Federal Reserve Bank of Chicago

Spatial Organization of Firms

Kristin Aarland, James Davis,
J. Vernon Henderson and Yukako Ono

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- The decision to split production and administration -

Kristin Aarland
Brown University

James Davis
US Census Bureau

J. Vernon Henderson
Brown University

Yukako Ono
Federal Reserve Bank of Chicago

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Abstract

A firm's production activities are often supported by non-production activities. Among these activities are administrative units including headquarters, which process information both within and between firms. Often firms physically separate such administrative units from their production activities and create stand alone Central Administrative Offices (CAO). However, having its activities in multiple locations potentially imposes significant internal firm face-to-face communication costs. What types of firms are more likely to separate out such functions? If firms do separate administration and production, where do they place CAOs and why? How often do firms open and close, or relocate CAOs? This paper documents such firms' decisions on their spatial organization by using micro-level data from the U.S. Census Bureau.

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1. Introduction

Firms' production activities are supported by various non-production activities such as management, marketing and administration. Such administrative and management activities play crucial roles including coordinating and monitoring production and purchasing services. While such administrative functions can be in principle performed at the same site where production takes place, many firms separate out such functions in favor of stand alone Central Administrative Offices (CAO) that include Headquarters (HQ) offices. Administration, when separated from production activities, can incur significant communications costs to overcome the loss of face-to-face interaction. Given this, why do firms separate central administration from production? What firm characteristics are associated with this decision? Some guidance can be found in the literature of industrial organization, corporate culture, and urban economics (e.g. Aghion and Tirole, 1997; Cremer, 1995; Davis and Henderson 2003; Duranton and Puga, 2002; Eccles, 1998; Lovely, Rosenthal, and Sharma, 2002; etc.).

While the literature on industrial organization and corporate culture does not address physical separation per se, several papers hint that there are potential managerial advantages in just separating the monitoring or evaluation authority from production plants. For example, in the theoretical work in Cremer (1995), under some conditions, a firm may choose optimally a lower level of monitoring ability, since a more accurate technology reduces the agent's incentive to work to signal high ability. Similar arguments can also be found in Aghion and Tirole (1997). In the context of spatial organization of firm, a firm's choice of lower level monitoring technology could be reflected in its decision to physically separate administration from production.

Another insight can be found in Eccles (1985), which discusses the idea that suspicion among plants about unfair treatment of some plants over others can corrupt incentive schemes of the firm. While it is not addressed in Eccles (1995), in the context of firms' spatial organization, the remedy for such a problem could be to physically separate the evaluation authority from all the production plants. Such separation may be particularly important when firms are industrially diverse. For example, suppose a firm has two plants each producing different products. If one plant's site is chosen for a firm's administration as well, the plant whose site was not chosen may suspect that the firm's

prime focus is on the other plant (for marketing or investing in fixed capital assets). Once such suspicion arises, this may discourage the manager of the plant without the administration. As another example, suppose a firm has plants that are geographically dispersed. If plants are geographically far apart, they may have little knowledge about the performance of other plants; this makes it difficult for a plant to see if the evaluation is fair by checking its performance relative to others. In such situation, locating the evaluation authority at a site of one of the plants may incur a risk of increasing the sentiment of unfair treatment. It is also possible that the separation of administration and production for a firm with geographically dispersed plants occurs so administration is placed to be able to reach all plants more equally.

In the literature in urban economics and economic geography, there are several papers that do explicitly examine physical separation. In the earlier literature (Aksoy and Marshall, 1992; Ginzberg, 1977), administrative functions represented by headquarters were viewed as being primarily located in large metro areas such as New York and were viewed as in fact providing the economic base for such cities. As we point out in this paper, such views appear to take rather extreme position about the role of headquarters in some big cities.

However, the modern urban economics literature provides some key insights, which are summarized in the notion of “functional specialization” introduced by Duranton and Puga (2002). Here, a firm may find it advantageous to locate production facilities in smaller (lower cost) and more specialized cities and set up its headquarters and administrative functions in a large diverse metro area with better availability, quality, and diversity of business and financial services. Such business and financial service inputs may be largely non-transportable, since design, purchase, and on-going usage require repeated face-to-face interactions between buyer and seller (Kolko, 1999). By locating a CAO in a large metro area within service concentrations and benefiting from the access to variety of services, a firm may be able to improve its overall productivity (Davis and Henderson, 2003; Ono, 2003).

Moreover, a firm may want a CAO "representative" in large visible markets, in order to help market the firm and hence indirectly the firm's products. Such CAOs might gather information from other CAOs (Davis and Henderson, 2003; Lovely, Rosenthal,

and Sharma, 2001) as well as other types of representatives of other firms about market conditions domestically and internationally.

As described above, the current literature provides some insights about a firm's decision whether to physically integrate or split management and production across multiple locations. However, in the literature there is little known about the actual patterns of such spatial organization of firms. For example, while people have written about the role of headquarters in cities such as New York, relatively little is known about which firms have headquarters or other managerial and administrative offices, where they are located, what they do in cities, whether such offices are more permanent versus fluid in location choices, and the like.

The goal of this paper is to document some stylized facts as a baseline for future theoretical and empirical work,[1] by presenting a variety of evidence on the nature and roles of CAOs. CAOs play a significant role in US economy, accounting for about 2.5 million workers. However, such offices are created only by less than 5 % of US firms and these firms, as we will show, are very large. One key issue explored in this paper is among bigger firms, what firm characteristics and organization determine whether a firm has a CAO or not. A second issue concerns whether the notion of functional specialization as Duranton and Puga (2002) appears in the data. Do CAOs outsource and if so how important is that role? Is outsourcing just a substitute for activities that were performed in-house, or is there any evidence to suggest that in-house and outsourced activity complement to each other? Moreover, in terms of physical separation, CAOs are divided into those which are located next or near to production units and those which are not collocated with any production units. We will explore what firm characteristics and spatial structures are associated with a firm's decision to collocate their CAOs or not. Given plants are dispersed and many CAOs are collocated with plants, one could also expect a high degree of spatial dispersion of CAOs. We will examine the extent of spatial dispersion versus the extent of clustering of CAOs in major metro areas such as New

[1] The prototype we have described best fits manufacturing firms. However, it also applies well to retail firms, in which CAOs of a department store chain coordinate the functions of the "production facilities" spread over many small and large metro areas and purchase intermediate service inputs for the firm. A similar comment applies to the financial and banking sectors.

York and Chicago, and ask whether NY represents a "corporate control" center as envisioned by Ginzberg (1977).

Finally, we turn to the topic of turnover – opening and closings – of CAOs, to see to what extent firms adjust the location of their administrative offices over time. Because CAOs support firms' production activities, firms may change CAO locations to accommodate various changes in their production activity. It is also possible that a firm adjusts CAO locations based on its experience, as it learns the optimal spatial organization as a whole and locations that are suitable or not suitable in which to locate administrative functions.

We will examine whether the rates and patterns of CAO turnovers are any different from those for production plants, by comparing our finding with Dunne, Roberts, and Samuelson (1988). As we show, CAOs are set up by large firms; thus we might expect set-up decisions to have a high degree of persistence. On the other hand, CAOs require low fixed capital and are potentially easier to relocate. Is there a suggestion in the data that firms experiment with CAO locations, for example, to find the best outsourcing places?

