The Land Premium in Eugene/Springfield:

Determining the price differentials of brownfield and greenfield parcels and the impact of the enterprise zone

By
Ryan Bricker

Jeremy Simantel

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under the supervision of
Prof. [Bruce Blonigen]

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Abstract: Using a hedonic pricing model, our research is twofold: One, we attempt to statistically estimate the market premium greenfield sites have over brownfield and possibly grayfield sites; and two, we analyze the West Eugene and Springfield Enterprise Zones' ability to increase the value for these sites. Our results indicate that there is no statistical evidence of a greenfield premium. Further, there is no evidence of brownfield properties selling at discounts relative to other parcels. The Enterprise Zone itself appears to have a negative impact on industrial properties selling prices.

Approved: _____

Prof. [Bill or Bruce] Date

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Introduction:

Communities concerned with external costs of city expansion in much of Oregon developed an "Urban Growth Boundary" (UGB) in the 1970's as a tool to limit the amount a city can grow in size. As industries continue to adapt to an ever-fluctuating consumer dynamic, industry turnover remains high, leaving older factories in their wake while putting new ones on the edges of the city. As the new factories threaten communal values represented in the UGB, the older buildings represent both a problem and an opportunity. These aged and sometimes abandoned buildings detract from the city's aesthetics, pose potential safety risks to surrounding neighborhoods, and tie up potentially usable land (Bartsch & Collation, 1997). For decades, Oregon cities have tried to revamp areas with heavy concentrations of these less-competitive and economically lagging industries, usually with little success. These buildings frequently have a real or perceived contamination that makes redevelopment costly and raises uncertain liability issues to owners of such property. When this happens, plots of land are often labeled as "brownfields" (Simons, 1998). This term can be characterized on one end of a continuum, ranging from heavily used, contaminated land (brownfields), to plots of land with no buildings, infrastructure, or contamination risks (greenfield). In the middle of this continuum is what is termed here as "grayfields". These, as defined here, hold buildings, but are not deemed contaminated. This spans a plethora of sites, ranging from heavily-used, but not yet contaminated plots, to a newly built house in a zone previously classified as greenfield.

Brownfields and their related contamination have been under the public eye for quite some time. In 1980, the Comprehensive Environmental Response, Compensation,

and Liability Act (CERCLA) was enacted. The primary intent of this act is to hold recent and current owners responsible for costs of cleanup for "any release or threat of release of hazardous substances." It is believed that the act has "caused considerable confusion and uncertainty (Collation & Bartsch, 1997)," for purchasers of brownfield sites due to the vague nature of the law. Collation and Bartsch go on to say that this uncertainty tied with mandatory cleanup has further increased the premium for greenfields. With that being said, moving from green to brown on the color continuum generally allows for more readily available infrastructure, meaning some costs can be reduced or eliminated. According to a case study done by the Port of Portland, though, the greenfield sites do have lower costs required when transforming the land by the purchaser, maintaining higher residual land value. This is important because economic theory suggests developers only take part in development of a parcel of land if the "value of the parcel converted to a new use, net of construction costs, exceeds the value of the parcel remaining in its current use (McGrath, 2000)."

Certain tools developed by city commissioners have profound effects on what plots are deemed cost effective to infill. Originally created to decrease unemployment in the early 1980's, enterprise zones give special tax benefits to firms investing in economically lagging areas. Combined efforts from the Board of Commissioners of Lane County and city officials drew the Springfield and West Eugene Enterprise Zones to hold some of the potentially most viable, yet still economically lagging areas in Lane County. The Springfield Enterprise Zone held firm from initiation in 1988, while the West Eugene Enterprise Zone ran from 1987, then was shut down in 1997 due to both a thriving

economy and political controversy. In 2005, though, the West Eugene Enterprise Zone was re-established as an attempt to enhance the local economy.

Using a hedonic pricing model, our research is twofold: One, we attempt to statistically estimate the market premium greenfield sites have over brownfield and possibly grayfield sites; and two, we analyze the West Eugene and Springfield Enterprise Zones' ability to increase the value for these sites. In determining the premium greenfield sites hold, it is difficult to eliminate the bias location has. Clearly, sites located close to the downtown area, interstate highways, and other key positions increases value on its own, and many brownfield sites inherit that advantage. Greenfield sites, on the other hand, are often on the fringes of the city, and this must be controlled for. Additionally, pre-enterprise zone and post-enterprise zone data is important in determining the zoning's actual effect. Fortunately, the fact that the West Eugene Enterprise Zone was eliminated in 1997, only to be restarted later, gives us a window in which prices should not have been affected by the enterprise zone. The Springfield Enterprise Zone has remained constant and when it was up for extension there were no uncertainties that it might not return.

Our research aims at informing effective policy development for encouraging infilling and rebuilding. Determining the market value effect enterprise zoning has on lots will show the quantitative impact the legislation has on firms' perceptions of value these lots have. This research is important for policy makers and community members alike, as it estimates the impact of current policy on the community's desire to infill and slow the growth of the UGB.

We find that brownfields have no real effect on prices in Eugene. This may be due to a sample selection bias, as we are only observing lots that were sold, as well as the limited number of brownfields in Eugene (we observed 15). We also find that greenfields have a substantial premium when dealing with land price. The enterprise zone, however, has not only a negative impact on prices as a whole, but land prices of lots as well. This reflects a negative effect of enterprise zoning, omitted variables, or some other data related problem.

First, this paper provides a literature review of studies relating to brownfields, greenfields, and enterprise zones. We are looking for methods used in determining their effects on prices, what their effects might be, and what research remains to be done. Next, the paper dives into our hypotheses, and explains our rationale behind them. After this, we describe the data we collected in order to test these hypotheses. Next, in our economic methodology section, we will be explaining the base model used throughout our regressions. This will be followed by our results and analysis, then ended with a section devoted to conclusion and room for future research.

