THE LOCATION OF EXECUTIVE SUITES AND BUSINESS CENTERS IN THE UNITED STATES: AN EXPLORATORY ANALYSIS

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1. INTRODUCTION

Rapid changes in business organization and the adoption of new working practices have altered corporate real estate requirements. Concentration on core business, outsourcing, more diverse patterns of employment, and shorter product life cycles have led to a re-evaluation of the way in which space and office services are procured. It has been suggested that firms are adopting a property core-periphery model, paralleling labor market practices. Core space is held on a long-term leasehold or freehold basis forming the permanent base of the firm. Peripheral space is acquired when business demand requires – in an expansionary phase, for specific projects, or for market entry – and then shed when no longer needed. The emphasis in peripheral space is on flexibility, speed of occupation and ease of exit. Some firms – particularly in new business sectors or innovative, volatile industries – may have virtually no core space requirements.

The Executive Suites Association (ESA) (2000) defines office business centers as *"shared office facilities, fully staffed and furnished. For a monthly fee, customers receive the use of an office and necessary services …* [and] *…share common areas. Other services … are generally available and are billed as used."* Office business centers thus provide tenants with a complete service combining space, facilities and services generally including office furniture, telecommunications, reception and secretarial facilities, meeting rooms, and catering. The required occupancy period is typically short – months rather than years. This arrangement affords firms considerable short-term flexibility – in that they can take space, operate with minimal set up time and, critically, exit when business needs demand. For this a considerable premium is paid over a conventional office rent.

In the US, the sector emerged in the 1960s and 1970s mainly through local sole operators. The sector grew in the 1980s but was poorly affected in the property recession. From these humble beginnings, the sector has grown rapidly, particularly at the exclusive end of the market and in recent years has experienced considerable consolidation. The ESA (*op cit*) estimate that there are over 4,000 centers in the US, with some 80,000 square feet of space and annual revenues of $2.5-$3 billion. International growth in the office business centers has also been marked, particularly in Europe. There now exist a number of global firms and alliances (HQ-Global Workplaces, Regus, the Alliance Business Center Network for example) providing an international network of centers for class A office space.

This research project, supported by the Real Estate Research Institute focuses upon the distribution of business centers offering executive suites within the US. After a brief review of the development of the market, the paper examines the availability of data, provides basic descriptive statistics of the distribution of executive suites by state and by metropolitan statistical area and then attempts to model the distribution using demographic and socio-economic data at MSA level. An appendix presents a preliminary view of the global distribution of suites.

2. THE DEVELOPMENT OF EXECUTIVE OFFICE SUITES & THE LOCATION OF BUSINESS

In both the US and UK, the impact of changing business practices on corporate real estate requirements has been the subject of much research (for a recent US review, see Manning & Roulac, 2001; for the UK, see Gibson & Lizieri, 1999, 2001). In this literature, it is suggested

that a set of interrelated business factors have changed the ways in which corporations organize their activity. Forces identified include globalization, innovation and convergence in information and communications technology, reorganisation of the workplace and the drive for flexibility in the production of goods and services. While these trends are not new (see, for example, Daniels, 1985), they have increased in intensity. Such factors both alter the way that business activity is conducted and change the locational imperatives of firms. This, in turn has altered the pattern of demand for real estate and the way in which that space is managed. Information technology creates new locational freedom, while downsizing, delayering, home-working and office intensification affect the aggregate level of demand. Further, the commonly made distinction between a core and peripheral workforce[1] implies a distinction between core and peripheral corporate real estate requirements.

Core corporate real estate is the business space that a firm requires on a long-term basis. The firm will be willing to sink capital in that space and, hence, requires time to amortize that capital. This favors owner-occupation or a long lease contract. However, such long-term commitments are not appropriate for space which is needed for cyclical expansion, or where there is uncertainty (new market entry, development of new product lines). Here the need is for flexibility, ease of entry and, critically, ease of exit. Furthermore, the evidence from the capital markets suggests that holding corporate real estate as a fixed asset is not favorable for shareholders (Nourse, 1994; Rodriguez & Sirmans, 1996). Firms might thus prefer to outsource real estate provisions and concentrate on their core business.

It is in this changing environment that the provision of executive suites has flourished. The executive suite provides a combination of office accommodation, business services, amenities and managed technology as a combined package. It is thus ideally suited to the peripheral requirements of firms and also to the space needs of smaller dynamic companies. Executive offices also offer "virtual space". A firm may use an office business center as a telephone and mail answering service, hire meeting rooms on an as need basis and, thus, create a virtual presence and business identity in an area whilst located remotely (see Gibson & Lizieri, 2000b). Charges for such space are high when measured on a square footage basis but cannot be compared to conventional rents, given the bundled package of services and the flexibility of entry and exit.

Despite its growing importance, there is little published research on the sector. In the US, the Executive Suites Association has published the findings of a survey of their members (ESA, 2000). This showed that the major business sector using executive suites was Technology (29% of clients) followed by Business Services (17.8%) and Financial Services (12.5%). Client firms ranged from new start ups (18%) through to non-US international firms (7%). UK survey work by Gibson & Lizieri (2000a, 2000b) produced a similar picture. Forty-one percent of executive suite occupiers were IT companies, 24% were business service firms and 21% financial service firms. Nearly two-thirds of firms in the UK sample operated internationally but there was considerable diversity in the size of firm and turnover. The principal activities carried out in the

[1] The peripheral workforce consists of those on part-time and short-term contracts, consultants, sub-contractors and others with no permanent long-term contract. Firms can expand and contract the peripheral workforce according to their business needs and the economic environment. The creation of a peripheral workforce, as with outsourcing, pushes risk away from the firm onto its contractors and suppliers.

UK serviced offices were new business development, marketing new products and client contact/business identity. The sector thus seems to serve growing and dynamic areas of the economy, where firms are likely to have short planning horizons and be unwilling to commit capital long-term for corporate real estate.

As far as we are aware, there has been no systematic study of the location of executive suites. At one level, one might expect provision would mirror office-based employment and that the same locational dynamics that affect corporate headquarters would affect the executive suite market. In general office market dynamics, it has been suggested that the US has seen a pattern of deconcentration of headquarters from large metropolitan areas in the North East to a more dispersed spatial pattern. Semple and Phipps (1982), for example suggest a stage model with an "ideal type" end point of no spatial concentration. Lyons (1994), by contrast, finds spatial concentration in a small group of cities – Atlanta, Dallas-Fort Worth for example – and a marked decline in New York's dominance. However, the "command and control centers" (the leading cities in the Noyelle and Stanback urban classification (1984) still contained 95% of corporate headquarters. Lyons notes that the engine of change is more new start ups and corporate growth rather than relocation. For a further review and analysis see Shilton & Stanley (1999).

