ABSTRACT

Title of Document: THE EFFECTS OF WATERFRONT DEVELOPMENT ON HOUSING PRICES: THE CASE OF EASTERN BALTIMORE

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Residential waterfront development has taken advantage of available land and water amenities in the centrally-located ports of many American cities. Its impacts on the housing market of the surrounding neighborhoods may not have been distributed evenly. This study measures how waterfront development has affected housing prices in a residential area south-east of Baltimore's downtown through time. The results indicate that development on the waterfront has had a positive impact on prices in the entire study area during the analyzed time-frame. However, this impact has been far more pronounced on the prices of properties located within a short distance from the water even decades after the initial projects on the waterfront were started. The study thus support claims that waterfront development has created uneven patterns of growth in Baltimore.

THE EFFECTS OF WATERFRONT DEVELOPMENT ON HOUSING PRICES: THE CASE OF EASTERN BALTIMORE

By

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Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

The relocation of port activities away from central cities caused by containerization and increasing space consumption by port industries has given many cities new opportunities to redevelop their waterfronts (Hoyle, 1988). In the United States, these waterfront redevelopments have often been associated with wider efforts to revitalize troubled downtowns. American cities have replaced port-related and industrial uses on the waterfront with offices, convention centers, retail, condominiums, entertainment and leisure venues, in an effort to attract service-oriented businesses, new residents, and tourists to their troubled central cores.

Baltimore's waterfront development has often been cited as a success in turning around the fortunes of the city's central core. Law (1988) credits redevelopment in Baltimore's Inner Harbor with promoting the city's role as a tourist center, and with transforming the city's image and thus enabling it to attract investments. Baltimore is often used as a case-study of what went right in the process of waterfront development. Millspaugh (1993) attributes the Inner Harbor's success to the strong partnership between the city government and the business community. In particular, he extols the role of the Charles Center-Inner Harbor Management, Inc. in establishing an efficient "delivery system" for developers who wanted to invest in the Inner Harbor (Millspaugh, 2001). Green (1999) praised Harborplace –a festival marketplace developed by the Rouse company- for giving the waterfront a new focus while recognizing the importance of the mix of recreational, cultural, and commercial activities for the waterfront's success. Robertson (1995) mentions Baltimore's

successful integration of private development and public space in his assessment of downtown redevelopment strategies.

While waterfront development in the Inner Harbor has generally been considered an achievement, Law (1988) cautions that it has not solved the problems of the inner city and that large areas of poverty surround the city center. Furthermore, investment on Baltimore's waterfront may have caused disinvestment in other areas. Zhu's (2001) study of Baltimore's office market points to the increased polarization of the downtown market created by waterfront development: Class-A office space backed by institutional capital and rented to financial institutions along the waterfront, and increasingly Class-B offices owned by small investors and with higher vacancy rates in the traditional Central Business District (CBD) north of Lombard St. Levine (1987a) criticized Baltimore's redevelopment strategy for promoting uneven growth and creating a dual-city where the dynamics of the new CBD and of the Inner-Harbor are increasingly distinct from those of the surrounding neighborhoods. Levine's criticism centers on the lack of positive spillover effects from the waterfront to the surrounding communities; particularly on the opportunity costs of investing the city's resources in the central core and on the lack of well-paid job creation for the low-income residents of the surrounding areas.

As commercial, leisure, and office developments filled downtown, residential construction has spread along the waterfront to the east and south of the Inner Harbor. New condominiums have brought new residents to neighborhoods such as Federal Hill, Fells Point, and Canton. By the late 1980s these developments started to raise concern amongst longtime residents over the spread of gentrification (Levine, 1987a).

However, new residences have been concentrated along the waterfront to take advantage of available land and water amenities and thus might not have affected all areas of these neighborhoods evenly. Specifically, development on the shore may have caused prices of properties near the water to rise dramatically while leaving housing values in the rest of the neighborhoods unchanged.

Waterfront development can have two contrasting effects on the difference between housing prices near the water's edge and those farther inland through time. Firstly, by converting port and industrial areas located along the shoreline into attractive residential environments, it may cause property values near the water to escalate while benefits may fail to spill over to neighborhoods in the hinterland. This effect would create a gap in housing prices between an expensive waterfront and a more affordable hinterland. Conversely, waterfront development can have the spillover effect of spurring gentrification and increasing property values inland through time as more investments are made in the private residences, commercial establishments, and public spaces located farther and farther away from the water. This secondary effect, which would take more time to develop, may partially offset the first effect and thus cause the gap in prices between areas near the water and the hinterland to decrease in the long run. Which of these effects prevails in the long-term will determine whether residential development along the waterfront of residential neighborhoods has the same polarizing effect that office and retail development has had on the CBD, as pointed out by Zhu (2001).

