The Location of Executive Suites and Business Centers in the United States

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Executive Summary. *In the 1990s, the executive suites market grew rapidly, responding to changing occupational requirements. Business centers provide tenants with fully serviced space and short leases. This provides flexibility but at a considerable premium to conventional rents. This study focuses on the distribution of executive suites and business centers in the United States. The number of centers in a metropolitan statistical area is found to be positively associated with the size of financial and business services employment. However, over a threshold, negative effects set in, dampening the number of centers found. There is an association between economic structure, economic dynamism and the concentration of business centers.*

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Introduction

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 full 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—they can take space, operate with minimal set-up time and, crucially, exit when business needs demand. A considerable premium is paid for this over the conventional office rent in a given market.

In the United States, the sector emerged in the 1960s and 1970s mainly through local sole operators. The sector grew in the 1980s but was badly affected by the national 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 (2000) estimate that there are over 4,000 centers in the U.S., with some 80 million square feet of space and annual revenues of $2.5–$3 billion. Internationally, development of the office business center concept has also been marked, particularly in Europe.

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There are a number of global firms and alliances providing an international network of centers for Class A office space.

The exploratory research in this study focuses on the distribution of business centers that offer executive suites within the U.S. A better understanding of the locational dynamics of the sub-sector will benefit both potential developers and suppliers of such space and investors considering exposure to the business center market. After a brief review of the development of the market and the literature on office location and clustering, the article examines the availability of data, provides basic descriptive statistics of the distribution of executive suites by state and by metropolitan statistical area (MSA) and then attempts to model the distribution using demographic and socio-economic data at the MSA level.

The Development of Executive Office Suites and Business Location

In both the U.S. and United Kingdom, the impact of changing business practices on corporate real estate requirements has been the subject of much research (Gibson and Lizieri, 1999, 2001a; and Manning and Roulac, 2001). This literature suggests that interrelated business factors have changed the ways in which corporations organize their activity. Concentration on core business, outsourcing, more diverse patterns of employment and shorter product life cycles have led to a reevaluation of the way in which space and office services are procured. Forces identified as driving this include globalization, innovation and convergence in information and communications technology, reorganization of the workplace and the drive for flexibility in the production of goods and services. While these trends are not new (*e.g.*, 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 patterns of demand for real estate (*e.g.*, Thrall, 2002), and the way in which that space is managed. Information technology creates new locational freedom. Downsizing, decentralization, home-working and office intensification adversely affect the aggregate level of demand for office space. 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. This favors owner-occupation or a long lease contract. However, such long-term commitments are not appropriate for space that is needed for cyclical expansion, or where there is uncertainty (new market entry or development of new product lines). In this situation, corporations need flexibility, ease of entry and, critically, ease of exit. Furthermore, evidence from the capital markets suggests that holding corporate real estate as a fixed asset is not favorable for shareholders (Nourse, 1994; and Rodriguez and Sirmans, 1996). Firms might thus prefer to outsource their real estate needs and concentrate on using their capital for their core business. As such, some firms—particularly in new business sectors or innovative, volatile industries—may have virtually no core space requirements.

In contrast, peripheral space is acquired when business demand requires—in an expansionary phase, for specific projects or for market entry—and is then eliminated when no longer needed. The emphasis in peripheral space is on flexibility, speed of occupation and ease of exit. It is in this changing environment that the executive suites market has flourished. The executive suite concept provides a combination of office space, business services and amenities as well as managed technology as a combined package. It is well suited for the peripheral requirements of a firm. Additionally, it is well suited for the space needs of smaller innovative 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 needed' basis and, thus, create a virtual presence and business identity in an area (see Gibson and Lizieri, 2000b). Charges for such space are high when measured on a square footage basis but cannot be compared to conventional office rents, given the bundled package of services and the flexibility of entry and exit from the market.

