.50	0.66	0.66
Filey	0.36	0.33	0.33	0.50	0.50	0.75	0.66	0.66	0.75	0.25	0.60	0.66	0.00	0.66	0.40	0.50		0.00	0.43	0.33	0.40	0.40	0.40
Mkt Weighton	0.09	0.08	0.08	0.00	0.00	0.00	0.17	0.20	0.00	0.00	0.25	0.20	0.00	0.25	0.33	0.00	0.00		0.17	0.00	0.33	0.33	0.33
Horsea	0.27	0.29	0.46	0.33	0.57	0.50	0.50	0.57	0.50	0.17	0.66	0.66	0.00	0.66	0.50	0.33	0.43	0.17		0.17	0.50	0.50	0.50
Easingwold	0.09	0.08	0.08	0.00	0.20	0.33	0.17	0.20	0.33	0.00	0.25	0.20	0.00	0.25	0.00	0.50	0.33	0.00	0.17		0.00	0.33	0.33
Stamford Bridge	0.27	0.25	0.25	0.66	0.33	0.50	0.50	0.60	0.50	0.33	0.75	0.75	0.00	0.75	1.00	0.50	0.40	0.33	0.50	0.00		0.50	0.50
Howden	0.27	0.25	0.25	0.25	0.33	0.50	0.50	0.60	0.50	0.33	0.75	0.75	0.00	0.75	0.75	0.66	0.40	0.33	0.50	0.33	0.50		1.00
Boroughbridge	0.27	0.25	0.25	0.25	0.33	0.50	0.50	0.60	0.50	0.33	0.75	0.75	0.00	0.75	0.50	0.66	0.40	0.33	0.50	0.33	0.50	1.00	

0.39

Given the (confirmed) degree of dissimilarity observed across towns through time, it perhaps would be expected that the nature of survival of firms on the North Yorkshire / East Riding Guild would vary significantly. However, Figure 4 below illustrates the range of survival outcomes across all 23 towns for 5yr, 10yr and 15yr time periods, suggesting that the pizza sub-population appears *not* to hold any obvious survival advantage vis-à-vis the other main sub-populations.

[2] Pianka's (1973) Community Similarity Index is simply X/N, where X is the number of sub-populations common to two towns and N is the total number of sub-populations occurring in either; thus community similarity equals 1 when two towns are identical, and 0 when they share no sub-populations.

Figure 4 – Overall and Sub-Population Survival (a)

	5yrs	10yrs	15yrs
All Firms	78%	64%	51%
All Pizza	75%	64%	50%
Chinese	99%	68%	59%
Indian	97%	57%	44%
Fish & Chips	87%	68%	54%

Figure 5 – Overall and Sub-Population Survival (b)

	N	Range	Minimum	Maximum	Mean		Std.	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
OVERALL10yr	21	.49	.51	1.00	.6886	.02835	.12993	.017
OVERALL15yr	21	.68	.32	1.00	.5729	.04119	.18874	.036
PIZZA10yr	13	.56	.44	1.00	.7554	.06506	.23458	.055
PIZZA15yr	10	.78	.22	1.00	.6110	.08477	.26806	.072
Chinese10yr	19	.50	.50	1.00	.7874	.04636	.20210	.041
Chinese15yr	15	.58	.42	1.00	.7900	.05665	.21941	.048
Indian10yr	11	.45	.30	.75	.5300	.04139	.13726	.019
Indian15yr	4	.25	.25	.50	.3850	.05979	.11958	.014
FC10yr	20	.57	.43	1.00	.7330	.04184	.18711	.035
FC15yr	19	.71	.29	1.00	.6026	.04713	.20542	.042
Valid N (listwise)	4							

However, as illustrated in Figure 5 below, when the individual survival means for each of the 23 towns are compared for 10yr and 15yr time periods, a wide degree of variance between towns is demonstrated. Thus, it is confirmed that in addition to real and measurable differences between each town (and therefore differences in the local environments experienced), survival outcomes for all of the main sub-populations vary quite considerably across both time and space. As such, it can be concluded with a high degree of confidence that the external environments experienced by pizza firms in the North Yorkshire / East Riding region are unique and reconcilable to their operations.

