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## GROWTH AND PERFORMANCE IN THE U.K. FINANCIAL SERVICES: HAS CLUSTERING IMPROVED THE BOTTOM LINE?

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### ABSTRACT

In this paper, clusters are defined as regional concentration of competing and related industries; with evidence of improved performance stemming from this concentration. We investigate the effects of cluster strengths, arising from critical masses of industries or the lack of it, on physical and economic growth of individual firms. We found strong and statistically significant relationships between cluster strengths to the growth and performance via looking at 17,534 financial services firms inside and outside clusters in England, Scotland and Wales. This is indicative of the competitive advantage stemming from firms' locational strategy and other clustering benefits found in literature.

Keywords: Clusters, Industrial Districts, Growth, Performance, Financial Services

JEL - G20, O40, O47, R10, R12, L80

## 1. Introduction

There is general agreement on why financial services cluster together, historically and in the present context, but there is limited research exploring if a firm's economic performance and growth are indeed superior in clusters, and if so, what are their determinants? This paper investigates whether growth and economic performances of firms are superior when clustered together, by examining 17,534 financial services firms in England, Scotland and Wales.

Many studies build around Swann's lifetime growth model have found significant clustering effects in biotechnology (Swann and Prevezer, 1996), broadcasting (Cook et al, 1999), aerospace (Beaudry, 2001) and financial services (Pandit et al, 2001) which generally revealed that firms physically grow faster in a cluster that is strong in their own industry. It is found that this growth might be attenuated if the cluster is strong in other related industries with little or no synergies with the industry in question.

Beaudry and Swann (2001) recently introduced regional fixed effects like the industry concentration and population density in their large-scale of all UK industries under the UK92 Standard Industry Classification (SIC) and found that clustering effects are significant in industries like financial intermediation (SIC 65) towards their lifetime growth. However, because the scale of study is large, classification to the financial services industries was generic at a broad 2-digit level (SIC 65, 66, and 67) to be definitive. The study did find that financial intermediation is certainly one clustered industry that benefit from locating among peers at certain locations.

Pandit et al. (2001) carried out an econometric study on financial services clusters in 14 U.K. regions with a more detailed industry classification breakdown into 8 major sub-sectors. In this study, it was observed that significant and positive clustering effects occurred in banking, non-bank financial intermediation and non-life insurance industries. However, the simplified growth model did not capture regional fixed effects and was based on an older 1997 data-set.

The unique feature of this paper is that it also investigates whether a firm's economic performance is influenced not only by these cluster strengths, but also by other cluster variables (such as population density, regional GDP and industry concentration). We define economic success as the ability of the firm to maintain economic viability and profitability better than its industry peers. This is, in contrast, to earlier works that have measured performance by the sole use of employment as an indicator. Economic performance is seen as a more accurate and meaningful measure of success for an enterprise's point of view than physical growth alone. In this paper, for simplicity, clusters are defined as regional concentration of competing and related industries, where there is evidence of growth and improved economic performance arising from locating close to one another in a region.

## 2. Literature Review

Clusters are a striking and common feature in today's economy. Nonetheless, this phenomenon is not new and has been the object of attention from a wide variety of social scientists for more than a century. In the last ten years, this phenomenon has attracted renewed interest from: the academic (Porter, 1998a; Swann, 1998; Saxenian, 1994); the business practitioner (The Economist, 1999; Owen, 1999); and the British Government (DTI White Paper, 1998); who have become aware of its central importance in competitive strategy.

The UK Department of Trade and Industry has recognised the strategic importance of clusters in the economy. In the recent White Paper published in 1998, clusters are defined as geographic 'concentration of competing, collaborating and interdependent companies and institutions which are connected by a system of market and non-market links' (DTI White Paper, Analysis and Background Report, 1998: 22). This term has since been used loosely by regional

governments (as a result of extensive governmental funding on clusters) to identify and cultivate growth or 'high value added' industries in their regions. However, there are no apparent evidence of critical mass or network linkages amongst these embryonic industries.

Martin and Sunley (2002) refuted this vague characterisation and concept of clusters, although a myriad of theoretical and empirical studies, as well as methodological investigations have been carried out. A major source of such ambiguity lies in the definition.

Clusters, according to Porter (1998c), are critical masses in one place of unusual economic success in particular fields. He further defined them as 'geographic concentration of interconnected companies, specialised suppliers, service providers, firms in related industries and associated institutions in particular fields that competes but also cooperates' (Porter, 1998a:197).

Rosenfield (1997: 4) defined clusters simply as 'concentration of firms that are able to produce synergy because of their geographical proximity and interdependence' whilst Roelandt and den Hertag (1999: 9) characterised clustering as networks of producers of strongly interdependent firms linked to each other in a value-adding production chain.

Swann (1998: 1) looked at clusters, in a geographical and technological sense, as a large group of firms in related industries at a particular location. Swann has taken the definition a little further in his empirical investigations by defining two main cluster strengths as the agglomeration sizes of similar-firms and related-firms in the region for a particular industry.

Taking the number of definitions further, Feser (1998: 26) said that 'economic clusters are not just related and supporting industries, but rather related and supporting institutions that are more competitive by virtue of their relationships'.

Clearly from this myriad of definitions, there are three main elements. Firstly, a cluster must consist groups of associated and interconnected firms that are linked vertically and/or horizontally through their commonalities and complementariness in products, services, inputs, technologies or outputs activities. Secondly, clusters are physical proximate groups of interlinked companies which can encourage the formation of, and enhance value creating benefits via their interaction. Lastly, co-location itself does not imply clustering when these associated clustering benefits like innovation, productivity, growth or other superior competitiveness cannot be shown or described.

## 2.1 Cluster and Competitive Advantage

Garelli (1997) postulated that four forces dominate the competitiveness environment of any country. One of the forces, the economy of globality assumes that production does not necessarily need to be close to the end-user. It benefits from the comparative markets worldwide, especially in operational costs. The economy of proximity inherent in a cluster, on the other hand, provides value-added services close to the end user.