Despite its growth, there is little published research on this real estate sub-sector. In the U.S., the Executive Suites Association has published the findings of a survey (ESA, 2000). They found 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%) to non-U.S. international firms (7%). Survey work in the U.K. by Gibson and Lizieri (2000a, b) produced a similar picture. Forty-one percent of executive suite occupiers were IT companies, 24% were business service firms and 21% financial service firms. The principal activities carried out in the U.K. serviced offices were new business development, marketing new products and client contact/business identity. Therefore, the subsector serves 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 their real estate needs. Those few published studies have neglected locational issues.

At one level, the market might be expected to mirror office-based employment and the same locational dynamics that affect corporate headquarters would also affect the executive suite market. In general office market dynamics, it has been suggested that the U.S. has seen a pattern of deconcentration of headquarters from large metropolitan areas in the Northeast to a more dispersed spatial pattern. For example, Semple and Phipps (1982) suggest a stage model with an "ideal type" endpoint 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 (1984) urban classification] still contained 95% of corporate headquarters. Lyons notes that the engine of change is more new start ups and corporate growth rather than relocation.

Another strand of the office location literature has pointed to grouping of economic activity, linking this phenomenon to the ideas of territorial competition and localized advantage popularized, *inter alia,* by Krugman (1991) and Porter (1998). The "new economic geography" suggests that firms locate in close proximity to benefit from information spillovers, specialist pools of labor and the efficiencies engendered by agglomeration and competition. This suggests a much more clustered distribution of office employment and a more complex pattern of distribution than simple regional shifts and deconcentration might suggest (Holloway and Wheeler, 1991). Shilton and Webb (1992) examine office employment in forty-five cities; their results suggest that analysis of office dynamics must take into account clusters of economic growth sectors. Shilton and Stanley (1999) demonstrate that, at a more micro level, headquarters office location is spatially concentrated and, in many cases, specialized by function.

In considering the location of executive suites and business centers, prior research suggests that the activities that generate demand for short-term, flexible space are likely to be found in the most dynamic sectors of the economy. In turn, the office dynamics literature suggests that this will lead to a clustered, rather than a dispersed pattern of location. Prior expectation is that there will be a concentration of executive suites in MSAs with high proportions of financial and business service employment or high-technology activity. It is these sectors that have experienced recent dynamic but volatile growth and, thus, have the most need for flexibility and bundled 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 the growing regional centers.

Furthermore, as Thrall (2002:137) suggests, "office sub-markets are highly interdependent with . . . geodemographic characteristics." While there will be a scale relationship (that is a correlation between employment level and number of business centers that offer executive suites), there will be relatively higher numbers of centers in MSAs with greater than average concentrations of finance, insurance and real estate (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 a relatively low number of centers.