Literature Review:

The hedonic model is a useful way to break down statistically the sales price of a parcel of land into its non-market characteristics. It has been used extensively after the seminal paper by Sherwin Rosen in 1974. The model has been extended to many different markets, from looking at environmental variables and their effect on home sales, to looking at compensation differentials based upon risk on the job. There has been much discussion in the literature about the proper functional form and the quality of results

from using a single market. A hedonic model takes the market price of the land and regresses it against the different characteristics that would affect the value of that parcel. This derives each characteristic's statistically implied affect on the market outcome. One thing that we are assuming when using time series data is that the demand for these characteristics stays fairly constant over time. Past literature regresses sales price against a vector of land characteristics, city wide characteristics, their dummies of brownfield measures, and, when applicable, whether or not the site was in an enterprise zone (Alberini 2005, Howland 2000 & Schoenbaum 2002).

Schoenbaum (2002) studied the Baltimore area looking at land values and brownfield designation. Data from 1963 to 1999 was used, with land values a proxy for sales price. Land values were used to gain more observations for a more meaningful analysis. Land values and sales prices were found to be highly correlated (.78) making land values a suitable proxy. It was found that there was no relationship between environmental contamination and land use variables, land vacancy rates, or property turnover. Another analysis looked at the amount of economic development, broken down into development, redevelopment, and demolition and found no relationship as well. This analysis suggests that the under-use of land, that brownfield policies were supposed to address, is due to some other reason than contamination issues.

Jackson (2002) analyzed the selling prices of industrial lands to see how they are impacted by contamination. In addition, he analyzed whether selling prices rebounded after remediation of contaminated lands. He used data of identified contaminated and previously contaminated sites from the Los Angeles, San Diego, and Orange and Ventura counties. He found that, "for previously contaminated and remediated properties, this

analysis finds no statistically significant sales price differences from otherwise comparable but uncontaminated properties (Jackson 2002)". He also found that properties with current contamination and no remediation were selling for 30% discounts compared to clean properties. This study finds that contamination only affects properties selling prices in the duration that the property doesn't have remediation.

Howland (2000) studied the transactions of industrial land in Baltimore and found that buyers are purchasing land but only at discounts. The land that is selling and being reused is generally the larger plots of land on the market. She tracked, over a two and a half year period, industrial properties as either currently in use, unoccupied, on the market, or sold. It was found that less than 5% of the land was either idle or not on the market. The market was simply adjusting by transacting these properties at discounted prices instead of remain on the market for sale for years.

In a 2004 study, Howland, explored these issues further and, through interviews with real estate agents found that the most significant barriers to land reuse were incompatible land uses and inadequate infrastructure. The market has already taken care of potential or known contamination through discounting the sales price. When looking at historic transactions in Baltimore, it was found that most of the properties were sold as clean sites, "15% are parcels that had confirmed contamination at their time of sale (Howland 2004)." It was also found that there were more sales in the later parts of the decade after there were improvements in remediation procedures, lenders better able to assess risk, and growing certainty about governmental cleanup standards. The larger problem of underused land parcels then is being motivated by their incapability with current use demands. Howland did interviews with real estate agents and property

owners for parcels that had been on the market for over 2 years and the common problems with redevelopment, "small, odd shaped sites; expense of removing obsolete buildings; outdated road size and configurations; inadequate water, sewer, and telecommunication infrastructure; existing land incompatible with industry (Howland 2004)." Her final analysis shows that parcels with known contamination sold at 67% discounts, suspected parcels at 65%, and parcels of land near contaminated sites at 42% discounts.

In another study of contamination risk study in the Baltimore area, Alberto Longo and Anna Alberini look at the relationship between the distance of a known contaminated site (one listed on a public registry) and it's monetary effect on the selling price of a parcel. The end result is that they found no relationship between proximity to a known contaminated brownfield site and the selling price of another parcel of land. In other words, there is no evidence of spillovers to unaffected properties from being near a contaminated site. This study included a dummy variable for if the site was in an enterprise zone to look at how some government interventions have influenced land values. The result was that enterprise zones and other forms of government intervention had little effect on selling prices. The selling price of the land was found to be more impacted by dimensions of the property other than potential contamination, "the dimensions of the parcel, the type of activity and land use, the location of parcel, the presence of buildings and their age, and the socio-economic characteristics of the census tract where the site is located (Longo 2005)." The paper cites another study, Ihlanfeldt and Taylor (2004), which studied the Atlanta area and found that there were effects on selling prices for properties near a contaminated site. In general this was an illustration

that the characteristics of the land and the city itself will have more of an impact then just looking at brownfield issues broadly. The Longo paper points out that both Atlanta and Baltimore are very different cities, Atlanta enjoying more growth and fewer contaminated sites. The paper ends by giving some general conclusions, that there is little incentive to clean up a contaminated parcel of land if the value of the land will not go up once the contamination is completed. This then would indicate that the problem of contamination is again not the ultimate cause of the brownfield problem.

Jackson (2001) studied the effect of previously contaminated industrial properties and their post-cleanup selling prices. He found that sites, after completing remediation, had their selling prices return to levels of similar parcels of uncontaminated land. This shows that the price discounts inherent in contaminated sites is reversible. There is incentive then for firms to remediate their properties to increase their parcels market value to be comparable to uncontaminated land prices in their respective city. Jackson did use a limited model in that he only regressed in a linear form and sales of properties that happened before remediation or during were ignored.