Below, we start with describing the details of the data and several stylized facts regarding CAO establishments and their firms. Then we turn to a more detailed examination of the questions and issues posed above.

2. Data and Overview

The main data sets we use in this paper are micro-level data from the Auxiliary Establishment Surveys (AES) and the Standard Statistical Establishments Lists (SSEL) compiled and organized by the U.S. Census Bureau. The AES is a census containing the CAO information while the SSEL is the list of all private establishments in the USA containing basic information such as location, industry, and total employment. Since the SSEL also provides the identifier of a firm with which each establishment is affiliated, the SSEL can be used to construct firm level characteristics. Such information can be linked to CAOs again using the firm identifier. We identify by firm the main production

activity (industry), degree of industrial diversification, geographical relationship among production facilities and CAOs, the location where the main production activity is performed, and so forth.

CAO as a part of auxiliary establishments

The AES is performed every five years, to capture the activity of all auxiliaries of firms. Auxiliaries are establishments that do not perform production or transaction activities but manage, service, or support the activities of, and are physically separate from, other establishments in the firm.[2] Micro-level data are available in five-year intervals starting from 1977.

Auxiliary establishments are classified by type such as central administration, R&D, computer data processing, communications, central warehouses, and trucking. While the survey scheme changes somewhat over time, in general, it asks for each establishment, both its function and the employment by several functions. Since the question regarding auxiliaries' function was not asked in 1977 and since that item was subject to missing and incomplete responses in 1992, until 1997, we define a CAO as an establishment for which the joint category of management, administrative and clerical employees dominates each of the other employment categories. In 1997, however, the micro data set contains missing variables for employment but not for function. Thus, for 1997, we base our definition on the question regarding the main function reported by each auxiliary establishment. The classification of auxiliary establishment is shown in Table 1 for 1997. CAOs represent by far the largest category with 72.9% of the data. Note that we did not include as CAOs 4% of establishments in the data, which are highly specialized and engaged in only one function such as accounting, legal, advertising, or personnel. Rather we study CAOs, which, in addition to such functions, play a role of monitoring, evaluating, and coordinating other production units. Other major categories reported by auxiliaries are warehousing, trucking, and repair (13.9%). R&D and data processing together only account for 3% of auxiliaries.

[2] Sales offices are not considered as auxiliary establishments in the Census. They are categorized in wholesale sector and covered under the Census of Wholesale Trade.

CAO and firm size

Table 2 provides a basic view of firms that have CAOs in 1997. Excluded entirely from Table 2 are about 5.1 million single establishment firms employing 44.3 million workers (Census (2001b)). This leaves us 167,126 multi-establishment firms employing 58.5 million workers in 1997; these are the largest and generally older firms in the country. Of these multi-establishment firms, firms that have any type of auxiliary establishments are only 20,635 firms; this accounts for only 12.3% of multi-establishment firms. However, in terms of employment, firms with auxiliaries account for 65.4% of the employment of multi-establishment firms, employing, on average, 13.4 times the employment and having 8.5 times as many production plants as a multi-establishment firms without auxiliaries. Auxiliary establishments are there to service production activities of very large firms. As we can see in Column 3, most firms with auxiliaries have at least one CAO.

The last column looks at what might be called "conglomerates," firms that have plants in more than one industry, and auxiliaries serving more than one industry's production activities.[3] These are 714 giant firms averaging over 13,580 employees each. In such a conglomerate firm, the average number of CAO per plant (.126) is lower than for all firms generally; however, each CAO of such conglomerate firms is much larger than the average size of CAOs. Conglomerates have bigger CAOs, each of which services more plants.

CAO and kinds of production activities (industries) supported

What kinds of production activities require firms to have stand-alone CAOs? Table 3 presents a breakdown of industry activities that CAOs support. As we can see, production activities that CAOs service seem to be concentrated in certain industries. In 1997 about 44% of CAOs and 33% of CAO employment are affiliated with retailing activities, and about 21% of CAOs and 39% of CAO employment support manufacturing activities. Together, manufacturing and retailing account for 65% in terms of CAOs

[3] The industry of a plant is defined by its one digit SIC (see Table 4). Auxiliaries report the predominant SIC of the within firm plants they serve. In cases of firms with multiple auxiliaries, we define as serving more than one industry the cases where at least two auxiliaries serve different 1-digit SIC industries.

counts and 73% in terms of CAO employment, to be compared to their 44.2 % share of national private employment. CAOs are thus heavily associated with manufacturing and retailing, and the CAOs supporting manufacturing activities are much larger than CAOs supporting other activities.

However, the activities relying on CAOs have changed over time. First, while the average employment size of a CAO (in contrast to production units) has risen over time in all industries, it has doubled for construction, business services, and other services. In terms of the number of CAOs, the fastest growing CAO sector between 1977 and 1997 is personal services.[4] In particular, in industries such as SIC 83 (residential living, job training, and day care), there are no CAOs in 1977 but almost 1,300 in 1997. This may be a move from "mom and pop" operations to conglomerate production, with resulting development of CAOs.

Finally, as columns 7 and 8 of Table 3 show, the growth of a given industry is not necessarily accompanied by a commensurate increase in the number of CAOs supporting the activity, suggesting heterogeneity across industries from an organizational perspective in both the spatial configuration and roles performed by CAOs in relation to the rest of the firm.

3. The Role of CAOs in Outsourcing

As noted in the introduction, the urban economics literature discusses the notion of the "functional specialization" with the idea that a primary role of CAOs is to outsource, or to purchase business and financial services for their production units. Here, we examine the extent of outsourcing. While in our data, the purchases of financial services are not "observed," (they are typically reflected in loan rates and contract terms, which are not available in our data), there is in the data information on some outsourced business services. The AES asks auxiliaries for their expenditures on services such as legal and accounting in 1992, and also advertising services in 1997. In Table 4, we report propensities to outsource for auxiliary establishments and CAOs, excluding those who we

[4] Some transport and all utilities, FIRE, and communications were out of scope in 1977 but are included today.

suspect are not responding to the questions regarding outsourcing (for more details, see the footnote under Table 4).

As one can see, in 1997, the outsourcing propensities of CAOs range from .55 to .64, and in both years, CAOs have greater outsourcing rates than all auxiliary establishments. This supports the idea that CAOs have a key outsourcing role as suggested in Duranton and Puga (2002). Moreover, our calculation based on data available in 1992 suggests this role is greater for CAOs that also identify as headquarters. For 1992, the questionnaire asks whether an establishment is a corporate headquarters, executive office or head office for the entire enterprise, although the questionnaire does not really define what is a headquarters. As the table shows, however, CAOs that claim to be "headquarters" have about 40% higher propensity to outsource than CAOs in general.

In addition, the table shows that outsourcing propensities may be increasing over time. Comparing the numbers between 1992 and 1997 for legal and accounting, we see a rise in propensities, modestly for legal services and substantially for accounting. The technology in intermediary service suppliers, and expertise and confidence in the use of outsourcing could be improving, although greater use in 1997 could also reflect recovery from the recession that occurred earlier in the decade.

