

World Trade Center Tenant Relocation Patterns after September 11th, 2001

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Alberto Abadie

Professor of Public Policy

John F. Kennedy School of Government

Harvard University

Cambridge, MA 02138

alberto_abadie@harvard.edu

Sofia Dermisi

Professor of Real Estate &

Pasquinelli Family Distinguished Chair

W.E.H. College of Business Administration

Roosevelt University

Chicago, IL 60603

sdermisi@roosevelt.edu

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- Objectives:

- a) Identify any underlying relocation patterns of the former World Trade Center tenants in the short and long-run
- b) Identify differences among the initial and long-run relocation patterns of these tenants
- c) Compare tenants' locations with industries' agglomeration patterns

- Study motivation:

- a) Lack of a comprehensive study on the tenant relocation patterns in the short and long-run after a major terrorist event
- b) Understanding the effect of agglomeration economies over the threat of terrorism for tenants which were directly affected by a traumatic terrorist event

This is a purely exploratory study which aims to describe the major WTC tenants' relocation patterns after September 11th, 2001

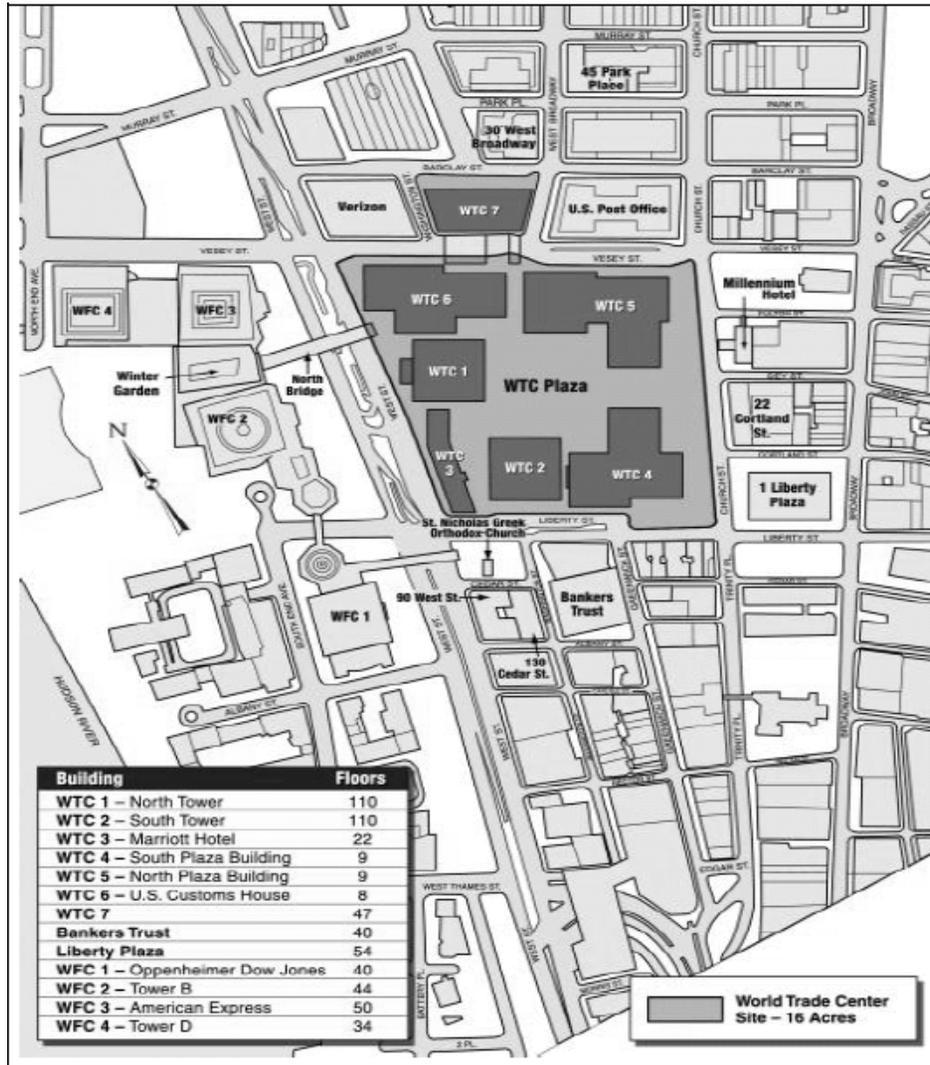
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Presentation overview