> *Proposition 3:* The ecological environment experienced by a firm is an identifiable feature that can be reconciled to their existence.

Now, we can consider proposition 3. As demonstrated in propositions 1 and 2, there is significant inter-town differences related to spatial heterogeneity. Therefore, it should be reasonable to discern identifiable elements of the ecological environment that reflect such variance also. The primary component of the ecological environment in this case is the availability of resources through which consumer income is possible. By determining the potential level of resource availability within each town across the period of the study we can therefore test this postulate. To do so, the total resource availability (i.e. average consumer spend per firm) for each year in each of the 23 towns over the period of study was measured. An accompanying assumption to this process being that the level of expenditure of take-away and restaurant food (i.e. total

potential spend by the residents of each town / no. of restaurants in each town) is relatively similar in total, but most likely different in its distribution across the various sub-populations. Using a Paired Samples T-Test to compare the potential resource availability across both time and space, the findings were very strongly in support of proposition 3. As illustrated in Figure 6, 75% of all comparisons were significantly different (at .05 or better). Those comparisons that were deemed *not* to be significantly different are highlighted by shading. Thus it can be concluded with confidence that the (proposed) primary component of the ecological environment does indeed vary in an identifiable and important way across both time and space. Now, we can consider the final proposition.

Figure 6 – Comparison of Potential Resource Availability

	York	Harr	Scar	Thor	Knar	Gool	Brid	Malt	Selby	Helm	Ripon	Driff	Pock	With	Pick	Kirk	Filey	MW	Horn	Easi	Stam	Howd	Boro
York																							
Harrogate	0.016																						
Scarborough	0.001	0.001																					
Thorne	0.001	0.001	0.001																				
Knaresborough	0.001	0.001	0.001	0.001																			
Goole	0.055	0.048	0.001	0.001	0.001																		
Bridlington	0.001	0.001	0.001	0.001	0.001	0.001																	
Malton	0.001	0.001	0.001	0.001	0.084	0.001	0.001																
Selby	0.001	0.001	0.001	0.001	0.001	0.815	0.001	0.001															
Helmsley	0.001	0.001	0.001	0.001	0.001	0.001	0.460	0.001	0.001														
Ripon	0.001	0.005	0.001	0.001	0.001	0.009	0.001	0.069	0.001	0.001													
Driffield	0.001	0.024	0.001	0.001	0.081	0.027	0.001	0.596	0.001	0.001	0.218												
Pocklington	0.001	0.020	0.001	0.132	0.141	0.017	0.004	0.112	0.013	0.001	0.031	0.035											
Withernsea	0.001	0.001	0.001	0.001	0.227	0.007	0.001	0.993	0.001	0.001	0.031	0.303	0.056										
Pickering	0.001	0.007	0.001	0.001	0.011	0.012	0.001	0.409	0.001	0.001	0.148	0.691	0.038	0.066									
Kirkbymoorside	0.017	0.034	0.001	0.001	0.357	0.007	0.001	0.976	0.001	0.001	0.250	0.628	0.102	0.989	0.545								
Filey	0.001	0.255	0.001	0.001	0.001	0.002	0.001	0.004	0.001	0.001	0.730	0.335	0.046	0.118	0.354	0.102							
Mkt Weighton	0.001	0.548	0.001	0.001	0.099	0.213	0.011	0.377	0.185	0.001	0.923	0.356	0.011	0.250	0.559	0.384	0.916						
Hornsea	0.001	0.203	0.001	0.001	0.001	0.433	0.001	0.001	0.157	0.001	0.012	0.001	0.013	0.001	0.002	0.001	0.067	0.310					
Easingwold	0.001	0.001	0.001	0.332	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.086	0.001	0.001	0.001	0.001	0.001	0.001				
Stamford Bridge	0.051	0.002	0.001	0.001	0.266	0.001	0.001	0.828	0.001	0.001	0.108	0.573	0.119	0.896	0.425	0.905	0.001	0.334	0.001	0.001			
Howden	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001		
Boroughbridge	0.256	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.169	

> *Proposition 4:* The selective environment experienced by a firm is an identifiable feature that can be reconciled to their existence.