In Table 5, for CAOs that report outsourcing in 1997, we report expenditures on outsourcing as a fraction of their wage bill. Expenditure rates differ considerably across the services, reflecting both the importance of the intermediate input in production and the extent of in-house versus outsourced activity. Overall, expenditures on accounting outsourced are equal to 13.4% of CAO wage bills and for legal it is 15.2 %, while advertising is a huge 36.6%. Advertising is the big-ticket item that must draw CAOs to cities offering high quality, diverse advertising firms. Not surprisingly advertising is more important for CAOs supporting retailing, compared to that supporting manufacturing. Outsourcing of advertising for retail CAOs is 59.5% of CAO wage bills, while it is 24.4% for manufacturing.[5] Given the extent of service outsourced and the need

[5] An upper limit would be to look at the relative expenditures by Auxiliary establishments which outsource all three functions. A lower limit would be to look at the relative expenditures by auxiliary establishments, which outsource any function. In general, auxiliary establishments are heterogeneous, outsourcing either all 3 functions or none.

for face-to-face interaction in service delivery, co-location with service providers may be important for CAO establishments (see Davis and Henderson, 2003; and Ono, 2003).

In Table 6, we look at the issue of substitution and complementarity between outsourcing and in-housing. Outsourcing a particular function is often viewed as replacing in-house production of that function in the firm. However, Table 6-a indicates that CAOs that outsource a particular function have a 2 to 3 fold higher percentage of employees internally working at that function. A CAO's practice of outsourcing a particular function seems to imply that the CAO itself, as part of monitoring, coordinating, and partnering with suppliers, must have a bigger not smaller in-house unit. In that sense of requiring in-house functions to support any degree of outsourcing, the two complement each other.

We further look at the relationship between the extent of outsourcing and in-house activity, for just CAOs that outsource a particular function. Table 6-b presents the correlation coefficient between the share of employees engaged in a particular function in a CAO and the expense of outsourcing the function represented as a share of CAO wage bills. Interestingly, we see that the correlation is very small, which indicates that beyond a fixed cost of in-house support to have any outsourcing, as outsourcing grows, there is a tension between substitution and complementarity of outsourcing and in-house activity.

4. CAOs and Firm Structure

Above, we have provided an overview of auxiliaries and CAOs, showing that CAOs are predominantly associated with larger manufacturing and retail firms. We examined basic statistics on outsourcing, an important function of CAOs. In this section, we take a closer look first at the firm characteristics that are associated with having a CAO, and then at the extent to which CAOs are physically separated from their production plants.

Why might firms physically separate out administration functions? First as firm activity at one location grows, administrative functions may reach a scale where they can no longer be housed in the plant. Moreover, separation removes administrators from the noise and pollution associated with production. Apart from this basic consideration, as discussed in the introduction, some papers in the literature on corporate governance and

corporate culture hint that there are managerial advantages in just separating the monitoring or evaluation authority from plants. For example, as we mentioned in the introduction, Cremer (1995) suggests that, under some conditions, a firm may choose optimally a lower level of monitoring ability, since a more accurate technology reduces the agent's incentive to work to signal high ability (see also Aghion and Tirole, 1997). In the context of spatial organization, a firm may separate administration from production activities to indicate the choice of lower monitoring technology. It is also possible that not locating firm monitoring authorities with any plants helps remove suspicion among plants about unfair treatment of some plants over others.

These reasons do not suggest that administration need be far removed from production. What are reasons for non-collocation? According to Duranton and Puga (2002) and Davis and Henderson (2003), firms might have incentives to separate their administration from production in order to locate the administrative offices closer to diverse intermediate service suppliers, which are highly concentrated in central cities. The proximity to suppliers facilitates face-to-face communication with suppliers, which is very important in purchasing services.[6]

Note that, as we will show later, of firms that have CAOs, 75% of them have CAOs only in counties where their production facilities are. We define CAOs as being collocated if they are in the same county as production units of the firm. This 75% collocation rate suggests that being close to production facilities is important for firms, although it is very possible that, within the same county, CAOs are located in downtown while production is in less-populated suburbs. In that sense, our definition of collocation in this paper is somewhat crude. However, it is still the case that locating the CAO in the same county does not significantly expand the variety of local intermediate services to which the firms have access.

Finally, we note that firms might locate CAOs away from production units but not necessarily where there are good outsourcing possibilities. As discussed above, firms

[6] Looking at service outsourcing behavior by manufacturing plants, Ono (2003) finds that production plants rely on their CAO for business services when the size of the local service market is large for the CAO and small for the plant.

with geographically dispersed plants, or that are industrially diverse, or larger, may require the authority for monitoring or evaluation to be separated from production, to improve the incentive of agents (plants). Non-collocation may help to enhance the independence of such authorities. However, it is also possible that firms, in order to coordinate production activities, need to locate CAOs centrally to all plants; such location may not necessarily be a large city.

In Table 7, we start by reporting results from a probit analysis examining characteristics associated with firms that have CAOs, compared to those that don't. This exercise is carried out for all firms in the USA with at least one production plant plus one or more other establishments of any kind (plants, sales offices, auxiliaries, retail outlets, etc.). Many of our intuitions are supported by the correlations in Table 7 for continuous variables. Table 7 shows the impacts on the probability of one standard deviation change in the variables; while, for dummy variables, it gives the impact of a switch from zero to one. For these exercises, we set the base probability at .0683, the predicted propensity of a firm with average characteristics (instead of .107, which is the observed propensity to have a CAO among all 167,126 multi-establishment firms).

From the table, we can see that bigger firms are more likely to have CAOs. A one-standard deviation increase in firm employment and in the number of plants raises the base probability by .0587 and .0182 respectively. For the former, this is an 86% increase in the probability, a substantial impact. So, CAOs, as should be clear by now belong to bigger firms, but within bigger firms there is a lot of variation.

First, as mentioned above and in the introduction, if plants of a particular firm are industrially diversified, then it may increase the need to separate an evaluation authority from any plant so as either to better coordinate across diverse activities or to avoid some plants suspecting unfair treatment. For firms with two or more plants we calculate a Hirschman-Herfindahl Index of the degree of plant specialization across industries. This is the sum of squared shares of firm plant employment in the ten different industries. A higher HHI, thus greater industrial specialization, decreases the likelihood for a firm to have CAOs. A one-standard deviation increase in the HHI, or degree of specialization, reduces the probability of having a CAO by .0256, a reduction from the base probability of 37%. Given that we control for the degree of geographical dispersion of production

activity, the statistically significant coefficient of HHI seems to indicate that even non-spatial aspects that characterize firms are important in firms' decisions concerning their spatial organization.

Turning to spatial dispersion, having plants in two or more counties, as opposed to just one county, raises the probability of having a CAO by .0351, a 51.4% increase. Maximal distance between any two counties with plants raises the probability of having a CAO, as does an increase in the (weighted by number of plants in each county) average distance for firms with plants in three or more counties.[7] Firms with more geographically dispersed plants are more likely to have a CAO, possibly to locate administration to a central place to help co-ordinate spatially disparate activities.

Now, we turn to examine an issue addressed in the recent urban economics literature. For firms with plants in two or more counties, we examine the association between the total employment of a county in which a firm has its dominant production activity (in terms of the firm's plant employment at county level), and the propensity for a firm to have a CAO. Based on Duranton and Puga (2002), it is possible that, in bigger counties, more business services are locally available, and therefore there is less need for a firm to establish a separate CAO if its production facilities are already located in a large metro area. The county size at the dominant plant location may also represent the scope of information available as well as the degree of visibility. As shown in the table, the coefficient is not significant, but is negative which is consistent with the story in Duranton and Puga (2002) and Rosenthal et al. (2001). As we discuss later, further evidence that supports this view is found.