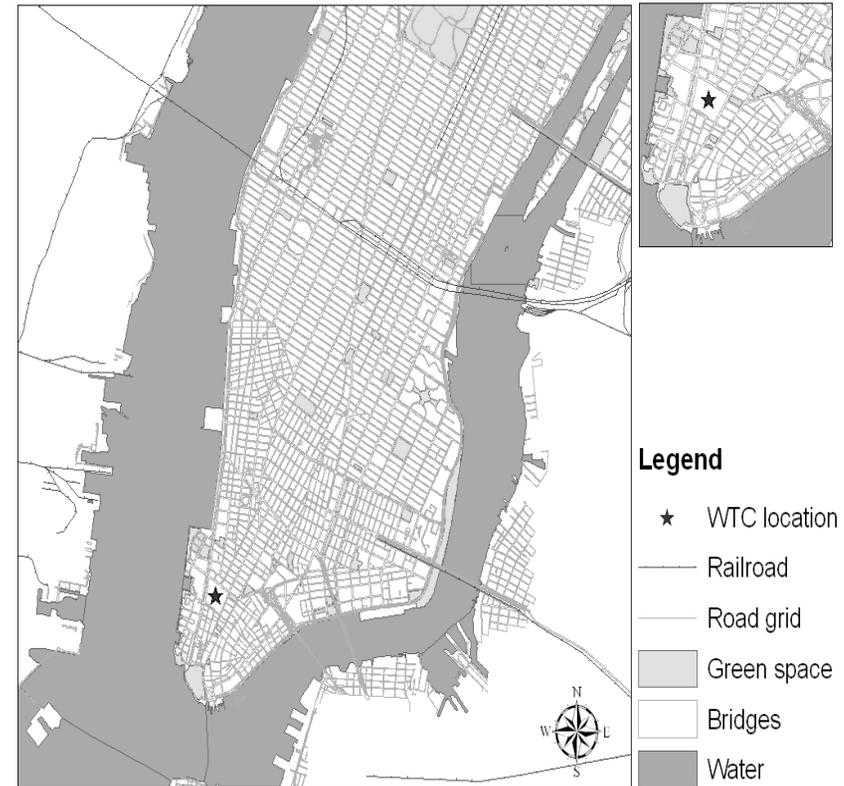
- World Trade Center (WTC) complex site
- Study parameters/sources
- Tenants' relocation patterns between two periods of time
- Tenants' distribution by industry and distance from WTC
- Agglomeration of tenants' industries by zip code
- Comparison of tenants' relocation patterns for the most popular industries
- Preliminary findings

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World Trade Center Complex Site



World Trade Center Site within Manhattan



Source: FEMA, “World Trade Center Building performance study: Data collection, preliminary observations, and recommendations”, FEMA 403/May 2002

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Study parameters/sources:

- Data on tenants' relocation between two points in time:

- * Location 1: Dermisi S. and J. Baen, "Urban Functionality and Corporate Location Decisions After September 11, 2001– Benefiting from the New York City Experience", Journal of Homeland Security and Emergency Management, 2:2, Article 3, 2005 (additional sources: CNN was also used to update the original Dermisi, Baen study)
- * Location 2: January/February 2009 (sources: CoStar Group, brokers & tenants)
- * Address geocoding with the use of batchgeo.com
- * All tenants studied for both locations had 20,000 square feet or more at the WTC complex

- Socioeconomic data:

- * NAICS data for zip codes where tenants relocated (source: zip code Business Patterns - 2008)

Tenants' trends at WTC complex and after

	Number of tenants	Avg. Square feet at WTC complex	Avg. Square feet at first location	Avg. Square feet at second location	SD Square feet at WTC complex	SD Square feet at first location	SD Square feet at second location
WTC 1	26	118,582 (26)	117,884 (20)	89,167 (21)	177,869	157,110	107,265
WTC 2	38	100,465 (38)	112,263 (33)	134,932 (34)	139,177	148,876	324,913
WTC 4	2	199,495 (2)	144,495 (2)	1,288,950 (2)	105,352	183,134	1,738,238
WTC 5	4	143,611 (4)	100,943 (4)	602,404 (4)	139,387	109,079	746,604
WTC 7	11	194,070 (10)	112,249 (9)	104,005 (9)	355,999	92,995	86,716
Overall	81	122,687 (80)	114,196 (68)	176,911 (70)	188,309	140,342	415,891

