Kuah, Adrian

Working Paper

Clustering in the UK financial services: The quest for the enigmatic pecuniary externality

Manchester Business School Working Paper, No. 560

Provided in Cooperation with:
Manchester Business School, The University of Manchester

Suggested Citation: Kuah, Adrian (2008) : Clustering in the UK financial services: The quest for the enigmatic pecuniary externality, Manchester Business School Working Paper, No. 560, The University of Manchester, Manchester Business School, Manchester

This Version is available at:
https://hdl.handle.net/10419/50695

The University of Manchester
Manchester
Business School

Working Paper Series

Clustering in the UK Financial Services: The Quest for the Enigmatic Pecuniary Externality

Adrian TH Kuah

Manchester Business School Working Paper No 560

Manchester Business School
The University of Manchester
Booth Street West
Manchester M15 6PB

+44(0)161 306 1320
http://www.mbs.ac.uk/research/workingpapers/

ISSN 0954-7401

Author(s) and affiliation

Dr Adrian T.H. Kuah
Bradford University School of Management
Emm Lane
Bradford
West Yorkshire
BD 9 4JL
Tel: 44 (0) 1274 23 4336
Fax: 44 (0) 1274 23 5680
Email: adrian.kuah@manchester.ac.uk;
a.kuah@bradford.ac.uk

Abstract

This paper explores the sources of agglomeration externalities in enhancing firm performance, in particular, the pecuniary externality that supports firms' bottom line. The fundamental argument on increasing returns leads to the premise that cluster size has beneficial influence to firm performance. However, recent arguments suggest that diseconomies may set in and the agglomeration of related sectors in a cluster lead to congestion that is detrimental to firm performance. The enigmatic pecuniary externality is under-researched but often discussed. In this research, the role of related sectors in boosting the member firm's financial performance is revealed through a cross-section data of some 17,000 financial services companies in the UK.

Keywords

Financial Services, Externalities, Industry Cluster, UK Regions and Competitiveness

How to quote or cite this document

Kuah, Adrian T.H. (2008). Clustering in the UK Financial Services: The Quest for the Enigmatic Pecuniary Externality *Manchester Business School Working Paper, Number 560*, available: http://www.mbs.ac.uk/research/workingpapers/

Clustering in the UK Financial Services:
The quest for the enigmatic pecuniary externality

1. Introduction

Cluster size, measured by two established cluster strength attributes, are found to work in opposite directions in promoting the growth prospects and financial performance of member firms. My findings support the need for related sectors to agglomerate in a geographical cluster, despite the arguments of rising congestion costs in earlier models of cluster growth. This study addresses three identifiable gaps in the literature: (a) by providing a more precise measurement of cluster size; (b) by employing financial measurement of returns to capital employed and solvency; and (c) by demonstrating that agglomeration of related sectors creates pecuniary benefits, which can be reflected in the bottom line.

A number of recent studies on how agglomeration externalities affect firms' performance remained inconclusive as they mainly focus on Marshall's (1920) scale economies, with varied performance measures used (see Shaver and Flyer, 2000; Chung and Kalnins, 2001; Folta et al., 2006). Limiting the study to *en bloc* consideration of scale economies does not advance the development of agglomeration theory as it does not promote the understanding of other agglomeration externalities at play. I argue that true cluster size should include competing sector, as well as, the lateral and vertical sectors that play a big part in generating other external economies. However, Beaudry and Swann (2001) contend related sectors add to congestion and could attenuate firm growth.

Nonetheless, such studies highlight an important yet fundamental gap to the agglomeration theory - in understanding the relationship between agglomeration effects and the firm's financial performance.The issue on firm's increased revenue, profitability or performance as a main outcome to clustering is rather important, see Parr (2002) and Folta et al. (2006), but has remained under researched. Other studies (Pandit, Cook, and Swann, 2001; Beaudry and Swann, 2001; Pandit and Cook, 2003) show that UK financial services display agglomeration characteristics, but only consider that performance effects captured through firm growth (as measured by employment size).

Empirical evidence of the existence of pecuniary externality[1] remains quite enigmatic (Parr, 2002; Autant-Bernard and Massard, 2005). Cook et al.'s (2007: 1337) study finds that there are rampant interdependencies of financial services activities within the London financial centre, but did not investigate the potential pecuniary externality arising as a result. Folta et al. (2006) support the importance of financial performance to companies in a cluster, as key employees of new ventures in clusters are more likely to leave or companies with marginal performance are more likely to close down.

The veracity of beneficial agglomeration effects is an important question, not lest because many governments and development agencies are expending vast resources supporting the development of clusters, see McDonald, Huang, Tsagdis, and Tusleman (2007). More particularly, within financial services, clusters are an obvious description of key global financial districts (Reed, 1981, Sassen, 1991); and as Gieve (2007) notes, the Bank of England sees much of London's success in financial services as a result of clustering. The case of British financial agglomerations is ideal as development of financial clusters in various regions were characteristics of historical events, such as building societies in the Yorkshire region or banking in the City of London. Financial agglomerations exists in many regions of the UK, such as a strong asset management cluster in Edinburgh (Southern Scotland) and regional financial centres in Leeds (Yorkshire), Manchester (North West) and Bristol (South West). Moreover, with global financial services institutions bearing huge profits in London, it would be interesting to gauge financial performance of these geographical clusters, assuming that data would be commercially available.

The fundamental premise is that the size of agglomeration must have a beneficial influence to firm performance. To address these concerns, this paper examines over 17,000 UK financial services companies across eight sectors and thirteen regions in the UK. The discussion will proceed in section two with a review of agglomeration externalities and the range of empirical work so far. Section three

[1] Tibor de Scitovsky (1954) highlighted that technological externalities (knowledge spillovers that result from non-market interactions) and pecuniary externalities are two main agglomeration forces in the new economic geography. Pecuniary Externality is said to exist if the profits of a firm depend not only on its own activity but also on the activities of other firms in upstream and lateral sectors that has the effect of lowering the market price of inputs. Due to the indirect interactions of related sectors, Antonelli (2008) argued that member firms are also able to exploit pecuniary externalities to innovate on new products due to market knowledge of production factors available to them at prices below their marginal productivity.

details the model and method. The discussion presents the data and results in section four, which then followed by conclusions.

2.1 Review of Empirical Literature

Shaver and Flyer's (2000) study on a broad array of industries' investments in the US looks at localisation economies, but point out those agglomeration economies have the potential to enhance firm performance. They use firm survival (after 8 years) as a performance measure, while the cluster size is measured by plant counts of the industry. Chung and Kalnins (2001) also describe Marshall's localisation economies of the Texan lodging sector, to which they find that similar traits or similar firms result in localized benefits, such as heightened demand, that improves firm performance. Likewise, Folta et al. (2006) combines the number of firms in 12 related biotechnology sectors in their quest for the relationship between cluster size and firm performance, measured through rates of patenting, alliances partnering and private equity partnering in the biotechnology industries. These studies investigated the cluster size mainly through the lens of localisation economies, whilst hugely ignoring other agglomeration economies.