With improvements in telecommunications and transportation infrastructures, the world is becoming more a global village - where physical separation is longer a barrier to international business relations and multi-national corporations (MNCs) thrive on tapping international resources (such as cheaper labour, raw material and location) for added competitive advantage. This has invaded the turf on economy of proximity. The enduring competitive advantages in a global economy, according to Porter (1998c), lie increasingly in local things - knowledge, relationships, motivation- that distant rivals cannot match.

Competitive advantage grows out of the value a firm is able to create for its buyer and this can be diagnosed through the value chain (Porter, 1985). Innovation is seen to be central in creating a competitive advantage by perceiving or discovering new and better ways to compete in an

industry and bringing them to market (Porter, 1990). Competitive advantage grows fundamentally out of improvement, innovation and change. Firms in a cluster will gain advantage over international rivals if they could find new and better means to compete through better linkages, knowledge spillovers and innovation.

Competitive advantage also involves managing the entire value system, encompassing the value chains of the firm, suppliers, channels and buyers. The importance of the entire value system to competitive advantage is manifested by the prevalence of clustering (Porter, 1990). The strongest competitive advantages, observed by Porter, often emerge from clusters that are geographically localised.

Porter (1990) has also noted that competitive advantage is sustained only through relentless improvements to the firm's product and organisation. Geographical concentration, indeed, is important for organisational improvement and technological innovation (Baptista and Swann, 1999).

Concentration of knowledge in the cluster will attract increased human capital to the cluster and, since the information exchange tends to be more informal, the spread of knowledge outside the region becomes limited. It takes strong pressure to counteract the inertia to change; rarely do these come exclusively from within a firm but from the external environment. A firm must expose itself to external pressures and stimuli in the cluster that would motivate and guide them with the need to act; the impetus to change; and the catalyst to innovate!

Baptista (1996) suggested that technological innovation is the heart of the dynamic process of cluster growth, acceded by new firm entry and incumbents' growth. Arthur (1990) noted that strong clusters tend to attract more firms, and regions with strong innovative record have an advantage in achieving more innovation; they are self-fulfilling and path-dependent. Innovative activity and output are found to be positively correlated with new firm entry and productivity growth (Swann et al, 1998)

## 2.2 Clusters and Externalities

Marshall (1890) characterised 'concentration of specialised industries in particular localities' as industrial districts which create external economies in the ready availability of skilled labour; the growth of supporting and ancillary trade; and the specialisation of firms in different stages and branches of production. Such external economies are dependent upon the size of the industry, region or economy. Martin and Sunley (2002) noted that Marshall's earlier model formed the basis of Porter's (1990) competitive diamond for national advantage and asserted that the competitive diamond is the driving force making for cluster development. Simultaneously, making clustering the spatial manifestation of the competitive diamond.

In urban economics literature, agglomeration externalities are due to any economies or cost reductions that are possible if several firms locate near to each other (Evans 1985). Externalities are impacts, side-effects or spillovers which are usually not reflected in the costs or prices of a particular good or service, i.e. not covered by a market mechanism.

Table 1: Cost and Benefit of Clustering

	Demand Side	Supply Side
Benefits	Customer proximity Reduced consumer search costs Information externalities Reputation	Knowledge spillovers Specialised labour Infrastructure benefits Information externalities
Costs	Congestion and competition in output markets	Congestion and competition in input markets (property and labour)

Source: Swann et al [1998: 57], with slight modifications

By being located close to one other, potential customers can reduce their searching costs and compare prices with quality. Reputation of a cluster, be it in quality or innovation, will further draw customers to the location for their custom. Silicon Valley has become an international cluster reputed for its design and innovation ability (Saxenian, 1994). Whereas Harley Street and Saville Row in London are reputed for quality medical and tailoring services respectively (Pandit et al, 2001).

Firms may sometime cluster in particular location to take advantage of close proximity to concentrations of their customers, which may of course be other firms. This can sometimes be imposed by the customers, such as Dell Computer, who stipulate that supply sources be located close to them to benefit from integration in the supply chain.

Most works on clusters and industrial districts have considered agglomeration externalities as the key force behind clustering. Externalities involve a diversity of supplier, information and knowledge spillovers on market conditions and technology transfer, which are more to add onto Marshall's model. Models of dynamic externalities argue that cities or clusters grow because they allow people to interact and learn from one another, and proximity promoted this.

Three types of externalities arise in the context of the clustering phenomenon: Location externalities resulting from geographical agglomeration within the same industry; and Urbanisation externalities arise from the agglomeration of firms in different industries. The success of London region can be explained primarily in terms of urbanisation economies of scope and scale – the co-location of financial services firms created an effective demand for factors of production in finance, qualified labour and technology (Simmie and Sennett, 1999). Economies of scale and scope build up barriers to entries and reduce costs, thus changing the structure of the industry and affecting the ways firms in the industry-wide compete.

The third is a particular type of agglomeration externalities: the knowledge spillovers. These spillovers, resulting from contact with other firms or institutions influence technological innovation and productivity as cited in Saxenian (1994). It also has a wider range of effects like altering the financing, marketing, managerial and organisational practices of firms; and hence affecting firm growth and changing the nature of market structure (Baptista, 1996).

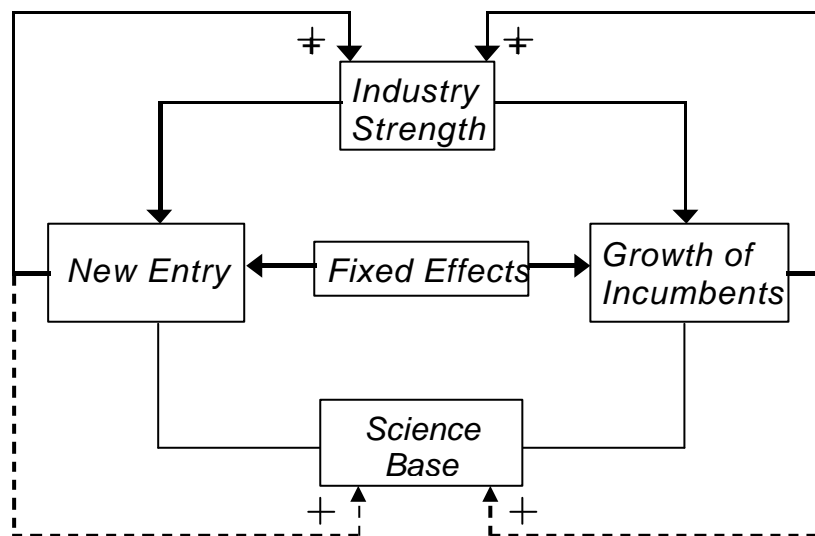
Knowledge spillovers arise from everyday contact, networking through geographical proximity, as well as from formal arrangements like joint-ventures and joint research work with Universities. Accessibility of information is certainly more important in the finance and financial services industries, and by means of clustering, this mechanism is enhanced