Despite a possible spillover effect of waterfront development on housing prices in the hinterland, a differential in terms of prices between waterfront areas and

the hinterland may persist even in the long run. This is due to the fact that some amenities associated with waterfront locations such as views of the harbor, the presence of a waterfront promenade, or the availability of marinas nearby can't spillover to inland areas. However, waterfront development may generate investments in buildings located near the redeveloped areas, and generate improvements in public spaces, schools, and security nearby. As areas in proximity to the redeveloped waterfront get revitalized, improvements may start to reach neighborhoods farther inland thus causing the difference in prices to narrow. This process may be very slow, especially in residential neighborhoods where residents are long-time owners and are unlikely to sell their homes in the short term despite increases in land values. Also, a lack of vacant parcels inland can give developers less opportunities to build housing with modern amenities there. Additionally, the construction of high-rises on the waterfront may limit any views that inland neighborhoods may have had of the harbor. Furthermore, any spillover effect may be hindered by barriers such as highways or rail-tracks that separate inland areas from the redeveloped waterfront. Lastly, the very characteristics of the existing housing stock may speed or slow down gentrification. If the original housing stock inland is less appealing than housing near the water in terms of size or architecture, gentrification may stop at a short distance from the waterfront.

While a difference between waterfront areas and the hinterland may persist, it may narrow over time if the secondary spillover effect of waterfront development is strong enough to counter the primary effect of escalating prices near the water. This study is an attempt to identify whether this has been the case in eastern Baltimore: a

section of the city which has experienced development along the waterfront since the 1980s and thus may have started to experience waterfront development's spillover benefits to inland neighborhoods. A hedonic model of property values can uncover whether this has been the case by measuring the impact of the distance from the waterfront on housing prices through time. A house is one of the largest investments most households make and its price is determined by the characteristics of the structure and of the lot, as well as neighborhood amenities. By measuring the magnitude of the coefficient of distance from the water in a hedonic model through time, we can see whether the secondary spillover effect of waterfront development has been strong enough to reduce the gap in prices between waterfront areas and the hinterland.

Chapter 2: Literature Review

Hedonic estimation is used by researchers to measure the impact of environmental amenities on the prices of housing by regressing environmental amenities (or disamenities) as well as other neighborhood and individual housing characteristics on observed prices in order to extract the impact of an environmental amenity on the market price of housing (Boyle and Kiel, 2001). Much research has focused on the impact of pollution as well as undesirable facilities such as power plants or hazardous waste-sites on housing prices in surrounding neighborhoods. Kohlhase (1991) analyzed the impact of Environmental Protection Agency (EPA) announcements that a toxic site has been added to the Superfund list on housing prices around the site by regressing the natural log of house prices on the distance from the nearest toxic waste site, on a vector of housing characteristics, on neighborhood characteristics and on seasonal dummies. She used separate regressions for each time-period analyzed, as well as a repeat-sales model with time-period dummy variables. Kiel (1995) also investigated EPA announcements' effects on house prices in Woburn, Massachusetts by conducting separate regressions for six time-periods. Kiel and McClain (1993) examined the impact of an incinerator from the time its construction was first rumored through its years of operations on house sales prices. The authors used separate regressions for each phase of the incinerator's lifecycle and a pooled regression in which they interacted the natural log of the distances from the incinerator with the different time-periods dummy variables. These studies, while focusing on different environmental disamenties, provide a

useful framework for the analysis of waterfront development's effects on house prices in surrounding neighborhoods.

While several studies have been conducted on the impact of water and water-quality on house prices, none of them address the impact of waterfront development on the value associated with being located near the water through time. Brown and Pollakowski (1977) studied the economic significance of undeveloped public land along the water, Steinnes (1991) measured the impact of perceived water-quality on land values, Garrod and Willis (1994) estimated the impact of waterside location on house sales prices along canals in Great Britain, Leggett and Bockstael (1999) measured the effect of water quality on property values along the Chesapeake Bay using Maryland Property View data. All these studies establish the positive effects of location near the water and of water-quality on property values nearby. However, they don't measure the effect of distance from the water caused by development on the waterfront. This study differs both from the descriptive case-studies found in numerous books on the subject of waterfront development and from house price hedonic studies which focus on the impacts environmental goods by using hedonic estimation to analyze the impact of waterfront development, as opposed to an environmental disamenity, on house prices.