Beaudry and Swann (2001) examine an array of UK industries and find that firm growth is positively related to the total employment of the same sector in the cluster. At the same time, firm growth is attenuated by the total employment of related sectors (through SIC codes at the broad 1 digit level). They interpret the latter as indication of congestion and competition in the supply market. The result does not support the need for related firms to cluster. The exclusion of small and young firms from this study inhibited inferences on how small firms benefit from larger clusters, while the mix of industries made it difficult to identify how service industries benefit from cluster membership.

Parr (2002) distinguishes internally-based agglomeration economies and external agglomeration economies. While it may be possible for firms in an agglomeration to benefit from more than one internally-based dimensions (scale, scope or complexity), many cluster studies focus on external economies in scale and scope, or externalities. Firms are motivated to locate near one another because of external agglomeration economies, which Arthur (1990) defines, as the net benefits of being in a location together with other firms increasing with the number of firms in the location. Parr (2002: 724-725) points out that the net benefits of all the external

agglomeration economies should be measured, as a certain externality facing a company may have a gross positive effect while another may have a gross negative contribution.

Although there are suggestions on the use of financial measures in addressing firm performance in clusters, see Folta et al. (2006) and Shaver and Flyer (2000), few studies have examined this (with exception to Nachum, 2003). More importantly, the literature reveals that empirical studies so far have failed to quantify the determinants at play in terms of pecuniary externalities that can benefit firm economically when firms agglomerate, see Parr (2002) and Autant-Bernard and Massard (2005).

Empirical findings of agglomeration effects carry a mixed message in disproportionate benefits. Baptista and Swann (1998) caution against congestion in established clusters; and Shaver and Flyer (2000) show that for the US biotechnology sector, returns to clustering are not homogenously distributed across firms, benefiting only younger firms with weaknesses in technology, human capital, suppliers and distributors. Folta et al (2006) further point out that marginal benefits decrease with cluster size and McDonald et al. (2007) show that clusters may not promote growth or performance across a variety of UK industries.

While previous studies focus on how localisation affects firm performance, it is only the works of Swann et al. that look at industrial clusters with reference to its competing sector and related sectors. This model has been established in numerous industries like high tech, computer, biotechnology, media and financial services industries (e.g. Baptista and Swann, 1999; Beaudry, Cook, Pandit, and Swann, 1998, Cook et al, 2001; Pandit et al, 2001). However, they failed to relate to agglomeration externalities, with the simplistic suggestions that related sectors only add to congestion effects. Most importantly, the use of financial measures has been limited.

This paper generally follows Porter's (1990) terminology of industrial clusters, which are "critical masses of competing sector and related sectors in a geographical region that competes and collaborate, but where evidence of improved performance can be demonstrated". The next two sub-sections will define the externalities arising from groups of competing and related sectors in a cluster, while section 2.4 will introduce the choice of financial performance measures.

2.2 Larger Agglomeration due to More Competing Firms

The agglomeration of similar firms creates localisation economies. The sources according to Marshall (1920) are several: labour market pooling, creation of specialised suppliers, and the emergence of technological knowledge spillovers. Weber (1929), Hoover (1937), and Rosenthal and Strange (2005) suggest using the specific sector size (e.g., employment or output) as useful measure of localisation economies. Henderson (2001) suggests using the count of plants in a specific sector. Shaver and Flyer (2000) use plant counts and adopt US states as boundaries for such economies, but they recognise that employment, which is more difficult to obtain, is a better measure.

Parr (2000) terms this as an external economy of scale. External economy of scale is possible in an agglomeration as firms can benefit from the pool of resources (e.g. technology, human capital, suppliers and distributors) found in a cluster. This would be more likely if more competing firms co-locate, also drawing more opportunities to collaborate to the extent of sharing large contracts if one is unable to cope (Saxenian, 1994). Krugman (1991) also argue that the pooling of specialised labour and suppliers, due to the large number of similar firms, can increase a firm's returns. Labour market pooling benefits both workers and firms on the supply side since a large labour pool helps individual firms cope with the uncertainty related to individual firm business cycle. An instance would the agglomeration effects observed in London Financial Centre, where there are a large number of contract workers, who are very mobile (Kuah, 2008). As a strong localised sector can support a greater number of specialised suppliers of specific inputs and services, economies of scale and scope can be established by the suppliers and firms thereby lowering supplies costs and increasing its variety.

Many studies (Baptista and Swann, 1999; Beaudry and Swann, 2001; Cook *et al*., 2001; Pandit *et al*., 2001; Swann *et al*., 1998; Swann and Prevezer, 1996) demonstrates that the agglomeration (or cluster strength) of own sector is an exogenous factor positively influencing the size of incumbents. The aggregate of employment in one's own sector is a favourable measure of localisation economies, as knowledge spillovers and externalities that are more difficult to measure occur at the employee level and between skilled workers in an agglomeration. Employment size is particular important for financial services as its output is based upon specialised labour, knowledge and new knowledge acquisition. Therefore, it is hypothesized that

the agglomeration of similar firms in an industry cluster is an exogenous force with a significant and positive influence on incumbents' growth performance.

In contrast, Baum and Mezias (1992) find that many competitors with similar traits in the Manhattan hotel industry are greater threats to each other, to the point of affecting their survival. As the cluster grows, there will be greater competition for workers, for land, and for utility services, leading to shortages and increase costs (Folta et al., 2006: 223). Having many similar firms in an agglomeration creates congestion costs on the demand side, resulting in increased competition in the output markets, which can attenuate company performance. An increase in the number of competitors in one's own sector at a location may reduce per-firm sales, prices, per-firm profits and per-firm growth (Cook *et al*., 2001; Pandit *et al*., 2001). Competition is seen as an exogenous force affecting firm performance (Tallman *et al*., 2004). Therefore, it is hypothesized that the agglomeration of similar firms in an industry cluster is an exogenous force with a significant negative influence on incumbents' financial performance.

2.3 Larger Agglomeration due to More Related Firms

Although more firms in an agglomeration may lead to congestion, there are reported benefits of having competitive supporting and related sectors in a cluster (Porter, 1990). Urbanisation externalities, as pointed by Jacobs (1969, 1984), arise from the diversity of industries in a city or region and would be associated with the benefits that arise irrespective of the firm's activity. Thriving industries at a location draw a more diverse labour pool and brings about better infrastructure and all the benefits associated with the formation of cities. Parr (2000) terms this an external economy of scope brought about by diversity of industries in urban concentration, which propagates as firms may also benefit from being close to a supporting industry that supports completely different industries. Rosenthal and Strange (2005) suggest that urbanisation economies may be measured by the total employment in a city.

More closely related to the agglomeration of related sectors is the external economy of complexity (Parr, 2000) arising when several related vertical and lateral sectors benefit from the presence of each other. For example, the nature of insurance and reinsurance processes involves a chain of insurance firms and private equity holders in the London financial centre to spread the risk acquired of a profitable venture, and therefore may bring net pecuniary benefits to all involved. Banks and

financial leasing companies also often transfer (or sell) their acquired loans as financial assets. Furthermore, within proximity, cost savings would arise from communication flows to reduce input-output problems. Pecuniary externality is said to exist if the profits of a company depend not only on its own activity but also on the activities of other companies in vertical and lateral sectors found in a cluster. There are known interdependencies of financial services activities within the London cluster (Cook et al., 2007), with profuse lateral relationships in the banking sector and the insurance sector, while fund management and investment banking maintain vertical relations to the commercial banks.