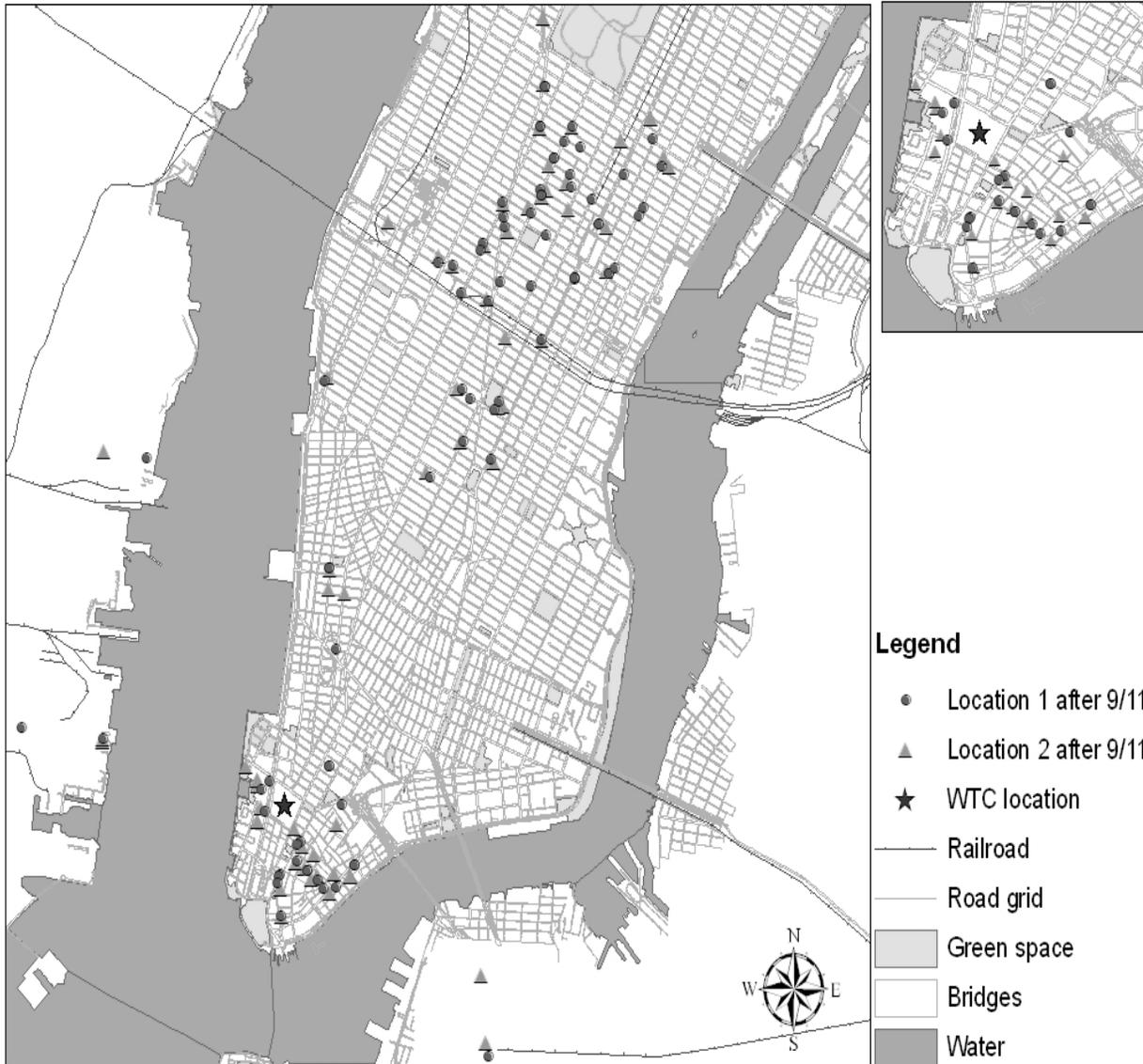
All of the above are per property

Number of observations in parenthesis

The differentiation in the number of observations between the first and second location is caused by: a) initial or second location variable information was not available and b) the company is currently out of business

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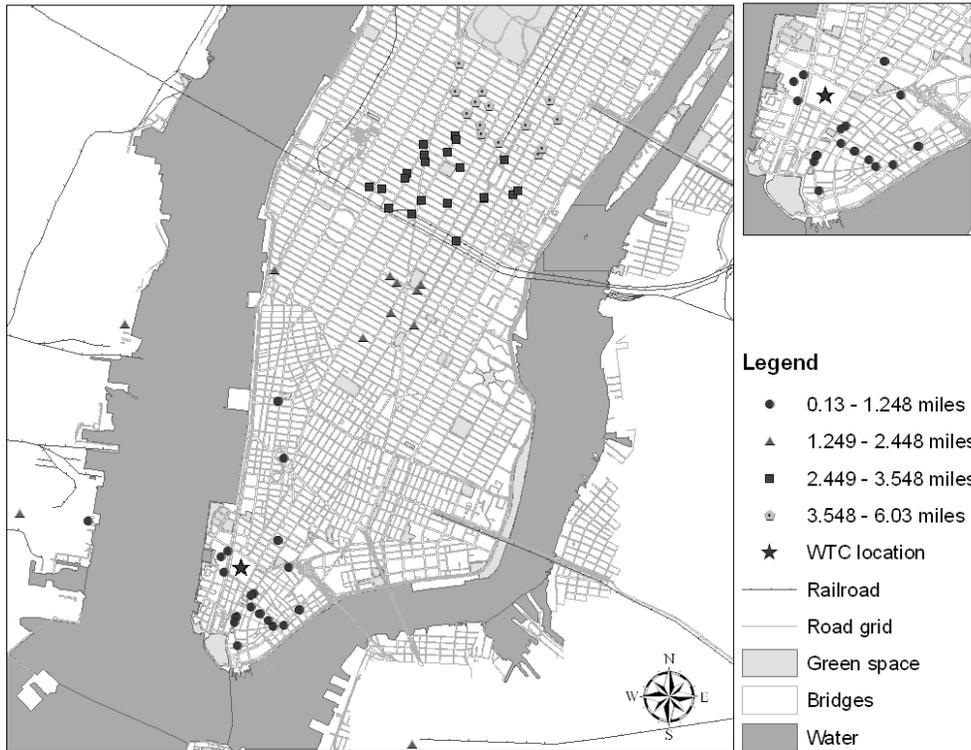
Tenant Relocation patterns



- A portion of tenants relocated in close proximity to the WTC site even initially
- High spatial concentration among two areas
- A few companies relocated beyond Manhattan

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Tenants' first relocation - distances