At the regional or aggregated level, it would seem that independent pizza firms held a survival advantage over all other firms for 5 and 10 year timeframes (i.e. 81% & 72% compared to all other firms, 60% and 44% respectively). Putting aside the issue of temporal variations, the nature of survival outcomes for local pizza shops is illustrated below in Figure 7. An interesting issue of note is the influence of the larger cities on the aggregated average survival. Both Harrogate and York potentially bias the sample due to their disproportionate size. The towns in *italics* all represent towns where pizza firms clearly exceed the regional average survival for pizza firms. Alternatively, the towns highlighted in bold all represent towns where pizza firms achieve relatively poor survival outcomes vis-à-vis the regional average. What is clear is that firms scattered across the region experience a range of selective environments from benign to very difficult.

Figure 7 – 5 and 10 Year Survival Comparisons

Town	**5 Yr Survival**	Town	**10 Yr Survival**
Thorne i	100%	Helmsley i	no data
Stamford Bridge c	100%	Mkt Weighton i	no data
Howden i	100%	**Easingwold c**	no data
Filey c	100%	*Thorne* i	100%
Malton i	100%	*Stamford Bridge* c	100%
Boroughbridge i	100%	*Howden* i	100%
Driffield i	100%	*Filey* c	100%
Helmsley i	100%	*Malton* i	100%
Hornsea i	100%	*Boroughbridge* i	100%
Pickering i	100%	*Driffield* i	100%
Mkt Weighton i	100%	*Hornsea* i	100%
Scarborough	95%	*Pickering* i	100%
Selby c	86%	*Scarborough*	95%
Bridlington	82%	*Knaresborough c*	75%
York	82%	Harrogate	73%
Overall	**81%**	**Overall**	**72%**
Harrogate	79%	Selby c	69%
Knaresborough	75%	York	65%
Goole i	*60%*	**Goole i**	60%
Ripon c	*50%*	**Bridlington**	55%
Easingwold c	*50%*	**Pocklington i**	50%
Pocklington i	*50%*	**Ripon c**	33%
Withernsea c	*0%*	**Withernsea c**	0%

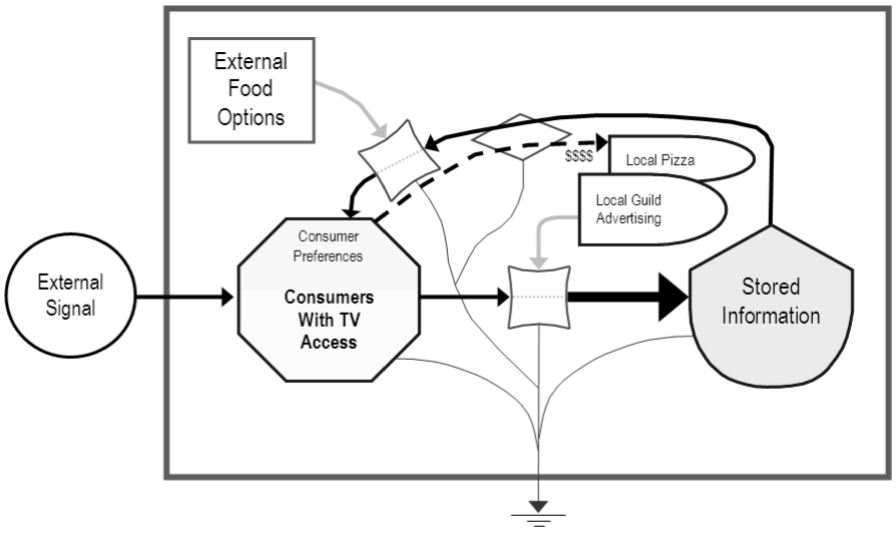
However, again it is those pizza firms located in isolated towns (identified with an 'i' in Figure 7) that appear most likely to benefit from a benign environment whereas those located in connected towns (identified with an 'c') would appear to have a much more difficult challenge in surviving. Isolated towns are defined as being so geographically distanced from other surroundings towns/cities that their inhabitants primarily consume food locally. Alternatively, connected towns are so geographically close to other surroundings towns/cities that their inhabitants also frequently consume food in other towns. To conclude, the differential survival of local pizza firms within the 23 towns investigated demonstrates different types of selection pressures that combine on a town by town basis to impact firms. Overall, sufficient support for all four propositions has been demonstrated.