A positive pecuniary externality would arise in agglomerations when the economic benefits outweigh the cost of clustering, such as the increased congestion and transportation costs. Parr (2002: 724-725) raises a valid point in that the net benefits of all the external agglomeration economies should be measured, as a certain externality facing a company may have a gross positive effect while another may have a gross negative contribution. Krugman's (1991b: 485) definition of pecuniary externalities somewhat focus on general external economies rather than those specific to an sector, where he associates those pecuniary externalities with either the demand or supply linkages. Another source of pecuniary externality lies in the transfer and cross-fertilisation of skilled labour between related financial sectors such as between banks and asset management companies. For example, one company's investment on staff training may eventually benefit another firm in the London financial centre, as the labour pool is reportedly 'very fluid' (Taylor et al, 2004).

As trade in the financial services is regarded as 'invisible', an input-output analysis may not reveal the benefit of such pecuniary externality. The composition of related financial services sectors in an urban area creates pecuniary externalities, more pronounced in a cluster containing critical masses of related financial sectors such as in a large financial centre. Such economies will be stronger in a cluster the more firms are inter-related through their business-to-business linkages (Chakravorty, 2003, Tallman et al., 2004) or in their sharing of the value chain (Porter, 1985; 1990).

However, the cluster strength in related sectors, measured by the level of employment is an exogenous force attenuating the firm's lifetime growth (Pandit et al., 2001). Similar studies argue that such brings in congestion costs and may attenuate firm growth. Frank (2003) contends that poaching has greater practical weight than the Marshallian labour pooling mechanism, while Kuah (2008) notes that there are a

large number of mobile contract workers in the London financial sector, and so may deter firm growth performance the greater the congestion. The availability of the labour pool in a cluster concerns with what a firm experiences whilst being in the cluster, and is thus an exogenous influence to the firm. It is hypothesized that the agglomeration of related firms in an industry cluster is an exogenous force with a significant and negative influence on incumbents' growth performance.

Chung and Kalnins (2001) then find that dissimilar firms gained most in performance due to heightened demand. Barnett and Carroll (1987) also note that proximity of neighbouring firms can be beneficial for a firm's survival when such neighbours are different and have inter-linked demands. This is likened to having related firms in a cluster that not only support and provide services to each other but also have intertwined demand. Employment is a good substitute for the pecuniary externality as skilled labour and knowledge transfer takes place amongst the workers.

Such pecuniary externalities may arise as the related labour pool (with transferable skills) move easily across firms in the cluster, hence new entrants and related firms will compete for the same source of labour. Frank (2003) cites that one of the reasons human capital specificity is important for companies' location decisions is because knowledge embodied in workers, and the poaching workers, in concentrated areas is a way for companies to raise their productivity. Seemingly, having dissimilar firms and diversity in a cluster may be beneficial to incumbents' performance. Therefore it is hypothesized that the agglomeration of related firms in an industry cluster is an exogenous force with a significant and positive influence on incumbents' financial performance.

2.4 Measures of Performance

There have been many measurements for defining a company's performance. Folta et al (2006: 225) argue that traditional measures of performance, such as financial revenues are not meaningful to industries with lengthy product development. However, they also point out to the importance of financial performance to incumbents in a cluster. Variables like return-on-capital-employed, return-on-equity, firm growth and firm size are common performance measurements (Bris, Koskinen and Pons, 2004; Chittenden, Hall and Hutchinson, 1996; Jordan, Lowe and Taylor, 1998; Ozcan, 2001 and Hall et al., 2004). Therefore, it can be argued that similar

performance variables could be applied for the econometric models involving companies of different origins.

Nachum's (2003) research on the London financial centre measures banks' performance solely on the merit of the return of capital employed (ROCE) as 'it is the most commonly used performance indicator in financial services'. ROCE is chosen as a firm performance indicator for the modelling work; it 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. It is a major and most common measure of profitability to determine whether: 1) the return earned is comparable to that earned by other similar financial institutions; 2) the assets of the financial institutions are utilised efficiently.

The capital adequacy (or solvency) is the standard used by most governments to identify troubled financial institutions (Ahn and Cha, 2004). The Central Bank of Ireland states that credit institutions' approach to the maintenance of sufficient funds must be set out using the solvency or capital adequacy ratio as a gauge (Central Bank of Ireland, 2000). The solvency ratio (SOLV) is defined as shareholder equity (capital) as a proportion of total assets (credit exposure). It reflects the gearing and capital adequacy of the financial institution. Folta et al. (2006) argue that 'acquiring capital on a timely basis' is a key indication of a company's value in a cluster. The ability and rate which firms can obtain private equity to maintain its financial stability is therefore important. This performance measurement relates to an important aspect, as Folta et al (2006) consider, which is the impact of cluster size on a company's ability to survive and attract capital. SOLV is a specific kind of gearing ratio: it indicates how much of 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-capitalised. The higher the ratio, the less risk for general creditors

The overall financial performance of a company should be understood by the inherent risks and potential returns to the stakeholders. A lowered risk increases an institution's ability to attract and retain deposits and other funds, ultimately affecting its business profitability. Profits (or returns) are the lifeblood of all commercial enterprises, including financial institutions. It is the profitability potential of a company that attracts and retains capital. The two chosen ratios reflect both risks and returns. These performance measures allow potential stakeholders to understand the

level of success or profitability to expect, with a reasonable amount of risk, from their investments. Bris et al. (2004) finds that 'firms in a tradeable sector show higher leverage and lower profitability and growth proceding an economic crisis' and therefore it can be implied that if firms perform well and are profitable, they would maintain a lower but sustainable level of leverage. The choice of these two ratios is far superior, say by choosing two profitability ratios, in demonstrating the rigour of the research hypothesis. While a high ROCE represents better profitability and performance of a company, a high SOLV only indicates more shareholder funds and lesser risks to creditors in the firms. The latter does not necessarily equate to better economic performance, but perhaps could lead to one with a balanced view of risk and returns.

3. Data and Method

3.1 Data

Data on 17,535 UK private and public companies founded between 1900 and 2001 that classifies financial services as their primary activity under the Standard Industry Classification (SIC 1992) has been used. FAME was the main source of data for identifying the company's attributes, such as its financial performance, location, foundation date and size. FAME captures all UK-registered companies including those yet to file their first set of accounts. More importantly, this commercial database contains rich sources of financial and employment data needed for our models.

Several researchers have defined clusters according to state boundaries (Shaver and Flyer, 2000), whilst others have looked at Metropolitian areas (e.g. Oakey, 1985) or counties (Pandit et al., 2001; Cook et al., 2001) to explicitly link firms to the economic activities of their regions. Similar to other UK studies (Baptista and Swann, 1999; Beaudry and Swann, 2001; Cook et al., 2001; Pandit et al., 2001; Swann et al., 1998; Swann and Prevezer, 1996), the data was classified according to each widely-defined UK geographical regions such as South East or Wales using their registered business postcodes. Each region contains several metropolitan areas or cities but is under the charge of a regional government. Thirteen UK regions conform to the boundaries set by the Office of National Statistics (the "ONS"). Other sources of UK information for computing other independent and dependent variables are from Regional Trends 2001 (ONS, 2001) and Business Clusters in the UK (DTI, 2001).

