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Why and where do headquarters move?

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ABSTRACT

This paper analyzes decisions regarding the location of headquarters in the U.S. for the period 1996–2001. Using a unique firm-level database of about 30,000 U.S. headquarters, we study the firm- and location-specific characteristics of headquarters that relocated over that period. Headquarters are concentrated, increasingly so in medium-sized service-oriented metropolitan areas, and the rate of relocation is significant (5% a year). Larger (in terms of sales) and younger headquarters tend to relocate more often, as well as larger (in terms of the number of headquarters) and foreign firms, and firms that are the outcome of a merger. Headquarters relocate to metropolitan areas with good airport facilities—with a dramatic impact, low corporate taxes, low average wages, high level of business services, same industry specialization, and agglomeration of headquarters in the same sector of activity—with all agglomeration variables having an important and significant impact.

1. Introduction

Headquarters tend to be concentrated geographically (the top 20 urban centers accumulate 75% of the headquarters weighted by sales in the continental U.S.) and their rate of movement is significant (about 5% in our sample between 1996 and 2001). This paper studies the determinants of headquarters' moves.

Cities and regions worry about attracting, or not losing, headquarters. This concern has grown more acute with the changes introduced by globalization. The reasons of the concern are the perceived external effects associated to headquarters as attractors of business services, a highly qualified pool of labor, as well as other headquarters. When headquarters move, municipalities and regional governments worry about the possible negative externalities in terms of direct and indirect employment losses, decrease in market thickness and in the quality of the labor market. Indeed, an outflow of large corporate headquarters may cause an important loss of qualified business service jobs. In this respect, Shilton and Stanley (1999) provide evidence that metropolitan areas with a higher number of and more diversified headquarters have higher per-capita income. To the contribution of headquarters to external effects we may add a more diffuse benefit of having business decision centers contributing to the image or trademark of a city and as partial insurance protection against delocations threats in downturns. The concern of local governments materialized when the Bank of America moved its headquarters from San Francisco to Charlotte, or Banc One from Columbus to Chicago (the latter subsequently lost for Chicago), both because of merger; when Boeing decided to move from Seattle to Chicago; or Volkswagen North American from Auburn Hills, Michigan, to the Northern Virginia suburbs.

The analysis of headquarter location is also relevant to other business activities like R&D, where informal or "soft" information exchange is crucial.[1] Sales offices and other white-collar information-intensive activities provide further examples (Holmes and Stevens 2004, Holmes 2005). This is to be contrasted with codified or "hard" information exchange for which geographic proximity is not as essential (Glaeser 1999, Cremer, Garicano, and Prat 2005).[2] Our findings on the determinants of the location of headquarters may be in consequence of wider applicability to those activities where face-to-face information exchange is crucial.

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[1] Jaffe et al. (1993) provide patent citation evidence of knowledge spillovers.
[2] The distinction between hard and soft information is also important in the incentive literature, providing a further explanation for the separation of management and production. Namely, separation may be a commitment device to monitor less intensively the agent and this way incentivate his initiative (Aghion and Tirole 1997).

The policy interest of the exercise should be evident. The first step in finding out what local governments can do to keep and attract headquarters is understanding the determinants of their location. While agglomeration externalities may justify subsidies (Garcia-Milà and McGuire 2002), our results are a first step to cook up a recipe for success in attracting headquarters.[3]

This paper studies the determinants of the location of headquarters according to the variables new economic geography model (available in the web Appendix to the paper) indicates that should matter:

- agglomeration variables: other headquarters;
- input cost: business services;
- corporate taxes;
- congestion;
- cost of transmitting headquarters' services; and
- firm-specific factors such as merger activity, size, and age of the headquarters.

Congestion is proxied by high wages, and the cost of transmitting headquarters' services by, among other factors, transportation facilities. We also control for the level of human capital and recreational amenities in metropolitan areas.

We use a unique database of more than 25,000 headquarters in the continental U.S., of which about 1500 moved between 1996 and 2001. Headquarters are defined as a management (administration and marketing) center of a firm; the average number of headquarters per firm in our sample is 15. We find that headquarters cluster in a small number of metropolitan areas and that they are more agglomerated than economic activity. In contrast to the results for the 1980s (Holloway and Wheeler 1991), we find a tendency towards greater concentration. New York is a declining dominant center, but, excluding New York, top centers show gains (sales-weighted). The tendency is that middle-sized service-oriented "sun belt" agglomerations gain at the expense of "rust belt" industrial centers.

We estimate the probability of relocation of headquarters to a metropolitan area with a three-level nested logit structure. A firm first considers whether to relocate the headquarters, classifies the potential locations by characteristics (geographic or by size class in our case) and chooses a nest, and finally chooses a location within the nest. This procedure is not at odds with usual practice. For example, when Boeing decided to move its headquarters from Seattle, it announced the characteristics of the potential locations of where to move.[4]

The main results are as follows.

- Headquarters relocate to metropolitan areas with good airport facilities—with a dramatic impact, low corporate taxes, low average wages, high levels of business services, same industry specialization, and agglomeration of headquarters in the same sector of activity. The effect of the agglomeration variables is important and significant. The level of human capital, as proxied by the percent of the labor force with a bachelor's degree, turns out to be highly correlated with the level of business services, and it is not significant. The effect of amenities such as recreational services is significant and the impact of having a large airport hub is robust to their introduction in the estimation.
- Headquarters that are larger (in terms of sales) and younger tend to relocate more often (corporate history matters), as do firms that are larger (in terms of the number of headquarters), are foreign, or are the outcome of a merger.
- Headquarters in locations with good airport facilities, low corporate taxes, and with agglomeration of headquarters in the same sector of activity tend to stay put.

When Boeing decided to move its main headquarters from Seattle it induced competition among Chicago, Dallas, and Denver as potential locations. Chicago offered by far the most generous package with incentives for more than U.S. $50 million.[5]According to our analysis, the negative aspects of Chicago are: highest wage, high tax (Dallas and Seattle are very low while Denver taxes are slightly higher than Chicago), largest population (congestion costs), and less specialization in transport equipment (i.e. Boeing SIC2 activity) than Denver or Dallas.[6] The positive aspects of Chicago are: highest levels of total headquarters and transport equipment headquarters (i.e. headquarters of same SIC2), and higher specialization on finance and business services (except for Denver, which is more specialized in business services). In conclusion, Chicago may have subsidized in order to counterbalance the negative aspects of the city and the headquarters' agglomeration effects may have loomed large in the decision.

The results we obtain are in line with recent economic geography models (Ekholm and Forslid 2001; Duranton and Puga 2005; Fujita and Thisse, 2006). A basic story is that headquarters are located in areas with business services and other headquarters. The first factor arises because of economies of scale in the provision of business services, and the second factor arises because of externalities among headquarters due to face-to-face interaction.[7] Headquarters benefit from diversified business services inputs and from the informal information exchange that close geographical proximity entails.[8]

The results are also consistent with a story according to which the decrease in communication costs facilitates the location of headquarters in areas where they can be more productive liberating the larger headquarters, at least, from the servitude of being close to production facilities. This may imply that cities specialize in management or production activities. (Fujita and Ota 1993; Duranton and Puga 2005; Fujita and Thisse, 2006).[9] When Boeing decided to move its main headquarters, it explicitly stated that it wanted to distance management from its traditional manufacturing base and look for a central location that could better accommodate a global and diversified aerospace company. Being close to a plant is however still important in so far a headquarter wants to locate in a metropolitan region specialized in its sector of activity. There is therefore a tension between (i) being close to a plant in order to save information costs, and (ii) being away from plants in order to give more autonomy to plant managers and profit from business services and headquarters externalities in a business center. This tension is being resolved due to major leaps in communication technology in favor of (ii) as the Boeing case shows. However, keeping other things constant, a firm

[3] Greenstone and Moretti (2004) concluded that local governments have incentives to provide subsidies to attract productive plants. See Glaeser (2001) for a survey of location-based incentives.

[4] See Garcia-Milà and McGuire (2002) for a study of the relocation of Boeing's main headquarters from Seattle to Chicago.

[5] See Garcia-Milà and McGuire (2002).

[6] However, Phil Condit, the chairman and CEO of Boeing in 2001, stated explicitly that he wanted to move the headquarters from Seattle so as not to be close to the existing operations: "As we've grown, we have determined that our headquarters needs to be in a location central to all our operating units, customers and the financial community—but separate from our existing operations". This turned a potential negative aspect of Chicago into a positive one.

[7] Evidence on the concentration and localization economies of business services in Japan and the U.S. is provided by Kolko (1999), Dekle and Eaton (1999) and Adserà (2000). See also Ciccone and Hall (1996).

[8] The results are also in line with Lovely et al. (2005) findings that the agglomeration of headquarters of U.S. exporters is driven by the need to acquire specialized knowledge of foreign markets. That is, that the need to acquire information fosters agglomeration by exporters much as headquarters in general agglomerate to exchange information.

[9] Fujita and Ota (1993) show in a location model of multi-unit firms that "the advancement of intrafirm communication technology will eventually lead to a dichomoty of firm activities, where the front-unit activity (specialized in extrafirm communications) will concentrate in the city center, while the back-unit activity will locate in the far suburbs." (p. 697).

still would like to locate its headquarters in regions with the same sector specialization.[10]

There are many studies that analyse the determinants and evolution of the geographical concentration of industrial activity (e.g. Kim, 1995, 2000; Ellison and Glaeser 1997; Rosenthal and Strange, 2003, 2004; Strauss-Kahn 2005). As summarized in Rosenthal and Strange (2004), empirical studies concur in showing the importance of knowledge spillovers, labor market pooling, input sharing but also natural advantage, home market effects and consumption opportunities in explaining industrial activity location/concentration. Knowledge externalities, as well as externalities on the inputs and the labor markets are essential to headquarters location decision. Our results confirm the relevance of such variables as determinant of headquarters location and are therefore in accordance with the firm location literature. Specific to headquarters is the importance of communication (proxied here by airports availability) as well as the irrelevance of home market effects and natural advantages.

Evidence on the determinants and evolution of the geographical concentration of business decision centers is more scarce: Holloway and Wheeler (1991) and, more recently, Shilton and Stanley (1999), Diacon and Klier (2003), Davis and Henderson (2004), and Lovely et al. (2005) are exceptions. In relation to the literature, we provide a full empirical analysis based on an underlying standard equilibrium economic geography model and we condition on a full range of potentially relevant variables. Holloway and Wheeler (1991) and Shilton and Stanley (1999) are mostly descriptive. Diacon and Klier (2003) examine the location of headquarter growth of large public companies in the 1990s with Compustat data. The overall picture that emerges is consistent with ours. Using a binomial probability model of the decision to move they find that companies with merger activity are more likely to move and that headquarters tend not to move from metropolitan areas with a large number of international destinations reachable from its airports and with a more educated labor force (variable which in our case is correlated with the level of business services). Our study is much broader with higher numbers of relocating headquarters and considered locations. By focusing on headquarters that relocates we avoid noise associated with the birth of headquarters such as the origin of CEO as well as endogeneity issues caused by simultaneous entry (birth) of a headquarters in a database (ranked by firms' size) and metropolitan area economic growth. Moreover, we include variables that come out as essential in headquarters production function according to new economic geography models à la Duranton and Puga (2005) or Fujita and Thisse (2006) such as wages, taxes or communication costs.

Davis and Henderson (2004) focus on headquarters' births and concentrate on the contribution of headquarters present and the diversity of business service. This makes their analysis closer to ours. However, the authors rely on a production function approach to derive headquarters' profits, and with their data (a U.S: Census Bureau micro data set on auxiliary establishments from 1977 to 1997), they cannot distinguish headquarters from other central administrative units. Their approach is based on a discrete count Poisson model of the location of headquarters birth. Their main objective is to distinguish the two different scale externality effects relevant for the location of headquarters: diversity of business services and presence of other headquarters. The results obtained are consistent with ours in terms of relevant variables and signs of the effects. There are differences in the quantitative impact of some variables but those should be attributed most likely to the use of different databases and econometrics methods.

[10] Henderson and Ono (2005) focuses on this trade off using Census data. They conclude that firms consider also the proximity of their production facilities when locating headquarters.

This paper is organized as follows. Section 2 presents the data and basic statistics on the location of headquarters and the evolution from 1996 to 2001. Section 3 puts forward the empirical methodology of the three-level nested logit we implement. Section 4 presents the results and Section 5 concludes.

