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Logistics Sprawl: Differential Warehousing Development Patterns in Los Angeles, California, and Seattle, Washington

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1 **Logistics Sprawl: Differential Warehousing Development Patterns in Los Angeles and Seattle**

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36 **ABSTRACT**

37 The warehousing industry experienced a period of rapid growth from 1998 to 2009. This paper compares
38 how the geographic distribution of warehouses changed in both the Los Angeles and Seattle Metropolitan
39 Areas over that time period. These two west coast cities were chosen due to their geographic spread and
40 proximity to major ports as well as their difference in size. The phenomenon of logistics sprawl, or the
41 movement of logistics facilities away from urban centers, which has been demonstrated in past research
42 for the Atlanta and Paris regions, is examined for these two areas. The weighted geometric center of
43 warehousing establishments was calculated for both areas for both years, along with the change in the
44 average distance of warehouses to that center, an indicator of sprawl. We find that between 1998 and
45 2009, warehousing in Los Angeles sprawled considerably, with the average distance increasing from
46 25.91 to 31.96 miles, an increase of over 6 miles. However in Seattle, the region remained relatively
47 stable, showing a slight decrease in average distance from the geographic center. Possible explanations
48 for this difference are discussed.
49

50 **INTRODUCTION**

51

52 Starting in the 1990's the logistics industry began experiencing rapid growth. This was reflected by
53 warehousing specifically, which for the purposes of this paper is defined as any industry falling under
54 North American Industry Classification System (NAICS) Code 493 - Warehousing and Storage. This
55 includes general, refrigerated, farm product, and other warehousing and storage. (Code 493 has kept the
56 same definition over our study period, eliminating possible bias in comparing different years). Across the
57 United States, employment in the warehousing industry increased by almost 400% between 1998 and
58 2006 at a compound annual growth rate of 22.25%, compared to total U.S. employment which grew by
59 1.3% annually (1). The number of warehousing establishments more than doubled from 6,712 in 1998 to
60 over 14,000 by 2008 (2). The trend continued until the recession, at which point the growth in the
61 warehousing industry began to slow. The number of warehousing establishments increased every year
62 through 2007, at which point there was a 1% decrease in establishments in 2008. From 2008 to 2011 the
63 number of establishments decreased at an average of 0.4% per year. Similarly the number of
64 warehousing employees increased every year through 2008, at which point there was a 4% decrease in
65 warehousing employment by 2009, and a further 3% decrease in 2010, before increasing less than a
66 percent in 2011 (3). This paper will compare the locations of warehouses in two major population centers
67 on the west coast - Los Angeles and Seattle, during the growth period. These two cities can be compared
68 to Atlanta, for which a similar analysis was completed in Dabanc and Ross (2012) (4).

69 Specifically, this paper will focus on a phenomenon known as logistics sprawl, which is the
70 tendency of warehouses to move away from urban regions toward more suburban and exurban areas (4).
71 Dabanc and Ross show this phenomenon to be occurring in the Atlanta area, which has a metropolitan
72 population of approximately 5.5 million people (5).

73 The Seattle area studied is smaller than Atlanta's, with a population of 3.5 million, while the
74 Greater Los Angeles area is much larger at approximately 18 million (5). Both Seattle and Los Angeles
75 are located next to the Pacific Ocean, and house major intermodal terminals, including the 1st and 3rd
76 largest container terminal complexes in the United States, respectively. This creates demand for
77 warehouses in the nearby area. Geographic features such as the Pacific and mountain ranges constrain
78 both regions geographically (but in diverse ways), influencing urban expansion patterns.

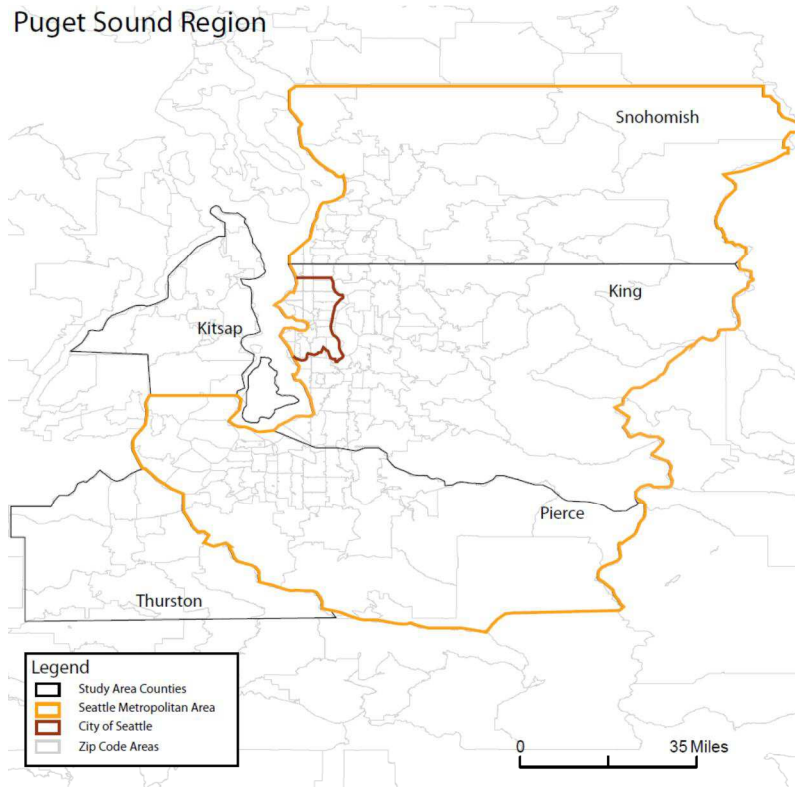
79 The LA area used in this study (commonly referred to as the Greater Los Angeles area) includes
80 Ventura, Los Angeles, Orange, San Bernardino, and Riverside counties, shown in **Figure 1**. Los Angeles
81 is bordered to the southwest by the Pacific Ocean, and is separated from much of northern LA and San
82 Bernardino counties by the San Gabriel Mountains to the north. There are also several smaller mountain
83 ranges in the area, recent expansion of both population and industry has been largely to the east.