However, the database has a problem with missing or incomplete data with respect to employment. Although financial statements dated 2001 were available, a number of observations was last dated 2000 or 1999 at time of research. Only 7,473 companies (42.3%) provide employment figures for the years between 1998 to 2001. In order to optimise the amount of employment data, the average firm size (of the last five years upon availability) is calculated. The aggregated employment figures in financial services per region were compared against the ONS (2001) and the magnitudes were found to be similar.

By using a cross-sectional frame of companies in financial services, we are also better able to understand this important sector through a larger number of observations of both large and smaller financial services firms. The use of average employment of firms would counter for the effects of business cycles on firm size, while the cross section analysis would cater for macroeconomic fluctuations which affect all business segments to the same degree.

3.2 Dependent variables

We model three measures of performance: firm size, return on capital employed (ROCE) and solvency (SOLV). Firm size is used as a first measure of performance, very similar to previous studies (Baptista and Swann, 1999; Beaudry and Swann, 2001; Cook et al., 2001; Pandit et al., 2001; Swann et al., 1998; Swann and Prevezer, 1996), to test the agglomeration effects on firm size. The return on capital employed ratio is chosen as another firm performance indicator similar to Nachum (2003), while the solvency ratio is the standard used by most governments to identify troubled financial institutions (Ahn and Cha, 2004). The FAME database provides good sources of data to estimate the latter two aspects of performance. The measures allow potential stakeholders to understand the level of success or profitability to expect, with a reasonable amount of risk to expect from their investments. The database contains 7473 (42.3%) observations on firm size, 13,759 (78.5%) observations on firms' return on capital employed and 17,081 (97.4%) observations on firms' solvency ratio.

3.3 Model specification

Within the literature, equation 1 is an established means of measuring agglomeration effects, see Baptista and Swann, 1999; Beaudry and Swann, 2001;

Cook et al., 2001; Pandit et al., 2001; Swann et al., 1998; Swann and Prevezer, 1996. The quest for a simplified and macro model to investigate regional financial agglomerations suggests that a cross-sectional analysis involving a large 'population' of available records covering the UK will be better than exploring a single cluster, say by using input-output analysis, or a longitudinal modelling concentrating on a fewer firms or selected agglomerations. The model is appropriate because the net benefits of all the external agglomeration economies can be measured, as a certain externality facing a company may have a gross positive effect while another may have a gross negative contribution. The cluster model with its variables explained in Table 1 can be represented as:

$$\mathbf{Perf}_{n\in\{I:c\}} = \alpha_P + \beta_P(\mathbf{Age}_n) + \gamma_{1P} \ln S_{Ic} + \gamma_{2P} \ln S_{Jc} + + \sum_v \delta_{vP} \ln V_v + \upsilon_P$$

Variable	*Description*
$\mathbf{Perf}_{n\in\{I:c\}}$	Performance of firm n from sector I at location or cluster c measured by either the natural logarithmic of firm size, ROCE ratio or SOLV ratio
$\mathbf{Age}_n$	Age of firm measured from date of incorporation to time of observation
α_P	Regression constant for performance regression
β_P	Coefficient indicating the performance change with age where $\beta_P = 1 + \sum_{c=1}^{C-1} d_c D_c + \sum_{i=1}^{I-1} d_i D_i$ • D_c represent cluster control variables (1 or 0), one for each of the UK regions (C= 13) • D_i represent sector control variables (1 or 0), one for each sub sector (I = 8) • d_c and d_i is their contribution to performance
γ_{1P}	Coefficient indicating the effect of one's own sector on the firm's performance
γ_{2P}	Coefficient indicating the effect of related sectors on the firm's performance
S_{Ic}	Total employment of the particular sector I at particular cluster c
S_{Jc}	Total employment of related sectors at particular cluster c
V_v	Represents other control variables namely: a) Population density: indicating the size of the region in supporting the economic activity, measured by size of population in cluster b) Regional GDP per capita: indicating the general economic activities in the region c) Employment diversity: indicating the regional concentration of particular sector within the financial services industry, measured by Herfindahl index
υ_P	Residual or disturbance term on performance regression

Table 1: Definition of Variables for the Performance Model

3.4 Independent variables

Parr (2002:721) raises the question on the level of disaggregation by considering whether one should classify a particular industry as a sum of its sub-sectors or as specific sectors. Unlike other works (Shaver and Flyer, 2000; Folta et al.,

2006) that classify the cluster size only on *en-bloc* activities to capture the extent of localisation economy, two main independent variables are used to represent the agglomeration effects from firms of the sector (S_{Ic}) and firms in related sectors (S_{Jc}).

S_{Ic}, the cluster strength in one's own sector proxies localisation externalities, while S_{Jc}, the cluster strength in other related sectors, reflects the possible pecuniary externalities - due to highly related nature of financial services activities. These measures of cluster size (using S_{Ic} and S_{Jc}) include only those firms that were active at the given time.

3.5 Control variables

Parr (2002: 729) points out that agglomeration of economic activity at a given location may simply be due to coincidence or spatial organisation during some previous industrial earlier era, rather the presence of agglomeration economies. The development of financial clusters at various regions was characteristics of historical events, say building societies in the Yorkshire region or banking in the City of London. Hence the method is independent of modern urban planning, generating enough reasons to investigate whether a greater financial agglomeration at a certain region produces better pecuniary externalities for incumbents. We do not need to adjust for policy effects as there is only one central bank (the Bank of England) and the economy is generally unified with a single regulator (the Financial Services Authority) in the Kingdom. Moreover, the cross-sectional analyses could adjust for economic and policy effects on the financial sector.

In the attempt to look at how agglomeration externalities (through cluster size) affect the firm performance, we have controlled for the sectorial and regional fixed effects through dummy variables. The UK is also divided into the 13 regions (See Table 2) in measuring the effects of stronger and weaker agglomerations. The official definition of various regions (ONS, 2001) is used to demarcate the regions, similar to other studies (e.g. Pandit et al., 2001). The geographical classification for each observation (firm) is verified by the postcode of its registered address, and coded as "1" in one of the 13 geographical regions, and '0' in other regional dummies.

Industry fixed effect do matter in terms performance (McGahan and Porter, 1997). The industry is divided into eight sectors, as seen in Table 3, to control for differences

in activity type used in the estimation model as suggested by Rosenthal and Strange (2005).