Chapter 3: Data

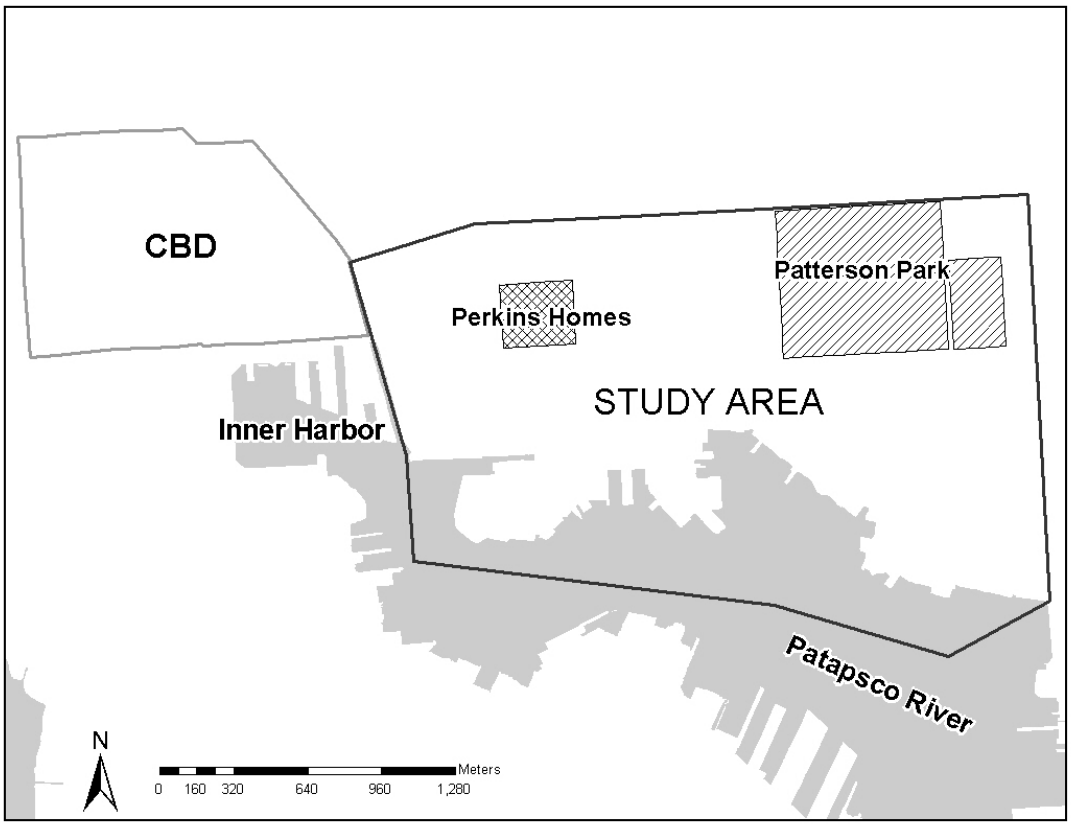
The area analyzed in this study is located east of Baltimore's Inner Harbor and extends from Jones Falls to East Avenue and from the Patapsco River to Baltimore Street (See Figure 1). It includes Baltimore's Ward 3, Ward 2, and most of Ward 1. The study area is comprised of the neighborhoods of Little Italy, Fells Point, Upper Fells Point, Perkins Homes, the Patterson Park Area, most of Canton and parts of Highlandtown, of the eastern Inner Harbor, of Baltimore-Linwood, of Butcher's Hill, of Washington Hill, and of Jonestown. The study area has been home to a large Eastern European community and has traditionally had a strong maritime character. Its waterfront has undergone major transformations since the1980s as new condominiums and townhouses were built where port and industrial facilities once stood. While this transformation has already changed the face of the waterfront substantially, more developments are underway.

Data from the 2000 U.S. Census for Baltimore's tract 101, 102, 103,104,105, 201, 202, 203, 301, 302, which correspond closely, albeit not perfectly, to the analyzed area, reveal substantial differences between the study area and the city as a whole. While 71% of the population of the analyzed tracts was white in 2000, the majority of the population in the city of Baltimore was black and only 31.6% was white. Furthermore, the study area's tracts' median household income, at $36,018 in 2000, was approximately $6,000 above the median household income for the city as a whole; the analyzed tracts' median house value, at $89,072 for single-family owner-occupied homes was almost $20,000 above the figure for Baltimore City. The data on incomes and housing values thus indicate that the study area was better off

economically than the rest of the city in 2000. An economically thriving area may be welcome news in a city that has lost 11.5% of its population and 76,799 jobs between 1990 and 2000 (Cohen, 2001, p. 418 and 419). The City of Baltimore has suffered in the second half of the 20th century from the same problems that have plagued other industrial cities in the north and Midwest: a declining industrial base, white-flight, abandonment of houses, and blight. Thus gentrification caused by waterfront development may be accepted by the municipality as a way to increase the city's tax base.

The study area is well suited for an analysis of waterfront development's effects on surrounding properties because it is large enough to contain a variety of small neighborhoods as well as a variety of developments on the waterfront including high-rise and mid-rise condominiums, and townhouses. Furthermore, there are no major barriers between the waterfront and the rest of the neighborhoods. Lastly, development on the study area's waterfront started decades ago and has had enough time to have a substantial impact on the surrounding neighborhoods. Thus it is possible to analyze whether redevelopment on the waterfront has spurred substantial investments in the housing stock located in the hinterland thus causing prices inland to increase or whether any spillover effect is overshadowed by the rise in prices of housing near the water.