Finally, as noted earlier, industry matters. The base case is light manufacturing. Relative to that, wholesale and retail firms are much more likely to have a CAO – the

[7] This is equivalent to calculating all pairwise distances among plants and averaging. The average distance between plants is $\Sigma_i \Sigma_j d_{ij} / n(n-1)$ for all plant pairs i and j within a firm, and d_{ij} is the distance between the centroid of plant i's county and the centroid of plant j's county ($dij=0$ if two plants are located in the same county.). Instead of calculating pairwise distances among all plants and averaging, for computational performance reasons we calculate pairwise distances between counties in which a firm owns plants and take the average weighted by the number of plants in each county, i.e. for all county pairs k and m, [$\Sigma_k \Sigma_m P_k P_m d_{km} / n(n-1)$] where P is the count of the firm's plants in the county.)

base probability rises from .0683 to .1007. Other industries such as construction, transport and utilities, business services, communications and FIRE in particular are much less likely to have a CAO.

There may be a concern that the industry dummies included in our probit analysis only broadly control for industry specific factors that influence a firm's propensity to separate administration. Especially within manufacturing sector, due to the varying degree of noise or unpleasant smell from production process, which would influence the propensity for a firm to separate administration, it would make sense to control for finer industrial categories. Thus, we perform the probit analysis including 2-digit level SIC dummies when the dominant production is manufacturing. The results remained qualitatively the same for all of the key variables.[8]

Note also that, in our sample, firms with only one plant are included only when they have at least one auxiliary establishment or CAO, since otherwise, they are not multi-establishment firms. This would increase the propensity to have a CAO for firms with one plant in our sample and may bias the coefficient of the number of plants downward. Thus, as another robustness check, we perform the same probit analysis by limiting the sample to firms with two or more plants, for which firms are included even if they do not have any auxiliaries. Column (3) in Table 7 shows the result of the probit with the new sample, which turned out to be qualitatively the same as that of probit with all of the multi-establishment firms.

We have also performed Tobit analysis using the number of CAOs as a dependent variable. We found that factors that are positively (negatively) associated with a firm's probability to have CAOs are also positively (negatively) associated with the number of CAOs that a firm has. However, we found that the maximum distance between counties with plants does not have a significant association with the number of CAOs, while it does in the probit. The difficulty in coordination or monitoring resulting from a particular

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[8] As for industry dummies, printing and publishing industries was shown to have a typical propensity of having a CAO among manufacturing industries. Industries that are shown to have greater propensities are petroleum, chemical, primary metal, stone and clay industries, and those which are shown to have lower propensities are furniture and industrial machinery.

plant being far from other plants may be overcome by creating a CAO, but increasing the number of CAOs does not further resolve the issue.

Now, given that firms create CAOs, where do they tend to locate CAOs? When firms create CAOs, they do not necessarily locate them far away from their production facilities. As noted earlier, in our sample of firms with CAOs, only 25% have their CAOs in a county where they do not perform any production activities. The statistic is confounded by the fact that it would be usual for retail or service firms to have an outlet or store in their CAO county, given operating establishments are usually more numerous and smaller in these segments, and spread throughout a region for geographic coverage. However, there are various reasons why firms create CAOs only to locate them close to plants, some of which were discussed above. Thus, we next examine what kind of firms would create CAOs in a county where they do not perform any production activities, hereafter called a non-collocated CAO.

Table 8 presents a probit analysis that examines characteristics associated with firms that have non-collocated CAOs, given the set of firms with CAOs. Here, for firms with any number of CAOs, we ask whether the firm has a non-collocated CAO. We use the same firm characteristics included in Table 7, but add a control for the total number of CAOs since the probability of having any particular type of CAO will increase when firms have more CAOs. We also performed the same probit analysis limiting the sample to firms with only one CAO, asking whether that CAO was co-located or not; these results are qualitatively the same as the ones in Table 8.

As shown in the table, the probability that a firm has at least one non-collocated CAO increases in situations where the firm is industrially diversified and geographically dispersed. Such features may not only make it more necessary to physically separate monitoring and/or evaluation authorities from production activities, but may also require such authorities to be located more independently (thus non-collocated with all production facilities) as the firm structure becomes more complex. Again, it is worth noting that the evidence seems to suggest that the degree of industrial specialization – a non-spatial aspect – influences a firms' spatial organization. As for the geographical dispersion of production activities, one could also interpret the coefficients as indicating that firms search for locations central to all plants.

We find the probability of having a non-collocated CAO increases when the firm has more of them. This could be just statistical, from having more draws on the possibility of non-collocation. However, this may also be due to the heterogeneity in functions that CAOs perform within a firm, as firm size grows. Some CAOs may be collocated to assist a particular plant, while others may be non-collocated in order to gain the access to diverse service available only in large cities.

We find perhaps oddly that the coefficient of the number of plants is not significant while average plant size is negative and significant. Controlling for the number of plants, as the average plant size increases, CAOs seem to be located closer to plants. Big production activities may have some specific needs that require administration to be collocated.

Lastly, we find that the firms whose production is located in larger cities tend to have more collocated CAOs. The coefficient is statistically significant. This is consistent with an outsourcing story where firms that have production facilities in smaller cities and rural areas would construct CAOs where the access to diverse service inputs is easier (Duranton and Puga, 2002). Large cities would also facilitate the access to information (Rosenthal et al., 2001) and improve the visibility of firms. Firms with production facilities in large cities have less need for a non-collocated CAO.

5. CAOs and Their Location

Here we turn to location patterns of CAOs and auxiliaries. Given common perceptions about cities such as New York, one might expect to see CAOs are highly spatially concentrated. However in the previous section, we saw that CAOs also tend to be tied to where their production facilities are. These plants are spatially dispersed and, as we will see, CAOs are somewhat spatially dispersed.

Figure 1 gives the basic picture, in which, for each USA county, we plot the location quotient against the log of county employment for 1997. The location quotient is the ratio of the county's share of national employment in CAOs to its share of national private employment, and indicates whether a county has a high or low concentration of an activity relative to its share of all economic activity. Many of small counties were suppressed in Figure 1 in order to meet the requirement for data disclosure; the figure,

however, reveals that there is vast diversity in the concentration of CAOs even within the counties of similar sizes, based on the distribution of counties that fall above or below a location quotient of one. We expected large counties to have high relative shares of CAOs. Yet we see that many mid-size counties also have high CAO location quotients.

In sum, the patterns indicate possible heterogeneity whereby some CAOs are located in larger urban counties with concentrations of business services, and others co-located near their production plants in smaller counties. As we discussed, there are various organizational and urban economic reasons to collocate or non-collocate CAOs with plants as well as to locate CAOs in large cities or not. The rather unexpected degree of geographical dispersion of CAOs seems to be due to the combination of such factors.

Is the CAO concentration consistent with the traditional view?

Here, we check whether our data support the traditional view that CAOs have very high concentrations in the very largest cities, by focusing on presenting the statistics on New York and Chicago. The traditional view would espouse that, for a city like New York, CAOs are the source of New York's economic life. Table 6 provides a summary of CAO shares of these cities in 1997. The numbers in Table 6 confirm the view that no city, even a New York or Chicago, has a very high share of CAOs. The maximum share of any county in CAO employment is Cook County, which has just 3.02% of the CAOs as compared to its 2.29% share of national employment.