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
NIRE	Coleraine, Derry, Ballymena, Strabane, Omagh, Ulster, Belfast, Newry, Craigavon, Dungannon, Eniskillen	***WMID***	Stoke-on-Trent, Telford, Wrekin, Shropshire, Staffordshire, Warwickshire, West Midlands, Worcestershire.
NWEST	Blackburn, Darwen, Blackpool, Warrington, Cheshire, Greater Manchester, Cumbria, Lancashire & Merseyside	***EAST***	Luton, Peterborough, Southend-on-Sea, Thurrock, Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk & Suffolk
NEAST	Cleveland, Darlington, Hartlepool, Redcar, Middlesbrough, Stockton-on-Tees, Tees Valley, Durham, Northumberland & Tyne/Wear	***SWEST***	Bath, Bristol, Bournemouth, Poole, Swindon, Torbay, Cornwall & Isles of Scilly, Devon, Dorset, Gloucestershire, Somerset & Wiltshire
YORKH	Humberside, N,S & W Yorkshire, Kingston, N & NE Lincolnshire, Leeds, Bradford, Sheffield, Hull, Halifax	***SEAST***	Southampton, Windsor, Milton Keynes Portsmouth, Reading, Isle of Wight, Wokingham, Buckinghamshire, Berkshire, E/W Sussex, Hampshire, Kent, Oxfordshire, Surrey
		LON	Inner and Outer London

Table 2: Definition of Regions in the UK

The firms in the sample was classified according to their primary activity on the basis of (a) classifications found in the literature on UK financial services (Buckle and Thompson, 1998); and (b) company SIC codes at the four-digit level shown in Table 2. The level of disaggregation into sectors (as suggested by Buckle and Thomson, 1998) is important as the clearer breakdown may enable the identification of the relevant agglomeration externality (Parr, 2002:721). However, it is also important not to over-disaggregate unless the study is specific to one sector. This study follows works of Pandit et al (2001) in adopting eight sectors for the industry. Each observation (firm) is coded "1" or "0" based on their primary sector as reported in FAME.

McKillop and Hutchinson (1990) note that the level of economic activity in a given region is the main factor influencing the size of its financial sector. In congruence, the level of financial GDP reflects the specific regional economic activity in this industry and is used as a control variable. The specific industry structure at the region plays an important role in the performance of firms (Porter, 1990; McGahan and Porter, 1997), and the industry concentration of financial services is used to control that aspect. Beaudry and Swann (2001) find that the regional population density has a significant influence on firm growth. Hence, control variables would include the regional population density, the regional GDP and the concentration index of financial industry in the thirteen regions in Model 1.

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 - Activities 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

Table 3: Definition of Sectors in Financial Services

The firm age is used as a control variable on the basis that as the firm becomes older, it is more able to attract and accumulate funds. Also as a firm gets older, it should theoretically be larger in size. Age is correlated with firm performance because of the selection on efficiency (Jovanovic, 1982). This is used in all the models.

Other than size, industry structure and economic activities variables, the study does not include firm status dummy variables like whether it is a subsidiary or headquarter operations. There are reasons for this: (a) populating a substantial database on firm attributes through company reports was infeasible; (b) a simple dummy variable to account for potential bias would not seem to add value to the fundamental premise that the cluster size has influence on firm performance.

3.6 Data Analyses

Two stages of analysis were carried out on the 17,535 financial services companies in the UK for the analysis on firm performance: Growth, ROCE and SOLV. The first stage analysis involved pooling all available observations in each of the three models. Cook's statistics were initially used to indicate any influential observation that might generally affect each model. To test the robustness of the models, 1%, 5% and 10% observations were randomly removed to examine the significance of the estimators. This was also carried out in the second stage analyses.

The second stage analyses involved dividing the sample according to the eight sectorial levels as specified in Table 3. This addresses the issue raised by Rosenthal and Strange (2005) that one ought to estimate agglomeration economies separately for different sectors. The sector-specific model will reveal the agglomeration effects and their significance to clustered-industry performance in the UK.

3.7 Limitations

Longitudinal data on employment is difficult to obtain and adopting a time-series study would limit the sample under investigation. Significant events such as shocks and mergers in the history of financial institutions were not really captured through this simple model, and only data on surviving firms were analysed. We could have, but did not, include the supporting industries in this study as it would be impossible to include relevant supporting industries in an extensive study on all the financial services sectors. The existing model assumes random assignments of firms to location, as the fundamental premise is that the size of agglomeration has ultimately some beneficial influence to firm performance, rather than why some firms choose to locate in certain agglomeration.

Beaudry and Swann (2001) also highlighted two potential issues of endogeneity. The first is the overestimate of own sector employment by including the employment of the firm in the aggregate S_{Ic}. They demonstrated that by doing so, the model introduces a small bias to the order of 1/n (in this case, n is large). The second issue of endogeneity arises if the dependent variable is included in the independent variable S_{Ic} which means that the disturbance term, υ, cannot be independent of the own sector employment aggregate S_{Ic}. This is a potential simultaneity bias from applying OLS to the model. However, they demonstrated that such biases are again negligible.

It is not definitive that unequal variance or heteroscedasticity exists over the range of the dependent(s) using residual plots, although it can be suspected for one of the three performance model (ROCE). There is also no indication of non-linearity between the outcome and the predictor for the three models. We used White's (1980) corrections and attempted a non-linear transform (square function of the predicted value) but omitted the procedures as results did not significantly improve and limited the sample under investigation. Beaudry and Swann (2001) also attempted to model

the problem of unequal variance in firm size by assuming that the variance is proportional to the square of age but claimed they have only 'touch the tip of the iceberg'. The initial analysis using a correlation matrix showed that collinearity between variables is not an issue, except for non-parametric data of population density and financial GDP that has a value higher than 0.8. The Pearson correlation did not indicate any issues between parametric variables. The models were tested using the RESET test, where multicollinearity was not perceived to be a problem with VIF values less than 2.5

4. Results and Discussion

4.1 Firm Size

The sector-specific result of the model is shown in Table 4. The coefficients are mostly significant at the 1% level. Cook's statistics confirm that only 11 observations (out of 7,473 observations) have a statistic equal or value greater than 0.004, with only one influential case at 0.03. The regression constants indicate that BSBANK and MARKET companies start at a much larger size compared to other sectors. The coefficients on Age indicate that BSBANK (2.7%), CREDIT (3.6%), LIFE (2.2%), and MARKET (3.0%) grew much faster than other financial services sectors in the UK, such as TRUST (0.6%), NLIFE (1.5%), INSAUX (1.8%) and FINAUX (2.0%). The coefficient on Ln (S_{Ic}), being positive and significant, points to the effects of localisation economies in promoting the lifetime growth of firms in the sample. Consistent with earlier published studies, the agglomeration of related sectors attenuates the growth of firms.

INSERT TABLE 4 ABOUT HERE

Table 5 reveals the outcome on the test of robustness where random observations are omitted at the 1%, 5%, 10% levels, with significant results being depicted. It becomes clear that a firm which locates in a cluster that is strong in its own sector has a tendency to grow faster than a firm that is not surrounded by its peers. Conversely, a rise in employment in related financial services sectors has a negative effect on firm size.