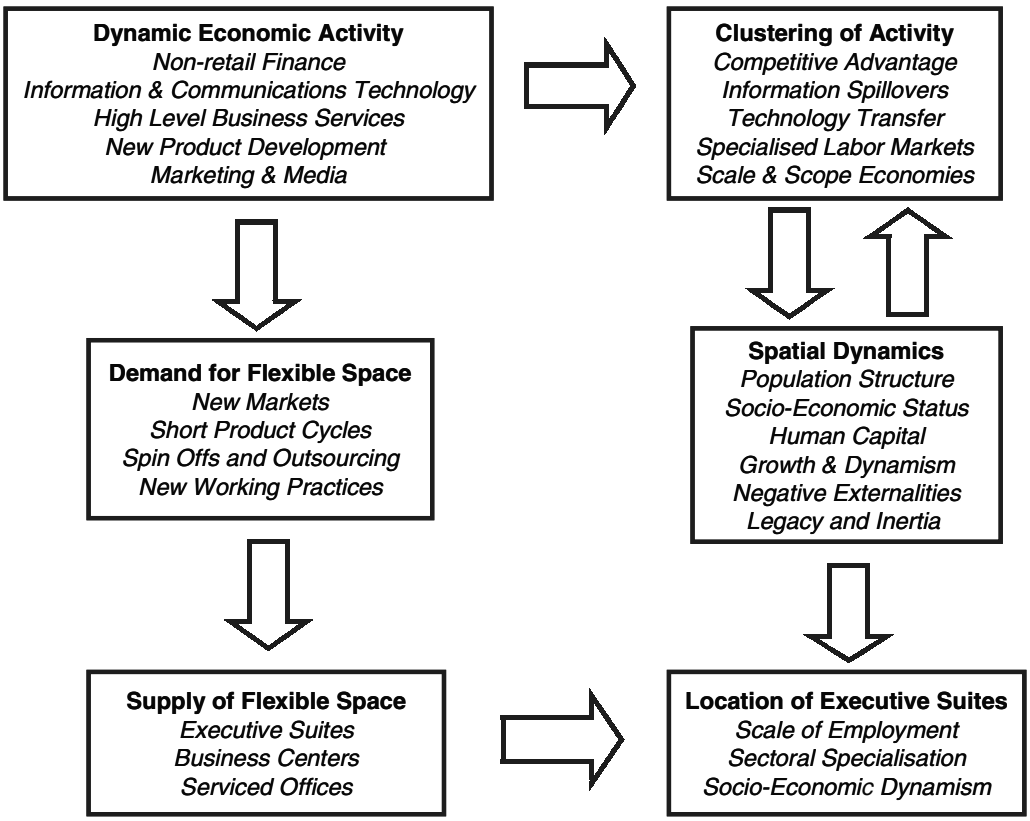
The relationship between size variables and number of centers is also likely to be non-linear, with the largest MSAs—particularly traditional metropolitan areas with high population densities—having fewer centers relative to employment and population levels than smaller, less dense MSAs (thus the expectation is for a negative sign on the CMSA and Million City dummies). This further suggests a hypothesis that for a given socioeconomic level "new growth" areas in the South and West are likely to have a higher number of business centers with the Northeastern seaboard perhaps having a relatively lower concentration of the centers. Exhibit 1 summarizes this basic conceptual model.

Data

Data collection corresponding to this broad model took place in the last quarter of 2000. The locations of U.S. business centers with office suites were drawn from online business space directories.[2] 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 MSAs, with 1,459 centers coded to MSAs.

Socioeconomic data on the MSAs were collected from a number of sources. Employment and unemployment variables included the total number of individuals employed, total number of establishments and employment by economic sector. The service sectors were further subdivided to isolate FIRE, business services, legal services, engineering and management services and other services.[3] The establishment data were split into large and small establishments with the larger

Exhibit 1
A Model of the Location of Executive Suites



establishments having a minimum of 1,000 employees. Population data gave population totals and population change between 1990 and 1996.[4] Further variables for MSAs included change in employment and unemployment rates; house prices and house price changes;[5] wage levels and wages relative to the U.S. 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.[6]

In addition to these data, a number of geographical and urban variables were generated. These included: dummy variables for the NCREIF regions; U.S. 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.

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 2, a quarter of the 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 (52.1%) of the 309 MSAs have no recorded executive suites.

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.[7] The location quotient for population shows twelve MSAs with LQs greater than 2.5. Seven of these have populations in excess of one 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 using location quotients based on total employment are nearly identical to those based on population. It was anticipated that FBS 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 3, the same set of MSAs with large LQs appears. For those MSAs over one million in population, 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).

Exhibit 2
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 D.C.	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

Exhibit 3
Financial and Business Service Location Quotients (LQ)

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 4 shows 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 employment (calculating employment location quotients), the District of Columbia had a very high degree of overrepresentation 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 have LQs below 0.50. These are predominantly smaller states in the Old South or Midwest.

Regression Models

Given this basic distribution of office business centers, this section attempts to model the distribution of business centers using a regression-based approach. Since this is exploratory work, the alternative specifications of a model of distribution are reviewed, rather than presenting a single "best" model. First, a very basic model is examined that relates the number of office business centers to the size of the MSA and then this basic model is augmented by including other variables that characterize and classify the MSA including geographical variables.[8] A number of data transformations are also used to improve the explanatory power of the model and to reduce any problems associated with the distributional form of the variables.

Model A1 attempts to explain the distribution of business centers that offer executive suites largely in terms of FBS employment. This acts as a scaling factor for the size of the MSA and also for the density of FIRE and business service activity. It provides superior explanatory power to other scale

Exhibit 4
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

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 5 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 6 column 2 by the negative coefficient on the Million City dummy variable. As expected, employment growth is positively associated with number of business centers, as is the 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 only significant at the 10% level but inclusion improves diagnostics.