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FIGURE 1 Los Angeles study area.

88 The Seattle-area counties studied were King, Snohomish, Pierce, Kitsap, and Thurston, stretching
89 from Everett in the north to Olympia in the south, shown in **Figure 2**. The Puget Sound provides a
90 geographic barrier to the west, and the Cascade Mountains border the east side of the urban region. There
91 are a few residential and industrial areas to the west of the Sound, but most of the population and
92 businesses are to its east. Transportation across the Sound is difficult as there is only one road crossing
93 the body of water in the southern end and all other travel must be made by ferry. The vast majority of the
94 population lives to the east of the water.



95
96 **FIGURE 1 Seattle study area (Source: U.S. Census Bureau).**
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98 The Los Angeles Metropolitan Area economy grew from approximately \$578 billion in real gross
99 domestic product (GDP) in 2001 to \$653 billion in 2009, a total growth of approximately 13% (6). The
100 highest yearly GDP during that time period was \$692 billion in 2008, which decreased by 5.6% in 2009.
101 Major sectors in the Los Angeles economy include manufacturing, trade, and banking and finance.
102 Transportation and warehousing comprise about 2.4% of total GDP (6).

103 The Seattle Metropolitan Area economy grew from approximately \$173 billion real GDP in 2001
104 to \$204 billion by 2009, a growth of approximately 18% (6). The highest yearly GDP during that time
105 period was \$211 million in 2008, which decreased by 3.3% in 2009. Major sectors include aerospace,
106 information technology, trade, and tourism (7). Transportation and warehousing comprise about 2.9% of
107 total GDP (6).

108 Trade is a major industry in both metropolitan areas. Transportation and warehousing make up a
109 similar percentage of total GDP in both areas (2.4 and 2.9%). Most sectors in both regions experienced
110 moderate growth until 2008 before declining due to the recession. However the Los Angeles
111 Metropolitan Area experienced a greater percentage decline in GDP from 2008 to 2009.

112
113 **LITERATURE REVIEW**
114

115 Sivitadinou (1996) made one of the first empirical studies of the location of warehouses in a U.S.
116 metropolitan area (Los Angeles) and examined its links with land prices (8), but her efforts were not
117 followed by many others. Urban economists have traditionally focused on the labor decisions of firms
118 and households to try and account for various aspects of urban form. The location and transportation
119 decisions made by the various entities in the supply chain as these parties manage logistics costs have
120 received considerably less attention (9), while they have become increasingly more important, especially
121 in metropolitan areas. The warehousing industry has undergone major restructuring, transforming it into a
122 distribution industry serving major importers and big box retailers (10, 11), based on direct access to

123 consumption markets, globalized networks of goods distribution, hub and spoke networks and just-in-
124 time operations. This has led to a rise in hub distribution centers (12). Very large distribution centers, or
125 `mega DCs_ (1) have driven the early growth in warehousing establishments in metropolitan areas in the
126 study period. Between 1998 and 2005, the number of distribution centers with more than 100 employees
127 increased twice as fast as smaller facilities (1). Today`s supply chains require a lot of logistics facilities,
128 and the efficiency of goods distribution depends upon the optimal location and sizing of freight terminals.
129 Freight transportation costs have decreased dramatically over the last thirty years (13). Low freight costs
130 create an `increased locational flexibility_ (14) for freight and logistics facilities. The opportunity for
131 good regional and national networking between facilities within a supply chain is a key factor (15).
132 Finally, some warehousing activities which were previously performed as part of a manufacturing or
133 distribution activity (and on the same premises), have been outsourced to logistics providers,
134 automatically increasing the number of warehouses. In some cases manufacturers have implemented a
135 specific warehousing/logistics facility when previously logistics functions (which required less space)
136 were performed within the manufacturing facility itself (see the example of Vernon, in Southern
137 California, presented in [16]). As noted by Hall and Hesse (2013), metropolitan areas retain logistics
138 facilities because they have a sort of `freight advantage_ that includes `labour, skills, infrastructure,
139 technology_ among others (17).