Firm Size			*Positive Effect & Highly Significant*	*Negative Effect & Highly Significant*
MODEL I	MODEL II	Cluster Strength Variable: Employment in OWN financial services sector in region	**BSBANK , CREDIT LIFE , NLIFE FINAUX , MARKET**	**TRUST, INSAUX**
		Cluster Strength Variable: Employment in OTHER financial services sectors in region	**TRUST, INSAUX**	**BSBANK , CREDIT LIFE, MARKET**
		Control Variable: Regional specialisation in financial services activities (or industry conc)	**None**	**None**
		Control Variable: Regional GDP in financial services	**INSAUX**	**BSBANK LIFE NLIFE**
		Control Variable: Regional population density	**BSBANK , INSAUX**	**MARKET**
F Change significant for			**BSBANK, NLIFE, FINAUX and MARKET**	

Table 5 Effects of Cluster Strengths on Lifetime Growth

In this analysis, what stands out are the TRUST and INSAUX companies, which perhaps shed light on the nature of these sectors as 'non-conformists'. In the UK, trust and pension fund firms (TRUST) are set up for many diverse purposes: for investments, savings and protecting particular assets for companies and societies. There are over 3,400 such firms in the sample of 7,473 firms - mostly small and newly formed entities. Growth in such institutions is exhibited by formation of new trust funds when they are substantially successful, instead of growing the firm size in most cases. Supporting and auxiliary activities to insurance and pension funds (INSAUX) is another sector that displays a negative effect when competing firms are clustered together. Here, it is apparent that there are fewer than 180 such firms in the entire UK and they are notably scattered countrywide. Both INSAUX and TRUST benefit from the activities of other financial services sectors around them. The large number of TRUST firms would affect the model if all the sectors were estimated together.

4.2 Returns on Capital Employed

The sector-specific results of the model are shown in Table 6. Cook's statistics confirm that 31 cases (out of 13,757 observations) have a statistic equal or value greater than 0.004, with only one influential case at 0.01 However, the lesser number of significant results in this model initially indicate that the agglomeration effects play

a lesser role. The very low R2 in each case indicates that agglomeration effects in the model account for a very small amount of variability in the ROCE. However, some sectors do display significant results. Although the second model is generally less significant, the results on the ROCE regression are very interesting as they oppose findings from the first model, where firms are found to perform better financially whilst agglomerating with related sectors and agglomerating with one's own sector may attenuate its financial performance.

INSERT TABLE 6 ABOUT HERE

From the test of robustnesss (See Table 7), it becomes clearer that CREDIT and LIFE sectors perform less well in terms of their returns on capital employed when clustered around competing firms, and they benefit from better returns if the regional cluster is strong in related sectors. The coefficient of Age, being negative and significant for TRUST, LIFE and NLIFE, implies that the age of a firm affects the returns on capital employed in a weak, negative but significant way. This could point to older firms being less profitable. The other control variables also play a lesser and insignificant role in this performance model.

Returns on Capital Employed			***Positive Effect & HighlySignificant***	***Negative Effect & Highly Significant***
MODEL I	MODEL II	Cluster Strength Variable: Employment in OWN financial services sector in region		**CREDIT, LIFE**
		Cluster Strength Variable: Employment in OTHER financial services sectors in region	**CREDIT, LIFE**	
		Control Variable: Regional specialisation in financial services activities (or industry conc)	**LIFE**	**BSBANK, TRUST**
		Control Variable: Regional GDP in financial services		**LIFE**
		Control Variable: Regional population density	**LIFE**	
F Change significant for			**TRUST, LIFE**	

Table 7 Effects of Cluster Strengths on ROCE Performance

4.3 Solvency

The sector-specific result of the model is shown in Table 8. Notably, the third model is more significant in almost all the sectors. The R^2, in each case, is higher than

the second model with more predictors having non-zero values. Cook's statistics reveal that only one case (out of 17,078 observations) has a statistic of 0.004, showing that there is no influential case that would affect the coefficients of the regression.

INSERT TABLE 8 ABOUT HERE

The effects from external economies are not clear at the first stage of analysis but there is an indication that specific sectors such as BSBANK, TRUST, LIFE, MARKET companies benefit from clustering with other related firms to enhance incumbent's solvency, meaning the percentage of shareholder equity to total assets is increased. On the other hand, the negative and significant coefficient for Ln (S_{Ic}) in BSBANK, TRUST, LIFE, MARKET suggests that co-locating with firms of own sector results in inhibition of one's solvency. From the test of robustness (See Table 9), it becomes clear that BSBANK, TRUST and MARKET sectors benefit most from being located with related financial services firms.

Solvency			***Positive Effect & Highly Significant***	***Negative Effect & Highly Significant***
MODEL I	MODEL II	Cluster Strength Variable: Employment in OWN Financial services sector in region		**BSBANK, TRUST, LIFE, MARKET**
		Cluster Strength Variable: Employment in OTHER Financial services sectors in region	**BSBANK, TRUST, MARKET**	**INSAUX**
		Control Variable: Regional specialisation in financial services activities (or industry conc)	**CREDIT, TRUST, FINAUX**	**LIFE**
		Control Variable: Regional GDP in financial services	**BSBANK, LIFE**	**TRUST, MARKET**
		Control Variable: Regional population density	**NLIFE, FINAUX**	**INSAUX**
F Change significant for			**BSBANK, CREDIT, TRUST, LIFE, FINAUX, INSAUX**	

Table 9 Effects of Cluster Strengths on SOLV Performance

The coefficients of Age are mostly positive and significant, implying that Age has a net positive effect on solvency performance. This seems reasonable, as when

more profits are retained and more shareholder funds are invested over the years, the institutional assets may not need to grow at the same rate. Also the control variables play a more significant role with the F-Change generally significant. The form of pecuniary externality arising from related sectors clearly would be beneficial for one's financial performance. When these sectors are located close to competing (similar) firms, localisation economies have a negative impact on their solvency.

5. Conclusion

Earlier studies have hugely ignored the interdependency of related sectors in an industry cluster, and treated the clustering as en-bloc to consider only Marshall's scale economies. A large cluster, consisting of its competing sector and its closely related sectors, provides different sources and types of agglomeration externalities. This paper reinforces the premise that cluster size has beneficial influence on performance, and finds that the clustering of closely related sectors improves the firm's bottom line.

By using the established cluster model, I confirm that the agglomeration of competing firms promoted the growth prospects of incumbents and the agglomeration of related sectors attenuated firm growth in six of the eight sectors. In extending the model to consider financial performance, I find that when firms are in a strong competing cluster, a negative effect on their potential financial returns may be experienced. CREDIT and LIFE companies demonstrate that if they are located in a strong cluster in their own sector, they perform less well in terms of returns on the capital employed. BSBANK, TRUST and MARKET companies have a lowered solvency as a result of locating in a strong cluster in their own sector. The results suggest greater competition amongst similar firms in a concentrated cluster results in profit distribution and equity distribution (on the demand side from shareholders and customers).

Conversely, clustering with related sectors could enhance incumbents' returns on capital employed and solvency. CREDIT and LIFE companies would benefit from better returns on capital employed if they were located in a cluster that was strong in related sectors, indicating these sectors demonstrate strong inter-dependencies on related sectors for financial intermediation to take place. Also, clustering with related sectors could enhance a company's solvency, especially in BSBANK, TRUST and MARKET companies. It suggests that these sectors benefit from a lowered asset held

(possibly from sharing physical resources with vertically related firms in the supply chain) and from increased funds derived on the demand side from customers. Generally, clustering with related sectors should allow companies to derive synergies and inter-firm networking for ease of transactions and creating greater pecuniary benefits.