2. Data, facts, and trends

In this section we present the data and statistics of the concentration and movements of headquarters.

2.1. Data

We look at the decisions made by U.S. firms when relocating their headquarters and choosing the new location. The headquarters-level data come from Dun and Bradstreet (D&B) and are for the years 1996 and 2001. D&B's database includes yearly data on approximately 200,000 headquarters that are listed in a firms' directory ranked by level of sales.[11] Headquarters are defined as a management center and are strictly different from a plant. More specifically, in our database a headquarters corresponds to a center of a firm's operations, administration and marketing activity. This general definition of headquarters encompasses regional managerial centers and may include sales offices.[12] A firm may have several headquarters (e.g. General Motors Corporation has its ultimate headquarters in Detroit, MI, and several other affiliate headquarters around the U.S., including Hughes Electronics Corporation in Los Angeles, CA, and Gmac Insurance Holdings Inc. in Southfield, MI). The D&B database distinguishes headquarters which are business establishments with branches or divisions reporting to them, and which are financially responsible for those branches or divisions (i.e., multi-site firms' headquarters) from headquarters of single-site firms. Whereas, typically, headquarters of multi-site firms are disconnected from production sites, single-site firms may locate both production and headquarter activity in the same location.[13] In our database about 80% of the headquarters are of the multi-site type. In order to ensure that we are studying the location decision of headquarters independent of the decision of locating production, we seek for results for the full sample of headquarters as well as for the subsample of multi-site headquarters.

The relevance and uniqueness of the D&B database stems from the fact that it provides the addresses of headquarters at the code level as well as specific company variables such as sales levels, the number of headquarters belonging to the firm, the date of birth of the headquarters, and (two-digit) standard industrial classification (SIC) codes. The database also allows the origin (U.S. or foreign) of the firm to which the headquarters belongs to be identified. Importantly, D&B allocates an identifier to each headquarters (note that headquarters from the same firm have different identifiers). This allows us to track headquarters over time and location. Precise data definitions and

[11] The accuracy of the D&B database has been cross checked with other sources such as the Fortune Magazine ranking of the 500 largest U.S. corporations and the Hoover rankings of the largest U.S. firms. Rankings and sales were similar across databases.

[12] This broad definition of headquarters is adequate for our work as regional headquarters as well as sales offices have similar inputs requirements than central headquarters in term of labor, business services or information. Their relocation across cities has similar implications on employment or economic activity than the relocation of central headquarters.

[13] In 1996, the average number of employees of multi-site headquarters is 200 while the average number of employees of the firm is 3630. This corroborates the intuition that these multi-site headquarters locate away from their plants. Note that single-site firms might be a regional headquarters with no production taking place at the site. For example, Salomon North America, a sporting and recreation goods company (French owned in 1996 while German owned in 2001), has relocated its single-site location from Georgetown Mass., to Portland over the 1996–2001 period. Such single-site firm is specialized in marketing, operations and sales activities. U.S. media refereed to this change of location as a relocation of headquarters.

Table 1
Percentage of total number of headquarters, total headquarters' sales and economic activity (personal income) by the top metropolitan areas, 1996–2001

	Percentage of total number of headquarters		Percentage of total headquarters' sales		Percentage of total number of manufacturing headquarters		Percentage of total manufacturing headquarters' sales		Percentage of total economic activity (personal income)	
	1996	2001	1996	2001	1996	2001	1996	2001	1996	2001
New York	15.1	14.7	20.8	17.4	12.4	12.0	17.2	16.3	11.9	11.7
Top 5 centers	35.1	34.4	42.4	39.4	33.0	32.4	45.8	48.8	29.9	25.5
Excluding New York	20.0	19.7	21.6	22.0	20.6	20.4	28.6	32.5	18.0	13.8
Top 10 centers	49.8	49.4	59.2	56.6	45.6	45.0	60.8	62.8	42.6	41.0
Excluding New York	34.7	34.7	38.4	39.1	33.2	33.0	43.6	46.5	30.7	29.3
Top 20 centers	64.4	64.1	74.9	73.0	61.8	61.2	77.7	76.3	55.6	56.1
Excluding New York	49.3	49.4	54.1	55.5	49.3	49.1	60.5	60.0	43.7	44.4

sources are given in the Appendix. Because of limited access to the D&B listing we restrict our sample to the 50,000 firms with the largest sales in 1996 and 2001.

We study decisions regarding the location of headquarters across U.S. metropolitan areas. The general concept of a metropolitan area, according to the Census Bureau, is a core area containing a large population nucleus, together with adjacent communities having a high degree of economic and social integration with that core. Metropolitan areas include metropolitan statistical areas (MSAs) and consolidated metropolitan statistical areas (CMSAs), which are urban areas composed of several MSAs. D&B's data are at the zip code level and are aggregated to the metropolitan area level, based on the 1995 Census Bureau definition. Metropolitan areas that are part of a CMSA are subsumed under the larger category.[14]

Our D&B database of the 50,000 firms with the largest sales in 1996 and 2001 does not allow us to identify births and deaths of headquarters. As we do not have an exhaustive listing of all headquarters within the U.S. for both years, we cannot distinguish "dead" headquarters from headquarters that have experienced a declining sales level (i.e. the headquarters' position in the ranking has decreased to below the 50,000 largest). We thus focus on the 29,000 headquarters which belong to both the 1996 database and the 2001 database (i.e., headquarters' identifiers appearing in both years). Out of these 29,000 headquarters, we only consider headquarters located in U.S. mainland metropolitan areas. We end up studying the location of 26,195 headquarters in 276 U.S. metropolitan areas.

The largest share of headquarters belongs to the Manufacturing sector (i.e. about 32%) while another 18% of the headquarters belong to the Wholesale and Retail trade sectors. Headquarters from the FIRE industries (Finance, Insurance, and Real Estate) account for about 16% of the total and headquarters from the Services industries account for about 15%.[15] The average size of a headquarters in 1996 (the amount of sales according to the D&B definition) is U.S. $200 million. The average number of headquarters for a firm in 1996 is about 54. Merged headquarters or those that have been acquired over the period account for 7%, and about 31% of headquarters are of foreign origin.

2.2. Clusters and movements

2.2.1. Headquarters cluster in a small number of metropolitan areas

A closer analysis of the data suggests that headquarters cluster in a small number of metropolitan areas. New York stands out as the dominant center, hosting 15% of the total number of headquarters representing 21% of headquarters' sales. These numbers reflect the presence of very large New York based corporations such as General Electric, Phillip Morris, AT&T, Texaco, and PepsiCo. Moreover, 65% of the headquarters are located in the top 20 centers. This represents 75% of headquarters sales with leading firms such as General Motors in Detroit, Exxon in Dallas, Mobil in Washington, Hewlett-Packard in San Francisco, Sears Roebuck in Chicago, and Cargill in Minneapolis. Table A5 in the Appendix presents the leading metropolitan areas by the number of headquarters and by sales levels in 1996.[16] Leading metropolitan areas for manufacturing sectors reflect the importance of traditional manufacturing centers with higher position of Detroit, Cleveland or Pittsburgh compared with the general ranking (Table A5 of the Appendix). Foreign corporations tend to locate their headquarters in metropolitan areas close to international borders (e.g. Pacific Coast, Canada, and Mexico) as centers such as Honolulu, Buffalo, San Diego, and Anchorage enter the top 20 metropolitan areas ranking. Finally, leading centers for the 50,000 firms database in 2001 show a better positioning for Kansas City and San Diego, and a worse positioning of traditional industrial centers such as Cleveland, St. Louis, and Milwaukee. This feature is caused by the large share of service sector headquarters that entered the sample between 1996 and 2001.

2.2.2. Headquarters dominance and economic dominance

Metropolitan areas differ widely in their size and it seems sensible to assume that larger metropolitan areas host more headquarters. As a proxy for economic activity, we use personal income at the metropolitan area level.[17]

Table 1 summarizes headquarters' concentration within the U.S. using the fixed set of headquarters present in both 1996 and 2001.[18] This table presents the percentage of headquarters and manufacturing headquarters belonging to the 5, 10, and 20 U.S. top centers in terms of both the number of headquarters and headquarters' sales. It also provides similar data for personal income. Three broad facts emerge. First, if one excludes New York from the top category, the importance

[14] As mentioned by a referee, ZIP codes are not census geography but units created by the U.S. Postal Office. As a consequence, some zip codes lie partially within and partially beyond a MSA. In order to assess the accuracy of our database we need to verify that a HQ in a specific zip code actually belongs to the MSA. We verified the location of all moving headquarters (our main database), 99% of which are correctly located. We also checked for the location of 75% of the 26,195 headquarters included in our analysis, 99.5% of the location are exact. In view of this result, we are confident about the accuracy of our spatial database. The verification process is available upon request.

[15] Tables A1–A4 in the Appendix provide summary statistic for the full database of about 50,000 headquarters and for the "reduced" headquarters database including the firms present in both 1996 and 2001. Importantly, statistics do not differ greatly across databases thus preventing us from major sample selection issues. We also report statistic for the headquarters that moved during the period. The specificities of these headquarters is studied in greater details in Section 4.

[16] Similar tables have been built for subsets of the database: manufacturing headquarters, foreign headquarters, and all available headquarters (i.e. the 50,000 firms of the main database including headquarters present in only one of the two periods). These tables are not included in this paper. They are available upon request.

[17] Such data is provided by the Bureau of Economic Analysis. Personal income is defined as the income received by all persons from all sources and is equivalent to GDP. Population was also used as a proxy for the size of metropolitan areas. Results are very similar to those obtained using personal income. These results are available upon request.

[18] This reduced database is used throughout the rest of the paper unless otherwise specified.

Table 2
Metropolitan areas gaining and losing the most headquarters between 1996 and 2001

Metropolitan areas	Change in number of headquarters	Number of headquarters lost	Number of headquarters gained	Metropolitan areas	Change in sales (percentage points)
Gaining					
Houston–Galveston–Brazoria	37	43	80	Houston–Galveston–Brazoria	1.54
Phoenix–Mesa	24	9	33	Charlotte–Gastonia–Rock Hill	1.37
Washington–Baltimore	23	36	59	Dallas–Fort Worth	0.73
Atlanta	20	46	66	Columbus	0.51
Cincinnati–Hamilton	14	9	23	Kansas City	0.48
Greensboro–Winston–Salem–High Point	14	2	16	San Francisco–Oakland–San Jose	0.44
Pittsburgh	14	15	29	Atlanta	0.43
San Antonio	11	4	15	Raleigh–Durham–Chapel Hill	0.38
St. Louis	10	9	19	Phoenix–Mesa	0.34
Charlotte–Gastonia–Rock Hill	9	19	28	San Antonio	0.29
Indianapolis	9	6	15	Cincinnati–Hamilton	0.26
Chicago–Gary–Kenosha	9	81	90	Omaha	0.24
Dallas–Fort Worth	8	63	71	Anchorage	0.22
Losing					
New York–New Jersey–Long Island	−105	243	138	New York–New Jersey–Long Island	−3.48
San Francisco–Oakland–San Jose	−42	84	42	Los Angeles–Riverside–Orange County	−1.05
Los Angeles–Riverside–Orange County	−31	104	73	Cleveland–Akron	−0.51
Philadelphia–Wilmington–Atlantic City	−17	70	53	Philadelphia–Wilmington–Atlantic City	−0.44
Seattle–Tacoma–Bremerton	−13	25	12	Pittsburgh	−0.39
Tulsa	−8	12	4	Washington–Baltimore	−0.38
Youngstown–Warren	−8	8	0	Detroit–Ann Arbor–Flint	−0.34
Cleveland–Akron	−8	30	22	St. Louis	−0.32
Buffalo–Niagara Falls	−6	12	6	Salt Lake City–Ogden	−0.28
Little Rock–North Little Rock	−5	5	0	Boston–Worcester–Lawrence	−0.22
Scranton–Wilkes–Barre–Hazleton	−5	6	1	Minneapolis–St. Paul	−0.16
Minneapolis–St. Paul	−4	26	22	Portland–Salem	−0.14

of the top centers increased across time in terms of headquarters' sales. Thus, the decline in headquarters' sales dominance seems exclusively caused by the decline of New York. This is in contrast to the period 1980–1987 where it is found that the top centers of headquarters for the Fortune 500 lose ground (Holloway and Wheeler 1991).[19] Second, although manufacturing headquarters are less concentrated in top centers than headquarters from all sectors, manufacturing headquarters' sales are more concentrated. Thus, the smaller proportion of manufacturing headquarters in top centers is counterbalanced by their larger size. The increase in manufacturing headquarters' sales concentration between 1996 and 2001 is particularly pronounced for the top 5 and top 10 centers. Third, and most importantly, headquarters are more agglomerated than economic activity. We note, however, that such relative concentration is smaller than conventional wisdom would expect. For example, in 2001 the percentage of headquarters' sales in New York was 17.4% (and about 15% of the total number of headquarters), while about 12% of the economic activity occurs in the city.