Figure 1: location of the study area



The data used in this study consists of last-year sales of residential properties in the study area obtained from the Maryland Property View 1997, 2000, and 2003 CDs. These three-year intervals were used because they coincide with the three-year tax assessment intervals of the study area. Therefore, each CD contains up-to-date assessments of each property's value. Since sales data collected by Property View each year ends at a different month (usually in the second or third quarter of the year), one entire twelve month period of sales was collected starting from the date closest to one year prior to the last date in which sales are available. Thus the 1997 dataset contains sales from 03/04/1996 to 01/22/1997, the 2000 dataset contains sales from 06/20/1999 to 06/19/2000, and the 2003 dataset consists of sales from 09/11/2002 to 09/10/2003. Lastly, only arms-length transactions were included.

Due to the incorrect geo-coding of a large number of observations in the Maryland Property View point layers and due to the absence of quality data on the size of each parcel sold, observations from the Property View databases were matched to their parcels obtained from a 2003 Baltimore City parcel layer by joining their block-lot numbers. The lot-sizes as well as the centroids from the parcel layer were then used in the analysis. This necessary process resulted in the exclusion of parcels that were subdivided between 1997 and 2003. It also resulted in the exclusion of condominiums, which constituted 6.67% of all residential sales in the three time-periods analyzed, from the study because their block-lot numbers didn't correspond to any parcel in the parcel layer. Lastly, this process assumes that the size of parcels whose block-lot number and address didn't change remained the same between 1997 and 2003. While this assumption is not true in all cases, it is probably rather reasonable for the overwhelming majority of observations in the study area. Furthermore, due to the presence of some observations with extremely low prices or very high prices, the dependent variable was regressed on the natural log of the total assessed value and the observations above three standard deviations were eliminated from the final analysis.

The hedonic regressions used in this study are specified in log-log form: this was the functional form which gave the best fit to the data. The natural log of deflated sales prices is the dependent variable. The independent variables include the natural log of the deflated assessed improvement value and the natural log of the lot size in order to control for characteristics of the buildings as well as of the lots. Prices and improvement values were deflated using a shelter-cost deflator for metropolitan areas

in the South with over 1.5 million residents obtained from the Bureau of Labor Statistics. The natural log of distance from the CBD was included as an independent variable to control for the potential amenity factor of being located near the employment centers, services, and retail located in the CBD. Buffers of 200 meters were created around the Perkins Homes (a public housing development located in the western portion of the study area) and around Patterson Park (a large park on the north-eastern end of the study area) to control for their effects on surrounding house prices. Furthermore, buffers of 50 meters along roads designated as urban arterials by the National Transportation Atlas were created to control for the negative effects of traffic and noise on housing facing busy streets. Finally, the natural log of the distance from the waterfront was included in the analysis. As with the natural log of the distance from the CBD, it is assumed that distance from the harbor will decrease house prices at a decreasing rate. Variables definitions can be found in Table 1, whereas statistics for the variables can be found in Table 2 and Table 3.

Table 1: variable descriptions

Name	Description
lnprice	Natural log of deflated sale's price
lnimprov	Natural log of deflated assessed improvement value
lnlotsqm	Natural log of lot size (in square meters)
lnartbuf	Natural log of transformed 50 meters urban arterial buffer
lndwater	Natural log of distance from the waterfront
lndcbd	Natural log of distance from the CBD
lnbufph	Natural log of transformed 200 meters around Perkins Homes
lnbufpp	Natural log of transformed 200 meters around Patterson Park
year2000	Dummy variable for sales extracted from the 2000 MD Property View dataset
year2003	Dummy variable for sales extracted from the 2003 MD Property View dataset
lndwa00, lndwa03	Interaction term between natural log of distance from the waterfront and year dummy variables
lndcbd00, lndcbd03	Interaction term between natural log of distance from the CBD and year dummy variables
lnbfph00, lnbfph03	Interaction term between the Perkins Homes buffer and year dummy variables
lnbfpp00, lnbfpp03	Interaction term between the Patterson Park buffer and year dummy variables

Table 2: data sample statistics of single-year models: mean (standard deviation), minimum, maximum

Name	1997 Dataset			2000 Dataset			2003 Dataset		
	Min.	Mean (St. Dev.)	Max.	Min.	Mean (St. Dev.)	Max.	Min.	Mean (St. Dev.)	Max.
lnprice	8.07	10.29 (0.68)	12.03	6.36	10.58 (0.74)	12.37	7.79	11.11 (0.61)	12.56
lnimprov	7.25	10.04 (0.61)	12.01	6.77	10.16 (0.65)	11.86	6.72	10.47 (0.69)	12.19
lnlotsqm	3.64	4.48 (0.29)	6.34	3.43	4.46 (0.32)	6.36	3.42	4.47 (0.31)	5.57
lnartbuf	0	0.16 (0.37)	1	0	0.22 (0.41)	1	0	0.18 (0.39)	1
lndwater	3.26	6.09 (0.69)	7.29	3.24	6.16 (0.62)	7.31	3.4	6.15 (0.60)	7.31
lndcbd	5.7	7.59 (0.37)	8.01	5.14	7.56 (0.40)	8.02	5.53	7.58 (0.36)	8.02
lnbufph	0	0.06 (0.23)	1	0	0.02 (0.14)	1	0	0.01 (0.12)	1
lnbufpp	0	.39 (.49)	1	0	0.35 (0.48)	1	0	0.34 (0.48)	1