### 2.3 Clusters, Growth and Positive Feedback

Positive feedback is seen to be playing a central role in clusters (Baptista and Swann, 1999; Beaudry *et al.*, 1998; Swann *et al.*, 1998; Swann and Prevezer, 1996). Agglomeration or external economies result in demand and supply conditions that are better in a cluster than in isolation and so promote the growth of incumbent firms and attract the entry of new firms. This growth and entry increases cluster strength and so promotes further growth and entry which begins to accelerate once a cluster has reached a critical mass (Pandit *et al.*, 2001). Porter (1998c) also acknowledged that the positive feedback loop within a cluster and that formation of new businesses amplifies the benefits of clustering.

Other extraneous effects from this positive feedback include a higher rate of productivity growth (Henderson, 1986), more prolific innovation (Baptista and Swann, 1998) and significant information and knowledge spillovers (Oakey, 1985). However, the feedback will not remain positive indefinitely. Beyond some saturation point, congestion and competition might slow down individual firms' growth and entry, and eventually possibly contributing to the decline of the cluster. This is suggested by Porter and is consistent with the argument on a cluster life cycle theory advanced by Swann *et al.* (1998).

Fig. 1: Positive Feedback in the Growth of Clusters



Source: Swann *et al.* (1998, p.68)

Swann's (1998) positive feedback model in Figure 2 aptly sums up how the clustering phenomenon, felt through the entry of new firms and the growth of incumbent firms, leads to a positive feedback loop, which will induce further growth within the cluster.

If the positive feedback mechanism is said to enhance the cluster growth and attract new firm entry; the reverse is said to be true as well. Porter (1998c) pointed out that rapid firm growth and new firm entry are two signals of a successful cluster.

Recent econometric works (this paper included) investigate into the rate of growth of the firm as a function of the strength of the cluster in which it is located and whether strong clusters attract a disproportionate number of new start-up firms.

Clustering makes it easier to benchmark against other players in the same industry; to measure and compare performances because local rivals share general circumstances. Companies within clusters have intimate knowledge of their suppliers' costs and managers are able to compare costs and employees' performance with other local firms - this is also a result of a close working relationship with each other.

Proximity improves communications and relationships with the suppliers as well. It could induce instantaneous support from the supplier to the troubled firm like debugging equipment even on short notices during breakdowns in the middle of the night. Saxenian (1994) noted all these and joint developments with the suppliers during the startup phase of Silicon Valley.

Growth and entry of firms as certainly apparent in successful clusters like that of London Financial Center. Competitive advantage derive from clustering comes in many forms: productivity; vertical and horizontal linkages; reputation; knowledge spillovers and other supply/demand factors. Do these and other agglomeration externalities also improve the bottom line of clustered firms?

### **3. Theoretical Interpretation of Model**

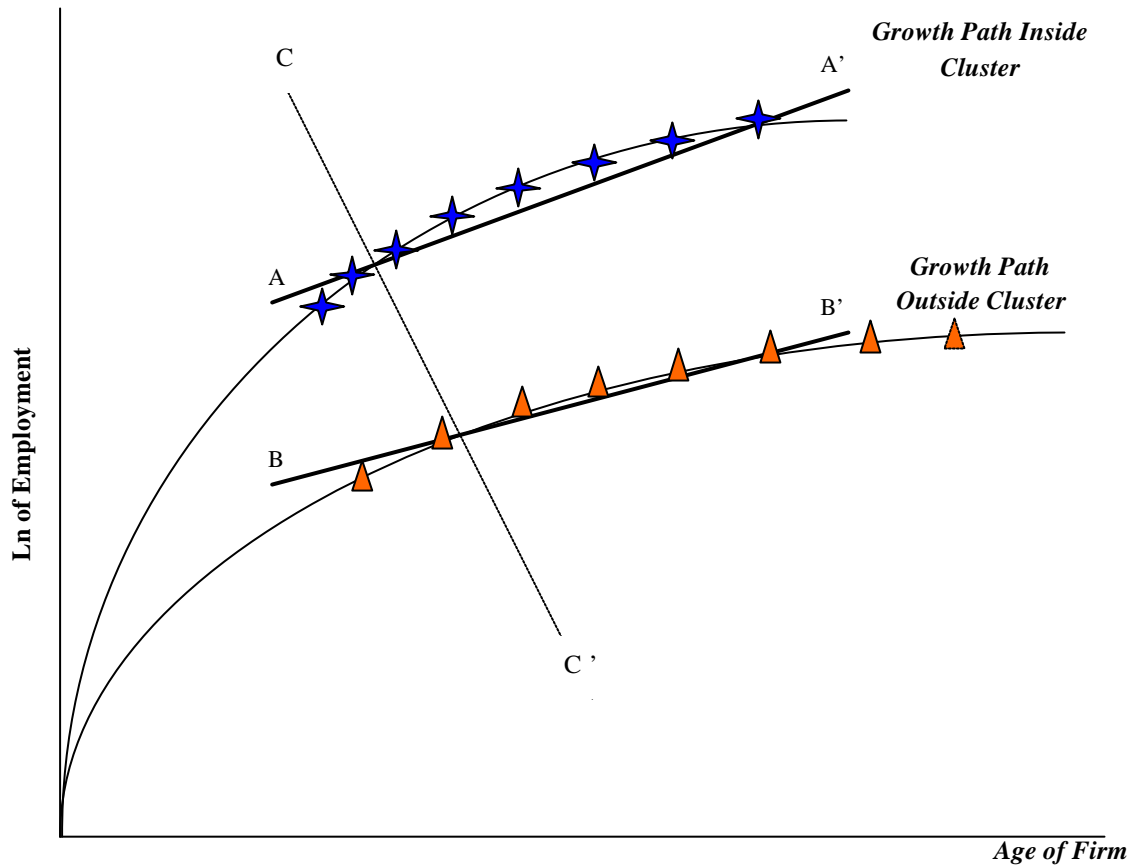
There are three broad categories of econometric models in analyzing the performance of companies in clusters. The first is the lifetime growth model used and further developed here. Another investigates into the entry of firms into clusters (Swann, 1998), while the third focuses on innovation or patenting in clusters (Baptista and Swann, 1998; Beaudry and Breschi, 2000)

The lifetime growth model is best explained with one hypothetical firm located in a cluster versus another located outside a cluster. As the vertical axis is a logarithmic scale of employment, a convex growth path implies very high growth rate when a firm is young but tails off and consolidates to a critical mass. This is realistic as small firms can achieve a high growth rate from a smaller base but the same rate could not be sustained, as the firm gets larger.