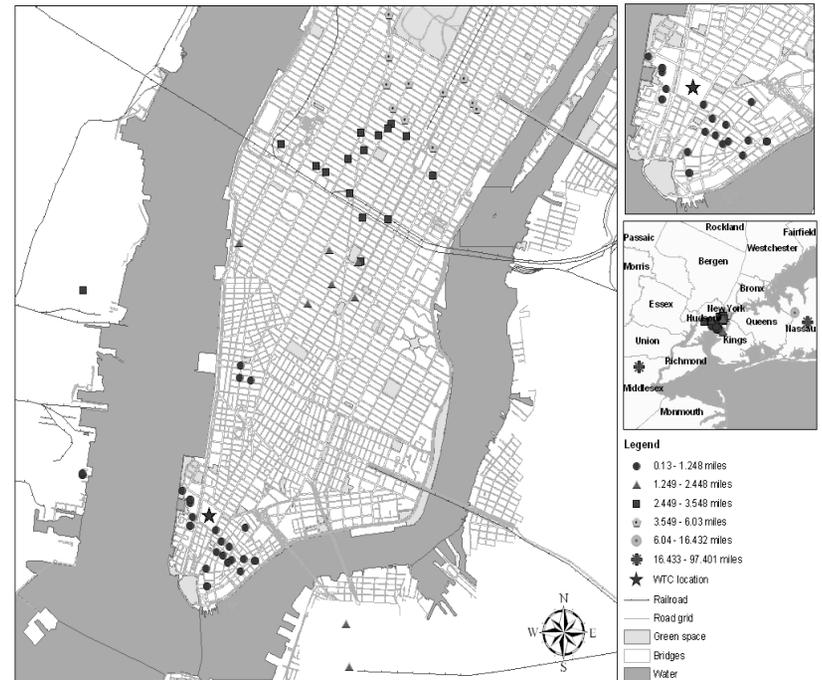
- Tenants' relocation from the WTC site was:

* Initially (location 1) from 0.1 to 6 miles

* Later (location 2) from 0.1 to 97 miles

- Avg. distance difference between locations 1 and 2

Tenants' second location - distances



First location				Second location*			
Avg. Distance from WTC	Avg. Square feet	SD. Distance from WTC	SD. Square feet	Avg. Distance from WTC	Avg. Square feet	SD. Distance from WTC	SD. Square feet
2.41(79)	114,196 (68)	1.43	140,342	4.06 (75)	176,911(70)	11.51	415,891

Number of observations in parenthesis

* The differentiation in the number of observations between the first and second location is caused by: a) initial or second location variable information was not available and b) the company is currently out of business

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Categories	Tenant Industry categories in maps	NAICS codes	NAICS category
	Government (not included in industry mapping)		
1	Transportation and warehousing	481111	Scheduled passenger air transportation
2	Information	517210; 519110	Wireless telecommunications carriers; News syndicates, Internet publishing and broadcasting and web search portals
3	Commodities, securities and exchanges	523130; 523210; 523120; 522293; 523930; 523110; 523920	Commodity contracts dealing; Securities and commodity exchanges; Securities brokerage; International trade financing; Investment advice; Investment banking and securities dealing; Portfolio management
4	Insurance & reinsurance	524130; 524298; 524113; 524126; 523920; 523930; 524292; 524210; 524114	Reinsurance carriers; All other insurance related activities; Direct life insurance carriers; Direct property and casualty insurance carriers; Portfolio management; Investment advice; Third party administration of insurance and pension funds; Insurance agencies and brokerages; Direct health and medical insurance carriers
5	Attorneys	541110	Offices of lawyers
6	Computer	541511; 541512; 541513; 541519; 541990	Custom computer programming services; Computer systems design services; Computer facilities management services; Other computer related services; All other professional, scientific, and technical services
7	Administrative management	541611	Administrative management consulting services
8	Other consulting services	541690; 541618; 541720	Other scientific and technical consulting services; Other management consulting services, Research and development in the social sciences and humanities
9	Education & Professional training	611310; 611430	Colleges, universities, and professional schools; Professional and management development training
10	Restaurants	722110	Full-service restaurants
11	Civic organizations & business associations	813410; 813910	Civic and social organizations; Business associations
12	Banking/portfolio management/investmnt	522110; 522120; 522291; 523920; 523930; 523110; 522293; 524292	Commercial banking; Savings institutions; Consumer lending; Portfolio management; Investment advice; Investment banking and securities dealing; International trade financing; Third party administration of insurance and pension funds
13	Space & Machinery leasing; Architecture/Engineering	531120; 532310; 532420; 541310; 541330; 541410	Lessors of nonresidential buildings (except miniwarehouses); General rental centers; Office machinery and equipment rental and leasing; Architectural services, Engineering services; Interior design services
14	Human Resources	541612; 541614; 524113; 524130; 524210	Human resources consulting services; Process and logistics consulting services; Direct life insurance carriers; Reinsurance carriers; Insurance agencies and brokerages

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Tenants' distribution by industry, distance from WTC and size

Observations

- The tenants' distribution by industry indicates that 3 industries (3, 4 & 12) represent tenants with 11 or more locations and the table below provides only a general overview not focusing on agglomeration which is analyzed using GIS
- The second location of former WTC tenants is on average further from their first
- The avrg. square feet (sf) in the second location increase compared to the first (due to 3 industries)

Overall comparison of the two relocations of former WTC tenants by industry type:

a) Distance from WTC:

- * 7 industries (government, 4, 5, 6, 8, 11 and 13) increased their avrg. distance in their second location (>16%)
- * 5 industries (1, 3, 7, 12 & 14) decreased their avrg. distance in their second location (>3%)

b) Size:

- * 9 industries (government, 4-8, 11, 13 and 14) decreased their avrg. sf in their second location (>12%)
- * 3 industries (3, 9 and 12) increased their avrg. sf in their second location (> 42%)