Anna Alberini (2005) looked at participation in government development programs (Voluntary Cleanup Programs, Enterprise Zones, Brownfield Zone Designations, etc…) and explored the effect on selling prices in the state of Colorado. It is theoretically possible for the government to encourage redevelopment of certain parcels of land through different types of incentives offered to firms that meet certain requirements. The author's main area of study was the Voluntary Cleanup Program and exploring issues with participation in this program, "Voluntary cleanup programs are based on the premise that protection from liability is desirable and should increase the

attractiveness of a property," (Alberini 2005). The same argument could be given to Enterprise Zones in that they make the land more attractive since there would be the option of tax breaks for firms that make required investments. Parcels of land will be reinvested in if they are given incentives. More detailed research looking at the effects of properties in an Enterprise Zones and sales prices showed a price discount of 43% (Alberini 27). More evidence, which matches results found by studies done by Jackson and Howland, finds that sites with confirmed contamination sell for discounts of 47% relative to comparably uncontaminated sites (Alberini 28).

Our literature review would seem to give credence, first mentioned by Howland and reiterated by Schoenbaum, to the idea that it might not be the contamination risk that is the primary cause of developers leaving brownfield sites vacant but the fact that these brownfield sites are not compatible to current uses that are demanded. Even if contamination were a problem the land would sell at a discount and there is evidence that this happens (Howland). The broader problem is the parcels of land that are vacant are not the characteristics that are demanded in today's market or that the infrastructure is in disrepair. The fact that these lands happen to be the sites that are most likely contaminated due to historical uses is just a coincidence.

Hypothesis Development:

Our guiding hypotheses are that greenfields hold a premium over brownfields and that location in an enterprise zone increases the value of lots, all else equal. We believe lots classified as "brownfield" will have an overall lower price, all else equal, as suggested by previous research (McGrath, 2000; Schoenbaum, 2002;

"Brownfield/Greenfield Development Cost Comparison Study"). Although the direction of the effect is fairly straightforward, determining the specific magnitude will provide greater interest. Also interesting, is the effect being classified as a brownfield has on simply the price of the land sold. We believe that brownfield classification will have a strong negative effect on the price of land being sold, with no effect on the price of the building being sold. Under this theory, the reverse should be true for greenfields; there should be a higher price for the land as it is deemed clean of any impurities.

While previous research seems lacking in possible grayfield premiums, we hope to control for it. According to our color continuum, grayfields come in different levels of intensity. They can be heavily used, or light to zero use. We believe that the amount of use will be tied strongly to the amount of investment over time put into the lots. We will use the "improved value" or "value added" to the land as a proxy for this.

The second part of our hypothesis is that enterprise zoning will increase the value of the land. This should be true, as the tax breaks provided effectively reduce the costs associated with owning a plot of land. As the costs decrease, theoretically, developers will be willing to pay a higher price for the land. One problem that remains, however, is limitations on who gets the tax breaks. First, businesses must "invest at least $50,000 in a building or major equipment within the enterprise zone," and second, "increase their employment in the zone by at least 10 percent (Warren, 2005)." This may lead to uncertainties and have a diminishing or nullifying effect on the premium paid for being in the enterprise zone. Within our data, there are actually two enterprise zones available. One covers west Eugene (The West Eugene Enterprise Zone) and one that covers most of Springfield. Springfield's enterprise zone has been effective for over 20 years and covers

Springfield almost entirely. This complete coverage combined with no testable years of deactivations makes it difficult to estimate the effects of the enterprise zone, and thus, we will not be testing it. Eugene's, on the other hand, had a gap between 1997 and 2005 where the zone was shut down, and covers a small corner of their total city (less than one forth of its total size). This gap allows us to have effectively "enterprise-zone-free" lots to compare the direct effect of re-establishing the zone in 2005 and the effects of the zone prior to its termination.

Data Description

Our data was collected courtesy of Lane Council of Governments (LCOG) using land information from the Regional Land Information Database (RLID). Data was extracted for properties with only industrial zoning codes so that we could focus on industrial properties. Spatial information on the industrial plots of land (e.g., distance to city center) was collected through the software program Geographic Information System (GIS).

The RLID database offers the most comprehensive and readily available statistical data for the land market of Eugene/Springfield. The data offers a multitude of statistics including selling prices (when available), assessed land value, the value of improvements done to the land, the current zoning, the current use of the land, spatial coordinates for the site for GIS, address, date of deed transfers, the acreage of the site, and other statistics about the land. LCOG maintains the database and gets their data from the tax assessor's office. These data were compiled for us by Sherry Giglia at the Lane Council of Governments in April of 2006.

There are a few adjustments that were made to the raw data before it was in usable form. First, we eliminated the observations that had sales prices of zero or NULL. We assume that this data was the result of an ownership transfer, such as a plot of land changing hands through inheritance. This represents either data mis-entry or a non-market transactions which we do not want to include in our analysis. In addition, any observations with sales prices less then $1,000 were dropped, as these properties must have other circumstances that are resulting in this abnormally low sales price. To correct our sales prices for inflation, we used data from Oregon State on inflation conversion factors to get our sales prices in terms of 2005 dollars. For a more detailed description of other adjustments, read Appendix A.

Using unique maplot ID's for each property, we were able to merge our initial sample of industrial properties into LCOG's 2004 release of GIS data. Virtually all the data transferred, with only 18 of over 2,000 observations dropping. The dummy variables for the Eugene and Springfield enterprise zones were then created using the GIS layers given to us by the respective cities' enterprise zone managers. Our distance variables were calculated "as the crow files" due to time constraints. We calculated distances to 27 locations which included a mix of interchanges of major freeways in the area and the city centers of the respective cities. Our final three distance variables were the minimum distances to I5 points, to the other highways in town, and to the city centers.