The growth path for the firm in a cluster lies above that for the isolated firm, and that although both start off with a similar size and slow down in growth upon the critical mass, firms in cluster achieve a higher absolute size.

AA' indicates the trend growth rate of a firm inside a cluster, while BB' indicates the trend growth rate of a firm outside a cluster. The line CC' represents a census line where we can obtain records on the firms. More precisely, suppose this census only records firms when they progress to the right of the line CC'. Then the sample of firms from inside a cluster will lie on an upper growth path to the right of CC'.

Fig. 2: Trend Growth Rate of Firms inside and outside Clusters



Source : Adpated from Beaudry and Swann, 2001

Given such constraint like the census (or any database used), we can see if we roughly fit two straight lines through the points, they are almost parallel to each other. This is not too realistic since their growth paths should not be the same. But it happens as the data represents an incomplete census of firms. When we regressed the logarithmic size against the age, the cluster effect may show as a higher intercept rather than a steeper slope. This has been indicated in previous studies (Beaudry and Swann, 2001).

In its full form, the growth model is seen as:

$$\text{Equation 1: } \ln E_{n\hat{\{I:c\}}} = a + b(\text{Age}_n) + g_1 \ln S_{Ic} + g_2 \ln S_{Jc} + \hat{a}_v d_v \ln V_v + u$$

Taking the model further, we tested if the performance of a firm is also dependent on these cluster strengths, as we wanted to know what part they play in determining economic performance.

$$\text{Equation 2: } \text{Perf}_{n\hat{\{I:c\}}} = a + b(\text{Age}_n) + g_1 \ln S_{Ic} + g_2 \ln S_{Jc} + \hat{a}_v d_v \ln V_v + u$$



<i>Variable</i>	<i>Description</i>
$E_{n\hat{I}\{I:c\}}$	Performance of firm n from sector I at location or cluster c
$Perf_{n\hat{I}\{I:c\}}$	Performance of firm n from sector I at location or cluster c
$Age_n$	Age of firm measured from date of incorporation to present date
a	Constant
b	Coefficient indicating the trend growth rate of the firm where $\beta = 1 + \sum_{c=1}^{C-1} d_c D_c + \sum_{i=1}^{I-1} d_i D_i$
	<ul style="list-style-type: none"> <li>• <math>D_c</math> represent cluster dummy variables (1 or 0), one for each of the UK regions (C= 12)</li> <li>• <math>D_i</math> represent subsector dummy variables (1 or 0), one for each sub sector (I = 8)</li> <li>• <math>d_c</math> and <math>d_i</math> is their contribution to the trend growth rate</li> </ul>
$g_1$	Coefficient indicating the effect of own sector strength in the firm's growth
$g_2$	Coefficient indicating the effect of strength in other sectors on firm growth
$S_{Ic}$	Total employment of the particular sector I at particular cluster c
$S_{Jc}$	Total employment in all subsectors other than I at particular cluster c
$V_v$	Represents other cluster strength variables namely: <ul style="list-style-type: none"> <li>a) Population density : - indicating the size of the region in supporting the economic activity, measured by size of population in cluster</li> <li>b) Regional GDP per capita :- indicating the general economic activities in the region</li> <li>c) Employment diversity : -indicating the regional concentration of particular industry within the financial services industries, measured by Herfindhal index</li> </ul>
u	Residual or disturbance term

### 3.1 Issues associated with Econometrics

There are some problems with this model that we are aware. Firstly, it is a simple model of organic growth and does not cope with non-organic growth like mergers, acquisitions and disposals, which is common in the current industry context. The second problem associates with heteroskedascity, where the variances to the growth path are known to be high in the early stage and late stage of the industry life cycle. Beaudry and Swann (2001) have attempted to address this problem but only manage to address the tip of the iceberg.

The third problem is endogeneity between variables such as  $\sum_{i \in \{I:c\}} E_i$ , the firm employment and the industry concentration index. However, it has been shown in Beaudry and Swann (2001) that while part of it may be almost negligible, most econometric works of this nature suffer from similar problems.

But as firms survive competition in the industry and get older, their sizes become larger. In an environment that is conducive to growth like that found in a natural cluster, we should theoretically find more older and larger firms.

### 3.2 Issues with Economic Performance

Direct measure of firms' economic performance will vary greatly as firms come in different sizes and are involved in different type of financial activities. As such, financial statements will

show differing levels of turnover and profit margin. To reconcile the first disparity, financial ratios are used as a measure of factors that influence the performance of a firm.

Ratios indicate the performance (risks & returns) that could arise for the stakeholders (such as debtors, creditors or shareholder) when dealing with the financial institutions. The factors that influence the risk of a financial institution are: its operating results; its quality of assets; the stability of liabilities; and the composition of assets, liabilities and shareholders' funds. An institution's ability to attract and retain deposits and other sources of funds affects its economic performance and is the main risk for financial services institutions.

Profits are the lifeblood of commercial enterprises. It is profits that attract and retain capital. They are necessary for growth, development and the very survival of all institutions. They are also a measure of the competences and ability of management (Palat, 1986: 55). Two ratios are chosen due to their importance to the financial services industries. Sound operating results and return on equity is measured in the first ratio, whilst the second ratio indicates the composition of assets, liabilities and shareholders' funds necessary for financial institutions to maintain good performance.