The model seems stable for different sub-samples. However, there is a small number of MSAs with large residuals. Atlanta, Dallas, Denver, Houston and Orange County have substantially more executive suites than predicted, while Philadelphia and (to a lesser extent) Tampa and Boston have considerably fewer centers than predicted by the model. These observations affect stability and residual tests (for example, the Jarque-Bera normality test is rejected given high positive kurtosis). Since there is some evidence of heteroscedasticity (with variance linked to the size variables), White heteroscedasticity consistent standard errors are reported throughout.

The large number of MSAs with no business centers is a cause for concern. Accordingly, Model A2 (Exhibit 6, column 3) 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.

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 a Principal Components Analysis (PCA). The first model created separate components for economic growth and employment structure to provide a cleaner component solution. The second combined the variables into a single component model to ensure orthogonality.[9]

Exhibit 5
Model A: Impact of Employment on Number of Suites

Exhibit 6
Regression Models

Model	A1	A2	B	C	D
Dependent Variable	N Suites	N Suites	N Suites	N Suites	N Suites
Constant	−10.781 −4.041***	−19.696 −3.296***	−2.154 −4.281****	−2.129 −4.675****	5.076 12.251****
FBS Employment	0.143 6.201****	0.150 10.120****	0.156 15.129***	0.154 14.809****	
FBS Employment^2	−6.99E-5 −2.982***	−7.61E-5 −4.692****	−8.05E-5 −7.294****	−7.81E-5 −7.053****	
Employment Change	64.987 2.916***	111.212 1.566			
Inbound Migration	15.756 3.308***	30.974 2.281***			
PCA Growth Component			1.881 5.296****		
PCA FBS Component			−1.236 −2.808***		
PCA2 Growth Component				1.637 4.906****	
PCA2 FBS Component				−0.951 −2.169**	
PCA3 Size Factor					10.000 10.079****
PCA3 Growth Factor					1.449 2.196**
PCA3 FBS Factor					3.064 7.749****
PCA3 Indust Structure					−1.177 −3.792***
Million City Dummy	−3.417 −2.122**	−4.396 −2.160**	−3.698 −2.808***	−3.488 −2.609***	
New England Census Region	−3.050 −1.749*	−5.554 −1.600*			
North East Dummy					−2.374 −2.490**
Adj. R^2	0.780	0.757	0.784	0.784	0.717
F-Statistic	180.86****	77.146****	224.88****	225.10****	156.87
Standard Error	5.580	8.189	5.797	5.794	6.64
Akaike Info Criterion	6.403	7.089	6.372	6.371	6.644
Schwartz Info Criterion	6.488	7.231	6.444	6.443	6.716
Log Likelihood	−982.34	−517.623	−978.43	−978.31	−1020.47
Sample Size	309	159	309	309	309

Notes: The dependent variable is Number of Business Centers. White heteroscedasticity consistent standard errors and covariances used. Independent variables: First row shows coefficient, second row *t*-Statistic.

* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.
**** Significant at the 0.1% level.

The separate growth analysis applied PCA to variables for unemployment change; employment growth (over four- and ten-year periods); the inbound migration variable; population change 1996–2000; and the economic strength indicator. Two principal components with eigenvalues greater than one explained 62% of the variation and were retained and rotated.[10] 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.[11]

In similar fashion, the employment structure model took non-scale employment variables: the percentage employment in FIRE, business services, primary and manufacturing industries, transport and utilities, wholesaling, retail and other services, along with the proportion of large firms and other indicators of establishment structure. The rotated solution showed that component one is a financial and business services factor (with high loadings on FIRE and business services employment and negative loadings on primary and manufacturing, retail and other services employment). The component explains 32% of the variation in the data.