The remainder of the paper discusses (with reference to the findings of Jones, (2009a)) the nature of how such heterogeneity develops in ways that are explainable vis-à-vis firm survival. The above propositions suggest that the environment is more that a space within which several firms exist. Taken together, the four propositions argue that to understand the transfer of resources between firms and/or the environs they operate within we must account for the nature of any environmental heterogeneity that is derived from the each individual firm's existence across time and space. Following this discussion, the findings from this paper will be discussed vis-à-vis the above propositions.

Discussion and Conclusion

Throughout the findings presented, it is argued that we must use more fine-scale analysis to appreciate how firms might acquire and exploit resources from their environs. Returning to the restaurant example (Jones, 2008; 2009a; 2009b), we can by way of an example reflect on the different processes impacting resource flows (to pizza firms) in connected and isolated towns. The systems modelling of Odum (1996) will be used to illustrate the specific differences between isolated and connected towns. In Figure 8, it is suggested that the external advertising signal of the franchised firm/s enters (the isolated towns) from the left of the system diagram. This signal is received by consumers with a television and the repetitive pulse of the signal is argued to be stored as information (about pizza) within the minds of the town's consumers. This information storage then influences the food preferences of the consumers and in the absence of the advertiser's actual pizza; locals consume pizza from the local provider. Thus, when the franchise signal is received, stored, and alters consumer preferences, the latent energy within the signal is converted into dollars for the local pizza shops. In Figure 8, the 'thinnest' lines specify the dispersal of available energy from the town. Thus, it is suggested that while two 'switches' could potentially divert the flow of this energy, this does not occur due to a lack of local guild advertising (from other related sub-populations) and the relative absence of other food options for consumers to consider. Let us now consider the suggested process in the connected towns.

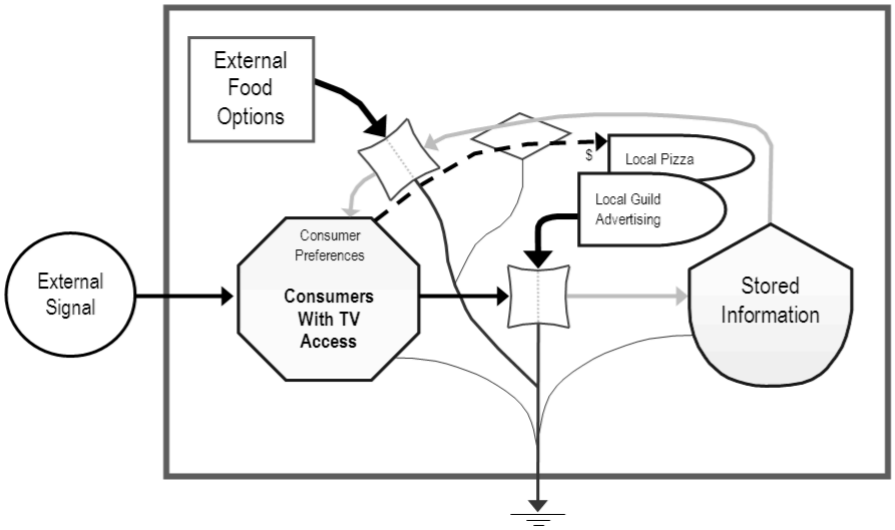
Figure 8 – Isolated Town Energy Flow



Conversely, in connected towns the flow of energy was seen to be diverted by these two separate 'switches'. As illustrated in Figure 9 below, increased levels of advertising by the local guild members can reduce the clarity and perceived intensity of the franchise signal, thereby reducing the amount of information stored in the town about pizza. Also, in connected towns the increased food options available to local consumers who are 1) more likely to work in a location outside their or residence and/or 2), are will to travel to nearby towns/cities to eat reduces the attractiveness of the local pizza shops. Now, the 'thinnest' lines become thicker as more potential energy (related to the franchisor's signalling) is lost from the town. That is, the inactivated

switches in Figure 8 have been activated by increased local advertising and increased local food options.