2.2.3. Many headquarters move

Table 2 accounts for the net changes in the number of headquarters and in headquarters' sales by metropolitan areas between 1996 and 2001.[20] Net changes suggest that headquarters moved away from the largest centers towards what Holloway and Wheeler (1991) call "second-tier" centers. The centers that gained the largest number of headquarters are Houston, Phoenix, Washington, and Atlanta, whereas the largest metropolitan areas, New York, San Francisco, and Los Angeles, lost the most headquarters. One may also note that sun belt centers added headquarters over this period (e.g. Houston, Phoenix, San Antonio, and Charlotte), while rust belt traditional centers have mostly lost headquarters (e.g. Philadelphia, Youngstown, and Cleveland).[21]

Because net changes often hide important flow variations, Table 2 also reports the flow for metropolitan areas gaining and losing the most headquarters over the period. This table reflects the significant movement of headquarters between 1996 and 2001. This is an important piece of information for our estimation of decisions regarding the location of headquarters.

Among the 500 largest headquarters in 1996, 36 have moved between 1996 and 2001. Table A7 in Appendix A presents these 36 firms and their movements. Two main trends emerged. Headquarters either relocated from smaller specialized metropolitan areas towards main business centers (e.g. Pharmacia and Upjohn Inc. relocated from Kalamazoo to New York, Monsanto Company relocated from St. Louis to New York, and BP America relocated from Cleveland to Chicago) or they moved from rust belt towards sun belt agglomerations (e.g. Mobil Corporation moved from Washington to Dallas, Avnet Inc. moved from New York to Phoenix, and Usx Corp moved from Pittsburgh to Houston). As a general statement we could say that middle-sized service-oriented sun belt agglomerations gain at the expense of large rust belt industrial centers.

2.3. Concentration measures

We rely on two distinct measures of concentration: Lorentz curves and the Theil index. Lorentz curves plot the cumulative frequency distribution of headquarters' sales against the cumulative frequency

[19] Holloway and Wheeler find that the concentration of headquarters in the top five and 10 centers declined between 1980 and 1987. This feature is apparent whether or not they include New York in the top centers.

[20] Table A6 of the Appendix presents net changes for manufacturing headquarters.

[21] Interestingly, Washington, DC's considerable decrease in manufacturing headquarters' sales is a consequence of the relocation of Mobil Corp to Dallas. Similarly, Boeing's relocation to Chicago explains the important decline in headquarters' sales in Seattle over the period. The good performance of Detroit in terms of headquarters' sales reflects the installation of DaimlerChrysler into the center. The decreasing headquarters' sales level in Dallas is a consequence of the relocation of American Petrofina to Houston and Totalfina Elf Services to New York.

Table 3
Concentration measures

	Number of headquarters (Theil index)	Headquarters sales (Theil index)	Number of manufacturing headquarters (Theil index)	Manufacturing headquarters sales (Theil index)
1996	0.055	0.219	0.121	0.336
2001	0.056	0.244	0.127	0.375

distribution of metropolitan areas weighted by personal income. The Theil index is a measure of entropy.[22] This index is potentially very useful.

In the computation of both measures, we weight locations by their personal income levels. The greater the Theil coefficient, the greater the concentration.

The impression of increasing headquarters concentration drawn from the tables is reinforced by examination of Table 3 and Fig. 1, which provide the concentration measures and portray the Lorentz curves, respectively.

Fig. 1(a) and (b) depict the Lorentz curve for headquarters' sales and manufacturing headquarters' sales, respectively. We see that the Lorentz curves are well below the 45° line, indicating that headquarters are more concentrated than economic activity, and that they cross.[23] Concentration measures are lower when metropolitan areas are weighted by personal income than while non-weighted: although far from egalitarian, the distribution of headquarters is representative of metropolitan areas economic size. In Fig. 1, the upper portion of the distribution experienced a decrease in concentration (stable concentration in Fig. 1(b)) whereas there is a concentration in the middle-upper part. This reinforces the idea that "second tier" centers have gained headquarters' sales over the largest centers.

The Theil coefficient is pretty high when sales-weighted, especially for manufacturing firms, indicating high inequality (for example, income inequality in France is about 0.15 in the Theil measure). Theil indices are increasing both in terms of the number of headquarters and headquarters' sales for the number of headquarters in location i, then the Theil measure ranges from a value of 0 when $p_i = 1/n$ to $\ln n$ when all of the weight is concentrated in one location. Theil indices satisfy the Pigou–Dalton condition (i.e. a shift from a large center to a smaller center lowers the index) for all headquarters as well as for manufacturing headquarters. The increase in concentration is small but noticeable, especially for manufacturing headquarters' sales. Such a feature could be expected from Table 1, which relates the increasing proportion of manufacturing headquarters' sales in top centers.

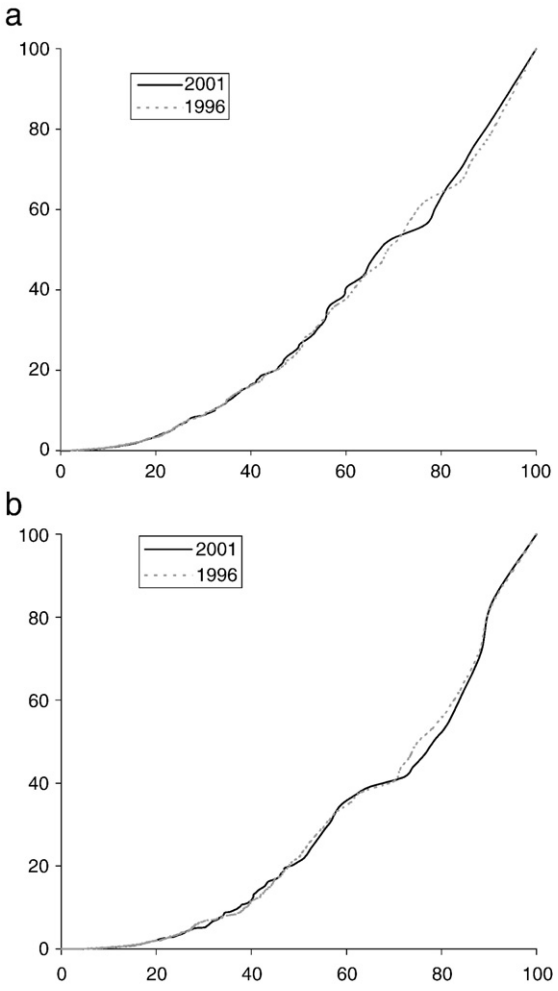

Fig. 1. Lorentz curves for (a) headquarters' sales and (b) manufacturing headquarters' sales. The x-axis is the cumulative frequency of metropolitan areas weighted by personal income and the y-axis is the cumulative frequency of headquarters' sales.

3. Empirical methodology

3.1. A model of location choice

In order to analyze the determinants of the decisions regarding the location of headquarters, we estimate a profit equation relying on the maintained assumption that firms choose the location that yields the highest profit. The firm decides whether to relocate its headquarters taking into account the attractiveness of moving to other metropolitan areas. If a firm chooses not to move then this means that the firm reaches its highest profit by staying in the present location. If the firm decides to relocate its headquarters it chooses a new metropolitan area taking into account the attributes of other metropolitan areas. Thus, a location decision is made by comparing characteristics in potential areas. We aim to identify how these characteristics influence profit.

A natural and widely used estimation procedure consistent with such an assumption is the discrete choice model.[24] In this paper, the decisions regarding the location of headquarters are estimated as a nested logit model. A crucial hypothesis in the logit model is indeed the independence of error terms. This implies an important property, the *independence from irrelevant alternatives* (IIA), which states that the ratio of the logit probability of any two alternatives is independent of the addition or deletion of any other alternative. It seems likely that the choice of metropolitan area for the displaced headquarters is not consistent with the IIA property. The unobserved component of profitability is likely to be correlated among metropolitan areas that are close substitutes (e.g. metropolitan areas located in the same U.S.

[22] The Theil index is derived from the notion of entropy in information theory. It ranges from a value of 0 to $\ln n$. If p_i represents the ith metropolitan area's relative ability to attract headquarters (i.e. $p_i = x_i/\sum_{i=1}^{n} x_i$ where x_i is, say, the number of headquarters in location i),then the Theil measure ranges from a value of 0 when $p_i = 1/n$ to $\ln n$ when all of the weight is concentrated in one location. Theil indices satisfy the Pigou–Dalton condition (i.e. a shift from a large center to a smaller center lowers the index.)

[23] This indicates that Gini coefficients are not good statistics of inequality. The Gini coefficient is a numerical representation of the degree of concentration and represents the distance between the Lorentz curve and the 45 line (egalitarian distribution). There are two issues with Gini coefficients. First, they place more weight on changes in the middle part of the distribution. If a transfer occurs from a larger location to a smaller location, it has a greater effect on the Gini if these locations are near the middle rather than at the extremes of the distribution. Second, if the Lorentz curves cross, it is impossible to summarize the distribution in a single statistic without introducing value judgements. The Theil index is robust to these sensitivity issues (See Sen (1997)).

[24] Recent papers that have used logit and/or nested logit estimations in the regional context include Devereux and Griffith (1998), Head et al. (1995), and Head and Mayer (2004).

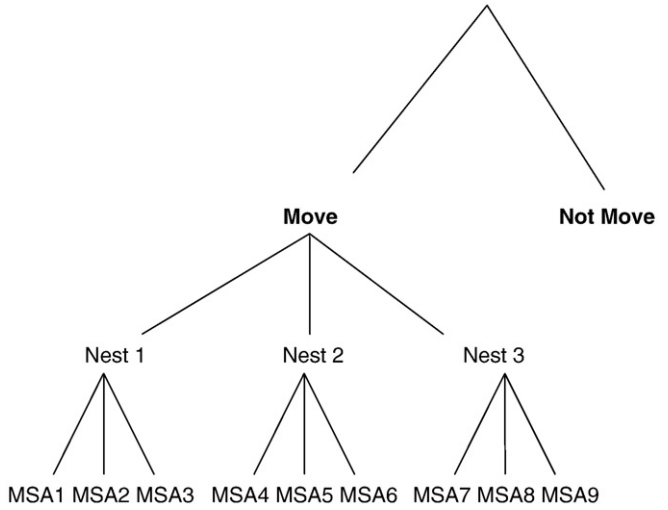

Fig. 2. The firm decision tree: a three-level nested logit. MSA1 corresponds to the Metropolitan Statistical Area 1. Nest 1 is a nest regrouping all MSAs belonging to region 1 or having a population of size 1.

region or metropolitan areas of similar size to that finally chosen). In terms of the IIA property, this implies, for example, that if we were to eliminate Los Angeles from our sample of alternatives, then the probability that a firm will decide to locate its headquarters in New York will increase proportionally more than the probability of locating in, say, Albany.[25]

The nested logit model permits for such a structure of the error term and reconciliates the estimation with the IIA property. In the nested logit model the set of alternatives faced by the firms is divided into subsets, called nests. IIA holds within each nest whereas it does not hold for alternatives in different nests.

The strategies available to the firm are a nested set of options as described in Fig. 2. We distinguish between two types of nested structures: (i) metropolitan areas partitioned into four groups as a function of the size of their population; and (ii) metropolitan areas partitioned into eight groups as a function of the U.S. region to which they belong.[26] In the population-nested model, the decision process of the location of headquarters is equivalent to first choosing the size of the metropolitan area conditional on having decided to relocate and then selecting a location among a subset of metropolitan areas of similar size. In the region-nested model, firms that move their headquarters first choose the region in which to relocate and then select among the alternatives (i.e. the metropolitan areas) belonging to the chosen region.