Dummy variables for what year the property sold are included to capture the effects that the passage of time has on prices. These effects do not include inflation, since we have already corrected for this in our adjusted selling price. Other effects that

these year dummies would capture is the condition of the economy, any trends in land prices over time, and preference changes of land over the period.

Our measure of greenfield was obtained by assigning a "1" to a property if its improved value was zero, and "0" otherwise. This is a safe bet since there has been no money added in addition to the land value to the property. One problem with this and other measures in our regressions, is that we are making the assumption that all characteristics observed now (zoning, improvement values, etc.) were the same when the land was sold (1988-present). This is not always a fair assumption, and should be considered in future research.

Lastly, our measure of brownfield was taken from the Department of Environmental Quality database of contaminated properties in Eugene and Springfield. There were not many brownfield industrial properties that were in our final regression analysis. This suggests that there is little historical contamination in the Eugene area. Our conclusions may be different from more problematic cities such as Baltimore and other east coast cities which have been analyzed in previous literature.

Our dependent variables were an inflation adjusted price and the adjusted price multiplied by one minus the improvement ratio. The second price should give us the percentage of the price associated with the land sold in the lot. We considered anything sold above $10 million an outlier, which were only in a couple observations. We also considered properties with acres of over 20 as outliers, as they represented only a handful of properties.

Econometric Methodology:

We examine the determinants of land prices using a hedonic price function which allows us to determine various characteristics' effects on market sales prices of land plots. This will enable us to see what effect being a greenfield, brownfield, or being in the West Eugene Enterprise Zone has on sales prices of those parcels of land.

We can think of the sales price of the land (P_X) being equal to that parcel of land's different characteristics, Z_i, and these characteristics are highly heterogeneous. This can be captured in equation (1) where Z is the numerical level of the characteristic being measured.

$$P_X = h(Z_1, Z_2, \ldots Z_i) \qquad (1)$$

As implemented by Alberto Longo and Anna Alberini, we will be using a hedonic price model to evaluate the market value impact of enterprise zoning on brownfield development. The base hedonic model we are using has the following format:

$$\text{Ln(Sales Price}_i) = \alpha + \beta_1 \ln(\text{Acreage}_i) + \beta_2 (\ln(\text{Acreage}_i))^2 + \beta_3 \ln(\text{Improvement Ratio}) + \beta_4 (\ln(\text{Improvement Ratio}))^2 + \beta_5 \text{ Distance to Eugene Center} + \beta_6 \text{ Distance to Closest HWY On-Ramp} + \beta_7 \text{ Distance to Closest I-5 On-Ramp} + D_8 \text{ West Eugene Enterprise Zone Properties} + D_9 \text{ West Eugene Enterprise Effective} + D_{10} \text{ Brownfield} + D_{11} \text{ Greenfield} + D_{12} \text{ Eugene} + D_{13} \text{ Industrial Zoning 1} + D_{14} \text{ Industrial Zoning 2} + D_{15} \text{ Industrial Zoning 3} + D_{16} \text{ Year One} + D_{17} \text{ Year Two} + \ldots D_{15+N} \text{ Year N}$$

- i denotes different sales transactions
- Sales Price is the sales price for the particular sales transaction
- Acreage is the number of acres in the lot sold
- Improvement Ratio is the tax assessed improvement value (building) divided by tax assessed improvement value plus tax assessed land value. This is a proxy for the portion of the lot's value attributed to the building
- Distance to Eugene Center is the distance from the site to Eugene's Courthouse
- Distance to Closest HWY On-Ramp represents the distance to the closest available on-ramp for the site
- Distance to Closest I-5 On-Ramp is the distance to the closest I-5 interchange or on-ramp

- West Eugene Enterprise Zone Properties is set to 1 when the lot is within the boundaries of the original West Eugene Enterprise Zone (regardless of whether or not it is in effect), 0 when not
- West Eugene Enterprise Zone Effective is set to 1 when the lot is within the boundaries of the original West Eugene Enterprise Zone, and the zoning is in effect (0 when not)
- Brownfield is 0 when site has no contamination, 1 when site has contamination
- Greenfield is 0 when lot has been built on, 1 when site has had no structures
- Eugene is set to 0 when lot is not in Eugene's borders, 1 when it is in their borders
- Industrial Zoning (1, 2, or 3) is the classification of the types of products that can be used on/produced within the factory as permitted by the city of Eugene and Lane County. Set to 1 if zoning is of the corresponding number (1, 2, or 3).

Empirical Results

Table 2 and 3 represent the results that will be discussed further in this section. Table 2 looks at the adjusted selling price (section A) that was observed in the data while table 3 looks at the portion of the price derived from the land (section B). Columns 2-4 examine how sensitive our results are to different time frames. Our database only has characteristics for the present time period, while sales data go back 20 years. If we use our full 20-year sample of sales price we implicitly assume land and property characteristics have not changed. Properties that have sold closer to the present should have few to no changes in land characteristics. For each section we include interaction terms to get a better picture of how greenfield and brownfield are affected by the enterprise zone incentives.

For both regressions, we find that the results explain roughly half of the observed variation in the data. The R^2 is generally larger when we include the interaction terms, giving our model jointly better explanatory power. F-tests reject the null hypothesis that our coefficients are insignificant.

I. Selling price of the property

Column 1 of Table 2 provides our base estimates for determinants of industrial property pricing in the Eugene-Springfield metro area.

A) Main Determinants of Industrial Property Prices

The main determinant of land selling price is the number of acres of the parcel. With our variables in logarithms, the coefficient estimates can be read as elasticity. Our estimates suggest that an increase in an industrial property's acreage by 10% increases the selling price of the land by 6%. However, the negative coefficient on the "acreage squared" variable suggests that for larger properties this elasticity is even smaller. Both of these findings are significant at the 1% level. It is not surprising that there is a lower elasticity at higher acreage properties, as many firms would find larger properties too big for their use.