Our prior expectations for the pattern of executive suites would be that there should be a clear relationship with financial and business service employment and with office-related high technology activity. It is these sectors that have experienced dynamic but volatile growth and that have most need of flexibility in the provision of space and office services. The relationship between office employment and the location of executive suites may, however, be non-linear. If there is a link between new start ups and executive suites (with the suites acting as an incubators and nurseries for new firms) then the demand for suites may be less in the largest established metropolitan areas than in growing regional centers.

3. DATA CONSIDERATIONS

In order to identify the location of US business centers with office suites, a number of on-line business directories were examined. Particular use was made of the business center search facility at www.esuite.com and the website of the executive suites association[2] (www.execsuites.org). From the database assembled, alliances (for example the Alliance Business Centers network, www.abcn.com) and firms with multiple outlets were identified and their own websites checked to identify any additional centers not listed in the directories[3]. Data collection took place in the last quarter of 2000. It should be stressed that the market is dynamic with new outlets opening weekly and firms consolidating. Care was taken to eliminate duplication resulting from mergers and acquisitions. In total, the database contained 1,692 business centers offering executive suites for which there was adequate information on ownership and location. These were then coded to metropolitan statistical areas (MSAs) with 1,459 centers coded to MSAs, leaving 193 unassigned.

Socio-economic data on the MSA were collected from a number of sources. Employment and unemployment variables were obtained from the Bureau of Labor Statistics. Data obtained

[2] Now renamed the Office Business Center Association International.

[3] Since the directories are compiled by self-registration, centers will inevitably be missing. However, there is no reason to presume that this would lead to any particular spatial bias.

included the total numbers employed, total number of establishments and employment by economic sector. These numbers were collected at single digit SIC code but the services sectors were further sub-divided by two digit code to isolate finance, insurance & real estate (FIRE), business services, legal services, engineering & management services and other services. The establishment data was split into large and small establishments with the larger establishments having a minimum of 1,000 employees. Population data was collected from the US census bureau, giving population totals and population change between 1990 and 1996. A further dataset for MSAs which included change in employment and unemployment rates; house prices and house price change (from Freddie Mac data); wage levels and wages relative to the US average; population density and population structure; a migration measure based on the ratio of inbound to outbound van shipments; and an overall economic health indicator was provided by United Guaranty, a national private mortgage insurance company in the US.

In addition to these data, a number of geographical and urban variables were generated. These included: dummy variables for the NCREIF regions; US Census Bureau geographical division dummies; a dummy if an MSA is part of a consolidated metropolitan statistical area (CMSA) and a dummy for all MSAs with a population in excess of one million. The State in which the (majority of the) MSA falls was also included in the dataset. Complete data records were available for a total of 309 MSAs.

Prior expectations are that while there will be a scale relationship (that is a correlation between employment level and number of business centers offering executive suites), there will be relatively higher numbers of centers in MSAs with greater than average concentrations of FIRE and business services employment; in MSAs that are dynamic (that is, that are experiencing rapid growth in employment and population); and in MSAs with above average income levels. By contrast, MSAs with high concentrations of non-service sector employment, unemployment and sluggish growth will have relatively low numbers of centers. The relationship between size variables and number of centers is likely to be non-linear, with the largest MSAs – particularly traditional metropolitan areas with high population densities – having fewer centers relative to employment and population levels than smaller, less dense MSAs (thus our expectation is for a negative sign on the CMSA and Million City dummies). This further suggests that the "new growth" areas in the South and West are likely to have a higher number of centers relative to socio-economic variables with the North East seaboard perhaps having relatively lower numbers.

After checking and cleaning the data, correlation matrices were examined to investigate the relationship between the number of centers in an MSA and the socio-economic and demographic data available. The correlation structure also provided important information on potential multicollinearity problems in the subsequent analysis. It was clear that there were strong interrelationships between the scale variables, the demographic and economic change variables and the industrial structure variables. This inevitably affected the choice of variables for further analysis. Before examining the models tested, the basic distribution of the centers is described.

4. THE BASIC DISTRIBUTION OF BUSINESS CENTERS

Business centers offering executive suites are very heavily concentrated in a small number of cities and MSAs. As detailed in Exhibit 1, a quarter of centers in the database are found in just five cities: Atlanta, Dallas, Chicago, Washington and Houston; the top twelve MSAs account for nearly half the centers. Alternatively, 161 of the 309 MSAs in the database have no recorded executive suites.

Exhibit 1: Executive Suites: Top Ranking MSAs

MSA	*Number of Centers*	*Cum %*	*Rank*
Atlanta	85	5.8%	1
Dallas	80	11.3%	2
Chicago	79	16.7%	3
Washington DC	69	21.5%	4
Houston	68	26.1%	5
Denver	58	30.1%	6
New York	56	33.9%	7
Los Angeles-Long Beach	55	37.7%	8
Orange County	55	41.5%	8
Minneapolis-St. Paul	38	44.1%	10
Phoenix-Mesa	37	46.6%	11
Boston NECMA	33	48.9%	12

Since many of the MSAs with high numbers of centers are large in terms of population and employment, location quotients (LQs) for employment, and finance and business services (FBS) employment were calculated[4]. The location quotient for population shows twelve MSAs with LQs greater than 2.5. Seven of these have populations in excess of a million: Atlanta, Charlotte, Dallas, Denver, Houston, Orange County and Raleigh-Durham. Large MSAs with low population LQs include Baltimore, Bergen-Passaic, Fort Worth-Arlington, Philadelphia and Riverside. As might be expected, the results from using location quotients based on total employment are nearly identical to those based on population. We anticipated that financial and business service employment might be a better indicator of the presence of executive suites and that there would be fewer large LQs. However, as shown in Exhibit 2 the same set of MSAs with large LQs appears: of the million population MSAs, only Charlotte (1.91) has an FBS-based location quotient of less than two. For those large MSAs with low population-based location quotients, all have financial and business service–based LQs below 0.5 except Riverside (1.31).

[4] A location quotient measures the over- or under-representation of a variable in an area given its size. For example, an LQ for population would be calculated as (Suites in MSA / Suites in USA) / (Population in MSA / Population in USA). An LQ of 1.0 would imply that the number of executive suites was proportional to the population share; LQs > 1.0 suggest over-representation and LQs < 1.0 suggest under-representation relative to population.

Exhibit 2: Financial and Business Service LQs

Large MSAs, High LQ	*LQ-FBS*	*Large MSAs, Low LQs*	*LQ-FBS*
Denver	3.13	Baltimore	0.24
Houston	2.88	Philadelphia	0.35
Atlanta	2.46	Fort Worth-Arlington	0.36
Raleigh-Durham	2.43	Bergen-Passaic	0.41
Orange County	2.37	Norfolk-Virginia Beach	0.42
Dallas	2.15	Middlesex – Somerset NJ	0.49

Note: an LQ > 1 shows "excess" executive suites relative to FBS employment in the MSA

Examining the distribution of office business centers by state, Exhibit 3 illustrates that ten states account for nearly two thirds of the business centers on the database, with California and Texas having the highest share. Adjusting for population and employment (calculating employment location quotients), the District of Columbia had a very high degree of over-representation with an LQ of over 9. There were 5 states with LQs over 1.5: Colorado (2.82), Georgia (1.74), Connecticut (1.73) and Massachusetts (1.68) with Texas (1.46) just below this level. Four states have no recorded executive suites and a further twelve states have LQs below 0.50. These are, predominantly, smaller states in the old south or mid-west.