In the nested logit model the value v_t derived from locating at t can be decomposed into attributes that are observable at the upper nest level (i.e. whether to move from the origin), the medium nest level r (i.e. region or population), and attributes observable within the lower nest level at the metropolitan area level. That is,

$$v_t = \phi B_m + \lambda Y_r + \beta X_t + \varepsilon_t$$

where B_m is a vector of explanatory variables that determine whether or not to relocate, Y_r is a vector of explanatory variables that determine whether to locate in region (or population nest) r, conditional on changing the headquarters' location, X_t is a vector of explanatory variables that determine the choice of metropolitan area, conditional on moving to region (or population nest) r, and ε_t is the error term, which is assumed independently, identically extreme value distributed and specific to each firm/location pairs.[27]

In terms of our theoretical model, B_m, Y_r, and X_t include corporate tax rates, wages, the cost of transmitting headquarters information to plants, some count of agglomeration of headquarters, and the availability of business services. These variables are observed at the locations of origin for the upper nest level (i.e. the whether to move model), and at locations of destination for the medium nest level (i.e. region-nested or population-nested level) and the lower nest level (i.e. the metropolitan area level).

The probability of moving to location t (in middle nest r) for a firm in industry i, P_{it}, can be written as the product of the conditional probabilities of each choice:

$$P_{it} = P_{im} * P_{ir|m} * P_{it|rm}$$

where P_{im} denotes the probability of choosing to relocate the headquarters, $P_{ir|m}$ is the probability of choosing an alternative in nest r conditional on having chosen to relocate, and $P_{it|m}$ is the probability of choosing location t conditional on having decided to move in nest r:

$$P_{it|rm} = \exp(\beta X_{it}) \Big/ \sum_{k=1}^{N_r} \exp(\beta X_{ik})$$

where $N_r \in r$ is the number of alternatives in nest r.

$P_{ir|m}$ depends on both nest-level characteristics Y_r and on characteristics of the alternatives that compose the nest through the so-called *inclusive value* $I_{ir} = \ln\left(\sum_{k=1}^{N_r} \exp(\beta X_k)\right)$:

$$P_{ir|m} = \exp(\delta_1 I_{ir} + \lambda Y_r) \Big/ \left(\sum_{k=1}^{N_r} \exp(\delta_1 I_{ik} + \lambda Y_k) \right)$$

P_{im} depends on a firms characteristics, on characteristics of the location of origin (through B_m) and on the industry-specific expected value of moving through the inclusive value $I_i = \ln(\sum_{k=1}^{R} \exp(\delta_1 I_{ik} + \lambda Y_k))$:

$$P_{im} = \exp(\delta_2 I_i + \phi B_m)/(1 + \exp(\delta_2 I_i + \phi B_m)).$$

where R is the number of nests. In a nested logit specification, we first estimate the choice of a metropolitan area within a region (respectively, population range) and then the choice of region (respectively, population range) taking into account the attractiveness of the metropolitan areas that belong to the region (respectively, population range). Thus, we first obtain the estimates of the coefficients from the conditional probability at the lowest level of the decision tree, $P_{it|rm}$. We identify the determinants of the choice of location, conditional on moving to region (respectively, population range) r. This depends on the explanatory variables X_t. Then we obtain the estimates of the coefficients from the conditional probability at the middle level of the decision tree $P_{ir|rm}$. This depends on nest-level characteristics and on the inclusive value I_{ir}.[28] The coefficient on the inclusive value, δ_1, is important as it measures the relevance of the nested structure. It reflects the degree of dependence among the unobserved parts of profit for metropolitan areas in a given nest, with lower δ_1 indicating less independence (more correlation). If $\delta_1 = 1$, then there is no correlation in the unobserved component of profitability, metropolitan

[25] Similarly, region wise, the probability that a firm will decide to locate its headquarters in, say, Santa Barbara will increase proportionally more than the probability of locating in, say, New Orleans.

[26] The four population nests are as follows: population greater than 4 million; population between 1.5 million and 4 million; population between 500,000 and 1.5 million; and population below 500,000. The eight region nests are: New England, Mideast, Great Lakes, Plains, Southeast, Southwest, Rocky Mountain and Far West. These regions are specified according to the Bureau of Economic Analysis definition.

[27] Recall that firms' subscripts are omitted for readability.

[28] Recall that the inclusive value reflects characteristics of the alternatives that compose the nest.

areas are not substitutes, and the nested logit is equivalent to a standard conditional logit estimation. Finally, we estimate the choice of whether or not to relocate the headquarters. P_{im} depends on firms' characteristics and characteristics of the location of origin and on the inclusive value I_i.[29] The nested logit model is estimated simultaneously for all nests (i.e. the parameters are constrained to be the same across nests).[30] As for standard logit, parameters of nested-logit are estimated using maximum log-likelihood techniques.[31]

We may encounter endogeneity issues caused by omitted variables at the location level. A headquarters' location decision in t may indeed be influenced by some location-specific attributes or location-specific macroeconomic aggregate shocks that also influenced the location of headquarters or business services in $t-1$. We are thus facing some location-specific variables that are carried through time and are not observed by the researcher. To deal with such endogeneity, we would need to include location-specific fixed effects. Unfortunately, the restricted time length of our database prevents the introduction of such location fixed effects.[32] This issue is rather common in the literature which does not provide any great strategies. We experiment with several dummies variables in order to correct for endogeneity issues. We use population range dummies in the region nested model to control for attributes specific to metropolitan areas of similar size. Similarly, we use regional dummies in the population nested model to control for attributes specific to metropolitan areas belonging to the same region. Finally, we introduce states fixed effect in both nested models.

3.2. Specification of the model

3.2.1. The decision of where to relocate (lower and medium nest level)

In order to analyze the firm's decision of where to relocate its headquarters, we need to significantly transform the database. First, we select the subset of headquarters that have actually moved between 1996 and 2001. Second, the set of potential centers in which the headquarters could relocate is restricted to the locations that host more than 0.1% of the total number of headquarters (i.e. the 50,000) in 1996. This represents 106 metropolitan areas and 88% of all moving headquarters. This selection has two purposes: (i) it simplifies the econometric analysis as nested logit models with a high number of locations are very difficult, if not impossible, to handle; and, more importantly, (ii) we eliminate locations that host very few headquarters and may add noise to our analysis. We thus work with a sample of 1441 headquarters.[33]

In order to obtain a basis for our regression analysis we built a theoretical model of headquarters location decision. As we make no attempt to perform a structural test, the model is not included in the present paper.[34] Our theoretical model suggests a set of variables influencing the value of location t for a firm that we can use in our empirical model. These variables can be broken down into three types: production costs (i.e. wages, w_t, and employment in financial and business sectors, l_t^{BS}), externalities (i.e. headquarters agglomeration variables, γ_t), and environment (i.e. corporate tax, T_t, and headquarters' services transmission cost, ρ_t). Our regression analysis will be of the form:

$$v_t = \beta_1 \ln(1-T_t) + \beta_2 \ln w_t + \beta_3 \ln \rho_{1t} + \beta_4 \ln \rho_{2t} + \beta_5 \ln \gamma_{1t} + \beta_6 \ln \gamma_{2t}^k + \beta_7 \ln \gamma_{3t}^k + \beta_8 \ln f_t + \beta_9 \ln b_t + \epsilon_t, \quad (1)$$

where T_t is the corporate tax level at t, w_t is the average wage at t, ρ_t denote two measures of headquarters' services transmission cost (ρ_{1t} is airport availability at t and ρ_{2t} corresponds to the distance between locations of origin and of destination t), γ_t are several measures of agglomeration (γ_{1t} is the total number of headquarters present in t, γ_{2t}^k is the number of same SIC industry headquarters present in t, and γ_{3t}^k is a measure of same SIC industry employment), f_t is the availability of financial services employment in t, and b_t is the availability of business services employment in t. Some measures of agglomeration vary over industry (k).

We have that $v_t=1$ if the firm's profit is maximized with headquarters in location t and $v_t=0$ otherwise.

For wage, we use the average wage per location. Although headquarters-specific wages or skilled-labor wages would capture headquarters' labor costs more appropriately, such variables are not available in the D&B database or in regional databases. High wages supposedly decrease a firm's willingness to locate its headquarters in a metropolitan area. We thus expect a negative coefficient on wages.

Business and finance employment data cover sectors assumed to be intensively used by headquarters. Business services encompass employment in advertising, employment agencies, computer services, legal services, engineering, and management services. Financial services consist of commercial banks, security and commodity brokers, dealers exchanges and services, and holding and other investment offices.[35] In the estimation, we use indices that reflect a metropolitan areas relative specialization in business or financial sectors. These measures are constructed as Hoover–Balassa indices and they evaluate the relative concentration of a sector (i.e. business or financial as defined above) in a metropolitan area with respect to the average concentration of this sector in the U.S.[36] Headquarters are eager to move to locations that have relatively high levels of business and financial services. The coefficient on business and financial sector indices are hence expected to be positive.

Externality variables include counts of existing headquarters and counts of existing headquarters from the same SIC code as the headquarters being studied. Such variables capture potential positive interactions between headquarters and they are assumed to positively influence a headquarters' location decision. As Section 2 of the paper evidences strong agglomerations of headquarters across metropolitan areas and a reconcentration over the period, we expect to find a significant effect.

We also include an index that captures metropolitan areas' specialization levels in the same SIC sector as the headquarters under study. The index is of the Hoover–Balassa type. Such a measure may be a good proxy of the location of final demand as production, in the presence of transportation costs, is likely to take place close to final demand. Thus, the index may also give some indication of the location of plants. A positive coefficient is assumed as headquarters

[29] Recall that the inclusive value is derived from the medium nest level and reflects industry-specific expected value of moving. The full relocation model should include set-up costs as relevant variable of the decision process. Assuming that set-up costs are the same in all potential areas, the impact or such costs on the decision of relocating depends mainly on firms' characteristics (e.g. bigger firms sales-wise are less sensitive to high set-up costs). Although, we do not have access to cost data, we aim to capture some of the set-up costs effects through firms' level data.

[30] We estimated the model relaxing this constraint. With different parameters across nests, the inclusive value is close to zero and insignificant which suggests an inadequate nested structure. Results are available upon requests.

[31] For more details on logit and nested logit methods see Train (2002).

[32] The location specific variables used in the econometric model exhaust the information span.

[33] This number includes headquarters that were located in metropolitan areas in 1996 and have moved to one of the 106 metropolitan areas by 2001. Extending the sample to firms that located in non-metropolitan areas in 1996 and have moved to one of the 106 metropolitan areas by 2001 increases the database to 1,582 headquarters. Empirical results obtained with the 1,582 samples are very similar to those presented here.

[34] The model is available upon request.

[35] These business and financial sectors are similar to those chosen by Davis and Henderson (2004).

[36] We compute the share of employment in the financial sector (respectively, business sector) in total employment of location i divided by the share of the financial sector (respectively, business sector) in U.S. total employment. If the index is greater than 1, then location i is relatively specialized in financial (respectively, business) activities.

are likely to locate in metropolitan areas that specialize in their sector of activity and therefore may host some of their plants.

Corporate tax rates are at the state level data from the World Tax Database. State corporate tax is levied in addition to federal corporate tax when a corporation derives income from sources within a state, owns or leases property there, employs personnel there, or has capital or property in the state. If a business operates in multiple states, income is apportioned according to complex formulae. For our purpose, corporate tax levels at the headquarters' location is the relevant variable as corporate taxes levied on plants do not vary with the location of the headquarters. As some metropolitan areas cover multiple states, we built weighted average corporate tax rates, where weights correspond to the share of the MSA (or the CMSA) belonging to specific states.[37] Taxes are assumed to have a negative impact on headquarters' location. As Taxes enter Eq. (1) with a negative sign (i.e. $1-T_t$), the coefficient on this explanatory variable is expected to be positive.

The cost of transmitting headquarters' services across regions is proxied by the availability of airports in the headquarters' metropolitan area. Greater availability is expected to increase the attractiveness of a location. We also include a measure of the distance between the 1996 headquarters' location and the 2001 headquarters' potential location. Assuming that the 1996 location hosts the headquarters' plant (i.e. assuming that in 1996 the headquarters were located close to the plant and may decide to move away from it by 2001), such a measure proxies the potential distance between the headquarters and its plant. Thus, the larger the distance, the greater the cost of transmitting headquarters' services and the less likely it is that the headquarters will locate in the metropolitan area. In consequence, we expect a negative coefficient on distance.