The improvement ratio is also positively related to the market price of an industrial property. Our findings indicate that when you increase the improvement ratio by 10%, the selling price will increase by 3.8%. Like acreage, the "improvement ratio squared" coefficient suggests that this elasticity increases for properties where the value of the buildings (and other improvements) becomes very high relative to the land value. These results are significant at the 1% level. Improvement ratio is our proxy for building values, so it is no surprise that this variable is highly significant. When firms find a plot of land that are more suitable for their needs, it may be cheaper for them to use it rather than purchase a greenfield to create a building for their needs.

The coefficients on the distance variables show there is no significant impact on industrial land prices, save for the coefficient on distance to Eugene city center variable. These estimates are expressed in terms of elasticity. As expected, location further away from the city center negatively impacts selling prices. This is significant at the 1% level. A comparable industrial property that is 10% further away from the city center will sell for 3.77% less. This is clear evidence that being further away from the city center is not optimal as most of the population and infrastructure is concentrated closer in to the city. Being further away from highway or I-5 on ramps seems to have a positive impact on industrial property prices but these results are not significant. This might point out that Eugene-Springfield is not that large of an area making it quick to get freight out of town.

The dummy variable coefficients capture the impact of the different industrial zonings classifications that are used in the Eugene-Springfield area on industrial properties prices. Our estimates suggest that regardless of the zoning designation the selling price will be statistically similar, holding all other land characteristics constant, to other zoning coded lands. The dummy variable for land transacting in Eugene is not statistically significant, indicating that there may be little difference between industrial properties selling in Eugene from properties selling in Springfield.

B) Connection to Hypotheses

According to our hypothesis, it is believed that there will be a greenfield premium on industrial properties in the Eugene-Springfield metro area. Our base estimates for greenfield industrial properties, in Column 1 of Table 2, find no evidence for a price premium. In fact, it appears that being an industrial greenfield will result in a price

discount relative to other comparable industrial parcels. The industrial greenfield price discount is, holding all other land price determinants constant, 168%. The estimate is significant at the 1% level. Part of the problem, as discussed in the data description, is that we have no historical measure of greenfield and that any property labeled as greenfield in the data is a property with no building or other improvements at present. This is likely to result in an adverse selection bias since properties that did sell as a greenfield property but were developed, would no longer show up in our data as initially selling as greenfield.

The second issue is that Greenfield properties are being compared here to properties with buildings on them or other improvements. In the next section, we will strip away the improvement values on all properties, so that we can do a more apples-to-apples comparison using measures of land values only.

The coefficient on brownfields indicates that they are negatively impacted, but it is not statistically significant. It is believed that this is due to a limited number of observations (17 out of over 1,600 were brownfields). The direction of the effect is correct, but precision is poor with so few instances of brownfield designations.

The second aim of our research was to determine the effect of the Enterprise Zone on industrial prices. Our estimates for the West Eugene Enterprise Zone indicate that industrial prices under the zone, while effective, sold at discounts on average of 1.69%. This is significant at the 5% level, which is strong evidence that industrial properties within the West Eugene Enterprise Zone are selling for less then comparable industrial properties. At this time, it is not understood why these properties seem to sell for discounts relative to comparable industrial parcels.

Since the West Eugene Enterprise Zone was disbanded from 1997 to 2004, we have a clear estimate of value for buildings in this area while there is no enterprise zone in effect. "*West Eugene Enterprise Zone Properties"* is the dummy variable for properties within the boundary of the enterprise zone. This estimate suggests that there was no statistical difference of properties simply located in the enterprise zone relative to other properties in our data. For some unknown reason, the implementation of the enterprise zone seems to reduce industrial parcel's selling prices.

C). Alternate Specifications and Models

Columns 2 and 3 of Table 2 provide estimates for our examination of determinants of land values for different time periods of our sample data.

It was important to run various sensitivity checks to make sure our results hold up at different time intervals due to the historic nature of our data. We ran regressions of the data from 1995 to 2006 (column 2) and from 2000 to 2006 (column 3). As evident by the R^2, our model explains more of the variation in the data when only using industrial properties that have sold in the last six years. This would be expected, considering that it is doubtful that many properties have undergone drastic changes in their characteristics in the last six years relative to properties sold 10 or more years ago. Any estimates that are drastically different from the results discussed above will be reviewed below.

With acreage, again being a measure of elasticity, our estimate suggests when we narrow the time horizon closer to the present; the elasticity of demand is increasing. However, the negative coefficient on the "acreage squared" variable suggests that for larger properties this elasticity is even smaller then found in the base regression. As we

increase the acreage by 10%, the selling price will increase by 7.2% according to the 2000 to 2006 estimates. The significance levels remain the same as the base regression.

The estimate for the improvement ratio's effect is also a larger, significant at the 1% level. For 1995 to 2006, an increase of an industrial parcel's improvement ratio by 10% increases the selling price by 5.19%. This suggests the Eugene-Springfield land market is becoming more sensitive to changes in the improvement ratio of industrial properties, holding other characteristics constant, as the selling date of the parcel gets closer to the present.

For the zoning dummy variables, our estimates are now each significant at the 1% level from 2000 to 2006. In part the data is more reliable considering it is unlikely the zoning of an industrial property has changed much in six years relative to the entire time period of our base regression. An industrial property being zoned i1 will increase selling prices on average by about 355%, which is the largest impact of the group. There is clearly a preference for being zoned i1 relative to other zoning options for comparable industrial properties.