140 The new distribution centers required by the current organization of supply chains and a
141 consumer-based economy are directly responsible for logistics sprawl, i.e. the tendency for warehouses to
142 move from urban to suburban and exurban areas (4). Historically, warehouses and freight terminals have
143 tended to be close to city centers and rail stations. Today, they need more space and are located as close
144 as possible to highway networks and airports (18). Suburban areas are attractive because of the
145 availability and low cost of land and also because of the availability of transportation infrastructure that
146 connects to a more complex system of regional and national flows. This has an impact on urban
147 landscapes by generating congestion, CO₂ emissions and local atmospheric pollution. These impacts are
148 the result of additional vehicle-miles travelled (VMT) generated by the increase in distances travelled by
149 trucks and vans to deliver commodities to urban areas where jobs and households remain concentrated.
150 Dabanc and Rakotonarivo (2010) calculated that cross-dock terminals for parcel and express transport
151 companies moved an average of 6 miles further away from the center of Paris between 1975 and 2008
152 (19). During the same period, jobs in general moved only 1.3 miles, meaning that logistics sprawl is much
153 more prevalent than the general sprawl of economic activities in metropolitan areas. They estimated the
154 net increase in annual CO₂ emissions resulting from the relocation of facilities serving the Paris region to
155 be 16,500 tonnes in 2008 compared with 1974.

156 The issue of logistics sprawl has recently generated some discussion among scholars, particularly
157 economic geographers. Cidell (2010) has shown that in 47 of the 50 large metropolitan areas she
158 surveyed, `decentralization_ of freight activity had occurred over the last 20 years (1986-2005), as
159 measured via Gini coefficients (20). Because data were processed at the county level, however, it was
160 difficult to account for some of the relocation patterns, as central counties can be very widespread and
161 changes in location within counties were not accounted for in Cidell`s studies. Bowen (2008) confirms
162 that logistics activities have experienced enormous, largely unnoticed, growth in recent years (15). He
163 shows that the growth in warehousing was more marked in suburban counties than in central and rural
164 counties: central city Metropolitan Statistical Area (MSA) counties saw warehousing establishments grow
165 at an annual growth rate of 10.2%, while the increase for non-MSA counties and other MSA counties
166 were respectively 9.3% and 11.8%. Hesse (2004), using two case studies from Germany, concludes that
167 logistics activities favor distant locations for many reasons, some of which are specific to this industry
168 while others apply to many economic sectors: overcoming congestion, planning requirements, or even the
169 influence of unions (21). Looking at the Inland Empire in Southern California, De Lara (2013)
170 emphasizes the role of temporary work availability and low-wage flexible workforce, demonstrating
171 substantial wage differences in transportation and warehousing industries in L.A and Orange Counties
172 compared with Riverside and San Bernardino Counties (22). These changes are embedded in a general
173 transformation of the logistics real estate industry, increasingly dominated by global players organizing

174 large networks of distribution centers. Allen and Browne (2010) have found a tendency for warehousing
175 to move away from urban areas to suburban areas in the United Kingdom and elsewhere in Europe. Land
176 prices in Europe have been steadily increasing recently, so they theorize that this move has occurred
177 partially due to cheaper land prices in suburban areas (23). The expansive roadway network in Europe
178 allows companies to construct large warehouses in more centralized locations. In England specifically,
179 they have found that warehousing districts are often strategically clustered along motorways close to, but
180 just outside of large cities. While this is partly due to accessibility to the road network, it is also `a result
181 of planning policy that encourages a concentration of such land use_ (23). We will come back to land use
182 policies in the discussion of this paper.