Return on capital employed ratio (ROCE), is defined as profit before tax as a proportion of long term debt and shareholder equity. The ROCE measures the rate of return on stakeholders' investment and whether the return made on an investment is better than alternatives available in other firms. ROCE is a major measure of profitability and enables an analyst to determine whether: 1) the return earned is comparative to that earned by other similar financial institutions; 2) the assets of the financial institutions are efficiently utilized.

Solvency ratio (SOLV) is defined as shareholders' equity as a proportion of total assets. It reflects the gearing and capital adequacy in the financial institution. Gearing indicates the level of financial risk which is being borne in addition to the business risk.

Creditors normally prefer low gearing ratios since the lower the ratio, the greater the cushion against creditors' losses in the event of a liquidation or a fall in demand and low profits. Owners, on the other hand, may seek high gearing either to magnify earnings, or because selling new stock means giving up some degree of control.

The importance of gearing is appreciated when it is realized that if, during a period of growth, a company borrows extensively, it can collapse should a recession occur and sales and profits fall. Furthermore, to a lender, a higher geared company has less capacity to obtain refinance than one that is not geared and therefore becomes riskier.

A specific kind of gearing ratio, SOLV shows how much of a deterioration in assets can be borne by the bank or financial institution. It serves as a quick check to determine whether a bank is under-capitalized. The higher the ratio, the less risk for general creditors. Credit institutions' approach to the maintenance of sufficient funds is set out using solvency ratio as a gauge. (Central Bank of Ireland, 2000).

## **4. Data**

### **4.1 Sources and problems**

The data-sets used in this study are mined from FAME database (Financial Analysis Made Easy) by geographical regions and SIC codes. The latest financial statements available in FAME were in 2001 for some firms, but most data was last updated in 2000 or 1999. Out of the 17,534 valid and existing companies downloaded from FAME, only 7473 companies (42.3%) provided employment figures. The main reasons are mainly attributed to:

- Holding and/or consolidated companies may not have data on employment published as their subsidiaries' employment were reported separately (for accounting purpose).
- Others are assumed to be small firms (i.e. 1-5 people) that do not file full financial reports and have insignificant number of employees

Due to the low figures percentage of employment figures reported, the FAME aggregated employment figures per region were compared with government publications and the magnitudes were similar. In addition, in order to optimise the amount of data for the regression, all available employment figures were extracted and the average firm size was used. However, the FAME database provided good sources of data for financial ratios to enable us to look into firms' economic performance. It contains 13,757 (78.5%) observations for ROCE and 17,081 (97.4%) observations for SOLV.

At the two-digit primary SIC 1992 level, three main financial services classifications can be found:- SIC 65 (Financial intermediation except insurance and pension funding); SIC 66 (Insurance and pension funding, except compulsory social security); and SIC 67 (Activities auxiliary to financial intermediation).

The two-digit level is too broad for our purposes and re-classification of firms according to activity was done on the basis of (a) classifications found in the literature on British financial services (Buckle and Thompson, 1998) and (b) company SIC codes at the four-digit level shown in Table 1. This would resolve the issue of the second disparity on different activities within the financial services industries.

The UK is also divided into thirteen regions shown in Table 2 to measure regional fixed effects in stronger and weaker financial clusters. Despite the clear demarcation shown below, much time were spent in allocating the postal codes to the correct region and deleting double entries. The breakdown of employment and firms in terms of regions are indicated in Table 3.

Tab. 2: Financial Services Industries

BSBANK	6510 - Monetary Intermediation 6511 - Central Banking 6512 - Other Monetary Intermediation including Banks and Building Societies
CREDIT	6520 - Other financial Intermediation 6521 - Financial Leasing 6522 - Other Credit Granting including Finance Houses, Factoring and Mortgage Finance Com.
TRUST	6523 -Activities of investment trust, unit trust, property trust, bank holding company, venture and development capital companies. 6602 - Pension Funding
LIFE	6601 - Life Insurance
NLIFE	6603 - Non Life Insurance
FINAUX	6700 - Activ ities Auxiliary to Financial Intermediation 6710 - Activities Auxiliary to Financial Intermediation except Insurance and Pension Funding 6713 - Activities Auxiliary to Financial Intermediation not classified elsewhere
INSAUX	6720 - Activities Auxiliary to Insurance and Pension Funding
MARKET	6711 - Administration of Financial Markets 6712 - Security Broking and Fund Management

Tab. 3: U.K. Regions for Financial Services

NSCOT	Highlands, Islands, Aberdeenshire, Angus, Dundee, Argyll & Bute, Perth, Kinross & Stirling	WALES	Clwyd, Dyfed, Gwynedd, Powys, Gwent, Mid, South & West Glamorgan
SSCOT	Borders, Fife & Clackmannanshire, Lothian, Renfrewshire, Ayrshire, Falkirk, Dunbartonshire, Lanarkshire, Dumfries/Galloway, Glasgow, Edinburgh, Helensburgh & Lomond	EMID	Derbyshire, Nottinghamshire, Lincolnshire, Leicestershire, Northamptonshire, Rutland
		WMID	Stroke-on-Trent, Telford, Wrekin, Shropshire, Staffordshire, Warwickshire, West Midlands, Worcestershire.
NIRE	Coleraine, Derry, Ballymena, Strabane, Omagh, Ulster, Belfast, Newry, Craigavon, Dungannon, Eniskillen	EAST	Luton, Peterborough, Southend-on-Sea, Thurrock, Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk & Suffolk
NWEST	Blackburn, Darwen, Blackpool, Warrington, Cheshire, Greater Manchester, Cumbria, Lancashire & Merseyside	SEAST	Bath, Bristol, Bournemouth, Poole, Swindon, Torbay, Cornwall & Isle of Scilly, Devon, Dorset, Gloucestershire, Somerset & Wiltshire
NEAST	Cleveland, Darlington, Hartlepool, Redcar, Middlesbrough, Stockton-on-tees, Tees Valley, Durham, Northumberland & Tyne/Wear	SWEST	Southampton, Windsor, Milton Keynes, Portsmouth, Reading, Isle of Wight, Wokingham, Buckinghamshire, Berkshire, E/W Sussex, Hampshire, Kent, Oxfordshire, Surrey
YORKH	Humberside, N,S & W Yorkshire, Kingston, N & NE Lincolnshire, Leeds, Bradford, Sheffield, Hull, Halifax		LON