We experimented with several middle nest level variables Y_r.[38] None of these variables were relevant, suggesting that the inclusive value captures most of the information.

3.2.2. The decision whether to relocate (upper nest level)

In order to study a firm's decision on relocation of its headquarters, we use the full database of firms that were located in a metropolitan area in 1996 and have made the decision of whether to relocate to one of the 106 metropolitan areas, as defined above, by 2001. Thus, we study the moving decision of about 25,900 headquarters.[39] The explanatory variables used in the estimation are similar to those defined above, except for firm-specific variables, which are added. Although these variables are not included in the theoretical model, they provide important information on the attributes of firms that choose to relocate. As described below such firm-specific variables are related to the influence of set-up costs on the decision of whether to relocate. Firm size is controlled by firm's sales level and by the size of the group to which the firm belongs. The age of the headquarters as well as a dummy stating whether firms have merged (or have been acquired) over the period, and the nationality of the firm (i.e. U.S. or foreign) are also included. All firms' data come from the D&B database. The estimation also includes an industry-specific "inclusive value", which has been computed at the middle nest level and reflects the attractiveness of moving for each industry. Finally, the size of the population of metropolitan areas, and regional and industrial dummies also enter the estimation.

At this level of the firm's decision tree firms compare whether they obtain a higher profit by staying in their present location or by moving. Such a decision should take into account moving and set-up costs. Such costs are not as relevant for headquarters as they are for plants, as headquarters do not require heavy capital investment, but they may however influence the decisions of whether to relocate. We may hypothesize that larger, younger, and foreign firms, as well as merged (or acquired) firms, will be less sensitive to moving and set-up costs and, in consequence, they are more likely to relocate some of their headquarters from the present location.

Coefficients on wages, corporate tax, headquarters' services transmission cost, headquarters agglomeration variables, and employment in financial and business sectors are expected to have opposite signs to those in the decision of *where* to locate, as variables are now measured at the location of origin.[40] We are estimating the parameters of variables that influence headquarters' relocation from their current location.

4. Results

We first provide the results of the "where to locate" estimation. We consider both the region-nested logit estimation, where nests depend on U.S. regions, and the population-nested logit estimation, where nests depend on the population range of metropolitan areas. We first estimate the choice of a metropolitan area within a region (respectively, population range) and then the choice of region (respectively, population range) taking into account the attractiveness of the metropolitan areas that belong to the region (respectively, population range). We estimate the "where to locate" model simultaneously for all nests by constraining the parameters to be the same across nests. Second, we focus on the results of the "whether to relocate" estimation. We thus provide the logit estimation of the parameters of firm- and location-specific variables that influence a firm's decision to move its headquarters from its 1996 location.

4.1. Decision of where to relocate: lower and medium levels of the nested logit model

Lower nest estimations yield the probability that a headquarters locates in a metropolitan area within a region or population range in function of the variables defined in Eq. (1). The choice of metropolitan area within a nest is conditioned on all attributes that are nest specific and thus do not vary across constituent metropolitan areas.

The results of the estimation are presented in Table 4. In the population-nested model (i.e., specifications (1), (2), and (3)), firms have an average of 26.5 choices of location whereas in the region-nested model (i.e., specifications (4), (5), and (6)) they have an average of 13.5 choices of location.[41]

Although the effect of wages is positive in specifications (1) and (4), such a positive effect is not robust to the introduction of variables capturing headquarters' agglomeration effects and the availability of financial and business services. Thus, it is likely that in specifications (1) and (4), higher wages reflect higher availability of qualified labor. The magnitude of the wage effect can be assessed by computing elasticities. In nested logit models, the elasticities are equivalent to computing $\hat{\beta}_i(1-P_r)$ where P_r is the probability of choosing an alternative in nest r and P_r is approximated by the average location choices. The coefficient on column (2) hence suggests that a 10% increase in the wage decreases the probability of choosing the metropolitan area by 25%. Population potentially reflects high availability of services and qualified labor in specifications (1) and (4), whereas it may suggest congestion costs in other specifications.

[37] As suggested by a referee, if a MSA lye across several states, firms self-select the lower tax state. Estimations using the minimum tax rate indeed show very close results, available upon request, to the one presented here.

[38] Such as population, average tax rate and some dummies as North/South or coast/no coast.

[39] From the database of 26,195 headquarters, we must omit the firms that have decided to relocate to some other location than the 106 metropolitan areas defined hereinabove. This eliminates 66 headquarters. Several other headquarters (249 to 374, depending on the specification) are not included in the estimation because some independent variables concerning these headquarters were missing.

[40] All are 1996 data.

[41] Results for the subsample of headquarters of multi-site firms are very similar to the ones presented here. They are available upon request.

Table 4
The *where* to locate model: first and second stage of the nested logit

Model	(1)	(2)	(3)	(4)	(5)	(6)
ln wage	0.61	−2.58***	−2.51***	1.44***	−1.37**	−1.37**
	(0.39)	(0.55)	(0.55)	(0.43)	(0.64)	(0.64)
ln (1−corporate tax rate)	3.87***	2.22**	2.21**	−0.61	−0.33	−0.40
	(0.91)	(1.02)	(1.02)	(1.15)	(1.26)	(1.26)
Airport small hub	0.25	0.04	0.01	0.32**	0.33**	0.23
	(0.19)	(0.21)	(0.21)	(0.16)	(0.17)	(0.18)
Airport large hub	0.58***	0.27	0.22	0.75***	0.65***	0.48**
	(0.22)	(0.24)	(0.24)	(0.19)	(0.22)	(0.22)
ln population	0.80***	−0.04	−0.00	0.82***	0.17	0.22
	(0.07)	(0.14)	(0.15)	(0.06)	(0.15)	(0.15)
ln (distance)		−0.23***	−0.23***		−0.07	−0.07
		(0.03)	(0.03)		(0.05)	(0.05)
ln (total headquarters)		0.45***	0.45***		0.28*	0.27*
		(0.14)	(0.14)		(0.16)	(0.16)
ln (headquarters same SIC)		0.50***	0.59***		0.44***	0.63***
		(0.05)	(0.08)		(0.06)	(0.08)
ln (HQ same SIC) squared			−0.02			−0.03***
			(0.01)			(0.01)
ln (share of employment same SIC)		0.72***	0.72***		0.74***	0.74***
		(0.11)	(0.11)		(0.11)	(0.12)
ln (share of employment in finance)		0.52**	0.52**		0.56**	0.61**
		(0.27)	(0.27)		(0.28)	(0.28)
ln (share of employment in business)		1.40***	1.42***		0.81***	0.74**
		(0.31)	(0.31)		(0.34)	(0.34)
N	30,566	30,519	30,519	24,989	24,982	24,982
Likelihood ratio index	0.024	0.088	0.088	0.246	0.279	0.280
Inclusive value(δ)	0.56***	0.52***	0.51***	0.53***	0.53***	0.54***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
N	5341	5341	5341	10,053	10,053	10,053
Likelihood ratio index	0.149	0.150	0.150	0.101	0.109	0.109

Note: Specifications (1), (2), and (3) are population nested, (4), (5) and (6) are region nested. Standard errors are in parenthesis. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. *N* corresponds to the number of headquarters that relocate (i.e. 1,441) times the number of potential locations for each headquarters. Note that, depending on the nest chosen, headquarters differ in the number of MSAs they are considering.

Interestingly, corporate tax rate levels have a significant impact on the choice of location of headquarters in the population-nested model, but are insignificant in the region-nested model reflecting the fact that corporate tax rates vary more appreciably across regions than across metropolitan areas within regions. Relying on specification (2), a one-point rise in the corporate tax rate yields a decrease of about 2.25% in the probability that headquarters will choose a location. This corporate tax effect is smaller than others found in the literature (e.g. Head and Mayer (2004) obtained an elasticity of about 5 with data on Japanese-owned affiliates establishing in 57 regions belonging to nine European countries between 1984 and 1995). Most studies, however, only consider manufacturing firms, which tends to inflate the tax effect. Using the manufacturing headquarters sample, we find that a one-point rise in the corporate tax rate yields a decrease of about 4.4% in the probability that headquarters will chose a location. Results for manufacturing headquarters are given in Table A9 in the Appendix.

Similarly, the distance between a headquarters' original location and destination is only significant in the population-nested model. Such a variable captures the potential distance between the headquarters' plant (assuming it is located in the headquarters' original metropolitan area) and the headquarters in its new location. It thus reflects the cost of transmitting headquarters' services. Whereas such costs may vary greatly between metropolitan areas within a population nest, they are likely to be small between metropolitan areas within a region nest.[42]

Relying on specification (2), a 10% increase in distance decreases the probability of choosing the metropolitan area by 2.2%.

In contrast, airport availability has a much more significant influence on the choice of metropolitan area in the region-nested model. This feature is not surprising, as metropolitan areas within population nests tend to host similar numbers of airports. Relying on specification (5), the probability of locating in a metropolitan area increases significantly with the availability of airports. Relying on odds ratio, we find that the probability of locating in a metropolitan area increases by 40% if the city offers a small hub and increases by 90% if the city offers a large hub, compared with a location with no hub. The impact is dramatic and confirms the intuition that headquarters rely intensively on airport connections in their relation with plants and customers.

The agglomeration variables also have a large influence on the choice of metropolitan area made by headquarters. The coefficients on the total number of headquarters and on the count of headquarters of the same SIC industry are always positive and significant.[43] Coefficients in column (5) suggest that a 10% increase in the total number of headquarters of a SIC different than the headquarters increases the probability of choosing a location by 2.6%, while a 10% increase in the number of headquarters from the same SIC industry increases the probability of choosing a location by 6.7%.[44] Specifications (3) and (6) in Table 4 introduce a nonlinear effect by including a quadratic term for the same-industry headquarters variable. The marginal effect of the presence of headquarters in a metropolitan area is decreasing in the size of the agglomeration. Relying on specification (6), a 10% increase in the number of same-industry headquarters in a metropolitan area that hosts one (respectively 100, 600) such headquarters increases the probability of choosing the location by 8.3% (respectively 5.8%, 4.8%).

Moreover, the probability of headquarters choosing a metropolitan area is increased if the metropolitan area is specialized in the headquarters' sector of activity. This is captured by the highly significantly positive coefficient on the measure of same SIC industry specialization. This result suggests that headquarters choose to locate where final demand, and consequently production of goods from their industry, is high. Among several options, headquarters may thus decide to locate close to some of their plants.

Importantly, both measures of relative availability of financial and business services are significant and have positive effects on the decision of headquarters' locations across all specifications.[45] A 10% increase in the measure of financial services specialization increases the probability of choosing a location by about 5%, while a 10% increase in the measure of business services specialization increases the probability of choosing a location by 7–13.5%, depending on the specifications. Whereas the availability of business services has a significant influence on the location decision of manufacturing headquarters (Table A9 in the Appendix), the availability of financial services is irrelevant as a determinant of manufacturing headquarters' location. This result is consistent with Davis and Henderson (2004).

In view of the value and significance of the inclusive value, the nested structure seems an appropriate methodology to study headquarters' location choice. Our inclusive value lies between 0.51 and 0.56 and is highly significant in all specifications. A coefficient approaching zero would suggest that conditional on the observed factors metropolitan areas within nests are almost similar from the point of view of the firm,

[42] Consider a headquarters originally located in Santa Cruz, CA. If such a headquarters chooses to relocate according to the population-nested structure and aims at locating in a CMSA, its cost of transmitting headquarters' services would be very different if it moves to Los Angeles, Chicago, or New York. In contrast, if the headquarters follows the region-nested structure of decision, its cost of transmitting headquarters' services would be quite similar in Los Angeles or San Francisco.

[43] Industrial codes are of the two-digit SIC level.

[44] Note that a 10% increase in the number of headquarters from the same SIC industry increases the probability of choosing a location because it increases both the same SIC headquarters agglomeration and total headquarters agglomeration. We must, thus, add the two effects, which leads to this 6.7% increase. These elasticities are in the same range than the elasticities found in Head and Mayer (2004), who measured the effect of the count of Japanese establishments on Japanese firms' decision to locate in the E.U.