Exhibit 3: Distribution of Executive Suites by State: Share and Employment-Based Location Quotient

State	*Suites*	*Share*	*Cumulative*	*LQ-Emp*
California	272	16.5%	16.5%	1.34
Texas	180	10.9%	27.4%	1.46
Florida	101	6.1%	33.5%	1.11
New York	100	6.1%	39.5%	0.96
Georgia	86	5.2%	44.7%	1.74
Illinois	85	5.1%	49.9%	1.13
Colorado	77	4.7%	54.5%	2.82
Massachusetts	66	4.0%	58.5%	1.68
North Carolina	52	3.1%	61.7%	1.11
New Jersey	51	3.1%	64.8%	1.02

5. BASIC REGRESSION MODELS

Given the basic distribution of office business centers described above, this section attempts to model the distribution of business centers using a regression-based approach. Since this is exploratory work, we review alternative specifications of a model of distribution, rather than present a single "best" model. We start with a very basic model relating the number of office business centers to the size of the MSA and then seek to augment this basic model by including further variables that characterize and classify the MSA. A number of data transformations improve the explanatory power of the model.

Model A1 attempts to explain the distribution of business centers offering executive suites largely in terms of financial and business service employment. This acts as a scaling factor for the

size of the settlement and also for the density of FIRE and business service activity. It provides superior explanatory power to other scale variables – population, total employment or total number of establishments. The impact of the variable is non-linear; the number of suites increases with employment but decreases with the square of employment, suggesting that, over a threshold size, larger MSAs have fewer business centers. As Exhibit 4 shows, the threshold employment level is around one million employees. This may be related to diseconomies of scale or to the more dynamic nature of cities lower down the urban hierarchy. This is confirmed in Exhibit 5 by the negative coefficient on the Million City dummy variable. As expected, employment growth is positively associated with number of business centers, as is our measure of inward migration.

One spatial variable is included: a dummy variable for MSAs in the Census Bureau's New England region. No other regional dummies proved significant (prior expectations had been that the mid-Atlantic region would have a negative impact and that there would be positive effects for the Mountain, West-Pacific and South Atlantic regions. While dummies for these regions were correctly signed, none proved significant). The negative impact of a New England location seems largely to result from lower than expected numbers of centers in the Boston region CMSA and in the Boston-Worcester-Lawrence-Lowell-Brockton NECMA in particular. The coefficient is just significant at the 10% level but inclusion improves diagnostics.

Exhibit 4: Model A: Impact of Employment on Number of Suites

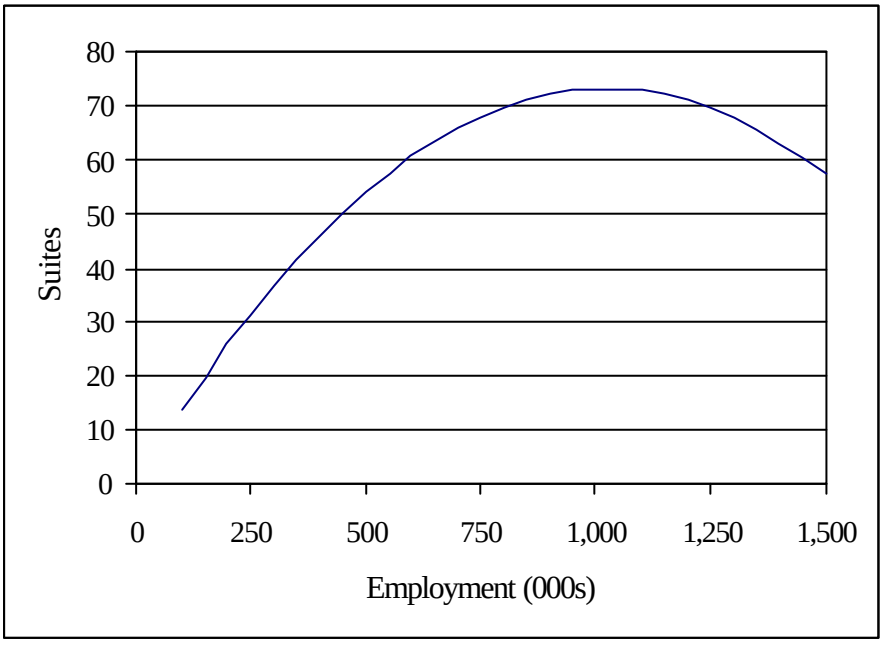


Exhibit 5: Model A1: Full Sample, Dependent Variable is No. of Business Centers

	Coefficient	Standard Error	t-Statistic
Constant	-10.781	2.668	-4.041 ***
FBS Employment (000s)	+0.143	0.023	+6.201 ****
FBS Employment (000s) Squared	$-6.99 * 10^{-5}$	$2.34 * 10^{-5}$	-2.982 ***
Million City Dummy	-3.417	1.610	-2.122 **
Employment Change	64.987	22.290	+2.916 ***
Inbound Migration	15.756	4.763	+3.308 ***
New England Census Region	-3.050	1.744	-1.749 *
White heteroscedasticity consistent standard errors and covariance			
Adjusted R^2 0.780		Akaike Info Criterion 6.403	
F Statistic 180.857 ****		Schwartz Info Criterion 6.488	
Standard Error 5.880		Log Likelihood –982.340	
N = 309			
Significance 10% (*) 5% (**) 1% (***) 0.1% (****)			

The model appeared stable for different sub-samples of the data. However, there are a small number of MSAs with large residuals: Atlanta, Dallas, Denver, Houston and Orange County have substantially more executive suites than predicted; Philadelphia and (to a lesser extent) Tampa and Boston have considerably less than the number predicted. These observations have an impact on stability and residual tests (for example, the Jarque-Bera normality test is rejected given high positive kurtosis). The large number of MSAs with no business centers is a cause for concern. Accordingly, Model A2 (Exhibit 6) uses the same regressors for a sub-sample that excludes all MSAs with no executive suites. The model is essentially unchanged, with all coefficients having the same signs and comparable magnitudes. The major change is that the employment change variable ceases to be statistically significantly different from zero due to an increase in the standard error.