Notice also that the high shares of New York in the business service sector. Compared to New York's 3% share of national CAO employment, New York has very high shares of national security brokers, advertising, legal, accounting, employment agencies, and management and public relations, which are, respectively, 24.5%, 14.7%, 7.24%, 5.10%, 6.22% and 4.25%. While New York may be viewed as a "headquarters" capital, it really is a service capital. Put another way, based on our data, CAOs account for 4% of New York City's employment. A similar size service industry nationally, banking and securities (similar in terms of national sector employment size), accounts for 14% of New York's employment. And advertising, legal and accounting services, whose national employment is about 80% in comparison to national CAO employment, account for 7% of New York's employment. Such service industries are much more concentrated

in New York than CAOs. This suggests CAOs and headquarters to some extent come to New York because of its service sector base, not the other way around.

Chicago's Cook county also has somewhat higher shares in business services, though not as high as Manhattan's. Cook county, also with a 3.02% share of national CAO employment, has shares of national security brokers, advertising, legal, accounting, employment agencies, and management and public relations of 3.13%, 5.77%, 4.09%, 3.39%, 3.98% and 4.60%.

It is also worth noting that the data confirm that New York is a financial CAO capital. While its overall share of CAOs is modest (2.76%), it has a 26% share of 1997 CAOs that support finance, insurance and real estate activities. While the average financial CAO size in New York is small as one can see from the table, it is possible large non-NY financial firms (increasingly) take the view that a presence in New York City is critical and choose to locate a CAO there as a result.[9]

In sum, the table seems to reject a view that headquarters provide the economic base for some big cities (Ginzberg, 1977; Aksoy and Marshall, 1992).

6. Opening and Closing of CAOs

So far, we have examined how a firm's spatial configurations, in the sense of the separation between administration and production activities, vary across firms depending on different firm characteristics. We found that many firm characteristics – both spatial and non-spatial – are important determinants of firms' decision where to locate their administration. Then, does a firm adjust the location of CAOs as its characteristics change over time, and/or as it learns, through the experience, the optimal places for administration or even the spatial organizational style suitable to its own organization?

In this section, we study the events underlying any changes in firms' spatial configurations, by focusing on the patterns of opening and closing of CAOs over time.

[9] Note that we expected a large concentration of CAOs in Delaware as it is well known that many firms incorporate there. We did not find an exceptional concentration there, and confirmed with the Delaware Department of State that firms are not required by law to have a physical presence in the state in order to incorporate there. Firms can incorporate through a retained law firm, and we do observe a large relative concentration of law firms in Wilmington.

Since we have data by Census year, we identify the opening and closing of CAOs every five years by using establishment identifier.

There are two establishment identifiers available in our data sets. One is called the Census File Number (CFN), which contains both a firm identifier and a within firm establishment number. Since it contains the firm identifier, the CFN of a particular establishment changes when the ownership of the establishment changes with mergers and acquisitions. The other is the Permanent Plant Number (PPN), which is an identifier associated with a physical location of the establishment such as a building or office suite.

In previous studies, PPNs have been used to study entry and exit patterns in manufacturing (Dunne et. al., 1988). Manufacturing plants are generally tied to a specific location, given their fixed capital (that is often specific to the production of a particular good). Thus, when there is new PPN, it usually is a new production facility. At the same time, when a PPN disappears, it means the plant was shut down. CAO activities, on the other hand, are not tied to a particular office space, being generally less capital intensive. For example, a CAO when it moves its location from one office to another nearby may be given a different PPN, when there is not change in its basic function, size, and role. Thus, using the PPN to analyze dynamics of CAO activities poses issues. In addition, PPNs were only introduced into the CAO files only from 1987, where CFNs are available from 1977.

For these reasons, we use the CFN identifier to capture the opening and closing of CAOs. We identify an establishment as a new CAO when an establishment first opened as a stand alone administrative office (a new CFN that appears for the first time in the AES file and the new CFN is a CAO).[10] A CAO is identified as closed if it disappears from the data set. Using the CFN allows us to exclude counting local CAO moves within a county as a closing and opening event, since CFN identification numbers, used as a vehicle to track survey forms, are not in practice changed following within county address changes. However, since the CFN of a particular establishment changes following ownership changes, acquired CAOs are counted as new entrants. Below, for years where PPNs are available, we will also attempt to distinguish takeovers from

[10] We do not include as new CAO those auxiliaries that report a switch in function from some other kind of auxiliary to a CAO.

genuine opening and closing. In particular, when the CFN of a particular CAO is changed but the PPN remains the same, we consider the CAO as "acquired (taken over)" by other firm.[11] Note that the range of industries covered in the economic censuses expanded over time. For example, FIRE was covered only from 1992. In order to avoid the influence of such changes in the coverage when capturing the opening and closing of CAOs, we focus on economic activities that are covered consistently between 1977 through 1997.[12]

Table 10 shows the overall opening and closing rates for any five-year period from 1977 to 1997. The opening rate between years *t* and *t+1* is the ratio of the number of CAOs that appeared between years *t* and *t+1* to that of existing (total) CAOs in year *t*. The closing rate between year *t* and *t+1* is the ratio of the number of CAOs that disappeared between *t* and *t+1* to that of the existing CAOs in year *t*.

Both the opening and closing rates are fairly high in any five-year period; the opening rate is between 54% and 61%, while the closing rate is somewhat lower, between 48% and 52%. These rates are much greater than the five-year entry rates of 40-42% and exit rates of 34-39%, calculated for manufacturing plants over the time period 1967-1982 found by Dunne *et al.* (1988).[13] Given that CAOs have in general low fixed capital it may not be surprising to find the turnover of CAOs to be higher than that of manufacturing plants. However considering that these are the decisions of mature firms, a research task would be to identify why firms choose to open, close and presumably relocate their CAOs so frequently.

The CAO turnover pattern is also characterized by an additional feature, reflecting perhaps the fact that these are decisions of mature firms. The employment of both new

[11] Note that, in such a case, it is also possible that a CAO of a completely irrelevant firm by chance occupied the office space previously used for a CAO of a particular company. However, given numerous office spaces available, the probability of such event is marginal.

[12] Excluded from the study of opening and closing of CAOs, are those which support the activity of agriculture, forestry, and fishing ; transportation, communications, electric, gas, and sanitary services; FIRE; health services; educational services; and membership organizations.

[13] Note that in the comparison of our findings with those of Dunne *et al.*, the definition of a firm differs. In this paper we use the legal definition of a firm, and as discussed above, a merger or a buy-out that results in the creation of a new legal entity is counted as an entry, and likewise for exits. This contrasts with the approach of Dunne *et al*., which counts each market a firm operates in as a separate firm.

and closed CAOs are quite large; new CAO employment comprises 35-39% of the total employment of pre-existing CAOs, and closing CAOs represents 28-39% of the overall CAO employment. This is again a contrasting feature to that of entry and exit of manufacturing plants, for which the size of entrants and exits are quite small. The output market shares calculated by Dunne *et al.* are 14-19% for entering plants and 15-19% for exiting plants. In another view, closing CAOs are on average 39-60% of the size of staying CAOs, with an increasing trend over time. In comparison, the exiting plants in Dunne *et al*. produce 31-37% of the output of the staying plant. Similarly, new CAOs in any five-year period have on average 48-56% of the employment of a pre-existing CAO, while the entering production plants in Dunne *et al*. on average produce 28-36% of the output of an incumbent plant. As noted above, the openings and closings of CAOs are conducted by mature firms, so the large employment shares of entering and exiting CAOs may not be surprising.[14] Again one can make the argument that the CAOs with their low fixed capital requirements are more malleable, which makes the closing of large supporting offices relatively easier than for manufacturing plants.