My findings support the need for related sectors to agglomerate in a geographical cluster, despite the arguments of rising congestion costs in earlier models of cluster growth. This paper reveals better insights on the influence of cluster size to firm performance by relating more closely to the sources of agglomeration benefits, providing a more precise measurement of cluster size, and using financial performance measures. The novel contribution to knowledge is that the two main cluster strength attributes are found to work in opposite ways in promoting different aspects of a firm's performance. The model fit of a large sample cross-section model may be lower compared to a longitudinal model focusing on fewer geographical clusters, but this exploratory work has revealed the important influences of the two clustering attributes to firm performance. It is clear that most financial services activities in BSBANK, CREDIT, TRUST, LIFE and MARKET sectors benefited most from being located with related financial services sectors. With this knowledge, policy makers must now concertedly plan for regional development through achieving critical mass in selective types of related sectors in creating pecuniary externalities, as well as ensuring there is critical mass in specific sector to promote the growth prospects of firms.

References

1. Ahn, C.Y., and Cha, B. 2004. Financial sector restructuring in South Korea: Accomplishments and unfinished agenda. *Asian Economic Paper 3:1*. MIT Press.

2. Antonelli, C. 2008. Localized appropriability: Pecuniary externalities in knowledge exploitation. *Manchester Business School Working Paper* 542.

3. Arthur, W.B. 1990. Silicon Valley locational clusters: Do increasing returns imply monopoly? *Mathematical Social Science* 19: 235-251.

4. Autant-Bernard, C. and Massard, N. 2005. Pecuniary and knowledge externalities as agglomeration forces: Empirical evidence from individual French data. *Proceeding of Knowledge and Regional Economic Development Conference*. Barcelona. June 9-11.

5. Baptista, R., and Swann, G. M. P. 1999. A comparison of clustering dynamics in the US and UK computer industries. *Journal of Evolutionary Economics* 9(3): 373-399.

6. Baptista, R., and Swann, G.M.P. 1998. Do firms in clusters innovate more? *Research Policy* 27(5): 525-540.

7. Barnett, W. and Carroll, G. 1987. Competition and mutualism among early telephone companies. *Administrative Science Quarterly* 32(3): 400-422.

8. Baum J. and Mezias S. 1992. Localized competition and organizational failure in the Manhattan hotel industry 1898-1900. *Administrative Science Quarterly* 37: 580-604.

9. Beaudry, C., and Swann, G. M. P. 2001. Growth in industrial clusters: A bird's eye view of the United Kingdom. *SIEPR Discussion Paper* No. 00-38.

10. Beaudry, C., Cook, G. A. S., Pandit, N. R., and Swann, G. M. P. 1998. Industrial districts and localised technological knowledge: The dynamics of clustered SME networking, *Research Report 3.3 (Clusters, growth and the age of firms; A study of three industries: Aerospace, Broadcasting and Financial Services)* for the European Community DG XII.

11. Bris, A., Koskinen, Y., and Pons, V. 2004. Corporate financial policies and performance around currency crises. *Journal of Business* 77(4): 749-795.

12. Buckle, M., and Thompson, J. 1998. *The UK Financial Systems: Theory and Practice*. Manchester, UK: Manchester University Press.

13. Central Bank of Ireland. 2000. *Implementation of EC Ownfunds and Solvency Ratio Directives for Credit Institutions Incorporated in Ireland*. Ireland. Available at: <http://www.centralbank.ie/documents/bsd/sol3006.pdf> [Accessed on June 2003]

14. Chittenden, F., Hall, G., and Hutchinson, P. 1996. Small firms growth, access to capital markets and capital structure: Review of issues and an empirical investigation. *Small Business Economics* 8: 59-67.

15. Chung, W., and Kalnins, A. 2001. Agglomeration effects and performance: A test of the Texas lodging industry. *Strategic Management Journal* 22: 969-988.

16. Cook, G. A. S., Pandit, N. R. and Swann, G. M. P. 2001. The dynamics of industrial clustering in British broadcasting. *Information Economics and Policy* 13: 351 – 375.

17. Cook, G.A.S, Pandit, N.R., Beaverstock, J.V., Taylor, P.J., and Pain, K. 2007. The role of location in knowledge creation and diffusion: evidence of centripetal and centrifugal forces in the City of London financial services agglomeration. *Environment and Planning A* 39(6): 1325 – 1345.

18. Department of Trade and Industry. 2001. *Business Cluster in the UK: A First Assessment*. London. Available at: < http://www.dti.gov.uk/clusters/> [Accessed Apr 2002]

19. Folta, T.B., Cooper, A.C., and Baik, Y. 2006. Geographical cluster size and firm performance. *Journal of Business Venturing* 21: 217-242.

20. Frank, B. 2003. Location decisions in a changing labour market environment, *DIW Berlin Discussion Paper 380*. Berlin: DIW.

21. Gieve, J. 2007. London, money and the UK economy. *Bank of England Quarterly Bulletin* 47 (3): 428–36.

22. Hall, G.E., Hutchinson, P.J., and Michaelas, N. 2004. Determinants of the capital structures of European SMEs. *Journal of Business Finance and Accounting* 31(5/ 6): 711- 728.

23. Henderson, J.V. 2003. Marshall's scale economies. *Journal of Urban Economics* 53: 1-28.

24. Hoover, E. M. 1937. *Location Theory and the Shoe and Leather Industries*. Cambridge, MA: Harvard University Press.

25. Jacobs, J. 1969. *The Economy of Cities*. London: Penguin Books.

26. Jacobs, J. 1984. *Cities and the Wealth of Nations: Principle of Economic Life*. New York: Vintage.

27. Jordan, J., Lowe, J, and Taylor, P. 1998. Strategy and financial policy in the UK small firms. *Journal of Business Finance and Accounting* 25: 1-27.

28. Jovanovic, B. 1982. Selection and the evolution of industry. *Econometrica* 50(3): 649-670.

29. Krugman, P. 1991a. *Geography and Trade*. Cambridge, MA: MIT Press.

30. Krugman, P. 1991b. Increasing returns and economic geography. *Journal of Political Economy* 99: 483-499.

31. Kuah, A.T.H. 2008. Is There A Diamond in the City? Leveraging the Competitive Advantage of the London Financial Centre. *Singapore Management Review* 30(2).

32. Levine, R. 1997. Financial development and economic growth: Views and agenda. *Journal of Economic Literature* 35(2): 688-726.

33. Levine, R. 2003. More on finance and growth: more finance, more growth? *Review, Federal Reserve Bank of St. Louis* Jul: 31-46.

34. Marshall, A. 1920. *Principles of Economics*, 8th Ed. London: Macmillan.

35. McDonald F., Huang Q., Tsagdis D. and Tüselmann H.J. 2007. Is there evidence to support Porter-type cluster policies? *Regional Studies* 41: 39-49

36. McGahan, A.M. and Porter, M.E. 1997. How much does industry matter really? *Strategic Management Journal* 18(S1): 15-30.

37. McKillop, D.G., and Hutchinson, R.W. 1990. *Regional financial sectors in the British Isles*. Avebury: Aldershot and Brookfield.

38. Nachum, L. 2003. Liability of foreignness in global competition? Financial service affiliates in the City of London. *Strategic Management Journal* 24: 1187-1208.

39. Oakey, R. 1985. High technology industries and agglomeration economies. In P. Hall and A. Markusen, eds., *Silicon Landscapes*. Boston, MA: Allen & Unwin.