Exhibit 6: Model A2: Excluding MSA with No Suites, Dependent Variable is No. of Business Centers

	Coefficient	Standard Error	t-Statistic
Constant	-19.696	5.976	-3.296 ***
FBS Employment (000s)	+0.150	0.015	+10.120 ****
FBS Employment (000s) Squared	$-7.61 * 10^{-5}$	$1.62 * 10^{-5}$	-4.692 ****
Million City Dummy	-4.396	2.035	-2.160 **
Employment Change	+111.212	70.996	+1.566
Inbound Migration	+30.974	13.579	+2.281 ***
New England Census Region	-5.554	3.471	-1.600 *
White heteroscedasticity consistent standard errors and covariance			
Adjusted R^2 0.757		Akaike Info Criterion 7.089	
F Statistic 77.146 ****		Schwartz Info Criterion 7.231	
Standard Error 8.189		Log Likelihood –517.623	
N = 159			
Significance 10% (*) 5% (**) 1% (***) 0.1% (****)			

There is a potential multicollinearity problem with the regressors in models A1 and A2. To control for this, two related models were tested that utilized factors derived from principal components analysis (PCA). The first model created separate components for economic growth and employment structure to provide a cleaner component solution, while the second combined the variables into a single component model to ensure orthogonality. In practice, the two approaches produced near identical results.

The separate growth analysis applied PCA to variables for change in unemployment; employment growth (over four year and ten year periods); the inbound migration variable; population change 1996-2000; and the economic strength indicator. Two of the principal components with eigenvalues greater than one explained 62% of the variation and were retained and rotated using the Varimax procedure. The resultant component matrix shows strong loadings for the first factor on employment change, population change and inbound migration and is clearly a growth factor. The second has a (negative) loading on change in unemployment and a positive loading on house price changes and may pick up variation associated with economic decline[5].

In similar fashion, the employment structure model took non-scale employment variables: the percentage employment in FIRE, business services, primary & manufacturing industries, transport & utilities, wholesaling, retail and other services, along with the proportion of large firms and other indicators of establishment structure. Four components with eigenvalues greater than one were retained. The rotated solution shows that component one is a financial and business services factor (with high loadings on FIRE and business services employment and negative loadings on primary & manufacturing, retail and other services employment). The

[5] The final component in a rotation tends to act as a "clean up" variable for remaining variation.

component explains 32% of variation. The second component contrasted primary, manufacturing and wholesale employment to retail and other services employment. The third component has strong loadings on transport, utilities and wholesale employment. The final factor is hard to interpret, but, tentatively identifies MSAs with high proportions of large firms.

The relationships between the rotated components and the executive suites variable were examined. The first growth component and the FBS component had explanatory power and were modeled alongside other variables. The others did not seem to be significantly related and were omitted from the specification. The preferred Model B is shown below (Exhibit 7). It is similar in structure to Models A1 and A2, although no spatial components proved significant. The FBS component has a negative sign. This seems to result from the positive correlation between size of MSA and proportion of FBS employment. Thus, the scale variable picks up the positive impact of FBS, with the FBS component picking up problems of specific MSAs or over-specialization. While the R^2 figure has improved only slightly, other diagnostics indicate that this is a superior model – both the information criteria are smaller, the F statistic is larger and the regression standard error has fallen. Additionally, the size of the constant term has fallen substantially[6].

Exhibit 7 Model B: Full Sample, Dependent Variable is No. of Business Centers

	Coefficient	Standard Error	t-Statistic
Constant	-2.154	0.447	-4.821 ****
FBS Employment (000s)	+0.156	0.010	+15.129 ****
FBS Employment (000s) Squared	$-8.05 * 10^{-5}$	$1.10 * 10^{-5}$	-7.294 ****
Million City Dummy	-3.698	1.339	-2.762 ***
PCA Growth Component	+1.881	0.355	+5.296 ****
PCA FBS Component	-1.236	0.440	-2.808 ***
White heteroscedasticity consistent standard errors and covariance			
Adjusted R^2 0.784		Akaike Info Criterion 6.372	
F Statistic 224.88 ****		Schwartz Info Criterion 6.444	
Standard Error 5.797		Log Likelihood –978.43	
n = 309			
Significance 10% (*) 5% (**) 1% (***) 0.1% (****)			

Although the correlation between the PCA Growth and PCA FBS components is only 0.324, a second component analysis was undertaken to ensure orthogonality. The seventeen variables used in the separate growth and employment structure analyses were combined and reduced using PCA. Three components explained 52% of the variation. These were retained. The rotated solution suggested that the first component was an FBS employment dimension, the second component a growth dimension and the third contrasted manufacturing and retail employment.

[6] As with Model A, there are a number of large residuals, with exactly the same MSAs exhibiting over or under prediction. Kurtosis and skewness in the residuals are at similar levels to Model A, leading to rejection of normality. As with Model A, the equation was re-estimated with all MSAs without executive suites excluded. This restricted model was near identical in structure although the FBS component was only statistically significantly different from zero at the 10% level.

As before, the Growth and FBS components had explanatory power in relation to the number of executive suites and are used in analysis. They are strongly correlated to the factors derived from the separate analyses: the two FBS components have a correlation of 0.897 and the two growth components have a correlation of 0.975. As a result, Model C (Exhibit 8) is near identical to Model B with minimal improvement in diagnostics and the same set of MSAs with large residuals.

Exhibit 8: Model C: Full Sample, Dependent Variable No. of Business Centers

	Coefficient	Standard Error	t-Statistic
Constant	-2.129	0.455	-4.675 ****
FBS Employment (000s)	+0.154	0.010	+14.809 ****
FBS Employment (000s) Squared	$-7.81 * 10^{-5}$	$1.11 * 10^{-5}$	-7.053 ****
Million City Dummy	-3.488	1.337	-2.609 ***
PCA2 Growth Component	+1.637	0.334	+4.906 ****
PCA2 FBS Component	-0.951	0.439	-2.169 **
White heteroscedasticity consistent standard errors and covariance			
Adjusted R^2 0.784		Akaike Info Criterion 6.371	
F Statistic 225.10 ****		Schwartz Info Criterion 6.443	
Standard Error 5.794		Log Likelihood –978.31	
n = 309			
Significance 10% (*) 5% (**) 1% (***) 0.1% (****)			

Finally, to counter the correlation between the components and the employment figures, a third data reduction exercise was undertaken. Twenty one variables, representing size (population, employment totals, numbers of establishments), change (employment and population growth, house price change, migration indicators) and employment structure were included in a single principal components analysis. Examination of eigenvalues and screen plots suggested retention of five components explaining 69% of the variation in the data. These were then rotated using the varimax procedure and factor loadings examined. The rotated solution was relatively simple to interpret: component one is a size or scale component; component two captures variation related to economic and population growth; component three is an FBS factor; component four contrasts primary and manufacturing employment with retail and other services; and component five has high loadings on transport, utilities and warehousing employment. These factors are orthogonal, removing any possible problems with multicollinearity.