Table 3: data statistics of pooled model: mean (standard deviation), minimum, maximum

Pooled Dataset							
Variable Name	Min.	Mean (St. Dev.)	Max.	Variable Name	Min.	Mean (St. Dev.)	Max.
lnprice	6.36	10.75 (0.74)	12.56	lndcbd	5.14	7.57 (0.38)	8.02
lnimprov	6.72	10.26 (0.69)	12.19	lndcbd00	0	3.00 (3.71)	8.02
lnlotsqm	3.42	4.47 (0.31)	6.36	lndcbd03	0	3.10 (3.73)	8.02
lnartbuf	0	0.19 (0.39)	1	lnbufph	0	0.03 (0.16)	1
year2000	0	0.40 (0.49)	1	lnbfph00	0	0.01 (0.09)	1
year2003	0	0.41 (0.49)	1	lnbfph03	0	0.01 (0.08)	1
lndwater	3.24	6.14 (0.62)	7.31	lnbufpp	0	0.35 (0.48)	1
lndwa00	0	2.44 (3.04)	7.31	lnbfpp00	0	0.14 (0.34)	1
lndwa03	0	2.52 (3.05)	7.31	lnbfpp03	0	0.14 (0.35)	1

Chapter 4: Results

The hedonic model was estimated in two ways, similarly to the study conducted by Kiel and McClain (1995): using separate regressions for each year, and using a pooled regression for the entire sample with interaction terms of the distance variables and year dummy variables. Due to the presence of heteroskedasticity, detected in the single-year regression as well as in the pooled regression by the Breusch-Pagan / Cook-Weisberg test, robust standard errors were used in all models. The results of the separate regressions are presented in Table 4. The variable of greatest interest to this study is the coefficient of the natural log of distance from the waterfront: observing its changes through the three analyzed time-periods can reveal whether waterfront development's primary effect of causing prices near the shore to escalate has prevailed over the secondary effect of generating investments in neighborhoods located progressively farther inland in a span of six year or whether the opposite is true. The changes in the coefficient from small, negative and insignificant in 1996/1997, to more negative and significant in 1999/2000 seem to indicate that waterfront development has increased the importance of distance from the water as a factor in the determination of house prices through time. It is particularly surprising that this variable is insignificant in 1996/1997 considering that several waterfront projects were constructed in the 1980s and should have had a substantial impact on house prices near the water by 1996/1997. Therefore, whereas we cannot state that distance from the waterfront had an impact on prices in 1996/1997, the regression results indicate that in 1999/2000 a 1% increase in distance from the waterfront led to a 0.25% decrease in sales prices. However, while the

coefficient changed substantially from the 1996/1997 period to the 1999/2000 period, it remained almost constant from the 1999/2000 period to the 2002/2003 period. This indicates that neither of the two main effects waterfront development has on the gap between property prices prevailed in this three-year interval and that perhaps an equilibrium between the two effects may have been reached in the study area. Nonetheless, generally the results are consistent with the hypothesis that waterfront development has caused property prices near the waterfront to escalate compared to those located further inland, thus increasing the difference between gentrified areas in proximity of the water, and the rest of the neighborhoods which are gentrifying more slowly.

Other variables included in the single-year models are generally consistent with expectations. The coefficients of the natural logs of improvement values and of lot sizes are positive and highly significant. Location along urban arterials seems to have had a negative and significant impact on house prices in 1996/1997 and in 1999/2000 but seems to have no impact in 2002/2003. Interestingly, distance from the CBD is insignificant in the first year analyzed but becomes positive and significant in second and third year. Perhaps this is caused by perceptions of crime in the areas of the traditional CBD. Being located within 200 meters from the Perkins Homes did not have a significant impact on surrounding property prices in any of the years under study, probably due to the low number of observations within 200 meters from the public housing site. However, location near Patterson Park had a negative and significant impact on prices in two of the three years analyzed: while this is

surprising, it could be caused by possible negative connotations attached to the park if it is used by homeless persons or other undesired users.

Table 4: regression estimates for single-year regressions

	1997 Dataset	2000 Dataset	2003 Dataset
constant	3.37**	2.57**	3.98**
	(0.98)	(0.65)	(0.57)
	[3.45]	[3.97]	[6.95]
lnimprov	0.67**	0.48**	0.52**
	(0.07)	(0.05)	(0.03)
	[9.22]	[10.33]	[15.81]
lnlotsqm	0.18**	0.43**	0.35**
	(0.08)	(0.07)	(0.05)
	[2.14]	[6.19]	[7.53]
lnartbuf	-0.13*	-0.15**	-0.06
	(0.08)	(0.05)	(0.04)
	[-1.74]	[-3.04]	[-1.44]
lndwater	-0.08	-0.25**	-0.23**
	(0.05)	(0.03)	(0.03)
	[-1.58]	[-7.31]	[-8.72]
lndcbd	-0.01	0.37**	0.21**
	(0.09)	(0.06)	(0.05)
	[-0.08]	[6.36]	[4.39]
lnbufph	-0.15	-0.02	-0.13
	(0.18)	(0.18)	(0.11)
	[-0.80]	[-0.11]	[-1.15]
lnbufpp	-0.20**	-0.12**	-0.04
	(0.06)	(0.04)	(0.03)
	[-3.60]	[-2.66]	[-1.31]
R squared	0.49	0.45	0.61
Observations	394	798	821

