OREGON'S BALLOT MEASURE 37:
EXAMINING THE HIDDEN EXTERNALITIES AND MARKET EFFECTS BEHIND A LAND USE INITIATIVE

By

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"Buy land, they're not making it anymore."
-Mark Twain

APPROVED: _____
Professor William Harbaugh

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ABSTRACT

For many Oregonians, there is a sharp dichotomy between personal freedom and government-imposed land use regulations. Proponents of Measure 37, which acts to relieve landowners from the burden of regulation, would contend that the initiative allows landowners to regain rights lost decades ago. Opponents would contend that regulation is needed to preserve Oregon's natural resources from being completely developed. In reality, the line separating the two sides is not so clear. It is Measure 37, a radical and poorly written privately-sponsored initiative, which has exacerbated the separation of these two interconnected schools-of-thought. After all, personal freedom is hindered by regulation because it limits choices, but a lack of regulation can lead down the same path.

This thesis empirically estimates the effect many social and environmental attributes, modifiable through Measure 37, have on sales prices in the Portland Metropolitan area. It finds that zoning changes can significantly decrease the sale price of neighboring properties. This suggests that this initiative is not a healthy direction for Oregon land use because it corrects perceived past unfairness with potentially greater unfairness.

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I would like to thank Professor Bill Harbaugh for all of the time and patience he put into this thesis in order to help make it a success. The empirical analysis could not have been accomplished without his unflinching confidence in my abilities to learn something new. Furthermore, I am grateful to everyone else who contributed their time and intellect to this project: Chelsea Byers and Jesse Cathey for co-authoring a similar study of Lane County zoning with me; Bruce Blonigen for the regression support; Ryan Sullivan for his programming skills and assisting in data collection; and Ken Kato for teaching me the beauty of GIS data.

Finally, I dedicate this thesis to my parents who have given me unending support in my pursuits and to my roommate, Michael who still believes that economists are concerned solely with predicting the stock market.

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I. A NEW INITIATIVE

On November 2, 2004 Oregon Ballot Measure 37 was approved by 61 percent of the voters in Oregon. Nationally, Oregon had been known for its progressive land and zoning regulations, yet voters suddenly decided to turn those regulations inside-out. Measure 37 instantly softened a land-use system that was once cited as rigid and unwelcoming by developers and an environmentalist's dream by others. In the past, strict urban growth boundaries around cities had kept many landowners from selling their farm or forest land to developers or building structures of their own. However, these same boundaries have kept acres of forest and streams from being paved over.

Measure 37, ultimately, commands that individual landowners must be compensated for reductions in the value of their property due to land-use regulations or zoning laws such as urban growth boundaries that place limits on allowable density. Proponents of the measure touted the idea of fairness; that there exists a constitutional mandate that owners must enjoy full property rights or else be compensated for their troubles. Oregon must reverse its view that "although a society at large might benefit from the regulation, society is not required 'to share the cost of the benefit…Instead, the accident of ownership determines who shall bear the cost initially.'"[1] Opponents pushed the idea that regulations have brought the benefits which we enjoy in Oregon today; that pristine coastal areas, farmlands and forests have been preserved through careful planning mechanisms from which all Oregonians derive benefit. In many cases, preservation of

[1] Gieseler, Steven, Lewallen, Leslie, and Sandefur, Timothy. "Measure 37: Paying People for what We Take." *Environmental Law*. Lewis and Clark Law School, Volume 36, Issue 1. Pg 83.

these environmental attributes raises the land value for all, even those affected by regulation. One landowner can restrict the liberties of a neighbor through adverse uses of their lands and furthermore, in the basest of arguments, "why should the public owe to a landowner [unregulated] rights that it does not owe to a stockholder or businessman?"[2]

The compensable amount mentioned earlier must be the difference between the "fair market value" of the property in question with the offending regulation and without.[3] Someone can claim that their land is worth less because a regulation takes away its potential for development, for instance. Claimants can have an appraiser determine the value of their land if it had a development on it by looking at similar pieces of land with similar developments and then extrapolating that development to the claimant's location. Therefore, the value of the land under a hypothetical development must be determined. The value of the land under this circumstance will be hypothetical because we can only observe it with the present regulation intact when making this value determination. Measure 37 demands that claimants receive the difference between the current land value and this unobserved land value.