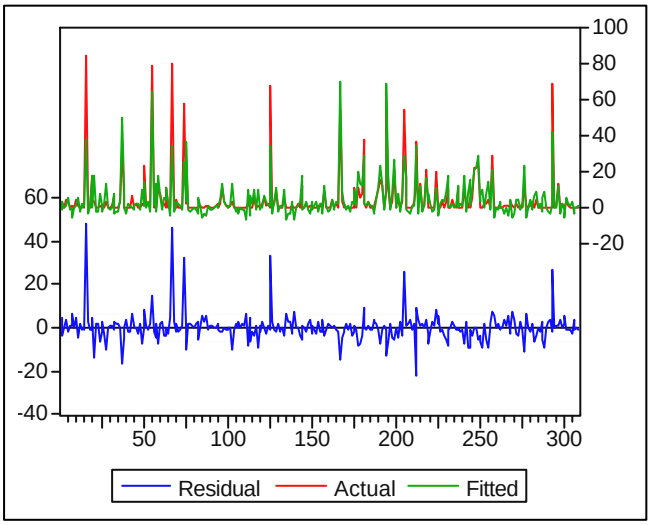
The transport, utilities and warehousing employment component does not appear to be associated with the number of executive suites in an MSA. The remaining four components along with a spatial variable – a dummy for location in New England or the Mid-Atlantic states – explained 72% of the variation in executive suites. As shown in Exhibit 9, Model D has favorable characteristics – the sign on the FBS component is positive, as fits prior expectations, while the industrial structure variable is significant and negative. However, the regression diagnostics are slightly worse than those of Model B and Model C and the problem of the small number of

extreme residuals is actually exacerbated (Washington, DC joining the previous five MSAs with "excess" numbers of executive suites).

Exhibit 9: Model D: Full Sample, Dependent Variable is No. of Business Centers

	Coefficient	Standard Error	t-Statistic
Constant	+5.076	0.414	+12.251 ****
PCA3 Size Factor	+10.000	0.992	+10.079 ****
PCA3 Growth Factor	+1.449	0.497	+2.196 ***
PCA3 FBS Factor	+3.064	0.395	-7.749 ****
PCA3 Industrial Structure Factor	-1.177	0.310	-3.792 ****
NE Regional Dummy	-2.374	0.953	-2.490 **
White heteroscedasticity consistent standard errors and covariance			
Adjusted R^2 0.717		Akaike Info Criterion 6.644	
F Statistic 156.87 ****		Schwartz Info Criterion 6.716	
Standard Error 6.64		Log Likelihood –1020.47	
N = 309			
Significance 10% (*) 5% (**) 1% (***) 0.1% (****)			

Exhibit 10: Residuals from Model D



6. TRANSFORMING THE BUSINESS CENTERS VARIABLE

Given the highly skewed nature of the executive suites variable (with so many MSAs having either zero or one business centers), models were run with a transformed dependent variable. With the large number of zeros, a log transformation can only be applied to around half the dataset. However, other transformations retaining an additive model generate improved results. The most promising appears to be a square root transformation. Examination of correlation

matrices and single variable regressions suggest that the basic set of explanatory variables is largely unchanged. However, the square root transformation improves the diagnostics of the multiple regression equation and reduces the extreme nature of outlying residuals.

Model E (Exhibit 11) uses the principal components employed in Model D. As can be seen, the impact of the size variable is non-linear, with the squared term having a negative coefficient. The interpretation of the squared variable here is somewhat more complicated than with an absolute size variable since the component has positive and negative factor scores. It suggests that executive suites are most prevalent (given other factors) in middle ranking cities. All other variables have the expected form and sign and are significant at the 0.01 level and beyond. Two dummy variables are included: a regional dummy for New England and a dummy for MSAs that are part of a CMSA again suggesting that the largest urban agglomerations have some negative impact on the number of centers.

Exhibit 11: Model E: Full Sample, Dependent Variable is Square Root of No. of Centers

	Coefficient	Standard Error	t-Statistic
Constant	+1.421	0.603	+23.588 ****
PCA3 Size Factor	+1.963	0.119	+16.472 ****
PCA3 Size Factor ^{2}	-0.131	0.021	-6.207 ****
PCA3 Growth Factor	+0.181	0.050	+3.592 ****
PCA3 FBS Factor	+0.765	0.043	+17.991 ****
PCA3 Industrial Structure Factor	-0.263	0.138	-2.971 ****
NE Regional Dummy	-0.420	0.147	-2.854 ***
CMSA Dummy	-0.410	0.138	-2.971 ***
White heteroscedasticity consistent standard errors and covariance			
Adjusted R^2 0.814		Akaike Info Criterion 2.375	
F Statistic 193.00 ****		Schwartz Info Criterion 2.472	
Standard Error 0.783		Log Likelihood –358.95	
N = 309			
Significance 10% (*) 5% (**) 1% (***) 0.1% (****)			

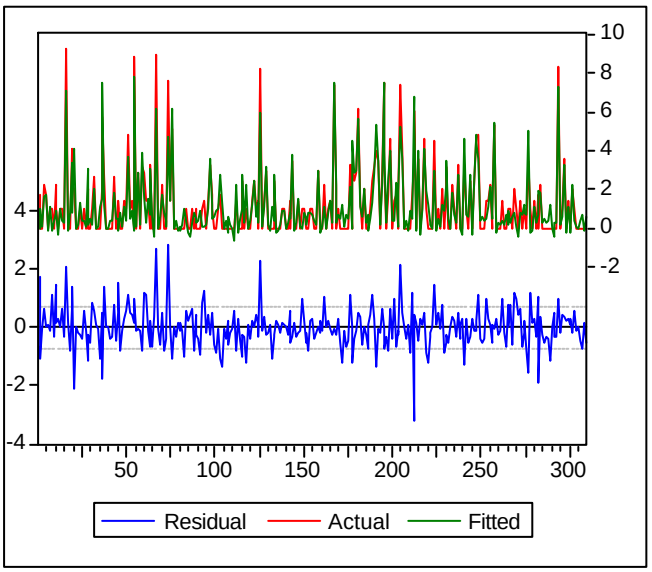
Comparing Model E to Model D, the diagnostics have improved considerably. The model appears to be stable. Re-running the regression excluding those MSAs without office business centers produces a near identical model, with all variables having the correct sign and very similar coefficients. The New England dummy, however, is no longer statistically significant from zero. The model passes the Chow breakpoint test, failing to reject the null hypothesis of no difference at the 0.05 level. Examining residuals, the absolute magnitude of the extreme residuals (after accounting for the square root transformation) is greatly reduced by comparison to the previous models. However, the MSAs with high positive residuals are the same as in earlier models: Denver, Houston, Dallas, Atlanta and Orange County. Philadelphia is, once again, the MSA with the largest negative residual. The residuals fail the Jarque-Bera normality test due, largely, to kurtosis.