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184 **DATA**

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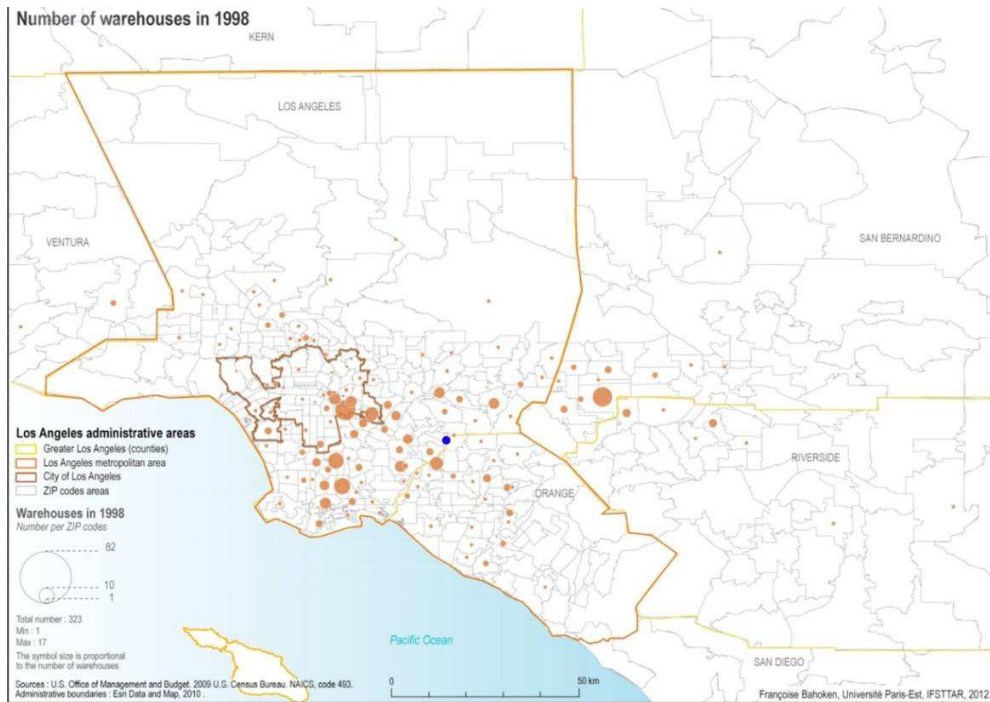
186 The research described in this paper was conducted using zip-code level establishment data. Data for all
187 establishments for the years 1998 and 2009 were downloaded from the County Business Patterns website
188 (<http://www.census.gov/econ/cbp/>). Structured query language (SQL) was used to isolate establishments
189 under NAICS code 493 specifically, and to aggregate establishment totals within a given region. The
190 final data sets were all zip codes in Ventura, Los Angeles, Orange, San Bernardino, and Riverside
191 counties in California and King, Pierce, Snohomish, Kitsap, and Thurston in Washington. ArcGIS
192 software was used to create maps of warehouse and establishment data. Additionally the barycenter, or
193 weighted geographic mean, was calculated and plotted for each region for each year using standard
194 ArcGIS procedures. These procedures are discussed further in the results section.

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196 **LOS ANGELES RESULTS**

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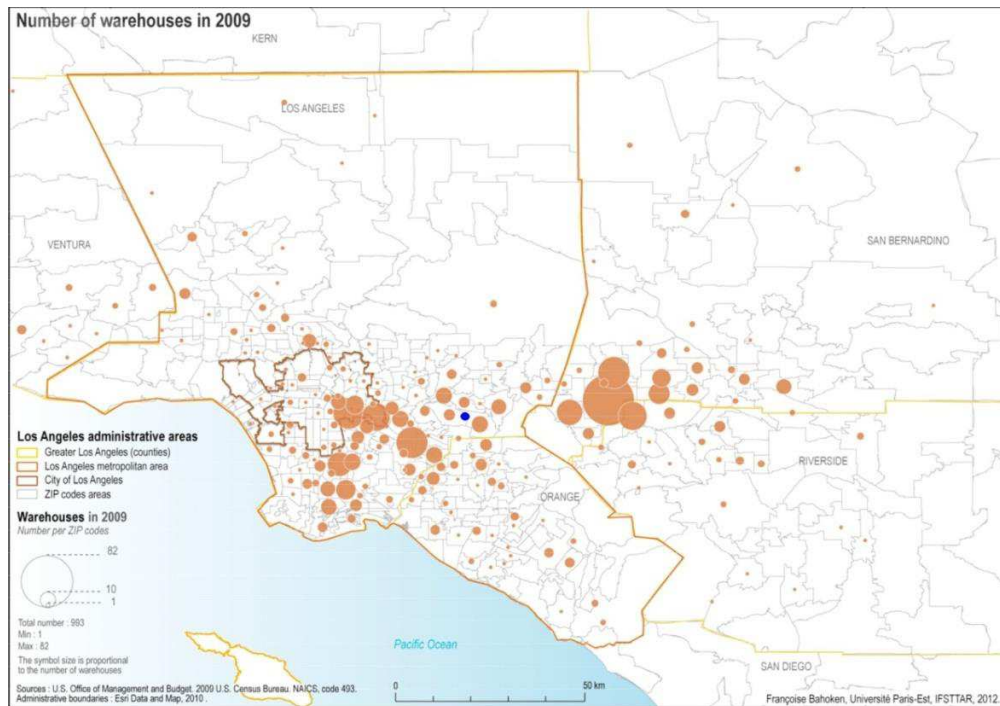
198 In 1998, the bulk of the warehousing establishments in the Los Angeles Metropolitan Area were located
199 in Southern Los Angeles County and east and south-east of downtown. **Erreur ! Source du renvoi**
200 **introuvable.** shows the locations of distribution centers in the Los Angeles study area in 1998, displayed
201 by zip code. The only zip code outside of LA County with more than 10 establishments is 91761 in
202 Ontario, CA, which has 16 facilities listed under NAICS code 493.