Tab. 4: Breakdown on UK Firms and Regional Employment

	Region	No of Firms (Data from FAME)	Regional Employment (Data from FAME)
1	Northern Scotland	119	28,142
2	Southern Scotland	702	89,134
3	Northern Ireland	17	7,905
4	North West	1,142	42,063
5	North East	178	7,192
6	Yorkshire & Humberside	770	140,680
7	East Midlands	446	15,267
8	West Midlands	928	30,473
9	Wales	214	30,473
10	East England	1,011	77,304
11	South West	1,958	82,495
12	South East	797	100,193
13	London	9,253	1,095,329

## 5. Results and Discussion

For the purpose of illustration, we have selected the region Yorkshire & Humberside in comparing with London. Yorkshire, incorporating Leeds, Bradford and Halifax, has 12.8% of Britain's building societies and 10.3% of Britain's non-life insurances activities. London, within the M25, is most often seen as one of the other capital of finance in western capitalism and consists of all specific industries identified in Table 1. The following table indicates the importance of financial services to the two regions:

Tab. 5: London and Yorkshire Statistics

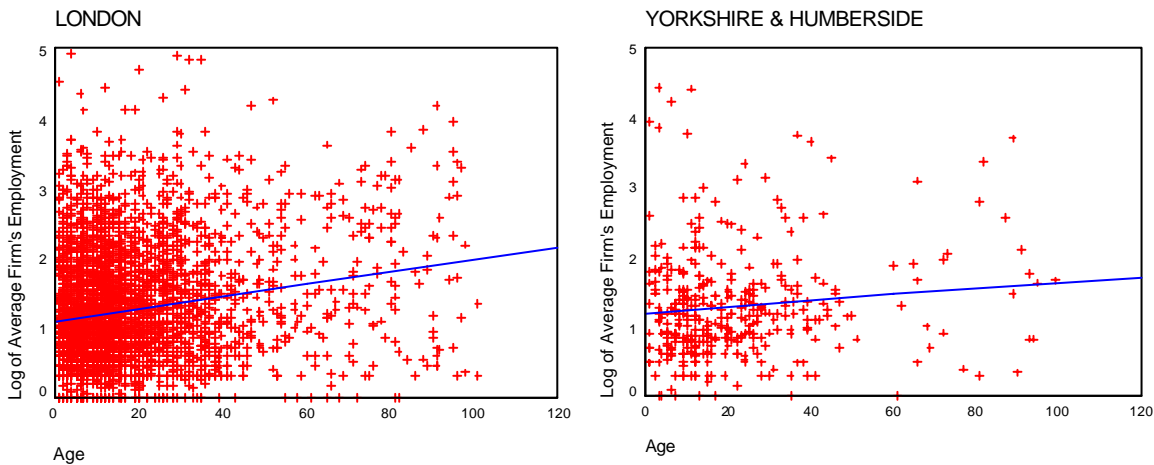
	Population * (mil)	Land Area * (sq km)	GDP from Fin & BusSvc * (£ mil)	Regional GDP * (£ mil)	GDP per capita (£ '000)	Percent of Financial Intermed to GDP **	Remarks on financial services employment **
<b>London within M25</b>	7.285	1,580	1,251,360	118,472	16.26	10.7%	Contribute 12% of regional employment
<b>Yorkshire &amp; Humberside</b>	5.047	15,411	297,395	51,448	10.19	4.7%	Contribute 1.5% of regional employment
<b>UK Total</b>	59,502	242,923	4,708,976	680,989	11.44	-	-

Source : \* Regional Trends, 2001 \*\* UK Business Cluster, 2001

### 5.1 Basic Statistical Comparison

Advancing the discussion in Section 3 on the lifetime growth, the below scatterplots of Employment versus Age for the two regions is evidence of lifetime growth and, not surprisingly, indicates a stronger growth rate for London than Yorkshire.

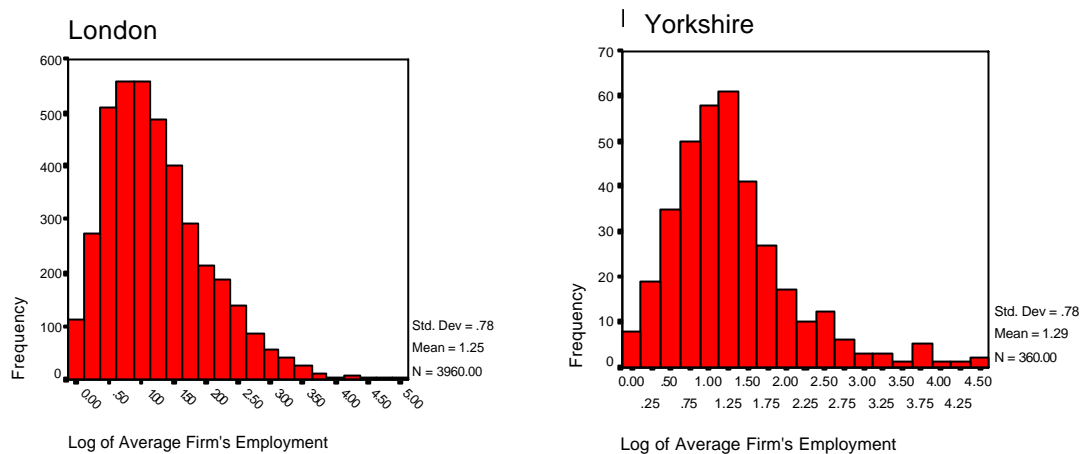
Fig. 3: Growth Trends in London and Yorkshire



Assuming the population of firm sizes to be normally distributed (in which case there is no reason to believe why not), the central limit theorem supports samples drawn from the population (or in this case in a region/ cluster) to be normally distributed.