Model diagnostics are marginally improved by substituting a direct size of MSA variable for the principal components size factor. Model F (Exhibit 12) preserves the structure of Model E but uses total number of establishments in place of the PCA3 size factor. The contribution of the FBS factor is reduced and the New England dummy no longer contributes to the model. Otherwise, there are strong similarities between the two specifications, as might be expected. The same five MSAs appear with high positive residuals, while Baltimore joins Philadelphia as having a high negative residual. These extreme residuals are of the same magnitude as those of Model E.

Exhibit 12: Model F: Full Sample, Dependent Variable is Square Root of No. of Centers

	Coefficient	Standard Error	t-Statistic
Constant	-0.033	0.069	-0.477
No. of Establishments	$+8.64*10^{-5}$	$5.59*10^{-6}$	+15.458 ****
No. of Establishments ^{2}	$-2.23*10^{-10}$	$-2.35*10^{-11}$	-9.512 ****
PCA3 Growth Factor	+0.198	0.048	+4.171 ****
PCA3 FBS Factor	+0.183	0.045	+4.090 ****
PCA3 Industrial Structure Factor	-0.143	0.035	-4.139 ****
CMSA Dummy	-0.280	0.121	-2.316 **
White heteroscedasticity consistent standard errors and covariance			
Adjusted R^2 0.843		Akaike Info Criterion 2.197	
F Statistic 277.56 ****		Schwartz Info Criterion 2.282	
Standard Error 0.718		Log Likelihood –332.47	
N = 309			
Significance 10% (*) 5% (**) 1% (***) 0.1% (****)			

Exhibit 13: Residuals, Model F



The final model, Model G detailed in Exhibit 4, examined seeks to explain the distribution of business centers using financial and business service employment as the scale/size variable (once

again, this has a non-linear effect with diminishing returns setting in). Using FBS means that variables that measure the proportion of FBS activity in an MSA do not have significant explanatory power. Economic change is captured using the principal components change factor employed in Models E and F. Two other variables improve explanation and diagnostics – the population age structure (with proportion of young adults positively related to number of centers, presumably reflecting economic structure, growth and dynamism) and the CMSA dummy, as before. Regional dummies do not contribute to explanation. The diagnostic evidence for this model compared to Model F suggests a marginal improvement. The model is more successful in modeling Dallas and Atlanta but Denver, Houston and Orange County have high positive residuals, Philadelphia, Boston and Baltimore high negative residuals. There is also some evidence of multicollinearity with population age and FBS employment having a positive correlation of 0.38.

Exhibit 14 Model G: Full Sample, Dependent Variable is Square Root of No. of Centers

	Coefficient	Standard Error	t-Statistic
Constant	-1.476	0.645	-2.288 **
FBS Employment	$+2.35*10^{-5}$	$1.55*10^{-6}$	+15.137 ****
FBS Employment ^{2}	$-1.61*10^{-11}$	$1.70*10^{-12}$	-9.472 ****
PCA3 Growth Factor	+0.183	0.048	+3.838 ****
Population Age Structure	+5.665	2.317	+2.444 **
CMSA Dummy	-0.267	0.113	-2.354 **
White heteroscedasticity consistent standard errors and covariance			
Adjusted R^2 0.847		Akaike Info Criterion 2.174	
F Statistic 340.989 ****		Schwartz Info Criterion 2.246	
Standard Error 0.710		Log Likelihood –329.83	
N = 309			
Significance 10% (*) 5% (**) 1% (***) 0.1% (****)			

7. CONCLUSIONS AND FURTHER DIRECTIONS

The models examined here present a relatively stable picture of the distribution of business centers offering executive suites. The number of centers in an MSA is positively associated with size – particularly with size of financial and business services employment. However, over a certain size threshold, negative effects set in, dampening the number of centers. This is reflected both in the negative sign on the square of whichever size variable is used and in the negative coefficients found for the CMSA and million city dummies. There appears to be an association between economic structure and distribution of business suites with, as expected, positive signs on variables measuring the share of employment taken by financial and business services and negative signs on non-FBS and, in particular, on manufacturing and similar economic activity.

Of the regression models tested, those with the most favorable statistical characteristics are Model C (with number of executive suites as the variable being modeled) and Model G (with the square root of the number of executive suites as the dependent variable). The latter, while harder to interpret intuitively, has superior statistical properties and explains around 85% of the variation

in the number of executive suites in an MSA. Both models suggest that there is a non-linear relationship with business services employment. Generally, the number of office suites rise with employment scale: however diminishing returns and diseconomies of scale set in for the largest MSAs. This is reflected in the negative sign on the squared employment term and the negative coefficient on the Million City (Model C) or CMSA (Model G) dummies. More dynamic cities are associated with economic and demographic growth which, in turn, is linked to larger numbers of executive suites.

A number of MSAs have considerably more office business centers than predicted by the model (Denver, Houston, Orange County in both models, Atlanta and Dallas in Model C) and a smaller number of MSAs with fewer than predicted by the model (Boston, Baltimore, Tampa and, in particular, Philadelphia). This raises an important issue in utilizing the models for strategic decision making. Do the groups of MSAs with "excess" centers have particular characteristics that make them particularly favorable locations for operation of executive suites? If so, are there similar MSAs that do *not* have high numbers of suites? If so, these would be favorable areas for investment. Alternatively, do these areas have "excess" suites such that supply-side saturation has been reached? If this were true, then investors might wish to look at those MSAs that have fewer suites than predicted by the model. Clearly further research is needed in this area. This study provides preliminary evidence that there are differences but more work needs to be done to understand the implications of these differences for investors.

There are many ways that the study can be extended. One would be to develop a more sensitive and complete set of variables capturing supply of space. The executive suites data collected thus far does not distinguish age, size or quality of building. Initial investigation suggests this would be a major data gathering exercise, since detailed information on each office business center is highly variable and missing in many cases. This line of research was beyond the resources available to the research team.

It would also be valuable to refine the explanatory data set. For example, a number of the sectoral employment variables may be too crude to capture the dynamics of the market. Thus, "financial and business service employment" includes high level business and commercial financial work that benefits from agglomeration and information economies confined largely to international and regional financial centers; more basic low added value business finance (such as settlement activity) that is increasingly being decentralized to lower cost locations; and retail financial services that are more ubiquitous. It is likely that the first of these three sub-sectors would generate greater demand for executive suites than the other two. In similar fashion, an employment variable that picked up business to business high technology activity (software, communications and software-hardware interface activity) might prove useful in explaining distributions and identifying areas with over- or under-supply of space. Finally, some measure of added value or income might be useful in augmenting the employment data.

A third extension might be to look at spatial distributions in terms of a diffusion effect. Few of the geographical variables tested had any great explanatory power. There was little evidence of a strong South and West effect even though these areas have grown relative to the North and East. Nor was it possible to discern a negative "rust belt" effect separate from the economic variables. It may be that the regional scale is too crude for analysis. However, another possibility is that the executive suite market is still evolving from a "pioneer" phase where development was led by a

small number of firms in particular cities. It is possible that such firms will have expanded by opening new office centers in nearby cities, producing localized clusters of suites that are not being detected by regional or state dummies.