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FIGURE 2 Los Angeles area warehousing, 1998. The weighted geographic center is indicated by a star.

By 2009, the warehousing industry had undergone a significant expansion, as shown in **Erreur ! Source du renvoi introuvable.**, below. The total number of warehousing establishments increased substantially, and two distinct concentrations of warehouses appeared - one near the city of Los Angeles, and one around Ontario and zip code 91761.



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FIGURE 3 Los Angeles area warehousing, 2009. The weighted geographic center is indicated by a star. There was moderate growth in both number of zip codes with warehousing establishments as well as total establishments within the city limits, shown in **Erreur ! Source du renvoi introuvable.** and **Erreur ! Source du renvoi introuvable..** Of zip codes with at least one establishment in 1998, 60 showed at least 100% increases in number of establishments. The number of establishments in Los Angeles County increased 134% from 220 in 1998 to 515 in 2009. Orange and Ventura counties experienced moderate growth. The most striking increase, however, appeared in western San Bernardino and Riverside counties, where in 1998 just one zip code had more than 10 establishments. As previously mentioned, this is centered around zip code 91761 in Ontario. The total establishments in San Bernardino County, for example, increased 641% from just 34 establishments in 1998 to 252 in 2009. Zip code 91761 increased from 16 establishments in 1998 to 82 in 2009. Several of the zip codes in the surrounding area also showed significant increases in number of establishments.

To quantify a potential shift in the location of warehousing establishments, a centrographic analysis of all establishments under NAICS code 493 was performed. The barycenter, or weighted geometric mean, of these was calculated for both years. The barycenter was weighted only by spatial distance; other warehouse characteristics, such as square footage or number of employees, were not included in the weighting. Then the distance from the barycenter to each establishment was calculated and averaged across all warehousing establishments. A similar analysis was done for all NAICS establishments. The findings can be summarized as follows:

- The average distance of warehousing establishments from their barycenter increased from 25.907 miles to 31.963 miles,
- but the average distance of all establishments from their barycenter remained stable, changing from 41.748 to 41.714 miles.

On the whole, there was very little change in distribution of all establishments, but warehousing has sprawled considerably. While establishments in the L.A. metropolitan area have not sprawled, warehouses have moved out an average of 6 miles. This suggests that within the L.A. metropolitan area, more truck miles are required to reach customers (for shipments or deliveries) in 2009 than was the case

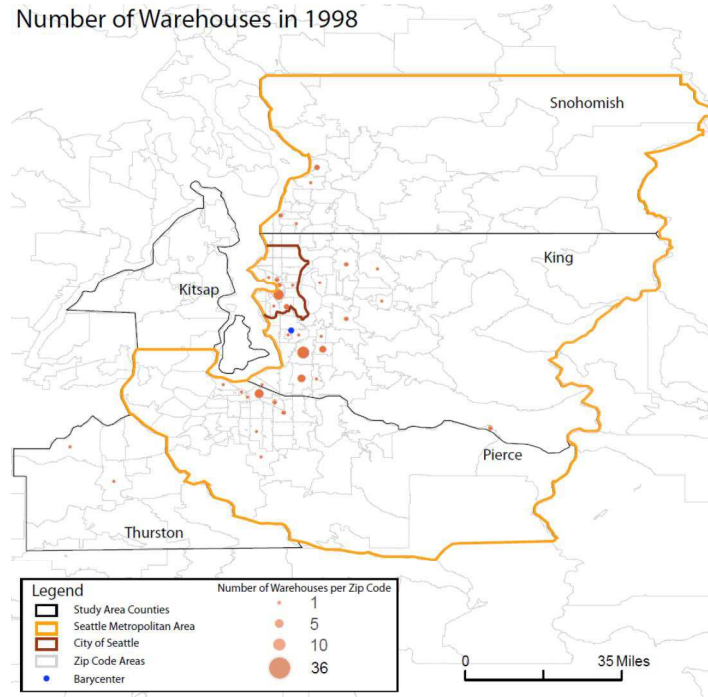
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240 in 1998. This is 'relative sprawl,' i.e. when logistics facilities move further away than the businesses they
241 serve for pick-ups and deliveries.

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243 **SEATTLE RESULTS**

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245 In the Seattle area, the same sets of analyses were performed. The number of warehouses increased
246 significantly within the study area, from 85 in 1998 to 212 in 2009, an increase of 149%. **Figures 5 and**
247 **6** show the number of warehouses by zip code for these two years, respectively.