While we observe high turnover of CAOs, it is useful to consider how much of the CAO turnover is the result of firm entry and exit. In Table 11, we distinguish between the opening of CAOs by existing firms from those of new firms. We see that around 80% of new CAOs are set up by existing firms (Table 11 (1) a). We further attempt to break out how much of the opening of CAOs is due to ownership changes for pre-existing CAOs. As one can see, most new CAOs are those which are newly created (Table 11 (1) a-1). The observed high turnover rates of CAOs are not due to the ownership changes.

Now, let us look at the size of new CAOs, distinguishing between those which are opened by existing firms and those which are opened by new firms. In Table 11 (2), we calculate the relative size of new CAOs as compared to the pre-existing CAOs. We can see that the size of new CAOs of existing firms is bigger than those created when new firms start. It is possible that existing firms are generally larger than new firms and thus require larger CAOs. However, it is also possible that existing firms are more confident

[14] We also use employment as our size measure as opposed to production volume, since a supporting office such as a CAO does not produce a good per se.

in the success of a new CAO based on their experience and thus construct larger CAOs than new firms.

Again for the latest two periods, for which PPNs are available, we look at finer categories by dividing the new CAOs into those which are newly constructed and those which were previously affiliated with other firms. From the table, CAOs that are acquired from other firms are larger than CAOs that are newly constructed. For example, the category in Table 11 (2) a-2 is typically the result of a firm acquiring other firms, and the CAOs taken over are between 3.9% to 24% greater than pre-existing CAOs affiliated with the same firms. The same tendency is found for the category in Table 11 (2) b-2, in which the acquisition of CAOs is mostly due to two or more firms merging and creating another new firm. Given the difference in size of an acquired CAO in relation to a new CAO, acquiring firms may be able to benefit from the revealed attributes of the existing workers and location as demonstrating that it is a favorable place to operate a CAO.

Next, in Table 12 we attempt to distinguish between CAO closures by continuing firms and by firms that exit. 60 to 70% of CAO closures are by firms that continue their operations (Table 12 (1) a). For firm closures that are mergers, CAOs sometimes remain and continue to operate under the new affiliation (Table 12 (1) b-2). When this happens, the CAOs are much greater in size than those which close, and even greater than existing CAOs which remain in operation under the same affiliation (Table 12 (2) b-2). This could indicate that acquiring firms select successful CAOs to remain in operation.

In Table 13, we look at the pattern of closing of young CAOs by presenting the closure rate of CAOs that were opened in the previous period. The table shows that the rates of early closure presented here are somewhat higher as compared to the overall closure rate we saw in Table 10. The share of early closures by firms that continue to be in business is also somewhat greater than that calculated based on all CAOs closed in Table 12. However, as we can see by comparing Table 13 (2) and Table 12 (2), the size of closed CAOs relative to those which were kept in operation is bigger for the case of young CAOs. Young CAOs may be closed even if they are big. This may be an indication of some degree of experimentation a la Jovanovic (1982), but with experimentation in finding the optimal location for a CAO in relation to the needs of the firm. For example, firms may experiment with locations to find an optimal balance

between tasks of monitoring and coordinating on the one hand and outsourcing on the other.

In Table 14, we keep track of the pattern of closings for CAOs created between 1977 and 1982, and present how the closure rate changes as those CAOs age. We see that 59% of the CAOs created during the 1977-82 period were closed during the subsequent five-year period. Of the CAO that survived until the next period, another 45% were closed during the second five-year period, and of those that survived until 1992, 40% were closed before 1997. In the end, only 10% of the cohort of CAOs that entered between 1977 and 1982 remained in 1997. One finding is that the CAOs that remain the longest were also largest in size when they were created. While firms may experiment in finding the optimal locations for their CAOs, it is possible that the size of CAOs at their entry reflect a firm's prior conjecture on the success of CAOs.

7. Conclusion

In this paper, we attempt to contribute to filling a void between theoretical models of internal firms' spatial organization and the limited empirical study of this organization. As there are many firms that operate in multiple locations, by locating different functions in different areas, empirical work in this area is important to understand what causes the concentration of some functions (Duranton and Puga, 2002) and what is the decision making mechanism behind a firm's initial decision to separate some functions from its main physical location.

Our focus in this paper is to present facts surrounding firms' decisions to physically separate part of their administrative activities and construct stand alone central administrative offices - CAOs. As we showed, there are significant differences between firms with and without CAOs. We found that firms that own CAOs are much bigger than those without CAOs. CAOs are typically created to support manufacturing and retail and wholesale businesses of firms. Firms are more likely to have CAOs if they are more industrially diversified and more geographically dispersed, and if their main production facilities are in smaller cities. However, interestingly, even when firms decide to separate administration from production facilities, most firms locate their CAOs nearby.

In addition to the cross-sectional differences between firms with and without CAOs, we also present facts surrounding the dynamics of the decision to open and close CAOs. We found that both opening and closing rates are high and the sizes of new and closed CAOs are large, possibly due to low fixed set-up costs. We also found some indications that in the process of opening and closing CAOs, firms go through some experimentation, to find the optimal locations for their CAOs and the optimal spatial configuration for the entire firm.

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Table 1: Function of Auxiliaries in 1997

	Percentage of each function
Total number of Auxiliaries	46,596
CAO	72.9 %
Warehousing, trucking and repair	13.9 %
R&D	2.23 %
Electronic data processing	.820 %
Accounting, legal, advertising, or personnel*	4.07 %
Other, unclassified	6.11 %
No answer (missing)	N/A

Source: Authors' calculation based on the 1997 AES.

* Establishments in this category are engaged in only one of these four functions, thus is highly specialized.

Table 2: Who has Auxiliary Establishments and CAOs?

	Multi-plant firms, No auxiliaries	Firms with at least one plant and auxiliaries		
		Total	Firms with CAOs	Firms with mixed plants and mixed auxiliaries
	(1)	(2)	(3)	(4)
Number of firms	146,491	20,635	17,908	714
Avg. firm employment	138	1,855	2,042	13,580
Avg. number of plants per firm	4.25	36.07	39.48	202.57
Avg. employment per plant	32.50	47.05	47.25	58.82
Avg. number of auxiliaries per plant*		0.285	0.267	0.211
Avg. number of CAO per plant*			0.246	0.126
Avg. employment per auxiliary		69.95	72.95	105.89
Avg. employment per CAO			72.76	124.50

Source: Authors' calculation based on the AES and the SSEL

Note: excludes Alaska, Hawaii. Excludes firms with Auxiliary establishments but no plants in the contiguous USA and 28,470 listed "multi-establishment" firms with a single plant but no Auxiliary establishments.

* The numbers were calculated by taking average of the number of auxiliaries/CAOs per plant calculated for each firm.