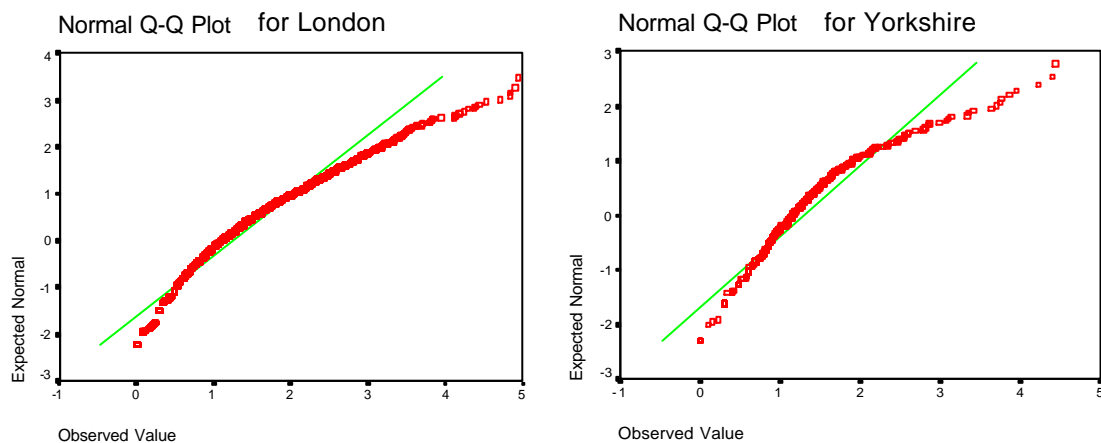
Taking London and Yorkshire & Humberside as two specific samples, it was noted that the region showed differing mean/mode on the distribution of companies' size; but the distribution remained relatively normal.

**Fig. 4: Distribution of Employment in London and Yorkshire**



An investigation of the Normal Q-Q Plot of the dataset shows some deviation, but not too great, from normality as confirmed by the distribution. If the data is normally distributed, then the observed value will fall perfectly along the straight line.

**Fig. 5: Normality of Employment in London and Yorkshire**



## 5.2 Regression on Lifetime Growth Model

The first set of results use a pooled model where 7473 observations in all industries and regions are combined. The next set of results split the entire UK sample in the eight industries and regressions were performed with differing level of outliers removed (1%, 5% and 10%), with the purpose of testing the robustness of the growth model.

Model I consists of the basic growth model variables and Model II incorporates additional variables of industry concentration, financial GDP and population density as these regional fixed effects are believe to be closely associated with the financial services cluster dynamics.

### 5.2.1 Pooled Results

Tab. 6: Pooled Result for Lifetime Growth Regression

	Model I with Outliers Removed			Model II with Outliers Removed			
	Coeff	Std Error	Sig	Coeff	Std Error	Sig	
Constant	1.625 ****	0.125	0.000	2.155 ****	0.263	0.000	Model I R Sq = 2.8%
Age	0.012 ****	0.001	0.000	0.012 ****	0.001	0.000	Model II R Sq = 3.0%
Ln (Own Employment)	-0.058 ****	0.012	0.000	-0.054 ****	0.014	0.000	Model I RSS = 11782.7
Ln (Other Employment)	0.106 ****	0.014	0.000	0.114 ****	0.032	0.000	Model II RSS = 11761.3
Industry Concentration				0.310 *	0.197	0.115	Sig F of Model I = 0.000 **
Ln (Financial GDP)				-0.144 ****	0.055	0.009	Sig F of Model II = 0.000 **
Ln (Pop Density)				0.071 ***	0.034	0.039	Sig F Change = 0.006 **

\*\*\*\*Significance at 1%; \*\*\* Significance at 5%; \*\* Significance at 10%; \* Significance at 20% levels

The coefficient on Age indicates a overall growth rate in financial services of 1.2 percent per year. This is a modest rate but less important, as it does not tell us much about the individual industries growth. The coefficient on Ln (Own Employment), being negative and significant, seems to indicate that cluster strength in own industry does not promote growth, whereas Ln (Other Employment) or cluster strength in other related industries promote growth in these financial services firms. This industry-wide result is in constrast to earlier studies and we will attempt to reconcile at a later stage.

We can also see that regional fixed effects seem to play an important role in supporting clustering (*Sig F Change between Model 1 & 2*), but in the pooled result, we cannot differentiate the role these effects play in individual industries.

#### 5.2.1 Industry Specific Results

The trend growth rates indicate that BSBANK (4%), CREDIT (3.6%), INSAUX (2.8%) and MARKET (3.2%) grow faster than the average growth rate of 1.8%. However, we note that other industries within the financial services have experienced a lower growth: TRUST (0.2%), LIFE (1.6%), NLIFE (1.4%), FINAUX (2%).

**Tab. 7: Effects of Cluster Strengths on Growth of Financial Services Industries**

		<i>Positive Effect &amp; Highly Significant</i>	<i>Negative Effect &amp; Highly Significant</i>
<b>MODEL I</b>	Cluster Strength Variable: Employment in OWN financial services industry in region	<b>BSBANK , CREDIT LIFE , NLIFE FINAUX , MARKET</b>	<b>TRUST, INSAUX</b>
	Cluster Strength Variable: Employment in OTHER financial services industries in region	<b>TRUST, INSAUX</b>	<b>BSBANK , CREDIT LIFE, MARKET</b>
<b>MODEL</b>	Fixed Effects Variable: Regional specialisation in financial services activities (or industry conc)	None	None
	Fixed Effects Variable: Regional GDP in financial services	<b>INSAUX</b>	<b>BSBANK LIFE NLIFE</b>
	Fixed Effects Variable: Regional population density	<b>BSBANK , INSAUX</b>	<b>MARKET</b>

The first two rows in Table 5 further confirm results of earlier studies that a firm located in a cluster that is strong in its own industry has tendency to grow faster than a firm that is not surrounded by its peers. Conversely, a rise in employment in other related industries has a negative effect on firms. This negative effect is explained in earlier literature as supply side issues in congestion and competition in the input market.

In this analysis, what stood out were the TRUST and INSAUX industries. This perhaps sheds light on the nature of these industries as ‘non-conformists’. In the U.K., trust and pension funds (TRUST) are set up for many diverse purposes: in investments, savings and protecting particular assets for companies, societies. There are over 3400 such firms in our pool of 7473 firms, mostly small and newly formed entities. Growth is exhibited by formation of new trust funds, instead of physical employment size in most cases. Supporting and auxiliary activities to insurance and pension funds (INSAUX) is another special industry that has a negative effect by having its competitors clustered together. Here, it is noticeable that there are less than 200 of such firms around in the U.K. and notably scattered countrywide. Both INSAUX and TRUST benefit from activities & growth of other financial services industries around them as seen from the reinforcing effect of regional GDP on INSAUX!