Industrial properties that sold between 2000 to 2006 it is found that our estimate suggest that properties in the Eugene area, these properties are selling at discounts on average of about 49%. The estimate for the enterprise zone is not significant, indicating no effect on industrial property selling prices relative to other comparable properties. Land in the boundary of the enterprise zone, as suggested by our estimates, is also not statistically different from other areas of the city.

D) Alternative Models

Column 4 of Table 2 provide estimates for our hedonic model including interactive terms of industrial properties in the Eugene-Springfield metro area.

These terms are trying to detect how the different dummy variables interact with each other. For instance, we wanted to understand how a brownfield industrial property is affected by the enterprise zone to see if firms on the margin of purchasing a brownfield lot might be affected by the enterprise zone. To do so we would want to look at brownfield properties within the Enterprise Zone and the way to do that is to multiply the variables together.

None of the interaction terms are statistically significant indicating there is no difference from these properties in the enterprise zone or Eugene from other industrial parcels.

II. Selling price of the land specifically

In this section we are going to attempt to tease out the selling price of the land itself. We do this multiplying one minus by using our proxy variable of the value of buildings (improvement ratio) by the adjusted selling price of the lot.

A) Main Determinants of Industrial Property Prices

Column 1 of Table 3 provides our base estimates for determinants of industrial land prices in the Eugene-Springfield metro area.

The coefficient for our acreage variable is indicating that there is still a positive impact to selling prices that is significant at the 1% level. Unlike our previous findings our "acres squared" term is not significant. When the acreage increases by 10%, the

selling price of the land rises by 5.74%. The impact of acres is less then it was when we were examining the full sales price (Table 2). The selling price of industrial lots is significantly described by the acreage of the lot, but their response is relatively inelastic.

Our coefficients for the zoning dummies indicate there is no statistical impact on the selling prices of industrial parcels. It is again hard to understand why these zoning terms have no effect but it must be kept in mind that these are the main zoning classifications for industrial properties. These estimates are relative to other zoning codes that we left out of the regression, such as campus industrial, which since they are more rare in the Eugene-Springfield area would result in these properties selling for a premium relative to the more common industrial zoning classifications.

Of the distance variables, our estimate suggests the only variable with a significant coefficient is the minimum distance to the Eugene city center. The relationship is still a negative one but the estimate is only significant at the 5% level. When the distance from the Eugene city center increases by 10% the industrial properties selling price will decrease by 3%. The other distance coefficients were found to be positive but are not statistically significant.

B) Connections to Hypotheses

The coefficient on industrial greenfield properties is now indicating that there is evidence of a greenfield premium, confirming our original hypothesis. The premium amounts to about 17% for the average property and is significant at the 5% level. It could be theorized that buyers are waiting for these greenfield properties to become more

valuable as industry in Eugene-Springfield continues to expand and needs more land to develop on.

The coefficient on the brownfield variable are insignificant though negative as expected, meaning there is no impact on the selling price of industrial properties if the property was at one time a brownfield. Whereas we might expect a property with contamination to sell at a discount, the lack of observations in our dataset makes it hard for us to draw too many conclusions from these results. Since few contamination problems appear in Eugene-Springfield properties, unlike more industrialized cities, local markets are not discounting these types of properties yet.

For industrial properties in the West Eugene Enterprise Zone, there is strong statistical evidence of a negative impact on selling prices. These properties sell for about 23% less then other comparable industrial properties outside of the Enterprise Zone when it is effective. The estimate is significant at the 5% level. Industrial properties located in Eugene do sell at premiums but this estimate is not statistically significant. Neither is the estimate for the Enterprise Zone properties when it was disbanded. When strictly looking at the selling value of the land we find that there is a strong evidence of a negative impact because of the Enterprise Zone.

C) Alternate Specifications

In Table 3, columns 2 and 3 are referenced below as we examine how our base regression coefficients change as we regress using different time periods for the Eugene-Springfield metro area industrial properties. The results stayed mostly similar except for what is noted.

The coefficient on our logarithmic measure of acreage remains positive but when the time period is narrowed, the effect grows. Precision has been lost in our estimates due to higher standard errors, but this has not reduced the significance level which is still at 1%.

The zoning classification coefficients are now showing negative relationships and Zoning Industrial 1 and Zoning Industrial 2 are significant at the 1% level when the industrial property sells between 2000 and 2006. The estimate for Zoning Industrial 3 is only significant at the 5% level. It was the case that i1 was significant at the 5% level from 1995 to 2006 while still showing a negative relationship with the selling price. From 2000 to 2006, being zoned as i1 reduced average prices by 91%. A larger effect then was witnessed from 1995 to 2006, in which being zoned as Industrial 1 resulted in a price decrease on average of 189%. Much of the gain in significance was due to gains in precision when looking across our different regression models. For all of the zoning variables it was the case that the standard errors fell with each restrictive years sold regression.

The greenfield premium that we had found in our base regression is now insignificant when looking at the coefficients for the sensitivity check. Again precision has been lost due to the increase in the standard error. An interesting result is that from 2000 to 2006 there appears to be a negative relationship between industrial greenfield's and their selling prices. This result is insignificant but points to changing conditions in the local land market possibly happening in the present.

Our estimates on the coefficients for industrial properties in the enterprise zone drop their significance, due to precision losses in our standard errors. The negative

relationship is only significant in selling years 1995 to 2006. The significance is gone by the time we reach years 2000 to 2006 but during this time range the Enterprise Zone has only been in operation 2 years. With more time and more observations the negative statistically significant relationship between being in the Enterprise Zone and selling prices will return. The other Eugene coefficients remain insignificant. The negative effects on industrial properties selling prices as a result of the Enterprise Zone remain in our sensitivity checks.