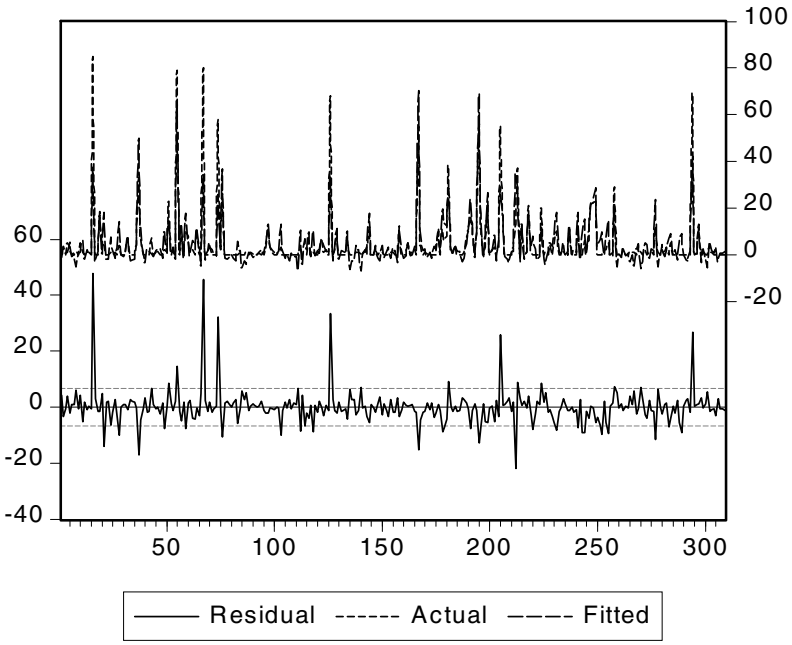
The second component contrasted primary, manufacturing and wholesale employment to retail and other services employment. The third component has strong loadings on transport, utilities and wholesale employment. The final factor is hard to interpret, but tentatively identifies those MSAs with high proportions 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 as Exhibit 6, column 4. 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 overspecialization. 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.[12]

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. The first component was an FBS employment dimension, the second component a growth dimension and the third contrasted manufacturing and retail employment. As before, the growth and FBS components had explanatory power in relation to the number of executive suites and are used in analysis. As a result, Model C (Exhibit 6, column 5) is nearly identical to Model B with minimal improvement in diagnostics and the same set of MSAs with large residuals.

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 and numbers of establishments), change (employment and population growth, house price change and migration indicators) and employment structure were included in a single principal components analysis. Five components explained 69% of the variation in the data. 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.

Exhibit 7
Residuals from Model D



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 6, column 6, Model D has favorable characteristics—the sign on the FBS component is positive, fitting 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 joins the previous five MSAs with an "excess" number of executive suites).

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 of the dataset. 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 does improve the diagnostics of the multiple regression equation and reduces the extreme nature of outlying residuals that are seen in Exhibit 7. As a result, residual tests of heteroscedasticity are improved by comparison to the regressions using the untransformed executive suites variable as the dependent variable. Nonetheless, White standard errors are reported for consistency.

Model E (Exhibit 8, column 2) 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

Exhibit 8
Regression Models

Model	E	F	G
Dependent Variable	Suites$^{0.5}$	Suites$^{0.5}$	Suites$^{0.5}$
Constant	1.421 23.588****	−0.033 −0.477	−1.476 −2.288**
FBS Employment			2.35E-5 15.137****
FBS Employment^2			−1.61E-10 −9.472****
N of Establishments		8.64E-5 15.458****	
N of Establishments^2		−2.23E-10 −9.512****	
PCA3 Size Factor	1.963 16.472****		
PCA3 Size Factor^2	−0.131 −6.207****		
PCA3 Growth Factor	0.181 3.592***	0.198 4.171****	0.183 3.838***
PCA3 FBS Factor	0.765 17.991****	0.183 4.090****	
PCA3 Industrial Structure	−0.263 −1.906*	−0.143 −4.139****	
Population Age Structure			5.665 2.444**
CMSA Dummy	−0.410 −2.971***	−0.280 −2.316**	−0.267 −2.354**
North East Dummy	−0.420 −2.854***		
Adj. R^2	0.814	0.843	0.847
F-Statistic	193.00****	277.56****	340.989
Standard Error	0.783	0.718	0.710
Akaike Info Criterion	2.375	2.197	2.174
Schwartz Info Criterion	2.472	2.282	2.246
Log Likelihood	−358.95	−332.47	−329.83

Notes: Square root of # of centers is the dependent variable. Sample size is 309. White heteroscedasticity consistent standard errors and covariances used.