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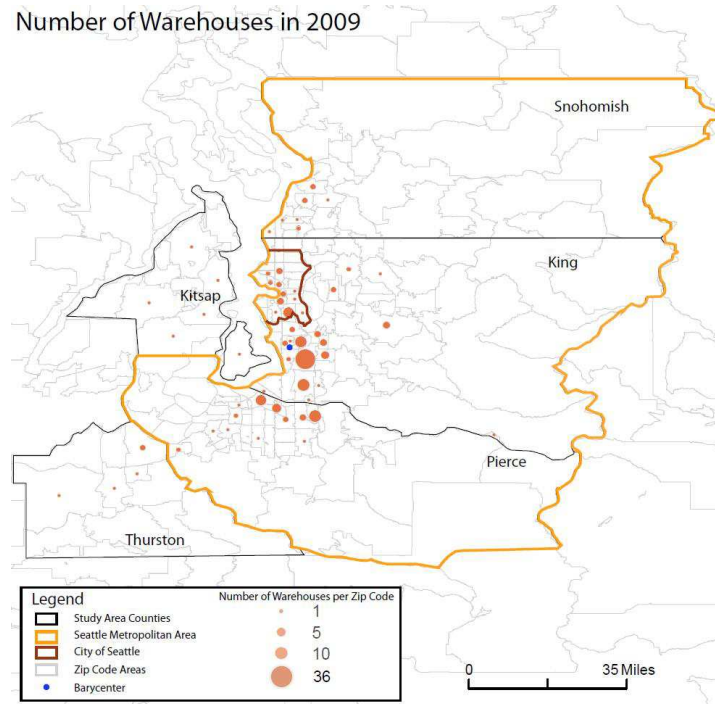


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251 **FIGURE 4 Seattle area warehousing, 1998 (Source: U.S. Census County Business Patterns).**

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253 In 1998, zip code 98032 had the most establishments at 15, and zip code 98134 was the only
254 other zip code with more than 7. There were 35 total zip codes with a warehousing establishment, and 85
255 total establishments in the area. All but 5 zip codes had 3 or fewer warehouses. There was nothing to the
256 west of the Puget Sound, and only two zip codes with establishments in the Olympia area. The barycenter
257 was plotted as a star.



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FIGURE 5 Seattle area warehousing, 2009 (Source: U.S. Census County Business Patterns).

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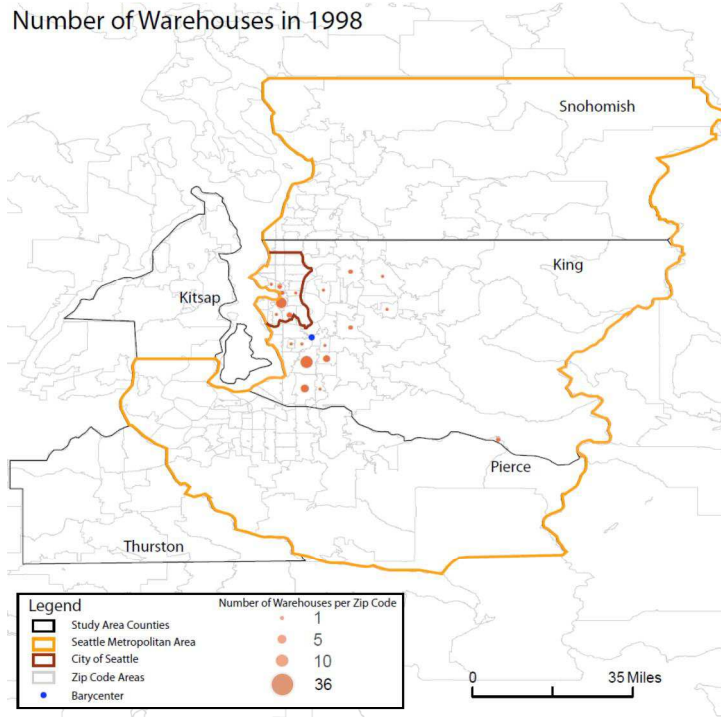
By 2009, however, the total number of establishments had increased to 212. The number of zip codes with at least one establishment increased 74% from 35 to 61. To the southwest, there are now 5 zip codes with establishments compared to two in 1998. Where there had previously been nothing to the west of the Puget Sound, there are now 7 zip codes with at least one warehouse. There are also more zip codes with more establishments to the north.

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The bulk of the new warehouses were built in the Kent/Renton area. Zip code 98032 had a 140% increase in number of warehouses, from 15 warehousing establishments in 1998 to 36 in 2009. There was a high concentration of warehouses near the barycenter in 1998, and additional warehouses were constructed in all of those zip codes by 2009. The barycenter shifted 2.27 miles to the southwest between 1998 and 2009.