This introduces a further dimension: time. First, it would be valuable to look at the expansion of the executive suites sector over time and space. This, too, would be a major data gathering exercise since there is little public information on the date of opening of individual centers. Second, the economic and demographic growth variables could be refined to examine different periods of growth. For example, looking at the MSAs with "excess" centers, a number are city-regions that expanded rapidly in the 1970s and 1980s and then declined. This might be significant. In the UK market, it has been suggested that part of the growth of the serviced office sector in the 1990s resulted from the financial and business services recession. This led to a high number of business start-ups (by "downsized" executives) who sought flexible real estate solutions that did not require long-term capital commitments. In addition, corporations sought space solutions that would allow them to expand and contract their real estate portfolios in response to market conditions, again helping establish service offices as a sub-sector. It is possible that a similar process occurred slightly earlier in the US market.

Given the ever-changing business environment and the drive for flexibility, it is likely that executive suites will assume a growing importance in corporate real estate strategies. The rapid growth of the sector across the 1990s may be checked in a more difficult economic context[7]. Nonetheless, the sector is likely to continue its expansion in the future, given the advantages presented to particular types of business activity. This paper represents a preliminary attempt to identify the factors linked to the distribution of executive suites. In turn, this may help point to those locations where further expansion is likely and, hence, early investment is favorable.

[7] Presumably this assumption underpinned market analysts' reaction to Regus's profits warning, which resulted in a $0.7 billion fall in its market capitalization in one day. Regus's shares in July 2001 were trading at just 12% of their peak value.

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APPENDIX: THE GLOBAL DISTRIBUTION OF EXECUTIVE SUITES

A1 Introduction

In addition to the 1,692 US business centers, we have assembled a database of 1,083 office centers in other countries. Further work is necessary to analyze these data. Assembling reliable comparable data is far more complex on an international scale than at individual country level. While aggregate national data is readily available, data for functional city-regions (MSA equivalents) – particularly for employment by sector - is much harder to obtain. Assignment of centers to city-regions is also a major task. At this stage, only preliminary findings are possible.

It is also important to note cultural and institutional factors that may cause biases in the database. Much of the source material was English language – and hence there may be a bias towards English-speaking countries, for example those in the economic ambit of the United States or former colonies of the UK. For other countries, the terms executive suite, serviced office or office business center may have no resonance. Secondly, the idea of a serviced office or executive suite is, in part, predicated on the "conventional" pattern of a long lease. Where lease lengths are long with legal constraints on leaving, the executive suite provides a flexible alternative. In a market structure characterized by short leases and ease of entry and exit, there may be much less call for the business center concept. Thus one might anticipate fewer serviced offices in Asian cities than in North American or European cities[8]. Finally, it is important to note that many serviced offices in emerging markets are not "indigenous". Rather, they provide the base for market entry by external firms. With those caveats in mind, this appendix presents a basic analysis of the location of serviced offices around the world. The figures below exclude the US executive suites.

A2 Distribution by Country and Region

Although there are 61 countries with executive suites/business centers recorded on the database, 75% of the centers are in just seven countries: with over 40% being in the UK (see Exhibit A). The dominance of the UK reflects both the linguistic bias noted above and the market structure – the continued dominance of very long leases (averaging around 15 years) has created a fertile environment for the growth of the serviced office sector. UK company Regus[9] is the largest global provider; HQ Global Offices has strong UK origins and the last ten years have seen rapid growth in the provision of space across the quality spectrum (Gibson & Lizieri, 1999).

One striking feature of Exhibit A1 is the absence of Asian countries in the top ten nations with office business centers. Japan ranks 12th, Singapore 15th and China 16th. Many of those centers (particularly in China) are run by US or European providers and targeted at western occupiers. This may reflect the nature of lease contracts in Asian markets. In other respects, the distribution of centers reflects GDP and economic development, although the presence of Mexico, Brazil (and, arguably, Canada) may relate to proximity to the US and diffusion of the concept of the executive suite center.

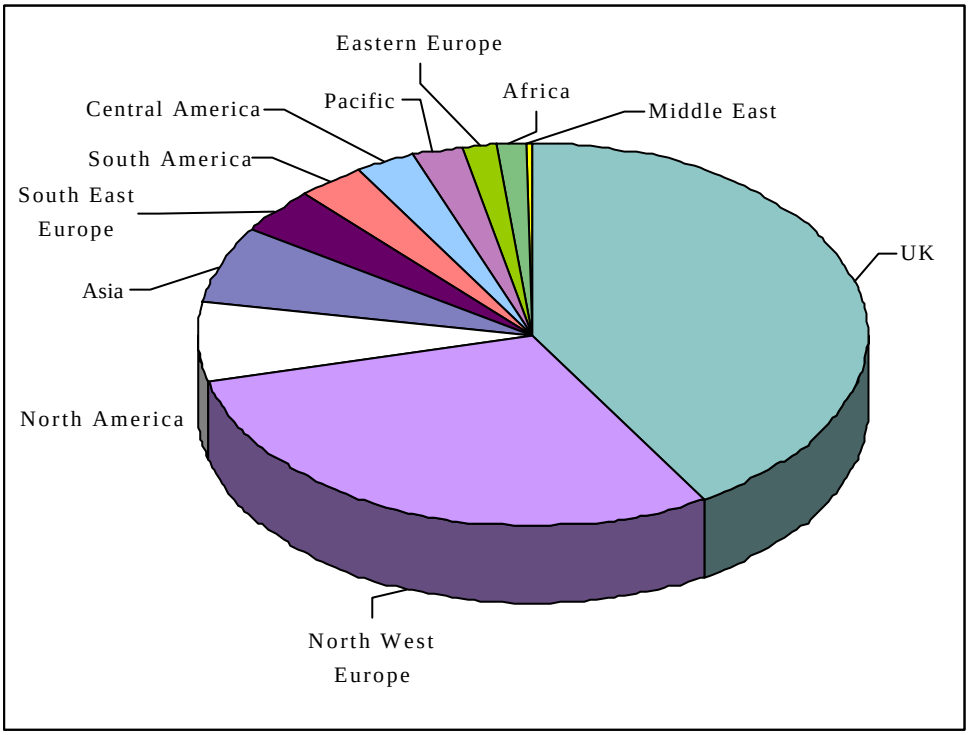
[8] However, any lack of security of tenure would encourage outsourcing of the provision of office facilities and services so this may not be true.

[9] Regus floated on NASDAQ but was founded and has its headquarters in the UK.