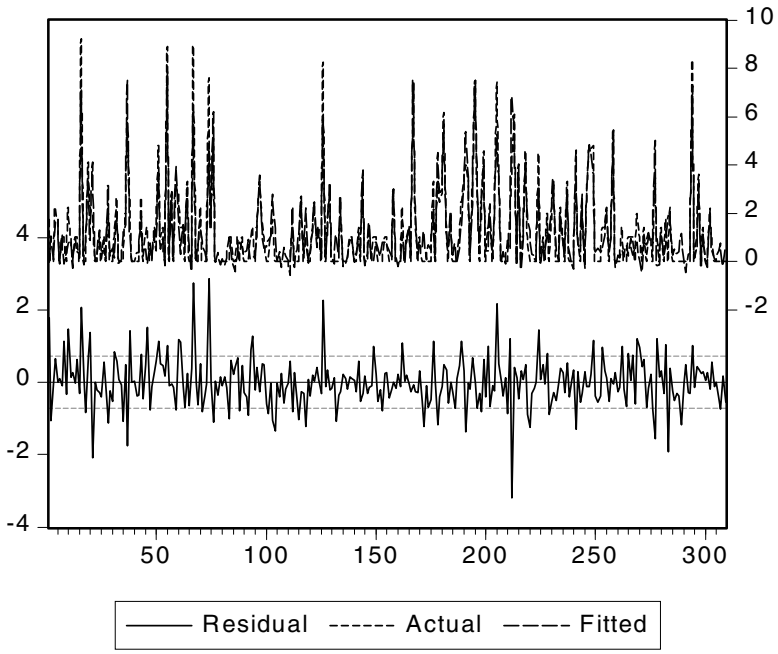
Independent variables: First row shows coefficient, Second row *t*-Statistic.

* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.
**** Significant at the 0.1% level.

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.

Comparing Model E with Model D, the diagnostics have improved considerably.[13] Examining the residuals, the absolute magnitude of the extreme residuals (after accounting for the square root transformation) is greatly reduced compared to previous models. However, the MSAs with high positive residuals are the same as in earlier models: Denver,

Exhibit 9
Residuals from Model F



Houston, Dallas, Atlanta and Orange County. Philadelphia is, once again, the MSA with the largest negative residual.

Model diagnostics are marginally improved by substituting a direct size of MSA variable for the principal components size factor. Model F (Exhibit 8, column 3) 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 9 shows Model F's residuals, showing that most are insignificant, with a small number of significant outliers.

The final model, detailed in Exhibit 8, column 4, seeks to explain the distribution of business centers using FBS employment as the scale/size variable (once again, this has a non-linear effect with diminishing returns setting in). Using FBS means that the 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 have high negative residuals. There is also some evidence of multicollinearity with population age and FBS employment having a positive correlation of 0.38.

Conclusion

The different models, summarized in Exhibit 10, present a picture of a relatively stable distribution

Exhibit 10
Summary of Business Center Distribution Models

Model	Dependant Variable	Independent Variables	Adj. R^2	*F*-Statistic
A1	# of Business Centers	FBS Employment**** FBS Employment^2*** Million City Dummy** Employment Change*** Inbound Migration*** New England Census Region*	.780	180.857****
B	# of Business Centers	FBS Employment**** FBS Employment Squared*** Million City Dummy** PCA Growth Component**** PCA FBS Component***	.784	224.88****
C	# of Business Centers	FBS Employment**** FBS Employment^2**** Million City Dummy*** PCA2 Growth Component**** PCA2 FBS Component**	.784	225.10****
D	# of Business Centers	PCA3 Size Factor**** PCA3 Growth Factor*** PCA3 FBS Factor**** PCA3 Industrial Structure**** NE Region Dummy**	.717	156.87****
E	Square Root of # of Centers	No. of Establishments**** No. of Establishments^2**** PCA3 Growth Factor**** PCA3 FBS Factor**** PCA3 Industrial Structure**** CSMA Dummy**	.814	193.00****
F	Square Root of # of Centers	PCA3 Size Factor**** PCA3 Size Factor^2**** PCA3 Growth Factor**** PCA3 FBS Factor**** PCA3 Industrial Structure**** NE Region Dummy*** CSMA Dummy***	.843	277.56****
G	Square Root of # of Centers	FBS Employment**** FBS Employment^2**** PCA3 Growth Factor**** Population Age Structure** CSMA Dummy**	.847	340.989****