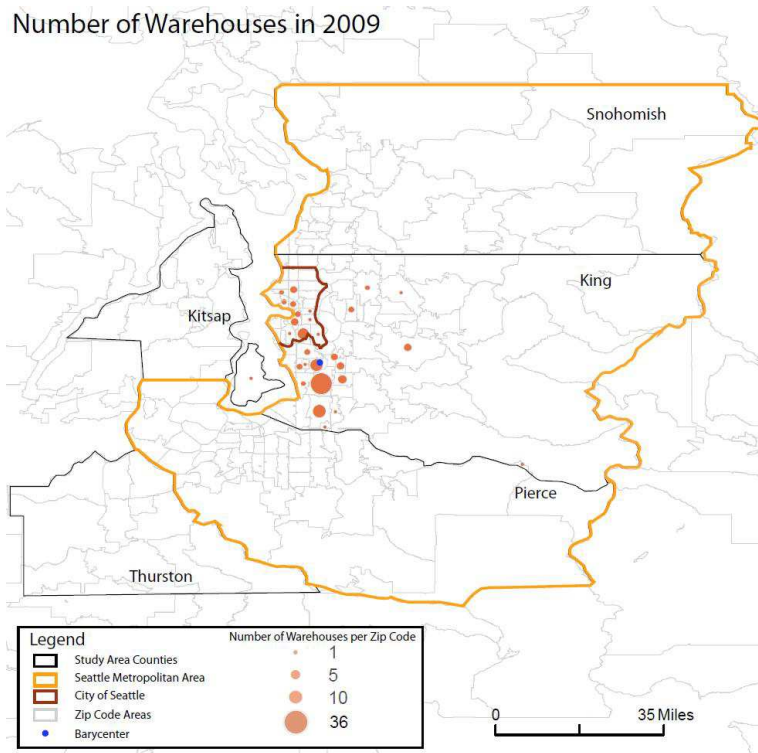
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The analysis was repeated for only King County, where the city of Seattle is located, shown in **Figures 7 and 8**, below. It was found that the barycenter moved 1.01 miles to the southwest, and the average distance from the barycenter decreased almost 20%, from 8.5 to 7.1 miles.



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FIGURE 6 King County warehousing, 1998 (Source: U.S. Census County Business Patterns).



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FIGURE 7 King County warehousing, 2009 (Source: U.S. Census County Business Patterns).

282 Similarly, the barycenter for all NAICS establishments in 1998 and 2009 was calculated. In this
283 case, very little has changed other than growth in the total number of establishments. The barycenter
284 moved 0.20 miles to the northeast.

285 As was completed with the Los Angeles data, the average distance of both warehouses and all
286 establishments from their barycenter was calculated, with results as follows:

- 287 • In 1998, the average distance of warehouses from the barycenter was 12.8 miles, which decreased
288 slightly to 12.0 miles by 2009, and
- 289 • The average distance of all establishments from the barycenter was 16.3 miles in 1998, compared
290 to 16.5 in 2009.

291 These numbers suggest establishments in the Puget Sound region have not sprawled significantly since
292 1998. Warehouses specifically may have even contracted spatially a small amount, however given the
293 uncertainty of exact locations of warehouses within a zip code, we would conclude that the average
294 distance remained relatively stable.

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296 **DISCUSSION AND DIRECTIONS FOR FUTURE RESEARCH**

297

298 Warehousing in the Los Angeles area has increased in two geographically distinct places – in the
299 metropolitan center, both in the city and in LA County near the city, and much further from the city in
300 western Riverside and San Bernardino counties. The city of Los Angeles has long been a warehousing
301 hub because of its proximity to the San Pedro Bay Ports and has a long tradition of manufacturing
302 activities in various places including close to the Downtown area. However there is limited room for
303 further expansion because it is so densely populated and the size of land parcels is limited. Further east in
304 Riverside and San Bernardino counties, there is more available land for new warehouses, and this land is
305 considerably less expensive. Suburban and exurban areas such as these can connect to a more complex
306 system of regional and national flows than more urban areas. Zip code 91761, for example, had more
307 establishments than any other zip code studied. While located further away from the San Pedro Bay
308 ports, this zip code contains parts of Interstate 15, Interstate 10, and State Route 60. Ontario International
309 Airport is also located within this zip code, giving the area further connections (air cargo activity was
310 437,000 tons in 2012). Additionally, many cities in these counties are taking steps to attract warehousing.
311 The Coachella Valley Economic Partnership has stated that developing warehousing within the valley,
312 which currently lies on the far eastern edge of the Inland Empire, is a high priority. Many have engaged
313 in various promotional activities to attract logistics such as Moreno Valley (16, 24).

314 In the Seattle area, the number of warehouses and the number of zip codes with warehouses
315 increased, including zip codes far to the southwest of the barycenter in Olympia, west across the Puget
316 Sound, and north of Seattle. However few of these zip codes had more than one or two establishments.
317 Only seven total zip codes had more than five establishments in 2009, and all were located less than 12
318 miles from the barycenter. Zip Code 98032 in Kent, WA, which has more than twice as many
319 warehouses as any other zip code in the Seattle area, is approximately 10 miles by road to both the Port of
320 Tacoma and Port of Seattle, and is less than two miles from Seattle-Tacoma International Airport. The
321 significant clustering of warehouses in the Kent/Renton area, near the weighted geographic center,
322 affected the distribution such that the overall distribution has contracted slightly.