D) Alternative Model

Column 4 of Table 3 shows the results when including the interactive terms in our hedonic model. For the most part the results are similar to the base regression in Column 1. The interactive terms will be discussed below and what their coefficients tell us of the land market in Eugene-Springfield metro area.

None of the interaction terms are statistically significant meaning there is no special interaction relative to other types of land. For example, there is unique about an industrial property being a greenfield property inside the Enterprise Zone compared to that of a grayfield in the Enterprise Zone.

Conclusion:

Among our results, several variables popped out with quite significant effects. Perhaps most interesting, was acres strong positive relationship that was not a one for one exchange. In addition to this, there was never a one for one relationship between our improvement ratio and the price the lot sold for, indicating a one percent increase in

building value relative to the land value, does not increase the value of the lot by one percent. Industrial zoning seems to have a strong positive effect on prices with respect to the building and land prices in recent years, but not overall, signifying a historical data collection problem. This may indicate that buildings previously used by different class industrial firms are demanded for future production with their respective classifications. Being in Eugene has an unclear effect on prices. Most recent transactions show a decline in building value, and no effect in land value. This may reflect changing tax assessor rulings, tax changes, or other macro effects. However, traveling further from Eugene's center results in a decline in price, suggesting it is still valuable to be near Eugene's labor.

We originally hypothesized that greenfields hold a premium over brownfields. We believe this because greenfields do not hold any inherit risks, namely contamination. In addition to this, we believe that location in an enterprise zone increases the value of the lots, all else equal. This is believed because the tax incentives provided by enterprise zone classification, presumably, increase the value of the lots. This is all based on the assumption that a driving factor in enterprise zone policy is to provide development in economically lagging areas.

In our preliminary regressions, we found that greenfields had a significantly negative effect on prices. This was believed to be attributed to the value of the buildings on the lots. Buildings in Eugene are relatively young when compared to the areas of previous research in the New England area (Howland, 2000, Jackson, 2001, Alberto & Alberini, 2005, & Shoenbaum, 2002), and more valuable as a result. We then argued that the value of the buildings on grayfields and brownfields have a significantly positive

affect on the prices, biasing our results. After controlling for the assessed value of the buildings, the effect greenfields had on sales prices was significantly positive. Brownfield classification, however, seems to have little significant effect on prices. It is unclear what the truth behind this is, due to such limited observations (total of 15 brownfields observed). The less significant results can be attributed to two big problems: one, there may not be that much of a contamination problem in Eugene (lots are not as aged as past research examined); two, brownfields appeared in about 1% of our observations, which is difficult to get a significant reading from.

Our second hypothesis examined enterprise zone's effect on price of lots sold. Contrary to our belief that the enterprise zone increased the prices of lots, they actually significantly decreased the price of lots sold. There were no significant impacts of the enterprise zone on price brownfields or greenfields were sold for. This is a difficult relationship to examine. We remain convinced that the relationship should at least be no effect, and find it hard to believe that it actually lowers the value of the land. This may be related to some omitted variables or other biases, and deserves more research.

Although our research holds a strong percentage of attributing characteristics ($R^2 > 0.4$), this does not mean we have captured all characteristics within the market. Future research should examine more closely the "value" the buildings hold in relation to the type of firm entering the market. For example, although a retail company might highly value a "big" building, we believe industrial companies value the size of their factory even more so. This leads us to believe that building size is an important omitted variable. The tax assessor's office should be able to provide this, along with other crucial variables such as building age. As buildings progress in age, they appreciate in assessed value, but

not necessarily in value to an industrial firm. An additional interesting relationship exists in the regulations enforced by the West Eugene Enterprise Zone. All enterprise zones have different regulations, and it is important to note that our research cannot be applied globally. What this does offer, though, is room for research on other enterprise zones and their respective effects on industrial land prices and other policy goals.

Appendices

Appendix A

1) More detailed information of adjustments to data sets

Another transformation of the data that we undertook was to collapse the data since there were large chunks of identical observations due to reclassifications that would happen to the maplots over time. A property would have the same descriptive statistics but would have changed in its land use description. In the RLID data that merits another line item which requires us to then collapse the data into one observation point. Since the observations were similar in all numerical statistics we could take the mean and sum the other categorical characteristics. This would allow us to count the number of times that; for instance, a property was classified as an I2 property. The summed variables were those of property class, zoning codes, and land use. Since we are interested in these variables being dummies we created new dummy variables so that any summed variable would take the value of 1 when the summed variable was greater then zero.

There were many instances were a company bought multiple lots as part of the same transaction but the transaction was broken into many account numbers. We collapsed these data points in a single observation.

Table 1

Variable	Obs	Mean	Std. Dev.	Min	Max
Selling Price	1674	11.82988	1.289726	7.006471	16.1035
Selling Price Land	1674	11.10895	1.303124	6.029808	15.88141
Acreage	1674	-.0455635	1.357057	-3.218876	7.422134
Acreage Squared	1674	1.84258	3.419201	0	55.08808
Zoning Industrial 1	1674	.0179211	.1327046	0	1
Zoning Industrial 2	1674	.5573477	.4968488	0	1
Zoning Industrial 3	1674	.1845878	.3880788	0	1
Eugene	1674	.7580645	.4283834	0	1
Enterprise Zone Properties	1674	.6589008	.4742203	0	1
Eugene Enterprise Effective	1674	.4796894	.4997366	0	1
Distance to Eugene City Center	1674	9.806501	.5553976	6.79737	10.79377
Distance to Nearest HWY OnRamp	1674	8.539632	.576381	6.057962	9.519056
Distance to Nearest I5 OnRamp	1674	9.920988	.6774804	7.140224	10.63929
Greenfield	1674	.172043	.3775306	0	1
Enterprise Zone Greenfield Interactive	1674	.0800478	.2714483	0	1
Brownfield	1674	.0077658	.0878073	0	1
Enterprise Zone Brownfield Interactive	1674	.0011947	.0345547	0	1
Eugene Brownfield Interactive	1674	.0041816	.0645492	0	1
Eugene Greenfield Interactive	1674	.1266428	.3326717	0	1