Note: numbers in round parentheses are standard errors and numbers in square parentheses are t statistics

* Significant at 10%

** Significant at 5%

The results from the pooled model are presented in Table 5 and seem to be consistent with the results from the single-year regressions. The natural log of the distance from the water seems to have a negative impact on housing prices already in the 1996/1997 period. The interaction variables between the natural log of distance

from the waterfront and the 1999/2000 and 2002/2003 dummy variables show that the impact of distance from the waterfront on market prices increased from 1996/1997 to 1999/2000 but didn't change significantly between 1999/2000 and 2002/2003. Differences between the pooled regression's coefficients and the coefficients from the single-year regressions are not sizable and are due to the fact that the coefficients of certain explanatory variables are kept constant through time in the pooled model whereas they are allowed to vary in the single-year models. The results from the pooled model validate those from the single-year regressions and show that the benefits of waterfront development have not spread equally throughout the study area.

The coefficients of other variables in the pooled regression are generally consistent with those from the single-year regressions: the coefficients of the natural log of the improvement value and of the natural log of the lot size are positive and significant. The coefficients of the natural log of distance from the CBD and of its interaction terms are similar to those from the separate regressions in the time-periods 1999/2000 and 2002/2003 and indicate a positive effect associated with being located far away from the CBD. The coefficients are different, however, for the year 1996/1997: whereas the single-year regression indicates an insignificant impact of distance from the CBD on prices, the pooled model points to a positive and significant, albeit small, impact in the same time period.

Proximity to the Perkins Homes was insignificant in all three time-periods, as it was in the single-year regressions. The impact of proximity to Patterson Park, however, changed from negative and significant in the 1996/1997 period to positive and marginally significant in the 2002/2003 period, thus indicating a stronger

turnaround of the park's amenity value to the housing market than the single-year models had revealed. Lastly, the year 2000 dummy variable has a negative and significant coefficient, despite the fact that the average deflated sales price in 1999/2000 was higher than the average deflated sales price in 1996/1997. Hence the coefficient indicates that the higher deflated sales prices were more than compensated by changes in other explanatory variables and in their coefficients.

Table 5: regression estimates from pooled model

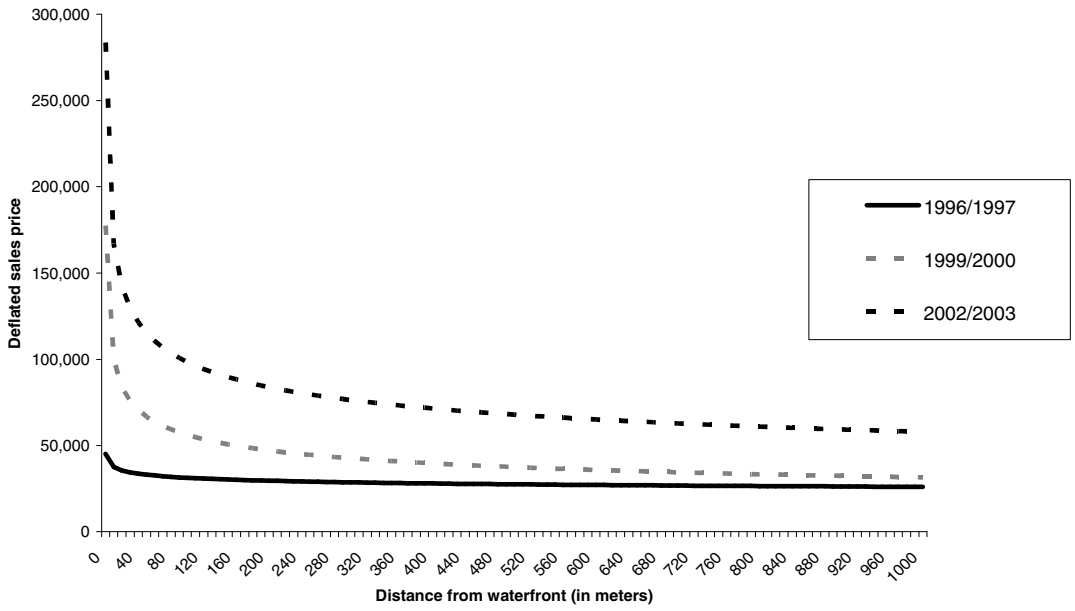
constant	4.00**	lndcbd	0.03**
	(0.68)		(0.09)
	[5.91]		0.40
lnimprov	0.52**	lndcbd00	0.33**
	(0.03)		(0.10)
	[19.92]		[3.27]
lnlotsqm	0.36**	lndcbd03	0.16
	(0.04)		(0.10)
	[9.95]		[1.63]
lnartbuf	-.11**	lnbufph	-0.13
	(0.03)		(0.18)
	[-3.82]		[-0.72]
year2000	-1.57**	lnbfph00	0.10
	(0.73)		(0.25)
	[-2.14]		[0.42]
year2003	0.03	lnbfph03	-0.02
	(0.70)		(0.21)
	[0.04]		[-0.11]
lndwater	-0.12**	lnbufpp	-0.17**
	(0.04)		(0.06)
	[-2.83]		[-2.81]
lndwa00	-.11**	lnbfpp00	0.04
	(0.05)		(0.07)
	[-2.02]		[0.55]
lndwa03	-0.11**	lnbfpp03	0.13*
	(0.05)		(0.07)
	[-2.26]		[1.88]
R squared	.61		
Observations	2012		