Table 3. Industries and CAOs

	1977		1997				1977-1997 growth of	
	Count of CAOs	Avg. CAO employ.	Count of CAOs	Avg. CAO employment	Share of national CAO employment (%)	Share of national employ (%)	CAOs (%)	Industry employment (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agriculture	821	76	758	87	2.7	1.2	-7.7	32.1
Construction	261	36	305	71	.87	5.4	16.9	54.4
Manufacturing	6,192	122	7,139	136	29	17.1	15.3	-5.77
Transport & utilities	N/A	N/A	1,243	77	3.9	4.6	N/A	67.4
Retail & wholesale	12,424	47	14,901	54	33	27.1	19.9	61.3
FIRE	N/A	N/A	1,339	49	2.6	7.2	N/A	63.2
Business, legal, Professional services	742	29	2,007	58	4.7	12.1	170	264
Communications & motion pictures	N/A	N/A	310	60	.76	1.6	N/A	37.7
Other services	1,532	25	5,960	52	12	23.6	289	131
All	21,972	67	33,962	73	100	100	N/A	
Totals		1.46M.		2.47 M.				

Source: Authors' calculations based on the AES and the CBPs.

Table 4. Proportions to Outsource

Percent of units outsourcing[3]

		Legal		Accounting		Advertising
	Year	1992	1997	1992	1997	1997
Auxiliary establishments*	(1)	.436	.487	.299	.448	.424
CAOs*	(2)	.544	.637	.377	.578	.545
HQs*	(3)	.741	N/A	.561	N/A	N/A

Source: Authors' calculations based on the AES.

* Because of changes in the way the micro-level data were edited, we use different criteria to identify establishments responding to the outsourcing questions. Auxiliary establishments that are included for the calculation of outsourcing propensities are those who respond to the function or HQ question for 1992, and those who respond to the function employment questions for 1997.

Table 5. For Outsourcers, Ratio of Expenditures to Establishment Wage Bill 1997[1]

	Legal	Accounting	Advertising
All CAO establishments	.152	.134	.366
Manufacturing CAO establishments	.157	.119	.244
Retail CAO establishments	.121	.157	.595

Source: Authors' calculations based on the 1997 AES.

[1] Calculated only for establishments reporting actual expenses (and wages).

Table 6. Outsourcing versus in-housing

a. Average share workers working in-house for each function in a CAO employment

	Legal	Accounting	Advertising
CAOs that outsource the particular function	.98%	26.01%	1.42%
CAOs that does not outsource a particular function	.28%	14.73%	.46%

Source: Authors' calculations based on the AES and the CBPs.

b. Relationship between the emphasis in in-house function and outsourcing, when CAOs outsource - Correlation between the share of employee engaged in a particular function in a CAO and the expense of outsourcing the function as a share of CAO wage bills –

Legal	Accounting	Advertising
.0126	-.0306	.0803

Source: Authors' calculations based on the AES and the CBPs.

Table 7. Probit analysis: Does a firm have a stand-alone CAO?[5] (1997)

	Probit			Tobit
Dependent variable	=1 if a firm has CAOs			Number of CAOs
	All multi-establishment firms (167,126 firms)		Firms with two or more plants (165,552 firms)	All multi-establishment firm (167,126 firms)
	Coefficient (Robust s.e)	Effect of 1 s.d. change (for dummy variable, discrete change from 0 to 1)	Coefficient (Robust s.e.)	Coefficient (Robust s.e.)
	(1)	(2)	(3)	(4)
ln (firm employment in plants)	.304** (.00474)	.00567	.331** (.00481)	1.928** (.0279)
No. of plants	.00191** (.000461)	.0182	.00174** (.00044)	.0211** (.000285)
HHI of firm plants industrial specialization if two or more plants[1]	-1.608** (.0265)	-.0256	-.557** (.0360)	-10.235** (.183)
D2 = 1 if plants in two or more counties	.281** (.0395)	.0352	.367** (.0393)	1.770** (.308)
D2 * max. distance between counties with plants	.0000532** (.0000124)	.000591	.0000761** (.0000121)	.0000705 (.0000945)
D3 * avg. weighted distance between plants[2] (D3=1 if plants in 3+ counties, 0 otherwise)	.000129** (.0000233)	.000017	.000123** (0000227)	.00130** (.00197)
D2 * ln (county employment of dominant firm county)[3]	-.00117 (.00329)	-.000267	-.00363 (.00325)	.00876 (.0253)
Industry dummy[4]				
Agriculture	.102** (.0520)	.0145	.190** (.0538)	.855** (.383)
Construction	-.374** (.0465)	-.0373	-.279** (.0484)	-2.392** (.360)
Heavy manufacturing	-.115** (.0245)	-.0140	-.107** (.0255)	-.687** (.187)

Transport & utilities	-.203** (.0317)	-.0233	-.243** (.0333)	-1.222** (.236)
Retail wholesale	.237** (.0212)	.0324	.219** (.0223)	1.382** (.157)
FIRE	-.610** (.0313)	-.0566	-.663** (.0332)	-4.531** (.224)
Business services	-.438** (.0258)	-.0444	-.497** (.0273)	-2.876** (.198)
Communication and motion pictures	-.172** (.0592)	-.0120	-.205** (.0614)	-1.505** (.417)
Other services	.106** (.0218)	.0146	.0878** (.0230)	.647** (.165)
Constant	-1.372** (.0368)		-2.534** (.0462)	-11.518** (.242)
Pseudo R^2	.218		.216	.135

Source: Authors' calculations based on the AES, SSELs, and the CBPs.

1) The index is the sum of squared shares of firm plants' employment in the 9 industries in Table 4.
2) Distances are between centroids of counties. Weights are numbers of firm plants in each county. The measure is equivalent to the average of all pairwise distances between plants (where that distance is zero for plants in the same county).
3) The dominant county for a firm is the county with the plurality of firm plant employment. The variable is ln (total county private employment).
4) Excluded category is light manufacturing.

( ): Huber/White/sandwitch robust standard error

** is significant at 5% level. * is significant at 10% level.

Table 8. Probit Analysis: Does a firm has a non-collocated CAO? (1997)

17,908 firms

	Probit
Dependent Variable: =1 if a firm has a co-located CAO	Coefficient (Robust s.e.)
ln (firm employment in plants)	-.139** (.00905)
No. of CAO	.0259** (.0102)
No. of plants	-.00007 (.000136)
Index of firm plant specialization if two or more plants[1]	-.687** (.0433)
D2 = 1 if plants in two or more counties	1.164** (.0920)
D2 * max. distance between counties with plants	.000244** (.0000292)
D3 * avg. weighted distance between plants[2] (D3=1 if plants in 3+ counties, 0 otherwise)	.000178** (.0000627)
D2 * ln (county employment of dominant firm county)[3]	-.0866** (.00746)
Industry dummies[1]	
Agriculture	-.196** (.0937)
Construction	-.873** (.115)
Heavy manufacturing	-.0898** (.0453)
Transport & utilities	-.232** (.0653)
Retail wholesale	-.612** (.0406)
FIRE	-.482** (.0705)
Business services	-.209** (.0545)

Communication and motion pictures	.0613 (.107)
Other services	-.673** (.0454)
Constant	.669** (.0573)
Pseudo R^2	.131

Source: Authors' calculation based on the AES, SSELs, and CBPs.

1) Excluded category is light manufacturing.