Table 2

	Base Selling Price	Base 1995 to 2006 Selling Price	Base 2000 to 2006 Selling Price	Interactive Selling Price
ln(Acreage)	0.6	0.622	0.721	0.598
	(0.023)**	(0.029)**	(0.041)**	(0.023)**
ln(Acreage) ^2	-0.052	-0.03	-0.034	-0.051
	(0.016)**	(0.02)	(0.03)	(0.016)**
ln(Improvement Ratio)	0.384	0.519	0.4	0.385
	(0.079)**	(0.106)**	(0.112)**	(0.079)**
ln(Improvement Ratio) ^2	0.048	0.06	0.03	0.048
	(0.016)**	(0.021)**	(0.02)	(0.015)**
Zoning Industrial 1	0.454	-0.442	1.517	0.439
	(0.69)	(0.87)	(0.329)**	(0.71)
Zoning Industrial 2	-0.643	-1.242	0.611	-0.642
	(0.67)	(0.85)	(0.180)**	(0.69)
Zoning Industrial 3	-0.652	-1.319	0.527	-0.638
	(0.66)	(0.85)	(0.157)**	(0.69)
Eugene	0.331	1.177	-0.682	0.324
	(0.67)	(0.86)	(0.228)**	(0.70)
Enterprise Zone Properties	0.164	0.099	0.137	0.157
	(0.10)	(0.12)	(0.13)	(0.10)
Enterprise Zone Effective	-0.2	-0.328	-0.277	-0.14
	(0.097)*	(0.127)**	(0.18)	(0.10)
ln(Distance to Eugene City Center)	-0.446	-0.363	-0.387	-0.442
	(0.064)**	(0.087)**	(0.145)**	(0.064)**
ln(Distance to Nearest HWY On Ramp)	0.026	0.039	0.1	0.032
	(0.05)	(0.06)	(0.08)	(0.05)
ln(Distance to Nearest I5 On Ramp)	0.127	0.05	-0.02	0.132
	(0.07)	(0.08)	(0.12)	(0.08)
Greenfield	-0.988	-1.098	-1.298	-0.85
	(0.086)**	(0.103)**	(0.142)**	(0.131)**
Brownfield	-0.239	0.088	-0.264	-0.134
	(0.37)	(0.29)	(0.75)	(0.30)
Enterprise Zone Greenfield Interactive				-0.298
				(0.17)
Enterprise Zone Brownfield Interactive				-1.48
				(1.87)
Eugene Brownfield Interactive				0.293
				(0.38)
Eugene Greenfield Interactive				0.01
				(0.18)
Constant	16.199	16.105	16.498	16.031
	(0.683)**	(0.916)**	(1.405)**	(0.690)**
Observations	1613	905	382	1613
R-squared	0.44	0.48	0.56	0.44

Robust standard errors in parentheses
* significant at 5%; ** significant at 1% ln stands for natural log

Table 3

	Selling Price Land	Selling Price Land	Selling Price Land	Selling Price Land
ln(Acreage)	0.574	0.592	0.679	0.571
	(0.024)**	(0.030)**	(0.045)**	(0.024)**
ln(Acreage)^2	-0.043	-0.016	-0.021	-0.042
	(0.017)**	(0.02)	(0.03)	(0.016)**
Zoning Industrial 1	0.168	-0.762	1.047	0.154
	(0.65)	(0.78)	(0.304)**	(0.67)
Zoning Industrial 2	-0.595	-1.213	0.504	-0.598
	(0.62)	(0.75)	(0.178)**	(0.65)
Zoning Industrial 3	-0.598	-1.252	0.395	-0.586
	(0.62)	(0.75)	(0.156)*	(0.64)
Eugene	0.496	1.419	-0.234	0.489
	(0.64)	(0.77)	(0.21)	(0.66)
Enterprise Zone Properties	0.097	-0.02	0.012	0.089
	(0.11)	(0.13)	(0.15)	(0.11)
Enterprise Zone Effective	-0.269	-0.359	-0.283	-0.203
	(0.102)**	(0.135)**	(0.18)	(0.11)
ln(Distance to Eugene City Center)	-0.304	-0.216	-0.248	-0.299
	(0.072)**	(0.093)*	(0.15)	(0.072)**
ln(Distance to Nearest HWY On Ramp)	0.053	0.065	0.076	0.061
	(0.05)	(0.06)	(0.08)	(0.05)
ln(Distance to Nearest I5 On Ramp)	0.082	0	-0.109	0.09
	(0.08)	(0.09)	(0.13)	(0.08)
Greenfield	0.161	0.173	-0.082	0.316
	(0.073)*	(0.09)	(0.13)	(0.126)*
Brownfield	-0.199	0.125	-0.429	-0.29
	(0.40)	(0.37)	(1.10)	(0.41)
Enterprise Zone Greenfield Interactive				-0.294
				(0.17)
Enterprise Zone Brownfield Interactive				-1.806
				(1.83)
Eugene Brownfield Interactive				0.756
				(0.47)
Eugene Greenfield Interactive				-0.014
				(0.18)
Constant	13.866	13.609	14.889	13.644
	(0.776)**	(1.003)**	(1.508)**	(0.784)**
Observations	1613	905	382	1613
R-squared	0.37	0.41	0.52	0.38

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

ln stands for natural log

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