Notes:
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.
**** Significant at the 0.1% level.

of business centers that offer executive suites. The number of centers in an MSA is positively associated with size—particularly the size of FSB 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, although 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 although diminishing returns and diseconomies of scale affect 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, are linked to larger numbers of executive suites. This is consistent with much of the prior research on the clustering of economic activity and office dynamics.

A number of MSAs have considerably more office business centers than predicted by the model (Denver, Houston and 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 and, therefore, might be favorable areas for investment? Alternatively, do these areas have "excess" suites such that supply-side saturation has been reached? If this is 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 between MSAs but more work needs to be done to understand the implications of these differences for investors.

There are many possible extensions to this initial study. One would be to develop a more sensitive and complete set of variables capturing supply of space. The executive suites data collected so far does not distinguish age, size or quality of building. Initial investigation suggests that this would be a major data gathering exercise, since detailed information on each office business center is highly variable, changes frequently and is often missing.

It would be valuable to refine the explanatory data set. A number of the sectoral employment variables may be too crude to capture the dynamics of the market. FBS employment includes both high level business activity that benefits from agglomeration and information economies confined largely to international and regional financial centers as well as the more basic low added value business finance (such as settlement activity) that is increasingly being decentralized to lower cost locations. It also involves 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. Similarly, an employment variable that picked up B2B 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 executive suite space.

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 rapidly 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. Another possibility is that the executive suite market is still evolving from a "pioneer" phase where development has been 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 dummy variables. Thus, spatial autocorrelation may influence the results.

This introduces yet another dimension: time. First, it would be valuable to look at the expansion of the executive suites sector over time as well as space. This, too, would be a major data gathering exercise since there is little public information on the dates 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 happening significantly faster in the executive suite market. In the U.K. 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 has occurred in the U.S. 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.[14] Nonetheless, the sector is likely to continue its expansion in the future, given the advantages presented to particular types of business activity. This article has made 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.

Endnotes

1. The peripheral workforce consists of individuals that have been put on part-time and short-term contracts. These would include consultants, sub-contractors and others with no permanent long-term commitment to the company. Firms expand and contract their peripheral workforce according to their business needs and the economic environment. The creation of a peripheral workforce, as with outsourcing, takes risk away from the firm onto its contractors.
2. Particular use was made of the business center search facility at www.esuite.com and the website of the Executive Suites Association (now renamed the Office Business Center Association International (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. 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.
3. Bureau of Labor Statistics.
4. U.S. Census Bureau.
5. Freddie Mac data.
6. Provided by United Guaranty, a national private mortgage insurance company in the U.S.
7. 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 U.S.)/(Population in MSA/Population in U.S.). 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 the population in a given MSA.
8. As a first step, correlation matrices were examined to investigate the relationship between the number of centers in an MSA and the socioeconomic 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 relationships 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. In addition, some consideration was given to the possibility of spatial autocorrelation. However, given the aggregation of data into MSA units, it was felt that there was little effect that could be interpreted meaningfully at that level.
9. In practice, the two approaches produced nearly identical results. The combined factors 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.
10. All factor rotations used the Varimax procedure.
11. The final component in a rotation tends to act as a "clean-up" variable for remaining variation.
12. 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.
13. The model appears to be stable. Re-running the regression excluding those MSAs without office business centers produces a nearly 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. The residuals fail the Jarque-Bera normality test due, largely, to kurtosis, but the distributional form is much less extreme.

14. 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, although they have subsequently recovered somewhat.

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