[45] We also used the level of employment in financial (respectively, business) services and the number of establishments in financial (respectively, business) services as a proxy for financial (respectively, business) availability. Results obtained are similar, but are less significant.

whereas a coefficient approaching one would reject the nested structure and suggest that all alternatives be considered separately.[46] Note that a Hausman–McFadden test run on the conditional logit model confirms the failure of the IIA assumption. Under the IIA assumption, we would expect no change in coefficients if we were to exclude one of the alternatives. The Hausman–MacFadden test shows that excluding New York gives strong evidence that we can reject the null hypothesis of no difference in coefficients with a Hausman–MacFadden statistic of 137 significant at the 1% level.[47]

The likelihood ratio index assesses the goodness of fit of our models.[48] According to this statistic, the region-nested model seems to fit the data better than the population-nested model. Further interpretation of the parameters shows however that these models provide different information depending on the specification of the nests. For example, the relevance of airport availability depends on whether we are considering cities that are geographically close (i.e., the region-nested structure) or cities that are close in their size (i.e., the population-nested structure). A *J*-test performed on specification (2) and (5) confirms these results. Although the parameter associated to the predicted value of the region-nested model estimated in the population-nested model has higher significancy than its counterpart, both parameters are significant. This suggests that each model adds information to the other.[49]

In order to correct for endogeneity issue caused by omitted variables at the location level, we introduce several dummy variables. Table A10 in the Appendix provides the results.

Specification (1) is population-nested and includes regional dummies whereas specification (3) is region-nested and includes population-range dummies. Introducing population-range dummies in the region-nested model makes the airport variables insignificant because availability of airports is highly correlated with cities size. Similarly, introducing regional dummies in the population-nested model makes the tax variable insignificant because tax rate is similar within region.[50] The main results are otherwise similar to the ones of Table 4. The population-nested specification (2) and the region-nested specification (4) include states fixed effects. Such fixed effects provides interesting results. First, the inclusive value is significant and close to zero. The error is hence almost perfectly correlated across alternatives that compose the nests. There are no dissimilarities between metropolitan areas which compose a nest: they are almost perfect substitutes to the firms. Thus, controlling for a number of variables, we have exhausted the location specific effects. Such improvement in term of controlling for location specific endogeneity has however a cost as we must drop the tax variable which is also at the state level. Importantly, the main results are unchanged.

As per a robustness check, several amenities as well as an education variable proxying for human capital were added to the regression as independent variables.

Amenities do not enter the production/cost function of the firm and therefore are not included in the main specifications. Local availability of amenities is however likely to matter in employees preferences and consequently may influence headquarters location decision. Moreover, airport variables are likely to be highly correlated with other characteristics of metropolitan areas. In order to test the robustness of our findings it is therefore important to control for such variables.[51] The amenities variables include amusement and recreational services (e.g., dance studio, theater, professional sport and the like), museums, health services and educational services. The amenity variables are constructed as Hoover–Balassa indices. Data are from the County Business Pattern Database. Table A11 in the Appendix provides the results.[52] Amusement and recreational services as well as museums enter the estimation significantly. The positive coefficient on recreational services confirms the relevance of high-end activities in attracting headquarters to a location. The negative coefficient on museums likely reflects the movement away from traditional rust belt centers which host most of the museums. Importantly, the relevance of having a large airport hub is robust to the introduction of amenities. Whereas the availability of amenities seems correlated with accessibility to small airports and finance services, hosting a large hub turns out to be a big advantage for a metropolitan area seeking to attract headquarters.

In order to capture the availability of human capital in a metropolitan area, we account for the percent of the labor force with at least a bachelor degree.[53] As shown in Table A11 in the Appendix, the educated labor force variable does not present statistic significance. In the region-nested model, the introduction of the percent of workforce with bachelor degree variable makes the business availability variable insignificant, whereas omitting the later results in a highly statistically and economically significant educated labor force variable with a coefficient of 0.41. This could be expected as business services employ educated labor force implying a high correlation between the two variables. Moreover, the educated labor force is well distributed across metropolitan area of similar size. This is reflected by the insignificancy of the variable in the population-nested model.[54] The availability of human capital thus plays a role in attracting headquarters whether directly or through the abundance of business services.

4.2. Decision of whether to relocate: upper level of the nested logit model

Table 5 provides the results of the upper level of the nested logit estimation. In Table 5, we use the results of specification (5) to compute the inclusive value and present four different specifications.[55] Specification (1) includes firm-specific variables, environment variables (i.e. corporate tax and airport availability), and standard location-specific variables (i.e. wages and population). Specification (2) adds region, industry, and population range fixed effects. These fixed effects capture part of the unobservable correlation in the characteristics of metropolitan areas within regions, industries, or in a similar population range. Specification (3) presents the full set of variables by adding cost variables that are specific to headquarters (i.e. employment in financial and business services) and agglomeration variables. Finally, specification (4) adds states fixed effects. The signs and magnitude of the coefficients are consistent across specifications. For the interpretation we rely on specification (3), which is the most complete (including tax) and significant.[56]

Firm-specific variables are highly significant. The larger the headquarters in term of sales, the more likely it is to relocate. This result may suggest that small headquarters may locate close to their plants, which are hard to move, whereas large headquarters, with global activities, are likely to be attracted by active business centers. Similarly, headquarters belonging to very large firms with several managerial centers (i.e. headquarters), are more likely to change metropolitan areas. If there Coefficients on the inclusive value and on

[46] See Section 3.1 for a further discussion on the significance of the inclusive value as a valid test of the appropriateness of the nested structure.

[47] Excluding other important metropolitan areas leads to the same conclusion albeit with lower significance.

[48] The likelihood ratio index measures how well the estimated model performs compared to a model where all the parameters are zero.

[49] Results of the *J* test are available upon request.

[50] Such effects are expected from the analysis of specifications (2) and (5) in Table 4.

[51] We thank a referee for pointing this out.

[52] As the health and educational services variables are not significant and have no impact on other variables, we do not include them in the table.

[53] Data are from the Current Population Survey, database on labor force by education attainment for January 1996.

[54] If we do not include the business services variable, the educated labor force variable becomes statistically and economically significant with a coefficient of 0.35.

[55] Results of the upper level model obtained with other specifications of Table 4 are similar to that presented below. Coefficients on the inclusive value and on the constant are the only results that vary.

[56] The inclusion of amenities variables in the "whether to relocate" estimation does not modify the results. Amenities are statistically insignificant in explaining headquarter decision to relocate. Other variables coefficients are unaffected.

Table 5
The *whether* to locate model: third stage of the nested logit

Model	(1)	(2)	(3)	(4)
ln sales	0.13***	0.13***	0.13***	0.13***
	(0.02)	(0.02)	(0.02)	(0.02)
ln (number of headquarters in the firm)	0.09***	0.09***	0.09***	0.09
	(0.02)	(0.02)	(0.02)	(0.02)
ln (age)	−0.31***	−0.30***	−0.30***	−0.30***
	(0.04)	(0.04)	(0.04)	(0.04)
ln (merger)	1.40***	1.37***	1.39***	1.39***
	(0.12)	(0.12)	(0.12)	(0.12)
ln (foreign)	0.64***	0.59***	0.65***	0.66***
	(0.10)	(0.11)	(0.11)	(0.11)
ln wage	0.23	0.75*	0.82	1.80**
	(0.38)	(0.42)	(0.60)	(0.78)
ln (1−corporate tax rate)	−0.91	−2.45*	−2.62*	
	(0.98)	(1.39)	(1.41)	
Airport small hub	−0.15	−0.32*	−0.40**	−0.27
	(0.12)	(0.17)	(0.19)	(0.20)
Airport large hub	−0.21	−0.44**	−0.52**	−0.48*
	(0.16)	(0.22)	(0.24)	(0.28)
ln population	0.02	−0.10	0.01	−0.05
	(0.06)	(0.08)	(0.16)	(0.21)
ln (total headquarters)			0.12	0.11
			(0.14)	(0.18)
ln (headquarters same SIC)			−0.28***	−0.29***
			(0.05)	(0.05)
ln (share of employment same SIC)			−0.13	−0.10
			(0.10)	(0.11)
ln (share of employment in finance)			0.22	−0.02
			(0.31)	(0.40)
ln (share of employment in business)			0.20	−0.21
			(0.33)	(0.40)
Inclusive value	0.08***	0.06***	0.15***	0.16***
	(0.02)	(0.02)	(0.03)	(0.03)
Constant	−6.82**	−9.99***	−12.83***	−21.76**
	(3.35)	(3.94)	(6.33)	(8.53)
Industry, population and region dummies	No	Yes	Yes	Yes
States fixed effects	No	No	No	Yes
N	25,880	25,880	25,755	25,672
Likelihood ratio index	0.033	0.040	0.046	0.055

Note: Standard errors are in parenthesis. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. *N* is the total number of headquarters for which all explanatory variables were available.

the constant are the only results that vary are set-up costs to change the location of a headquarters then larger firms may be able to afford it more easily (e.g. less costly per unit of sales, say). This may also reflect the global strategy of large firms which spread their activities over several locations and aim at being present in most profitable locations. In contrast, small firms with reduced numbers of headquarters have local strategies and are more reluctant to make changes.

The coefficient on the age of the headquarters suggests that young headquarters are more likely to relocate. A 10% increase in age decreases headquarters' probability of moving by about 3%. This result suggests that corporate history matters as established headquarters, in activity since the late 1800s or early 1900s, are more reluctant to change location than headquarters in activity since the second part of the 20th century. As expected, the coefficient on the merger dummy variable is positive. Headquarters belonging to firms that have merged or have been acquired between 1996 and 2001 have a higher probability of relocating. Similarly, foreign firms are more likely to relocate than their U.S. counterparts.

Although mostly not significant, the coefficient on wages suggests that high wages in a metropolitan area positively influence a firm's decision to move its headquarters. The effect of corporate taxation on the decision to relocate headquarters is also meaningful. A one-point rise in the corporate tax rate yields an increase of about 2.8% in the probability of headquarter's relocation. As in the *where* to locate model, airport availability is highly relevant in a headquarters' decision of whether to relocate. The larger the airport hub, the less likely the headquarters is to move away from such a metropolitan area. The probability of relocating decreases by 33% if the current location offers a small hub and decreases by 40% if the current location offers a large hub, compared with a location with no hub.

Headquarters are less likely to relocate if they are currently in a metropolitan area with a large number of headquarters belonging to the same industry. The coefficient in column (3) suggests that a 10% increase in the number of headquarters from the same SIC industry decreases the probability of moving by about 4%. In contrast, the index of specialization in the headquarter's sector of activity is insignificant. For manufacturing headquarters however, this index is high and significant (see Table A12 in the Appendix). Production is less geographically dispersed in manufacturing than, say, in the service or retail sectors causing manufacturing headquarters to be more reluctant to move from a metropolitan area that specializes in their sector of activity.

The important move away from the New York metropolitan area (also the biggest agglomeration of financial and business services) may have caused the lack of significance of financial and business specialization variables. Adding a New York dummy to the regression does not however modify the results. We also experimented adding a dummy for the five centers that lost the most headquarters over the period. Once again, the results are unchanged. In view of these results, headquarters decision of whether to relocate seems to be more dependent on headquarters specificities than location specificities. The location variables that influence a headquarter decision to leave a MSA are the unavailability of a large airport hub and the non-agglomeration of headquarters from the same industry.

These results are consistent with the findings of Section 2. Headquarters find it important to locate close to each other and large headquarters (in sales) tend to relocate in greater proportion. This may explain why the increased concentration is more obvious in sales levels than in number of headquarters (see Table 3).

The coefficient on the inclusive value is highly significant although quite low (Table 5). Thus, the attractiveness of moving depends somewhat on the two-digit SIC industry in which the firm specializes. This feature is not relevant for the manufacturing headquarters sample for which the inclusive value is always insignificant. Within manufacturing, firms in different two-digit sectors thus value moving in a similar fashion.

5. Conclusions

In summary, headquarters location choice tends toward metropolitan areas with good airport facilities, low corporate taxes, low average wages, high levels of business services, same industry specialization, and agglomeration of headquarters in the same sector of activity. Larger (sales-wise) headquarters tend to relocate more as well as foreign firms, global (in terms of their numbers of headquarters) firms, and firms that are the outcome of a merger. Corporate history matters, as older headquarters are less likely to move. These results reflect our findings of Section 2 which show a reconcentration of headquarters toward upper-middle sized service-oriented "sun belt" centers.