# map categories	Tenant Industry categories in maps	First location				Second location*			
		Avrg. Distance from WTC	Avrg. Square feet	SD. Distance from WTC	SD. Square feet	Avrg. Distance from WTC	Avrg. Square feet	SD. Distance from WTC	SD. Square feet
	Government (not included in industry mapping)	1.76 (7)	89,871 (7)	1.43	98,991	2.11 (8)	71,942 (7)	1.3	64,157
1	Transportation and warehousing	3.39 (1)	-	-	-	2.76 (1)	-	-	-
2	Information	2.84 (3)	49,783 (3)	2.75	14,231	2.79 (2)	50,733 (2)	2.19	20,949
3	Commodities, securities and exchanges	1.98 (20)	132,957 (18)	1.56	165,939	1.92 (19)	219,864 (19)	1.49	443,690
4	Insurance & reinsurance	2.49 (11)	154,045 (10)	1.4	195,056	2.91 (11)	111,754 (10)	4.92	95,200
5	Attorneys	3.41 (5)	100,994 (5)	0.35	137,480	4.9 (5)	85,594 (5)	8.45	143,762
6	Computer	2.81 (2)	50,100 (2)	0.6	39,739	3.55 (1)	20,200 (1)		
7	Administrative management	3.52 (1)	26,000 (1)			3.41 (1)	11,609 (1)		
8	Other consulting services	1.82 (2)	22,750 (1)	1.84		3.65 (2)	13,357 (2)	0.74	1,800
9	Education & Professional training	2.39 (3)	30,450 (2)	1.84	14,778	2.4 (3)	43,344 (3)	1.85	43,442
10	Restaurants	3.64 (1)	-	-	-	out of business	-	-	-
11	Civic organizations & business associations	0.99 (3)	40,500 (3)	1.22	37,871	7.62 (3)	28,680 (3)	10.77	18,741
12	Banking/portfolio management/investmnt	2.62 (14)	126,197 (10)	1.33	91,425	2.46 (13)	420,696 (12)	1.58	794,244
13	leasing;Architecture/Engineering	2.96 (4)	49,250 (4)	0.78	24,129	26.47 (4)	43,338 (3)	47.32	23,626
14	Human Resources	3.46 (2)	378,972 (2)	0.05	199,443	2.02 (2)	301,399 (2)	2.09	80,050

Number of observations in parenthesis

* The differentiation in the number of observations between the first and second location is caused by: a) initial or second location variable information was not available and b) the company is currently out of business

World Trade Center Tenant Relocation Patterns after September 11th, 2001

Spatial distribution of 14 industries across the Manhattan zip codes with former WTC tenants' representation