Banks and building societies (BSBANK) grow better with strong regional population. However, active financial services provision in the region does have a slight negative effect on notably BSBANK, LIFE and NLIFE, and of course this can be explained from the demand side as congestion and competition in the output markets.

What seems interesting, at first glance, is that the regional specialization of financial activities (or the lack of it) did not seem to have a significant effect on the growth of firms. This is a contradiction to earlier econometric works of Beaudry & Swann (2001). However, on closer inspection of this earlier work, industry concentration effect was only significant in one sector for financial services (SIC 65) and not particularly for SIC 66 & 67. Moreover, industry concentration was defined slightly differently due to the different groupings (in our case, eight industries were defined). The additional fixed effects introduced in Model II are found to be highly significant for four industries, namely BSBANK, NLIFE, FINAUX and MARKET.



### 5.3 Regression on Economic Performance

The results make use of 13,757 observations for ROCE and 17,081 observations for SOLV in all industries and regions, split into eight specific industries to report on their significant but individual findings

#### 5.3.1 Industry Specific Results

The result on economic performances are very interesting as it opposes earlier findings on growth in which firms are found to grow faster physically in a cluster that is strong in their own industry, whilst growth is attenuated if the cluster is strong in other related industries.

Highly significant results here indicate that clustering with other related financial services firms clearly enhances incumbents' economic performance, while co-locating with own industry result in competition which does not promote incumbents' economic performance. Economic performance is positively correlated to clustering along with related industries to derive synergies and competitive advantage such as linkages and inter-firm networking, necessary for financial intermediation and activities.

Clearly, BSBANK, CREDIT, TRUST, LIFE, FINAUX and MARKET industries benefits from being located with other financial services industries although the performance model is not sophisticated enough to point out the exact relationship with which specific industries.

Tab. 8: Effects of Cluster Strengths on Performance of Financial Services Industries

		<b>Regression for SOLVENCY, ROCE</b>	<i><b>Positive Effect &amp; Highly Significant</b></i>	<i><b>Negative Effect &amp; Highly Significant</b></i>
<b>MODEL I</b>		Cluster Strength Variable: Employment in OWN financial services industry in region		<b>BSBANK, TRUST, LIFE, MARKET</b>  <b>CREDIT, LIFE</b>
		Cluster Strength Variable: Employment in OTHER financial services industries in region	<b>BSBANK, TRUST, INSAUX, MARKET</b>  <b>CREDIT, LIFE</b>	<b>INSAUX</b>
<b>MODEL II</b>		Fixed Effects Variable: Regional specialisation in financial services activities (or industry conc)	<b>CREDIT, TRUST, FINAUX</b>  <b>LIFE</b>	<b>BSBANK, TRUST</b>
		Fixed Effects Variable: Regional GDP in financial services	<b>BSBANK, LIFE</b>	<b>TRUST, MARKET</b>  <b>LIFE</b>
		Fixed Effects Variable: Regional population density	<b>NLIFE, FINAUX</b>  <b>LIFE</b>	<b>INSAUX</b>  <b>TRUST</b>
		F Change significant for	<b>BSBANK, CREDIT, TRUST, LIFE, FINAUX, INSAUX</b>  <b>TRUST, LIFE, FINAUX</b>	

In this model, the effects of regional fixed effects variables also played a more significant role, especially in TRUST, LIFE and FINAUX although direct interpretation is difficult. The additional fixed effects introduced in Model II are found to be highly significant for most of the industries, except for NLIFE and MARKET industries.

## 6. Conclusion

This paper investigates the effects of cluster strengths, measured by the critical masses of similar and related industries in the regional proximity, to the physical growth and economic performance of firms inside and outside of a cluster. Overall, we found significant and positive clustering effects in the British financial services industries. A firm located in a cluster that is strong in its own industry has a tendency to grow physically faster than a firm that is not surrounded by its peers. Conversely, a rise in employment in other related industries has a negative effect on firms' growth.

In the industry-specific regression on lifetime growth, the results were very interesting as we observed that, although most financial services industries conform to the norm, TRUST and INSAUX stood out amongst the rest in the financial services industries. This is certainly true as growth is exhibited by formation of new trust funds, instead of physical growth in most cases, whereas there are less than 200 firms involved in activities auxiliary to insurance supporting the entire U.K. for clustering effects to be observed. The pooled result on lifetime growth is flawed as a result of more than 3400 TRUST firms (out of 7473 data) in the sample used.

The trend growth rates indicate that BSBANK (4%), CREDIT (3.6%), INSAUX (2.8%) and MARKET (3.2%) grow fastest in the British financial services industries. The average industries growth rate is about 1.8%. from our lifetime growth regression or 1.7% reported in Pandit et al (2001).

On the other hand, it is found that clustering with other related financial services firms clearly enhances incumbents' economic performance in a cluster, whereas co-locating with a strong own-industry results in greater competition which does not aid incumbents' economic performance. Superior economic performance is seen to be positively correlated to clustering along with other related financial services industries to derive synergies and competitive advantage such as linkages and inter-firm networking, necessary for financial intermediation and activities. Clearly, BSBANK, CREDIT, TRUST, LIFE, FINAUX and MARKET industries benefits from being located with other financial services industries although the performance model is not sophisticated enough to point out the exact relationship with which specific industries.

Regional fixed effects introduced from Beaudry and Swann (2001) play a highly significant role in improving a firm's economic performance for most of the industries, except for NLIFE and MARKET industries.

While the nature of this econometric work may not be superior in identifying the linkages and other interactions between the firms in a cluster, it has indeed help to gain insights on the nature and dynamics of financial services industries in clusters. Are firms more profitable whilst located in a successful cluster? This research outcome is most relevant to small-medium sized financial services firms (depending on the specific industry) in weighing the right cluster strength & fixed effects in their location decisions - in particular the question of whether the improved performance obtained from clustering in the Southeast of England, and London more specifically, offsets the high operating costs in those regions.

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