Our results imply that a metropolitan area that wants to keep and attract headquarters must improve airport facilities, lower taxes, and promote the location of business services and other headquarters. It also helps to increase recreational amenities and the education of the labor force (which tends to be correlated with the level of business services). The dramatic and robust impact of a better airport cannot be underscored. However, the results we obtain should be used with care for policy purposes. Indeed, in order to attract business services and headquarters direct subsidies and incentives can be provided, and this is what cities do. Our model presents some of the elements that cities may take into account in this respect but more precise policy prescriptions should await a more complete estimation of the externalities due to agglomeration.

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Appendix

A.1. Headquarters' data

Our headquarters database is built from D&B's *Who Owns Whom* publication. D&B's business database is one of the world's largest with over 84 million companies worldwide. *Who Owns Whom* is a worldwide company directory file that links a company to its corporate family, showing the size of its corporate structure, its family hierarchy, as well as key information on the company. The D&B *Who Owns Whom* database is developed from company interviews as well as government sources, large-volume mailings, and third-party sources. Company data include sales levels, SIC code, age of the headquarters as well as country of ownership of the corporation (see Tables A1–A4).

A.2. Metropolitan areas and regions: concept and components

Metropolitan areas include MSAs and CMSAs. MSAs must include at least one city with 50,000 or more inhabitants, or a Census-Bureau-defined urbanized area (of at least 50,000 inhabitants) and a total metropolitan population of at least 100,000. An area that qualifies as an MSA and has a population of one million or more may be recognized as a CMSA if separate component areas that demonstrate strong internal, social, and economic ties can be identified within the entire area and local opinion supports the component areas. Locations' definitions change over time as new MSAs and CMSAs are added. Before the creation of a CMSA we keep track of all separate MSAs that later form the CMSA in order to obtain a consistent time series. Similarly, before the creation of a MSA we keep track of all separate counties that later form the MSA.

A.3. Independent variables

Wages are from the Bureau of Economic Analysis, Regional Economic Information System database.

Business and financial services employment data are from the County Business Pattern, U.S. Census Bureau, for 1996 and 2001. The following SIC codes were selected: advertising (7311, 7312, 7313, 7319), employment agencies (7361), computer services (7371, 7372, 7373, 7374, 7375, 7376, 7377, 7378, 7379), legal services (81), engineering and management services (8711, 8712, 8713, 8720, 8731, 8732, 8733, 8734, 8741, 8742, 8743, 8744, 8748), commercial banks (6020), security and commodity brokers, dealers, exchanges and services (6210, 6220, 6230, 6280), and holding and other investment offices (6710, 6720, 6732, 6733, 6792, 6794, 6798, 6799). Data were aggregated to the MSA/CMSA levels.

Externality variables: headquarters agglomeration variables are built from the D&B database whereas industries agglomeration indices are built from the County Business Pattern. SIC2 level data are used to build agglomeration effects of same SIC levels.

Corporate tax rates are from the World Tax Database (WTDB) for 1996 and 2001. The WTDB is a project of the Office of Tax Policy Research. This database has current and historical data on the tax systems of the world. It is provided by the University of Michigan Business School.

Airports data are from the Bureau of Transportation Statistics (BTS): Airport Activity Statistics of Certificated Air Carrier (1999). We constructed dummies that indicate the availability of airports in a location. Airport D2 takes a value of 1 if the location corresponds to a large airport hub. This airport enplaned more than 1% of total enplaned passengers per year (i.e. more than 6,106,287 passengers). Note that according to the BTS, there are 29 large hubs. Airport D1 takes a value of 1 if airports in a location enplaned from 0.05% to 1% of total enplaned passengers per year (i.e. from 305,314 to 6,106,287 passengers). There are 75 of these small airport hubs. Airport D0 takes a value of 1 if airports in a location enplaned less than 0.05% of total enplaned passengers—177 locations presented such a feature.

Table A1
Sector composition

Industrial sector (SIC1)	Headquarters database		Reduced headquarters database		Moving headquarters database	
	Frequency 1996 (%)	Frequency 2001 (%)	Frequency 1996 (%)	Frequency 2001 (%)	Frequency 1996 (%)	Frequency 2001 (%)
Agriculture, forestry, and fishing	0.14	0.15	0.09	0.10	0.07	0.00
Mining	1.96	1.85	1.73	1.74	3.33	3.12
Construction	3.61	3.89	3.73	3.71	2.57	2.71
Manufacturing	30.96	29.08	31.79	31.57	33.59	33.80
Transportation, communication, and utilities	7.56	7.95	7.46	7.52	8.81	9.16
Wholesale trade	17.16	16.90	17.80	17.76	20.82	20.61
Retail trade	6.79	6.77	6.95	6.98	5.27	5.34
Finance, insurance, and real estate	16.19	15.19	15.83	15.92	9.72	9.65
Service industries	15.25	17.89	14.64	14.69	15.81	15.61
Total number of headquarters	50,212	52,513	26,195	26,195	1441	1441

In table TA1 to TA4, the reduced headquarters database corresponds to the database of firms present in both 1996 and 2001.

Table A2
Origin composition

Origin of corporation	Headquarters database		Reduced headquarters database		Moving headquarters database	
	Frequency 1996 (%)	Frequency 2001 (%)	Frequency 1996 (%)	Frequency 2001 (%)	Frequency 1996 (%)	Frequency 2001 (%)
U.S.	69.65	66.56	69.70	67.07	62.60	58.57
Foreign	30.35	33.44	30.30	32.93	37.40	41.43
Total number of headquarters	50,212	52,513	26,195	26,195	1441	1441

Table A3
Status composition

Status	Reduced headquarters database Frequency (%)	Moving headquarters database Frequency (%)
No change in status by 1996–2001	92.86	85.57
Merged/acquired by 1996–2001	7.14	14.43
Total number of headquarters	26,195	1,441

Table A4
Summary statistics

	Headquarters database		Reduced headquarters database		Moving headquarters database	
	Mean 1996	Mean 2001	Mean 1996	Mean 2001	Mean 1996	Mean 2001
Sales (millions constant $)	199.4	228.7	279.7	330.4	385.4	407.6
Family size	54.2	68.4	52.3	72.8	62.7	99.6
Age in 1996 (years)	16.7		18.9		15.3	
year started	1979		1977		1981	

Table A5
Leading metropolitan areas by number of headquarters and headquarters' sales in 1996

Metropolitan areas	Number of headquarters	Metropolitan areas	Sales (×U.S. $millions)
New York–New Jersey–Long Island	3954	New York–New Jersey–Long Island	1,490,597
Los Angeles–Riverside–Orange County	1804	Chicago–Gary–Kenosha	499,081
Chicago–Gary–Kenosha	1532	Detroit–Ann Arbor–Flint	384,339
San Francisco–Oakland–San Jose	951	Los Angeles–Riverside–Orange County	338,464
Boston–Worcester–Lawrence	945	San Francisco–Oakland–San Jose	324,822
Philadelphia–Wilmington–Atlantic City	885	Dallas–Fort Worth	302,642
Houston–Galveston–Brazoria, TX	806	Philadelphia–Wilmington–Atlantic City	249,651
Washington–Baltimore	767	Minneapolis–St. Paul	228,154
Dallas–Fort Worth	721	Washington–Baltimore	217,835
Atlanta	684	Houston–Galveston–Brazoria	203,888
Detroit–Ann Arbor–Flint	625	Atlanta	189,515
Minneapolis–St. Paul	513	Boston–Worcester–Lawrence	165,901
Cleveland–Akron	400	Cleveland–Akron	125,778
Miami–Fort Lauderdale	371	St. Louis	122,920
Seattle–Tacoma–Bremerton	369	Pittsburgh	100,589
St. Louis	367	Cincinnati–Hamilton	99,015
Pittsburgh	331	Seattle–Tacoma–Bremerton	94,984
Denver–Boulder–Greeley	306	Hartford	85,784
Milwaukee–Racine	283	Columbus	71,417
Charlotte–Gastonia–Rock Hill	270	Charlotte–Gastonia–Rock Hill	67,075

Table A6
Metropolitan areas gaining and losing the most manufacturing headquarters between 1996 and 2001

Metropolitan areas	Change in number of headquarters	Metropolitan areas	Change in sales (percentage points)
Gaining			
Greensboro–Winston–Salem–High Point	10	San Francisco–Oakland–San Jose	1.76
Pittsburgh	10	Detroit–Ann Arbor–Flint	1.22
San Diego	7	Chicago–Gary–Kenosha	0.82
Detroit–Ann Arbor–Flint	7	Houston–Galveston–Brazoria	0.51
Phoenix–Mesa	6	Austin–San Marcos	0.49
Indianapolis	5	Cincinnati–Hamilton	0.47
San Antonio	5	Dallas–Fort Worth	0.41
Dallas–Fort Worth	5	Atlanta	0.35
Raleigh–Durham–Chapel Hill	4	Phoenix–Mesa	0.33

(*continued on next page*)

Table A6 (*continued*)

Metropolitan areas	Change in number of headquarters	Metropolitan areas	Change in sales (percentage points)
Nashville	4	San Antonio	0.31
Jacksonville	4	Columbia	0.18
Losing			
New York–New Jersey–Long Island	−32	Washington–Baltimore	−1.64
Cleveland–Akron	−10	Seattle–Tacoma–Bremerton	−1.26
San Francisco–Oakland–San Jose	−8	St. Louis	−1.00
Youngstown–Warren	8	New York–New Jersey–Long Island	−0.98
Minneapolis–St. Paul	−8	Cleveland–Akron	−0.96
Philadelphia–Wilmington–Atlantic City	−7	Los Angeles–Riverside–Orange County	−0.41
Los Angeles–Riverside–Orange County	−7	Richmond–Petersburg	−0.31
Denver–Boulder–Greeley	−3	Raleigh–Durham–Chapel Hill	−0.31
Tulsa	−3	Kalamazoo–Battle Creek	−0.23
Rochester	−3	Reading	−0.13
Atlanta	−3	Nashville	−0.13
Allentown–Bethlehem–Easton	−3	Hartford	−0.11

Table A7
Headquarters relocation among the 500 largest 1996 headquarters

Company name	Industrial sector	Metropolitan area 1996	Metropolitan area 2001
Ahold U.S.A. Holdings, Inc.	Grocery stores	Atlanta	Washington
Ashland Inc.	Petroleum refining	Huntington	Cincinnati
Avnet Inc.	Electronic part and equipment	New York	Phoenix
Banc One Corporation	National commercial banks	Columbus	Chicago
Bank of America National Trust and Savings	National commercial banks	San Francisco	Charlotte
Boeing Company, The, Inc.	Aircraft	Seattle	Chicago
BP America Inc.	Petroleum refining	Cleveland	Chicago
Browning–Ferris Industries Inc.	Refuse systems	Houston	Phoenix
First Data Corporation	Computer processing/Data	New York	Denver
Fleming Companies, Inc.	Groceries	Oklahoma	Dallas
FMC Corporation	Alkalies and chlorine	Chicago	Philadelphia
Fort James Corporation	Paper mills	Richmond	Atlanta
Fortune Brands Inc.	Distilled and blended liquors	New York	Chicago
GTE Corporation	Phone communications	New York	Dallas
Highmark Inc.	Hospital and medical insurance	Harrisburg	Pittsburgh
Honeywell Inc.	Automatic regulating controls	Minneapolis	New York
Lincoln National Corporation	Life insurance	Fort Wayne	Philadelphia
MCI Communications Corporation	Phone communications	Washington	Jackson, MS
Mobil Corporation	Petroleum refining	Washington	Dallas
Monsanto Company Inc.	Organic fibers non-cellulosic	St. Louis	New York
Norwest Corporation	National commercial banks	Minneapolis	San Francisc
Pharmacia and Upjohn Inc.	Pharmaceutical preparation	Kalamazoo	New York
PNC Bancorp Inc.	National commercial banks	Pittsburgh	Philadelphia
RevcoDiscount DrugCenters Inc.	Dispensing chemists	Cleveland	Providence
RJR Nabisco Inc.	Cigarettes	New York	Greensboro
Rockwell International Corporation	Display/Control instruments	Los Angeles	Milwaukee
Standard Oil Company, The, Inc.	Petroleum refining	Cleveland	Chicago
Tenneco Inc.	Cardboard	New York	Chicago
Tosco Corporation	Petroleum refining	New York	Phoenix
Transamerica Corporation	Life insurance	San Francisco	Chicago
Union Pacific Corporation	Railroads line haulage	Allentown	Omaha
Unisource Worldwide, Inc.	Printing and writing paper	Philadelphia	Atlanta
Usx Corporation	Crude petroleum/Natural gas	Pittsburgh	Houston
Vf Corporation	Trousers male	Reading	Greensboro
Waste Management of North America Inc.	Refuse systems	Chicago	Houston
Westinghouse Electric Corporation	TV broadcasting stations	Pittsburgh	New York