Tenant industry mix by zip code – location 1

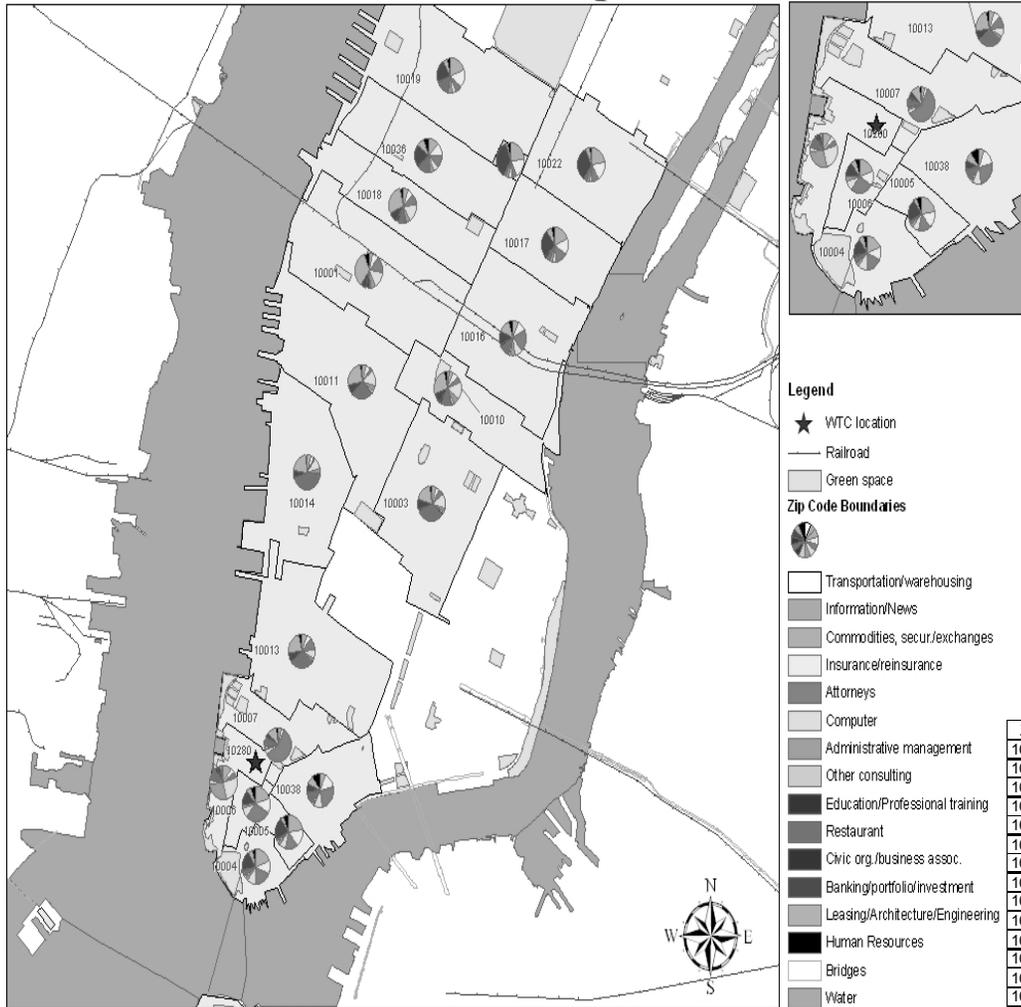


ZIP	tid11	tid12	tid13	tid14	tid15	tid16	tid17	tid18	tid19	tid110	tid111	tid112	tid113	tid114
10001					25.00%				25.00%			25.00%	25.00%	
10003			100.00%											
10004														
10005			28.57%	28.57%				14.29%			14.29%	14.29%		
10006			50.00%								50.00%			
10007			100.00%											
10010						25.00%					25.00%	50.00%		
10011			50.00%											
10013			100.00%											50.00%
10014		100.00%												
10016				50.00%	50.00%									
10017			20.00%			20.00%				20.00%			20.00%	20.00%
10018			25.00%					25.00%				50.00%		
10019			16.67%	16.67%	16.67%				16.67%			33.33%		
10020			100.00%											
10022			60.00%		20.00%							20.00%		
10036	12.50%		25.00%	25.00%	12.50%		12.50%						12.50%	
10038			50.00%						50.00%					
10280			66.67%									33.33%		

World Trade Center Tenant Relocation Patterns after September 11th, 2001

Spatial distribution of 14 industries across the Manhattan zip codes with former WTC tenants' representation

Tenant industry mix by zip code – location 2



ZIP	tid21	tid22	tid23	tid24	tid25	tid26	tid27	tid28	tid29	tid210	tid211	tid212	tid213	tid214
10001	25.00%								25.00%			25.00%	25.00%	
10003														
10004												100.00%		
10005			28.57%	42.86%	14.29%							14.29%		
10006			100.00%											
10007			100.00%											
10010				33.33%							33.33%	33.33%		
10011			66.67%										33.33%	
10013														
10014		33.33%	33.33%	33.33%										
10016				100.00%										
10017			50.00%										50.00%	
10018			50.00%					50.00%						
10019			33.33%		33.33%				33.33%					
10020												100.00%		
10022			50.00%									50.00%		
10036			20.00%	20.00%		20.00%	20.00%					20.00%		
10038									33.33%		33.33%			33.33%
10280					50.00%							50.00%		

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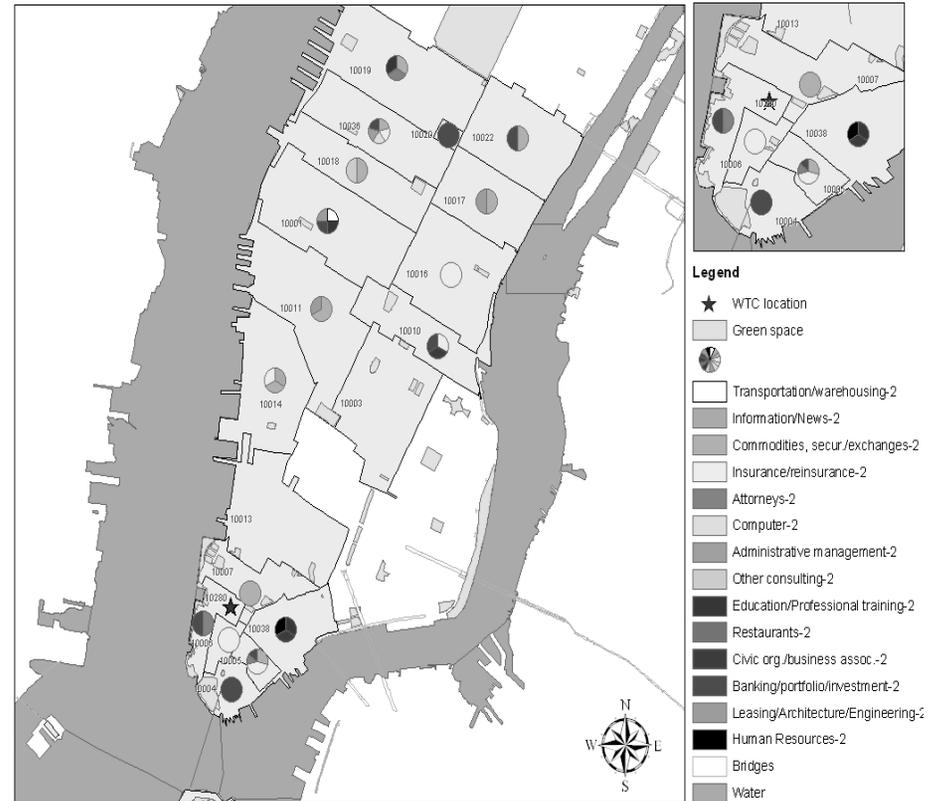
Tenants' industry mix by zip code – location 1



- The industry mix changes substantially between the two locations close to the WTC
- Certain zip codes (100013 & 10003) lose tenants who relocated there initially
- Industry mix becomes less diverse in certain areas at the second location (10016, 10017, 10022, 10019)

- Commodities, securities/exchanges as well as banking are present in multiple zip codes in contrast to insurance tenants which have presence in less

Tenants' industry mix by zip code – location 2



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- Density for the industries or tenants i is calculated by:

$$\text{Density}_{ij} = \frac{k_{ij}}{\sum_{i=1}^{14} k_{ij}}$$

where D_{ij} is the density of industry i in zip code j , k_{ij} represents the number of establishments of industry i (with i taking values 1-14) in zip code j (with j being: 10004 through 7, 10038 & 10280)

- The density comparison of WTC vs. non-WTC area indicates that commodity tenants moved initially closer to WTC although their current movement is outward in contrast to insurance tenants.