* Significant at 10%, ** Significant at 5%

Figure 2 is derived from the single-year regressions and shows the effect of distance from the waterfront on predicted deflated sales prices of houses with other

characteristics corresponding to the means presented in Table 2. The graph shows that deflated sales prices in the study area have increased independently of distance from the waterfront in the span of six years. In contrast to this trend, an analysis of deflated sales prices of residential non-condominium improved properties with a price above zero in Baltimore City reveals that the deflated average sales price decreased from $53,732 in the 1996/1997 period to $39,970 in the 1999/2000 period only to rise back to $53,231 in the 2002/2003 period, thus remaining essentially flat in the six years analyzed.

Figure 2: effect of distance on predicted deflated house prices from single-year regressions



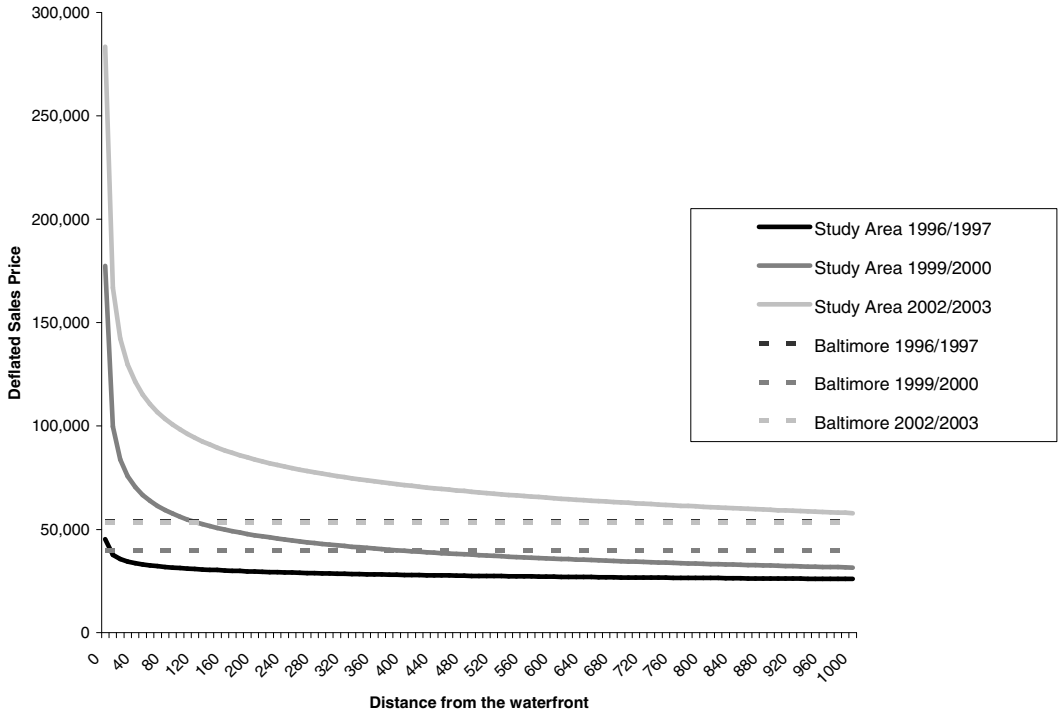
While deflated sales prices increased throughout the study area, the most dramatic increases have occurred near the waterfront, as shown by the spike in the prices of properties located on the shore. The sales price for a dwelling with average

characteristic located 50 meters from the waterfront has increased from $33,075 in the 1996/1997 period to $115,293 in the 2002/2003 period, or 249%, whereas the sales price for a dwelling with average characteristic located 1 kilometer away from the waterfront increased from $26,027 to $57,885, or 122%. Therefore, the deflated sales price of a dwelling located very close to the waterfront increased twice as much as the price of a dwelling located a kilometer away from the waterfront in percentage terms.