Table A8
The where to locate model: conditional logit; The whether to locate model: straight logit

Model	Where to locate		Whether to relocate	
Specification	(1)	(2)	(3)	(4)
Ln sales			0.13 ***	0.13 ***
			(0.02)	(0.02)
ln (number of headquarters in the firm)			0.08 ***	0.08 ***
			(0.02)	(0.02)
ln (age)			−0.31 ***	−0.31 ***
			(0.04)	(0.04)
ln (merger)			1.39 ***	1.39 ***
			(0.12)	(0.12)

Table A8 (*continued*)

Model	Where to locate		Whether to relocate	
Specification	(1)	(2)	(3)	(4)
ln (foreign)			0.67 ***	0.68 ***
			(0.11)	(0.11)
ln wage	0.47	−2.80***	0.82	1.80**
	(0.36)	(0.53)	(0.60)	(0.78)
ln (1−corporate tax rate)	3.97 ***	2.08 **	−2.79**	
	(0.86)	(0.93)	(1.41)	
Airport small hub	0.44 ***	0.33 **	−0.38**	−0.23
	(0.15)	(0.17)	(0.18)	(0.20)
Airport large hub	0.80 ***	0.59 ***	−0.53**	−0.45*
	(0.18)	(0.20)	(0.24)	(0.28)
ln population	0.85***	0.00	−0.06	−0.14
	(0.05)	(0.13)	(0.15)	(0.21)
ln (distance)		−0.23***		
		(0.02)		
ln (total headquarters)		0.46***	0.00	0.02
		(0.14)	(0.14)	(0.18)
ln (headquarters same SIC)		0.47***	−0.09**	−0.09***
		(0.05)	(0.03)	(0.04)
ln (share of employment same SIC)		0.75 ***	−0.35***	−0.33***
		(0.10)	(0.10)	(0.10)
ln (share of employment in finance)		0.51 **	0.16	−0.07
		(0.26)	(0.31)	(0.40)
ln (share of employment in business)		1.40***	0.23	−0.16
		(0.31)	(0.33)	(0.40)
Constant			−10.99*	−19.74**
			(6.30)	(8.50)
Industry, population and region dummies			Yes	Yes
States fixed effects			No	Yes
N	152,746	152,640	25,922	25,839
Likelihood ratio index	0.152	0.193	0.043	0.052

Note: Standard errors are in parenthesis. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. *N* is the total number of headquarters for which all explanatory variables were available.

Table A9

The where to locate model: first and second stage of the nested logit for manufacturing headquarters

Model	(1)	(2)	(3)	(4)	(5)	(6)
ln wage	0.32	−2.24**	−2.25**	0.79	−0.54	−0.37
	(0.66)	(0.93)	(0.93)	(0.76)	(1.08)	(1.09)
ln (1−corporate tax rate)	3.83**	4.35***	4.36***	0.73	2.09	1.96
	(1.59)	(1.72)	(1.72)	(2.07)	(2.27)	(2.27)
Airport small hub	0.16	0.35	0.35	0.18	0.43 *	0.38
	(0.29)	(0.33)	(0.33)	(0.24)	(0.26)	(0.27)
Airport large hub	0.19	0.52	0.52	0.41	0.63 *	0.54
	(0.34)	(0.39)	(0.39)	(0.30)	(0.35)	(0.36)
ln population	0.88***	0.61**	0.60**	0.86***	0.54**	0.59**
	(0.13)	(0.25)	(0.26)	(0.11)	(0.26)	(0.27)
ln (distance)		−0.32***	−0.32***		−0.11	−0.11
		(0.04)	(0.04)		(0.09)	(0.09)
ln (total headquarters)		0.10	0.10		−0.04	−0.05
		(0.24)	(0.24)		(0.26)	(0.27)
ln (headquarters same SIC)		0.42***	0.41***		0.41***	0.53***
		(0.09)	(0.15)		(0.10)	(0.15)
ln (headquarters same SIC) squared			0.002			−0.03
			(0.03)			(0.02)
ln (share of employment same SIC)		0.80***	0.80***		0.78***	0.77***
		(0.15)	(0.15)		(0.16)	(0.16)
ln (share of employment in finance)		−0.09	−0.10		−0.08	−0.02
		(0.48)	(0.48)		(0.49)	(0.50)
ln (share of employment in business)		1.63***	1.63***		0.67	0.63
		(0.55)	(0.55)		(0.58)	(0.58)
N	10,597	10,597	10,597	8729	8729	8729
Likelihood ratio index	0.022	0.093	0.093	0.209	0.249	0.249
Inclusive value (δ)	0.55***	0.43***	0.42***	0.57***	0.53***	0.54***
	(0.05)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)
N	1845	1845	1845	3319	3319	3319
Likelihood ratio index	0.122	0.120	0.120	0.109	0.112	0.112

Note: Specifications (1), (2), and (3) are population nested, (4), (5), and (6) are region nested. Standard errors are in parenthesis. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. *N* corresponds to the number of manufacturing headquarters that relocate (i.e. 480) times the number of potential locations for each headquarters. Note that, depending on the nest chosen, headquarters differ in the number of MSAs they are considering.

Table A10
The where to locate model: first and second stage of the nested logit with population-range dummies, regional dummies, and States fixed effects

Model	(1)	(2)	(3)	(4)
ln wage	−1.38**	0.30	−1.08*	−1.20
	(0.66)	(1.04)	(0.66)	(0.92)
ln (1−corporate tax rate)	−0.01		0.26	
	(1.32)		(1.31)	
Airport small hub	0.09	−0.26	0.08	0.46**
	(0.21)	(0.28)	(0.21)	(0.21)
Airport large hub	0.35	−0.28	0.33	0.53**
	(0.25)	(0.34)	(0.25)	(0.27)
ln population	0.07	0.95***	0.12	0.48**
	(0.16)	(0.26)	(0.17)	(0.24)
ln (distance)	−0.23***	−0.23***	−0.07	−0.03
	(0.03)	(0.03)	(0.05)	(0.05)
ln (total headquarters)	0.27*	0.25	0.30*	0.04
	(0.16)	(0.23)	(0.16)	(0.24)
ln (headquarters same SIC)	0.50***	0.54***	0.45***	0.48***
	(0.05)	(0.06)	(0.06)	(0.06)
ln (share of employment same SIC)	0.71***	0.76**	0.75***	0.74**
	(0.11)	(0.11)	(0.12)	(0.12)
ln (share of employment in finance)	0.61**	1.78***	0.65**	1.06***
	(0.29)	(0.39)	(0.30)	(0.37)
ln (share of employment in business)	0.90***	0.41*	0.69**	0.59*
	(0.35)	(0.47)	(0.36)	(0.45)
Region dummy	Yes	No	No	No
Population range dummy	No	No	Yes	No
State fixed effect	No	Yes	No	Yes
N	30,519	30,519	24,982	24,982
Likelihood ratio index	0.090	0.18	0.280	0.34
Inclusive value (δ)	0.52 ***	0.03 ***	0.54 ***	0.01 ***
	(0.03)	(0.002)	(0.03)	(0.001)
N	5341	5341	10,053	10,053
Likelihood ratio index	0.150	0.080	0.109	0.003

Note: Specifications (1) and (2) are population nested, (4) and (5) are region nested. Standard errors are in parenthesis. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. *N* corresponds to the number of headquarters that relocate (i.e. 1441) ties the number of potential locations for each headquarters. Note that, depending on the nest chosen, headquarters differ in the number of MSAs they are considering.

Table A11
The *where* to locate model with amenities: first and second stage of the nested logit

Model	(1)	(2)	(3)	(4)
ln wage	−2.98***	−2.97***	−1.90***	−2.05***
	(0.59)	(0.61)	(0.68)	(0.69)
ln (1−corporate tax rate)	1.13	1.28	−1.11	−0.73
	(1.13)	(1.18)	(1.29)	(1.31)
Recreational services	0.22**	0.20*	0.25**	0.23**
	(0.11)	(0.11)	(0.11)	(0.11)
Museums	−0.12**	−0.12*	−0.12*	−0.10
	(0.06)	(0.06)	(0.07)	(0.07)
Educated labor force		0.05		0.28
		(0.20)		(0.21)
Airport small hub	0.02	−0.02	0.27	0.21
	(0.20)	(0.20)	(0.17)	(0.18)
Airport large hub	0.22	0.18	0.54**	0.52**
	(0.24)	(0.24)	(0.22)	(0.22)
ln population	−0.06	−0.14	0.17	−0.09
	(0.15)	(0.22)	(0.15)	(0.23)
ln (distance)	−0.23***	−0.23***	−0.07	−0.07
	(0.03)	(0.03)	(0.05)	(0.05)
ln (total headquarters)	0.52***	0.54***	0.38**	0.36**
	(0.14)	(0.15)	(0.16)	(0.17)
ln (headquarters same SIC)	0.50***	0.50***	0.44***	0.44***
	(0.05)	(0.05)	(0.06)	(0.06)
ln (share of employment same SIC)	0.73***	0.75***	0.76***	0.77***
	(0.11)	(0.11)	(0.11)	(0.11)
ln (share of employment in finance)	0.42	0.40	0.46	0.48
	(0.29)	(0.29)	(0.30)	(0.30)
ln (share of employment in business)	1.30***	1.24***	0.78**	0.54
	(0.33)	(0.36)	(0.36)	(0.39)
N	30,519	30,459	24,982	24,748
Likelihood ratio index	0.088	0.088	0.280	0.278

Table A11 (*continued*)

Model	(1)	(2)	(3)	(4)
Inclusive value (δ)	0.52***	0.55***	0.53***	0.54***
	(0.03)	(0.03)	(0.03)	(0.03)
N	5341	5341	10,053	10,053
Likelihood ratio index	0.151	0.151	0.109	0.109

Note: Specifications (1) and (2) are population nested, (4) and (5) are region nested Standard errors are in parenthesis. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. *N* corresponds to the number of headquarters that relocate (i.e. 1441) times the number of potential locations for each headquarters. Note that, depending on the nest chosen, headquarters differ in the number of MSAs they are considering.

Table A12
The whether to locate model: third stage of the nested logit, manufacturing headquarters

Model	(1)	(2)	(3)
ln sales	0.23***	0.22***	0.23***
	(0.03)	(0.03)	(0.03)
ln (number of HQ in the firm)	0.06	0.06	0.05
	(0.04)	(0.04)	(0.04)
ln (age)	−0.23***	−0.22***	−0.22***
	(0.06)	(0.06)	(0.06)
ln (merger)	1.41***	1.42***	1.43***
	(0.20)	(0.20)	(0.20)
ln (foreign)	0.57***	0.53***	0.57***
	(0.18)	(0.18)	(0.18)
ln wage	0.51	1.25	1.49
	(0.68)	(0.78)	(1.05)
ln (1−corporate tax rate)	−2.40	−4.64*	−5.24**
	(1.72)	(2.54)	(2.60)
Airport small hub	−0.19	−0.71**	−0.77***
	(0.20)	(0.31)	(0.31)
Airport large hub	−0.09	−0.46	−0.52
	(0.27)	(0.39)	(0.40)
ln population	−0.01	−0.12	−0.36
	(0.10)	(0.14)	(0.28)
ln (total headquarters)			0.25
			(0.25)
ln (headquarters same SIC)			−0.12
			(0.10)
ln (share of employment same SIC)			−0.51***
			(0.17)
ln (share of employment in finance)			−0.34
			(0.54)
ln (share of employment in business)			−0.35
			(0.57)
Inclusive value	−0.03	−0.02	0.02
	(0.04)	(0.04)	(0.06)
Constant	−9.96*	−15.51**	−15.37
	(6.07)	(7.18)	(11.07)
Industry, population and region dummies	No	Yes	Yes
N	8104	8104	8092
Likelihood ratio index	0.041	0.047	0.054

Note: Standard errors are in parenthesis. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. *N* is the total number of headquarters for which all explanatory variables were available.

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