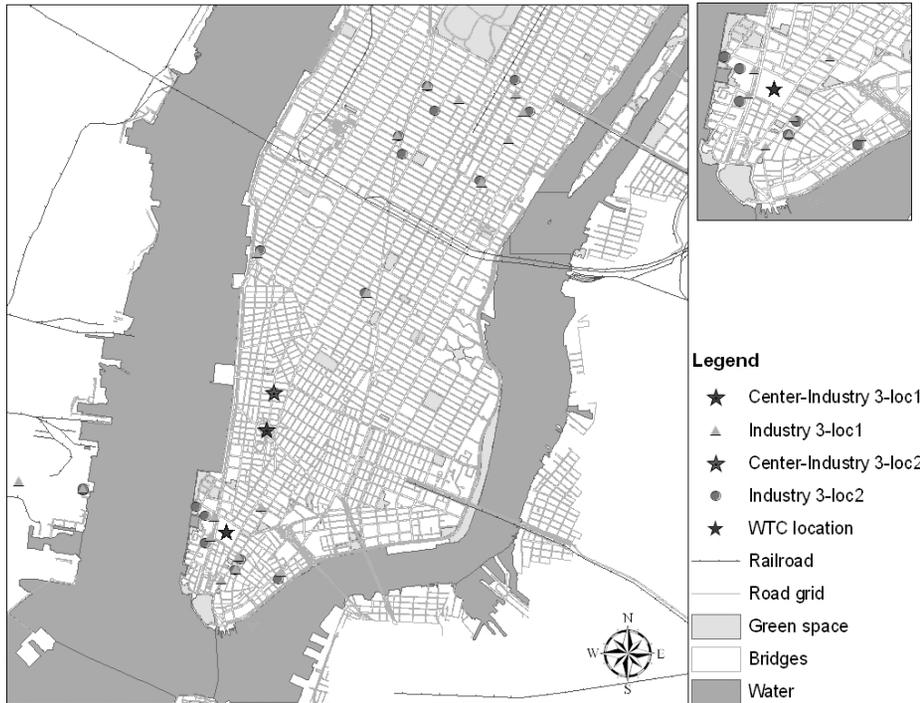
- Banking tenants seem to increase their presence at both areas

Density in WTC area (zip codes: 10004 through 7, 10038, 10280)			
	Commodities, securities and exchanges	Insurance & reinsurance	Banking/portfolio management/investment
Industry density - near WTC	14.57%	12.29%	13.42%
Tenant density in loc 1	28.00%	12.00%	12.00%
Tenants density in loc 2	23.08%	19.23%	15.38%
Density beyond WTC but within Manhattan (below Central Park and north of the WTC)			
Industry density - beyond WTC	13.71%	12.21%	19.91%
Tenant density in loc 1	22.50%	15.00%	22.50%
Tenants density in loc 2	35.71%	14.29%	25.00%

* The distribution of tenants among each industry indicates that 3 industries represent tenants with 11 or more locations shifting the focus of the study to only those and their distribution by zip code

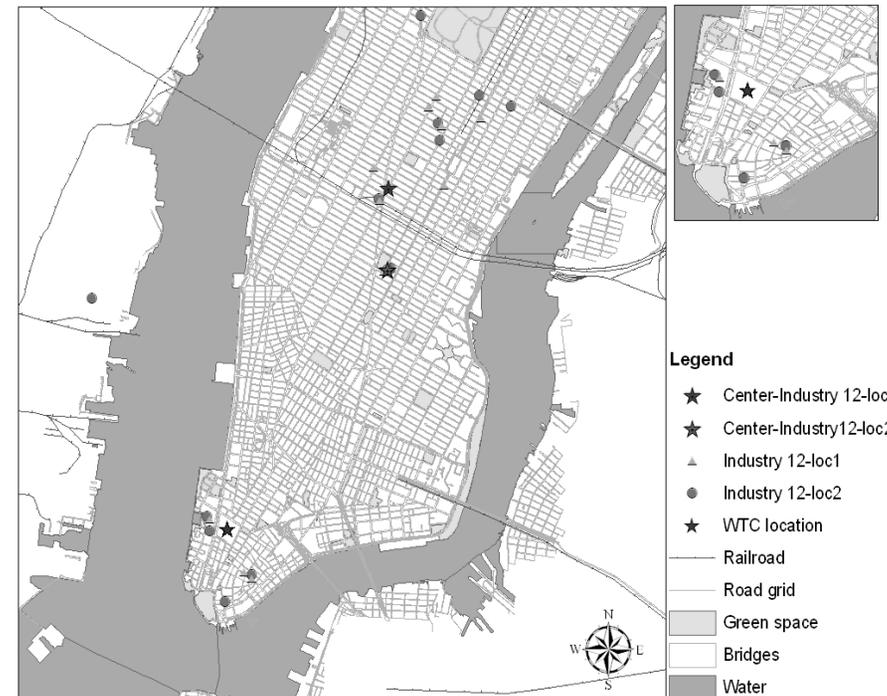
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Spatial distribution of industry 3 tenants between the two locations



# map catego	Tenant Industry categories in maps	Distance between first & second center (miles)
3	Commodities, secur./exchanges	0.29
12	Banking/portfolio management/investmnt	0.64