( ): Huber/White/sandwitch robust standard error

** is significant at 5% level. * is significant at 10% level.

Table 9. CAO Activity in New York and Chicago

1997 (Percent shares of nation total)

	New York County	Chicago (Cook County)	NY & Chicago
Share of national employment	1.84	2.29	4.05
Share of CAOs	2.76	2.22	5.78
Share of CAO employment	3.00	3.02	5.28
Share of service CAOs	5.14	2.35	7.49
Share of service CAO employment	4.56	2.87	7.43
Share of FIRE CAOs	25.84	2.99	28.83
Share of FIRE CAO employment	10.14	6.47	16.61
Share of national employment In Selected service industries			
Security brokers	24.5	3.13	
Advertising	14.7	5.77	
Legal	7.24	4.09	
Accounting	5.10	3.39	
Employment agencies	6.22	3.98	
Management and public relation	4.25	4.60	

Source: Authors' calculations based on the AES and the CBPs.

Table 10: Overall Opening and Closing Rates 1977-97

	1977-82	1982-87	1987-92	1992-97
Opening rate	.540	.614	.562	.578
New CAOs employment share	.354	.385	.375	.374
New CAOs relative size	.479	.491	.534	.564
Closing rate	.481	.523	.480	.499
Closed CAOs employment share	.276	.362	.359	.387
Closed CAO relative size	.391	.510	.599	.600

Source: Authors' calculations based on the AES.

Table 11: New CAO and Firm Entry

	1977-82	1982-87	1987-92	1992-97
(1) Share in terms of CAO counts				
a) Existing firms	.819	.766	.830	.783
a-1) Newly created CAO	N/A	N/A	.776	.716
a-2) CAO acquisition	N/A	N/A	.054	.067
b) New firms	.181	.234	.170	.216
b-1) Newly created CAO	N/A	N/A	.136	.183
b-2) CAO acquisition	N/A	N/A	.034	.033
(2) Relative size to stayer				
a) Existing firms	.540	.522	.530	.570
a-1) Newly created CAO	N/A	N/A	.481	.526
a-2) CAO acquisition	N/A	N/A	1.243	1.039
b) New firms	.202	.391	.522	.523
b-1) Newly created CAO	N/A	N/A	.365	.403
b-2) CAO acquisition	N/A	N/A	1.302	1.193
(3) Size of existing CAOs	102.45	103.23	89.56	94.64

Source: Authors' calculations based on the AES.

Table 12: CAO Closure and Firm Exit

	77-82	82-87	87-92	92-97
(1) Share in terms of CAO counts				
a) Firm remains	.653	.598	.633	.689
b) Firm closed (include merger and acquisition)	.347	.402	.367	.311
b-1) CAO closed	N/A	N/A	.301	.259
b-2) CAO taken over by other firms	N/A	N/A	.066	.052
(2) Relative size to staying CAO	.391	.510	.599	.600
a) Firm remains	.403	.520	.670	.639
b) Firm closed (include merger and acquisition)	.370	.496	.475	.513
b-1) CAO closed	N/A	N/A	.329	.377
b-2) CAO taken over by other firms	N/A	N/A	1.134	1.197
(3) Size of existing CAOs	97.60	100.13	91.13	88.21

Source: Authors' calculations based on the AES and SSELs.

Table 13: Comparison of Five-year Closing Rates and Relative Size

	1982-87	1987-92	1992-97
(1) Total closing rates	.587	.540	.584
a) Share firm stays	.627	.674	.750
b) Share firm exits	.373	.326	.250
(2) Avg. size relative to existing CAOs	.600	.771	.819
a) Firm stays	.610	.803	.828
b) Firm exits	.583	.649	.792
(3) Avg. employment of survivor	64.93	58.05	54.36

Source: Authors' calculations based on the AES and the SSELs.

Table 14: Length of Life for 1982 CAO Entrants[1]

			Average employment			
	Counts	Closing rate[2]	1982	1987	1992	1997
Closed b/w 1982-87	6,950	.587	38.95			
Closed b/w 1987-92	1,927	.446	54.44	55.32		
Closed b/w 1992-97	851	.396	62.63	64.64	66.38	
Present in 1997	1,212		78.60	86.74	91.14	92.34

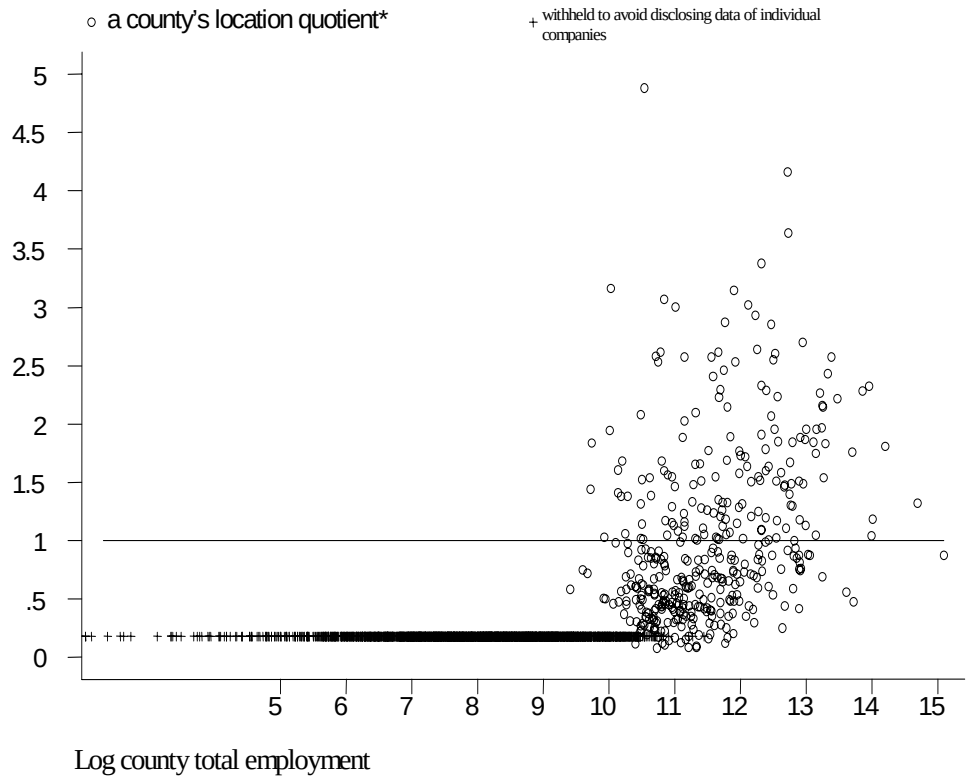
Source: Authors' calculations based on the AES and the SSELs.

[1]There are 11,847 CAOs entering in 1982. The exits do not add up to this since the switch-outs* have been omitted.

[2] Conditional exit rate, i.e., the probability of exiting in cell, given that the CAO has survived until that cell.

* In our sample we define a CAO as an auxiliary establishment whose greatest employment category is administrative employment. For most CAOs this holds true over the sample period, but in some occasions, CAOs change their employment composition sufficiently to switch their majority employment away from administrative employment (switch-out), and in some cases, the some auxiliaries switched in from having other function as a main function (switch-in).

Figure 1



(Source: Authors' calculations based on the AES.)

* Ratio of a county's share in national CAO employment to the county's share in national private employment

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