40. Office of National Statistics. 2001. *Regional Trends* 36. London: HM Stationery Office.

41. Ozcan, A. 2001. Determinants of capital structure and adjustments to long run targets: Evidence from UK company panel data. *Journal of Business Finance and Accounting* 28: 175-198.

42. Pandit, N. R., Cook, G. A. S., and Swann, G. M. P. 2001. The dynamics of industrial clustering in UK financial services. *The Service Industry Journal* 21(4): 33-61.

43. Parr, J.B. 2002. Agglomeration economies: ambiguities and confusions. *Environment and Planning A* 34: 717-731.

44. Porter, M. E. 1990. *Competitive Advantage of Nations*. New York: Free Press.

45. Reed, H.C. 1981. *The Pre-eminence of International Financial Centres*. New York: Praeger.

46. Rocha, H.O. and Sternberg, R. 2005. Entrepreneurship: The role of clusters. Theoretical perspectives and empirical evidence from Germany. *Small Business Economics* 24: 267-292.

47. Rosenthal, S. S., and Strange, W.C. 2005. The micro-empirics of agglomeration economies. In *Companion to Urban Economics*. London: Blackwell.

48. Sassen, S. 1991. *The Global City: New York, London and Tokyo*. New Jersey: Princeton University Press.

49. Saxenian, A. 1994. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Boston, MA: Harvard University Press.

50. Scitovsky T. 1954. Two concepts of external economies. *Journal of Political Economy* 62: 143-151.

51. Shaver, J. M. and Flyer, F. 2000. Agglomeration economies, firm heterogeneity, and foreign direct investment in the United States. *Strategic Management Journal* 21: 1175-1193.

52. Swann G. M. P., Prevezer, M., and Stout, D., eds. 1998. *The Dynamics of Industrial Clustering: International Comparisons in Computing and Biotechnology*. Oxford: Oxford University Press.

53. Swann, G. M. P. and Prevezer, M. 1996. A Comparison of the Dynamics of Industrial Clustering in Computing and Biotechnology. *Research Policy* 25: 1139-1157.

54. Tallman, S., Jenkins, M., Henry, N., and Pinch, S. 2004. Knowledge, clusters and competitive advantage. *Academy of Management Review* 29(2): 258-271.

55. Weber, A. 1929. Theory of the Location of Industries, C. J. Friedrich (Trans.). Chicago: University of Chicago Press.

Firm Size by Industry	BSBANK		CREDIT		TRUST		LIFE		NLIFE		FINAUX		INSAUX		MARKET	
Variables	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err
Constant	**9.527******	1.988	**1.498***	1.045	**2.017******	0.243	**1.284******	0.331	**1.335******	0.295	**2.237****	1.164	**2.056****	1.164	**7.838******	1.627
Firm Age	**0.027******	0.008	**0.036******	0.008	**0.006******	0.002	**0.022******	0.003	**0.015******	0.002	**0.020*****	0.009	**0.018*****	0.009	**0.030******	0.009
Ln (S_{Ic})	**0.403*****	0.158	**0.358*****	0.126	-0.025	0.044	**0.195******	0.054	**0.132*****	0.054	**0.289******	0.139	0.000	0.139	**0.419******	0.127
Ln (S_{Jc})	**-0.860*****	0.275	**-0.163***	0.115	**0.068***	0.046	**-0.088*****	0.042	-0.002	0.057	-0.138	0.156	0.114	0.156	**-0.691******	0.194
Adjusted R^2	8.5%		14.3%		0.4%		6.0%		5.2%		8.6%		3.6%		8.0%	
RSS	1364.2		585.9		11001.2		3097.1		3444.5		340.1		493.7		701.3	
Sig F	**0.000******		**0.000******		**0.002******		**0.000******		**0.000******		**0.014*****		**0.095****		**0.000******	
N	246		184		3464		1363		1622		121		176		297	

**** Significant at p <0.01; *** Significant at p < 0.05; **Significant at p<0.10; *Significant at p<0.20

Table 4: Cluster Performance by Industry – Firm Size

ROCE by Industry	BSBANK		CREDIT		TRUST		LIFE		NLIFE		FINAUX		INSAUX		MARKET	
Variables	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err
Constant	**128.228****	77.56	20.619	39.821	**29.717*****	12.047	**98.664*****	27.081	**64.245*****	25.136	65.948	111.76	**128.855***	82.598	18.434	129.97
Firm Age	0.387	0.301	0.232	0.348	**-0.161****	0.084	**-0.327****	0.195	**-0.332*****	0.155	0.532	0.983	-0.480	0.630	-0.349	0.671
Ln (S_{Ic})	-0.366	5.441	2.910	4.957	**-5.127*****	2.072	**-9.061*****	4.349	-0.977	4.823	-3.642	9.005	**16.786***	10.554	-4.223	10.572
Ln (S_{Jc})	-9.951	10.14	-1.580	4.369	**4.413*****	2.179	2.067	3.278	-1.330	5.124	-1.931	11.596	**-19.51****	11.089	5.204	15.865
Adjusted R^2	1.3%		0.1%		0.1%		0.6%		0.2%		0.6%		1.7%		0.1%	
RSS	6634424.2		13088119.3		120723331.4		36565096.1		50114973.2		5716572.2		3931857.6		10214241.3	
Sigl F	**0.130***		0.845		**0.025****		**0.017****		**0.123***		0.798		0.286		0.942	
N	430		733		7486		1857		2420		184		219		428	

**** Significant at p <0.01; *** Significant at p < 0.05; **Significant at p<0.10; *Significant at p<0.20

Table 6: Cluster Performance by Industry – ROCE

SOLV by Industry	BSBANK		CREDIT		TRUST		LIFE		NLIFE		FINAUX		INSAUX		MARKET	
Variables	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err
Constant	-14.59	23.738	**27.885*****	11.638	**26.146******	3.583	**29.989******	7.166	**13.479*****	5.709	-5.031	24.362	**61.555******	23.440	**29.209**	29.179
Firm Age	0.040	0.092	**0.326******	0.101	**0.452******	0.025	**0.310******	0.054	**0.317******	0.038	**0.717*****	0.224	**0.475******	0.185	**0.410******	0.142
Ln (S_{Ic})	**-2.964****	1.658	-1.235	1.414	**-1.767******	0.620	-1.274	1.147	**1.585***	1.119	1.906	1.905	1.220	2.632	-1.797	2.311
Ln (S_{Jc})	**6.922*****	3.110	0.560	1.268	**2.935******	0.655	0.805	0.865	-0.535	1.183	1.746	2.562	**-4.043***	3.025	2.394	3.545
Adjusted R^2	1.1%		1.3%		3.5%		1.5%		2.5%		5.5%		3.3%		2.0%	
RSS	840511.5		1598745.8		18258896.9		3688512.8		4223300.6		527261.4		473443.7		678764.9	
Sig F	**0.144***		**0.012*****		**0.000******		**0.000******		**0.000******		**0.002******		**0.035*****		**0.022*****	
N	502		871		9514		2190		2989		255		264		493	

**** Significant at p <0.01; *** Significant at p < 0.05; **Significant at p<0.10; *Significant at p<0.20

Table 8: Cluster Performance by Industry – SOLV