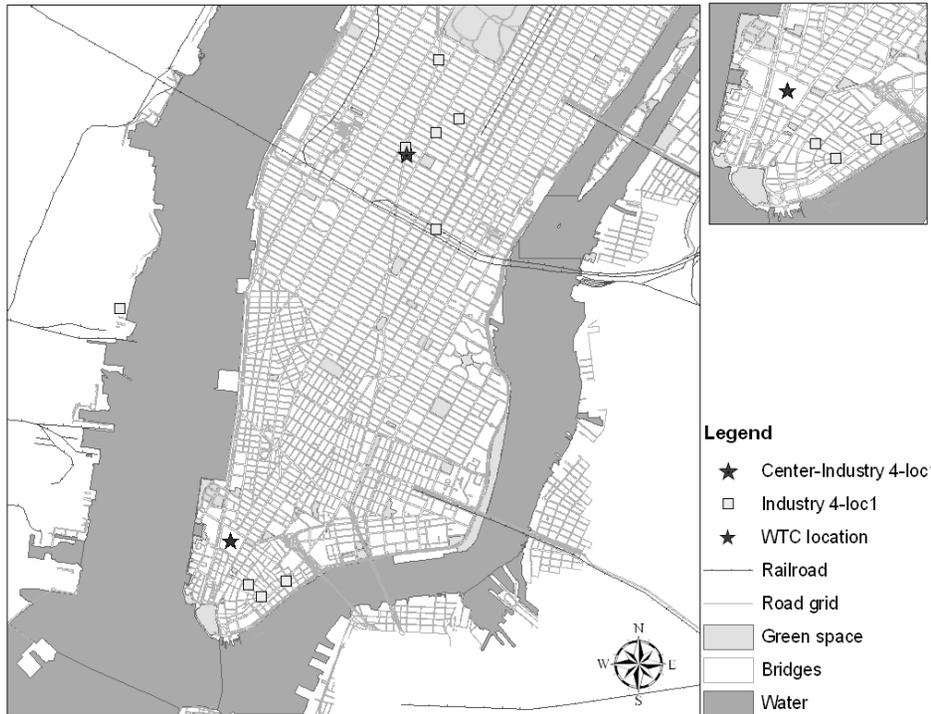
- The spatial distribution of tenants from both industries (3 & 12) and locations does not change significantly with the central feature moving less than 1 mile
- The absence of significant movement between the two locations and for both industries keeps the two spatial aggregations (one close to Wall street and the other close to the southern corner of Central park) intact



Spatial distribution of industry 12 tenants between the two locations

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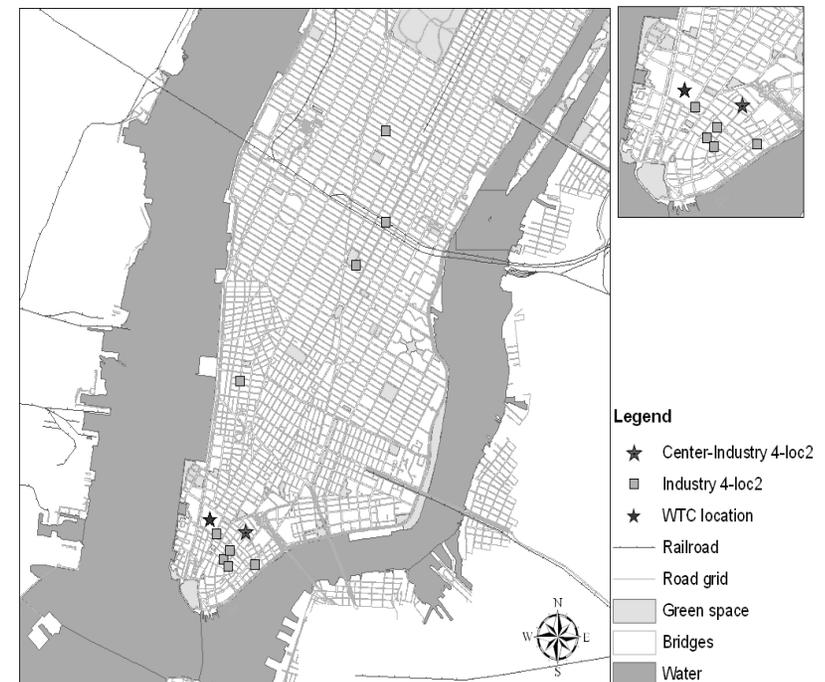
Spatial distribution of industry 4 tenants in location 1



- Insurance tenants are the only ones among the three studied with a significant shift in their second location towards their original WTC site. This shift moves the central feature of the second location to more than 3 miles
- Two spatial aggregations still exist, with one close to Wall street and the other shifting further south from its original location at the southern tip of Central park

# map catego	Tenant Industry categories in maps	Distance between first & second center (miles)
4	Insurance & reinsurance	3.23

Spatial distribution of industry 4 tenants in location 2



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Preliminary findings

- The average distance between the WTC and the second relocation increased as well as the square feet
- Even the initial relocation patterns after the WTC attack indicate that the attack did not prevent certain tenants/industries from relocating in close proximity
- The spatial distribution shows two agglomerations; one close to Wall Street and the other in the midtown Manhattan closer to Central Park
- Commodities/securities tenants' presence in the WTC area shrank (based on density) in their second relocation while insurance increased their presence substantially