A comparison of the different curvatures of the three lines also reveals the ripple-effect that waterfront development is having by causing gentrification to spread farther inland through time. Whereas the sales prices of two properties located 200 and 500 meters from the waterfront respectively would have been almost the same in the 1996/1997 period, the price of the property located 200 meters from the waterfront would have been substantially higher than the other one in the 2002/2003 period. Perhaps more years of data will show that the curvature will continue to change in the future as gentrification spurred by waterfront development expands inland. Furthermore, since prices decline with distance from the water, it is possible to see at which distance from the waterfront predicted prices in the study area intersect with the average prices in the city of Baltimore in the three analyzed time periods. Figure 3 shows the predicted deflated housing prices in the study area at various distances through time as well as the average price of residential, improved, non-condominium sales above zero in Baltimore. Since Baltimore's deflated average sales price in the 2002/2003 period was almost equal to the deflated average sales price in the 1996/1997, the two lines overlap in the graph. The graph indicates that,

whereas none of the predicted prices is as high as the average price in the city of Baltimore in the 1996/1997 period, properties located approximately 390 meters from the waterfront would have sold at the average sales price in the city of Baltimore in the 1999/2000 period, and properties located approximately 1440 meters from the waterfront would have sold at the average sales price in the city of Baltimore in the 2002/2003 period. Therefore waterfront development has lifted prices of properties located farther and farther inland above the average sales price in the city.

Figure 3: predicted deflated sales prices in the study area and average deflated sales price in the city of Baltimore



Chapter 5: Conclusions

This study analyzed the impact of waterfront development on the housing market in a study area east of the Inner Harbor by measuring the effect distance from the water has had on house prices through six years. The results indicate that development on the waterfront has had a positive impact on prices in the entire study area between 1996 and 2003, but that this impact has been far more pronounced on the prices of properties located within a short distance from the water. While waterfront development is causing positive spillover effects to house prices to spread progressively inland, this effect is still overshadowed by the rise in prices for properties located very close to the shore. These three effects combined have increased the gap in prices between properties located near the water and those in the hinterland. Unlike Zhu's (2001) study of Baltimore's CBD, this analysis doesn't seem to indicate that waterfront development has shifted capital from the neighborhoods of the study area located far away from the water to those located near it. To the contrary, waterfront development in residential districts of the city has had a positive effect on prices for all properties in the analyzed area. However, the results also indicate that, by causing an escalation in prices of properties in very close proximity to the water, residential waterfront development has promoted uneven growth in housing prices in the study area.

This research paper has several limitations that warrant attention. By being limited to a specific area of Baltimore, the results of the study are not generalizable to neighborhoods that experienced waterfront development in other cities. In particular, the fact that the study area has been majority white, may have influenced the speed at

which gentrification has spread inland. Furthermore, while results indicate that prices increased throughout the study area in the six year analyzed, how much of that increase was due to the effects of waterfront development and how much was due to a more general "back to the city" movement, which may have occurred even if waterfront development hadn't taken place, is not known.

This study is limited in its scope since it is an attempt to measure the impact development on the waterfront has had on neighborhoods intended as geographic entities. It does not measure the impact waterfront development has had on the residents of the surrounding neighborhoods and it does not attempt to accurately identify the winners and the losers from the process of gentrification that waterfront development has engendered. Increased housing values can be a mixed blessing for property owners: they increase the owners' net-worth and enable them to take out loans based on the higher value of their real-estate assets but they also result in higher property taxes. Overall, households owning property near the water who desire to move out might be the biggest beneficiaries from waterfront development. Renters might be amongst the biggest losers as higher land values cause rents to increase. Furthermore, low-income homebuyers may find themselves unable to afford a home in the study area, which raises questions as to whether the municipality should promote income diversity through legislation such as the inclusionary zoning bill that would require developers to include affordable units in their residential projects currently being considered by the City of Baltimore (Rosen, 2006). Furthermore, while this study's results indicate that waterfront development has had positive spillover effects to surrounding communities in terms of property prices, they also

validate Levine's assertion that waterfront development has created uneven patterns of growth (1987a). Nonetheless, by focusing exclusively on housing prices, this analysis is limited in that it doesn't address the specific points concerning employment creation raised by Levine.

Future research comprising more years of data might help shed more light on the long-term effects on prices caused by waterfront development. Furthermore, research on residential neighborhoods that experienced waterfront development in other cities might uncover similarities and differences with Baltimore's experience. More research on the quantity and type of jobs created in newly redeveloped waterfront areas is needed to determine employment benefits of redevelopment which may go well beyond surrounding neighborhoods. Even if waterfront development has a positive impact on a small geographical area in terms of prices, it may positively impact the whole city if it generates higher revenues for the municipality. A study comparing higher property tax revenues generated by waterfront development and the costs associated with servicing newly redeveloped waterfront areas such as increased police protection, transit, or infrastructure provision, could determine the net benefits of waterfront development to municipal coffers and may provide fresh evidence to the debate between Levine (1987b) and Berkowitz (1987) on whether redevelopment in the central core can really benefit everyone.

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