323 In Seattle, it was found that several zip codes which previously did not have any warehouses
324 gained some. The effect of this expansion was mathematically negated by the much larger increase in
325 warehouses near Kent, WA, which is relatively close to Seattle. When repeating the barycenter analysis
326 for only King County, shown in **Figures 7 and 8**, it was found that the barycenter moved away from the
327 county to the southwest, but that warehouses in this area moved closer to the barycenter on average. The
328 clustering of warehouses is centrally located between the Ports of Seattle and Tacoma. Additionally, it is
329 very close to SeaTac International Airport, and it is located next to Interstate 5 and State Route 167, the
330 two major north-south routes in the area.

331 Why do we observe a clustering, and increased concentration of warehousing activity in the Puget
332 Sound region, but sprawl in the Los Angeles area? While not a conclusive analysis, we can point to
333 several factors that may be significant, some of which provide opportunity for further research.

334 **Local Factors**

335 Some factors explaining the Seattle situation pertain specifically to Seattle. Zip code area 98032 is in a
336 very favorable situation relative to the ports, airport, and freeways, and land was still available there at the
337 end of the 1990s. Besides, there is a lack of large land parcels elsewhere, due in part to the physical
338 geography of the Seattle metro area.

339 **Very Large Metropolitan Areas vs. Smaller Metropolitan Areas**

340 One hypothesis is that logistics sprawl is characteristic of very large metropolitan areas, which serve both
341 as trade nodes to the entire region/country as well as enormous consumer markets. Distribution centers
342 need to be located close to regional infrastructure networks in order to serve the local, regional and
343 national economy. Differentials in land prices (suburban-ex-urban land prices compared with central land
344 prices) may also be more important in the largest metropolitan areas. To our knowledge, no empirical
345 studies nor theoretical works are available that could verify a relationship between city size and
346 warehouses' locational behavior. Although not looking at this particular question, Hall and Hesse (2013)
347 from several case studies identify an ideal-typology of the relationship between places and goods flows,
348 drawing lines between cities that clearly have very different sizes (17).

349 **Growth Management**

350 Growth management looks at ways of conditioning residential and other developments to the provision of
351 necessary services (utilities, infrastructure) and the minimization of negative impacts. It may have played
352 a role in explaining the differences between Seattle and Los Angeles regarding the siting of logistics
353 activities, although this second hypothesis requires further research. Unfortunately freight is generally
354 omitted from the literature on growth management and sustainable transportation. Works assessing policy
355 tools aimed at mitigating sprawl and climate impacts of transportation (25, 26) or proposing planning
356 tools such as the 'transport energy specification' (27) are provided but do not mention freight. 'Urban
357 growth boundaries' and 'form-based codes' are two planning strategies increasingly adopted in U.S.
358 cities that are deemed interesting (28) because they are regional and long term. These are the policies
359 implemented by the states of Oregon, Washington and Tennessee. Indeed, in 1990, the Washington State
360 legislature adopted the Growth Management Act. The purpose of this act was to ensure coordination
361 between local and state governments with regards to growth. Local governments are required to follow a
362 comprehensive planning process for any potential new developments. The act created a framework that
363 actually constrains how and where warehouses can be constructed and may have affected how the
364 distribution of warehouses has changed over time. However, specific assessment of the Growth
365 Management Act on warehouses has not been made.

366 California has not implemented a similar policy of coordinated planning. SB375, the State's CO₂
367 mitigation through growth management legislation, leaves much leeway to local communities for final
368 decisions on land uses and has led to some interesting developments in freight planning. In 2011, for
369 example, the San Diego Association of Governments (SANDAG) became the first urban region of
370 California to adopt a Sustainable Communities Strategy as a mandatory component of its regional
371 transportation plan. It includes two actions directly related to freight land uses: "Update the SANDAG
372 Regional Comprehensive Plan (RCP) to include policies, programs, and guidelines to integrate goods
373 movement land uses and facilities, with minimal impact to adjacent communities." And "Support and
374 provide assistance for the update of local general plans to identify the long-term needs of moving goods,
375 industrial warehousing infrastructure, and connectors to the regional freight network. Coordinate this
376 effort with economic studies and RCP updates." SB375, however, is not comparable to the strategy
377 adopted in Washington. In metro Los Angeles, there happened to be a lot of open space to the east, in the
378 'Inland Empire', the Riverside-San Bernardino-Ontario Metropolitan Area, which contributed to a

379 substantial increase in the number of warehouses there. This had the effect of both expanding the region
380 as well as moving the barycenter to the east. While roughly 60 miles by road from the Ports of Los
381 Angeles and Long Beach, these new warehousing districts are located in suburban areas near major
382 freeways and an international airport. Due to the availability of cheap land, actions by suburban
383 communities to encourage growth, and, potentially, lack of legislature to discourage growth, we see
384 logistics sprawl occurring in the Los Angeles Metropolitan Area.
385

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387

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393 University of Paris-Est grant program for visiting professors.

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