Exhibit A: Distribution of Executive Suites by Nation

Country	Centers	% of Database	Cumulative %
United Kingdom	442	41.3%	41.3%
Germany	143	13.4%	54.7%
Canada	72	6.7%	61.5%
France	57	5.3%	66.8%
Austria	32	3.0%	69.8%
Mexico	26	2.4%	72.2%
Netherlands	26	2.4%	74.6%
Australia	24	2.2%	76.9%
Brazil	21	2.0%	78.9%
Spain	18	1.7%	80.5%

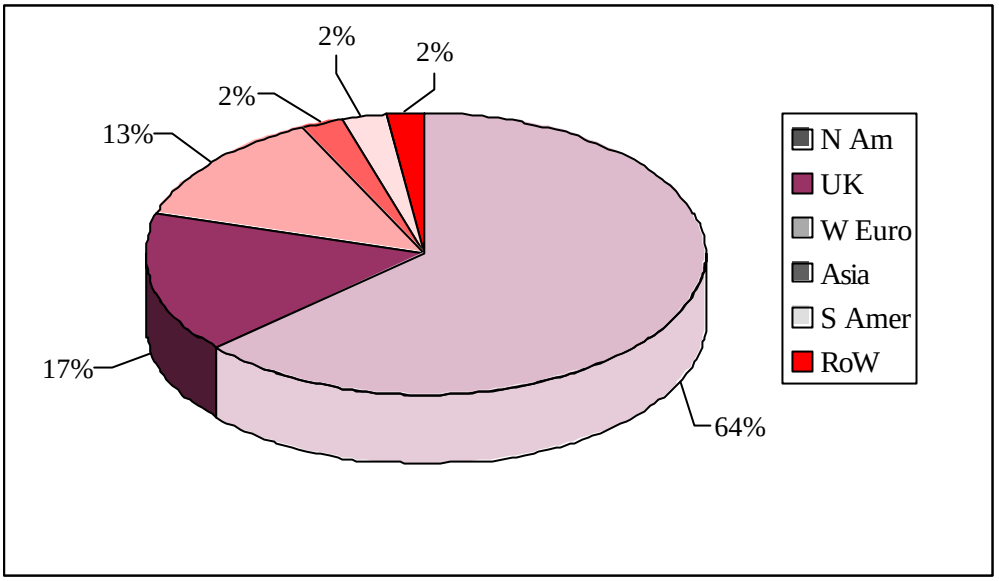
Exhibit B: Regional Distribution



Note: USA excluded.

Exhibit B shows the regional distribution of executive suites globally with the US excluded. As expected, the UK dominates. Within Western Europe, most of the office centers are in the northern and western countries (including France) with far fewer found in the southern and eastern countries. The UK, North West European and Canada make up 78% of all centers recorded on the database. When the US executive suites are included, as illustrated in Exhibit C, they dominate the picture.

Exhibit C, Regional Distribution Including USA



A3 City-level Distribution

Although there are 416 towns and cities in the database, the distribution of office business centers is highly concentrated which is similar to the US database. The ten locations with the largest number of centers contain over a quarter of all the executive suite centers recorded. Fifty percent of the centers are found in 44 locations.

Exhibit D: Executive Suites: Twenty Highest Ranked Cities

City / Town	*Number of Suites*	*% of total*	*Cumulative*
London (UK)	117	10.9%	10.9%
Paris (F)	25	2.3%	13.3%
Vienna (A)	19	1.8%	15.1%
Toronto (Ca)	19	1.8%	16.8%
Manchester (UK)	17	1.6%	18.4%
Frankfurt (D)	16	1.5%	19.9%
Vancouver (Ca)	15	1.4%	21.3%
Mexico City (Mx)	15	1.4%	22.7%
Munich (D)	14	1.3%	24.0%
Bristol (UK)	14	1.3%	25.4%
Hamburg (D)	13	1.2%	26.6%
Tokyo (J)	13	1.2%	27.8%
Singapore (Si)	13	1.2%	29.0%
Brussels (Bel)	12	1.1%	30.1%
Sao Paulo (Brz)	12	1.1%	31.2%
Berlin (D)	12	1.1%	32.4%
Sydney (Aus)	11	1.0%	33.4%

Dusseldorf (D)	11	1.0%	34.4%
Birmingham (UK)	11	1.0%	35.5%
Madrid (E)	10	0.9%	36.4%

Examining Exhibit D, certain patterns can be discerned. As might be expected, the majority of the cities with high numbers of executive suite centers are large, million cities in developed economies. Half of the top twenty cities are international or regional financial centers, confirming the link between financial and business service employment and presence of executive suites found in the US analysis. London's 117 centers ranks first in the world: there is not a US MSA that has as many centers as this. London is a global city, one of the three largest international financial centers and has a property market characterized by very long leases creating a considerable demand for the fully-serviced flexible format. This demand helped sustain a number of major suppliers who have now become international providers. Nine of the top twenty are capital cities, eleven are the largest cities in their country but only four are primate cities.

Modeling the distribution at a global scale is extremely difficult given the incompatibility of data and marked economic, cultural and political situations. A preliminary attempt utilized as explanatory variables population of the urban agglomeration and a set of dummy variables: (a) located in developed economy; (b) located in UK; (c) international financial center; (d) capital city. The model results detailed in Exhibit E has all coefficients significant and correctly signed but an adjusted R-squared of just 28%:

Exhibit E: Model of the Global Distribution of Suites

Suites = -2.55 + 0.75 Pop + 3.73 DevEcon + 2.39 UK + 12.10 IFC + 3.61CapCity
(-1.98) (3.32) (2.80) (2.28) (6.50) (2.61)

Figures in brackets are t-statistics, n = 250, adjusted R^2 = 0.283, RMSE = 6.89, F = 20.61
Population in millions. All coefficients are significantly different from 0 at 0.05 level and above

Applying a logarithmic transformation to the dependent variable improves the explanatory power with the adjusted R^2 increasing to 36%. The UK dummy ceases to play a significant role in this specification but other variables are significant and correctly signed. Further improvements result from applying a square root transformation to the dependent variable (the same transformation applied in Model G for the US date), producing an adjusted R^2 of 41% as detailed in Exhibit F.

Exhibit F: The Global Distribution of Suites: Square Root Transformation

$Suites^{0.5}$ = 0.73 + 0.11 Pop + 0.57 DevEcon + 0.23 UK + 1.81 IFC + 0.45 CapCity
(5.14) (4.44) (3.88) (2.00) (8.83) (2.97)

Figures in brackets are t-statistics, n = 250, adjusted R^2 = 0.411, RMSE = 0.76, F = 35.75
Population in millions. All coefficients are significantly different from 0 at 0.05 level and above

Although exploratory in nature, these results are promising. The strength and significance of the international financial centers dummy points to the importance of a high level of financial

activity as a source of demand for executive suites and serviced offices. In emerging economies, in most instances the capital city will be the point of entry. Executive suites may be developed to supply the needs of foreign firms seeking to establish a presence in the new market, but unwilling to commit to purchase or commit to a long lease while market conditions are uncertain. The positive UK dummy may reflect the long average lease length or the rapid growth of the sub-sector. A possible refinement might be to include a lease length variable in the analysis. At this point, this research raises more questions than it answers providing a very fruitful area for further research.