Figure 9 – Connected Town Energy Flow



Consideration of the suggested flows of energy through connected and isolated towns allows one to draw a clear distinction between the type of contingent conditions that would support or suppress the efficient acquisition of vital resources from the firms' environs. In connected towns 'switches' are activated due to high levels of guild (or sub-population) advertising that reduces the clarity and intensity of the franchise signal, thereby potentially reducing the amount of information (about pizza) stored in the minds of local consumers. This inturn reduces the influence on consumer preferences for pizza, which even in the event that they might exist are weakened by the availability of other food options immediately beyond the town's boundaries. In contrast, in isolated towns, the switches are not activated by increased levels of (local) advertising or the immediate availability of attractive food options external to the town.

To recap, while it is highly likely the astute operators in large towns have altered their operations to avoid direct competition, by and large resource acquisition was seen by Jones (2009a) to be a process related to specific properties of the local environment (as determined on a firm by firm basis) that is essentially gifted to local firms. Its potential influence is largely determined by factors beyond the control of a single firm, and improved by the existence of non-adversarial behaviour. Under conditions of non-adversarial coactions (Haskell, 1949) and isolation, the advertising signal can be usefully thought of as a form of *emergy* (Odum, 1996). Odum defined *emergy* as available (or stored) energy of one kind previously required directly and indirectly to make a product or service that can be converted into useful energy by other entities located within a specific region. During the second phase of the study, there was little evidence in the UK context that local firms are aware of the benefit they gain from the invisible force that in this study is referred to as *Transferred Demand*. Likewise, neither of the major franchised firms seemed aware of the (overall) positive influence their advertising had on the survival of local pizza firms. Essentially, *Transferred Demand* can be categorized as a classic commensalism,

where one or more firms benefits and the other remains unharmed, regardless of intentionality. Several implications of this research are now considered.

First, it has been shown that unobserved heterogeneity *can be observed* by operating our investigations at the correct level of scale (see Weins, 1989) and collecting specific data related to the resource transfer processes of interest. Data such as local advertising, accurate estimates of consumer spending on a good or service, and the degree to which firms operate within the same location, same operating hours and/or with the same offerings provides such data. At present, it is argued that regardless of the statistical rigor achieved in past and current organizational studies research that accommodates abstract notions of the environment, the field is often too far removed from other mainstream approaches (e.g. ecology) in conceptualizing the environment to expect progressive theory development.

Second, the problem of resource flows/transfers being invisible to recipients and/or researchers. Jones (2009a) observed that many of the Pizza shop owners were unaware of the potential benefit they stood to gain from the franchised firms' advertising. Given that the large franchise chains were also unawares of the potential positive impact of their advertising upon independent firm, we as researchers should not always assume that accurate data can be collected from single sources. Clearly there is a need to use mixed-methods to increase the use of triangulation to develop greater consensus of the reality we investigate. Further, the very nature of the tools and concepts we carry into the research field should be reflected upon for their actual usefulness. For example, a novel study by Kangas and Risser (1979) of resource partitioning in the fast-food industry by two ecologists offers insights into what is ecologically possible. This study demonstrated the mindset of the ecologist contemplating the study of resource-partitioning processes in a socio-economic setting.

Third, researchers must ensure they understand the nature of the environmental conditions associated with the process of resource acquisition. A limitation of this study is that it was limited in drawing upon the input primarily of surviving small business owners (due to an inability to access such data across the entire time period under investigation). However, it can be concluded with reasonable confidence that the process of resource acquisition (be it between firms and other firms and/or other stakeholders) will be influenced positively and/or negatively by the environs that operate within. However, clearly it is important that an emphasis is placed on explaining, rather than merely controlling for, environment heterogeneity.

Finally, there is a need to avoid being trapped within one paradigm of thinking. This study has demonstrated that value of adopting an inter-disciplinary approach. In doing so, attention has been given to Hodgson's (2001, p. 90) Principle of Consistency, that "explanations in one domain have to be consistent with explanations in another, despite examination of different properties and deployment of different concepts". It has previously been argued forcefully that not doing so has seen past work in the area of organizational ecology fail to satisfy even the most basic tenant of ecological thought (see Young, 1988; Zucker, 1988). An exciting challenge clearly exists to acquaint ourselves to other research methodologies used to research similar phenomena in different domains of enquiry. There have been many advances in our thinking on such matters and we should all remain curious as to how our collective thinking can be further advanced via greater inter-disciplinary collaboration.

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