The compensation award must come from the tax and general funds of the governing body that enacted the legislation, which are usually state and county governments. If the governing body can not or will not pay the claimed lost property value, then the governing body must "modify, remove, or not apply the land-use regulation or land-use regulations to allow the owner to use the property for a use permitted at the time the owner acquired the property."[4] The third action—not applying

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[2] Sullivan, Edward. "Year Zero: The Aftermath of Measure 37." *Environmental Law*. Lewis and Clark Law School, Volume 36, Issue 1. Pg. 139.
[3] Ballot Measure 37, full text, Section (2).
[4] Ibid. Section (8)

the regulation—is generally interpreted as pertaining to a certain landowner and a certain property. "The regulation is still in force; however the owner is permitted to undertake a use inconsistent with the regulation."[5]

Furthermore, the measure states that anyone who has maintained ownership of a piece of land both before and after a regulation has been enacted has the right to file a Measure 37 claim. This right is extended to any land regulation that has occurred in the past as well as the future. Land that has stayed within a single family, regardless of who the current owner is, also qualifies for a claim. Therefore, regulations that have been in effect for decades can suddenly be overturned and people can demand compensation for years of lost development potential. The retroactive nature of the measure will potentially create many more claimants with much larger compensation requests compared to similar yet proactive compensation systems in Florida and Texas. No other measure or law has ever been passed in the U.S. which gives compensation retroactively for regulations enacted in the past.

The effects of the measure thus far can be underscored by looking at some statistics regarding claims. As of October 28, 2005, a total of 1,264 claims had been received by the State of Oregon. Of these, 317 concluded with regulation waivers and only 32 were denied. The rest were still either being processed or litigated. By April 27, 2006, the claim total had only climbed to 1,605 with 454 final determinations; no compensation had been awarded by this time. This small gain is due to a period of suspended claims processing while the Oregon Circuit and Supreme Courts worked out the measure's constitutionality. The story most pertinent to this thesis, however,

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[5] Maukonen, Jona. "Transferring Measure 37 Waivers." *Environmental Law*. Lewis and Clark Law School, Volume 36, Issue 1. Pg 181.

concerns the amount of land value that these 1,605 claimants perceive has been lost. In aggregate, monetary awards of $3.2 billion dollars have been requested, averaging $1.9 million dollars a claim. Likewise, this amount is 2.5% of Oregon's 2004 gross state product.[6]

Due to the large awards demanded by claimants and the budget shortfalls within the state government and coupled with the fact that "a claimant need only establish on the *balance of probabilities* that there has been *some* reduction in the fair market value of the subject property in order to obtain a waiver,"[7] there is little possibility that any claims will be settled through means of monetary compensation. Opponents believe that the measure's lasting impact will be felt in this domain. The waivers will create a patchwork of conflicting land uses whereby once protected land and its neighbors will be subjected to increased pollution, noise and traffic.

On the other hand, some believe that the greatest impact of Measure 37 may be felt years in the future when Oregon's planners and local governments begin to approach land-use planning in a different light. One commentator believes that there will develop an "unwillingness of the state or local governments to adopt regulations that might be the source of future Measure 37 claims."[8] Planners' work may be stifled and local governments may end a periodic review process that amends and implements local regulations. He labels this condition, "land-use sclerosis," using a medical term that invokes the idea of paralysis. Proponents of the measure would counter that this is a

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[6] These statistics originate from the Oregon Department of Land Conservation and Development. See: http://www.lcd.state.or.us/LCD/measure37.shtml#Summary_of_Claims_Filed_with_the_State.
[7] Sullivan. Pg. 143. Emphasis belongs to the author.
[8] Ibid, Pg. 157.

beneficial impact; the government will carefully consider how regulations impinge on private property rights and plan accordingly.

Since this measure was introduced, its legality and fairness have been hotly debated. The exact meaning and definition of clauses within the measure have been interpreted and reinterpreted. Interpretation of the measure has differed even among various county governments. Overall, opponents believe that the measure will strip away the planning and environmental protections that have made Oregon the scenic state that it is today, as well as waste millions of taxpayer dollars. Proponents believe that this measure will restore individual property rights and curb out-of-control government restrictions.

The following thesis will illuminate the current debate over Measure 37 as well as point to flaws written into the initiative. Ultimately, I hope that this project provides both rhetorical and empirical evidence to support the idea that Measure 37, as written is vague, unfair and does not adequately incorporate proven economic principles. It will be assumed, however, that Oregonians wish to improve and amend the former land-use scheme based upon their voting behavior. This revealed desire will not be dismissed. Therefore, this thesis will not argue for the previous system to remain static but rather formulate solid arguments against the familiar "fairness" rhetoric of Measure 37. Ideas and analysis advanced in this thesis will be relevant as opponents and proponents of land regulation continue the debate over the merits of the measure in both the public forum and possibly again at the ballot box in the future.

This thesis will begin with a rhetorical discussion of Measure 37 and land regulation in general. The Section II will highlight land regulation in the U.S.

Constitution and legal precedents that have formerly been set. Then, the discussion will shift to the history of regulation in Oregon and how the measure may affect the future. The Section IV will compare the measure to other states' land-use systems. Compared with states that are known for less restrictive regulation, Measure 37 pushes the envelope even further. It expands both the potential base of qualified claimants as well as the amount of damages each can claim. The initiative accomplishes this through wording that does not sufficiently honor or interpret economic principles, an argument that will be developed in Section V. Succinctly put, claimants are given the opportunity to measure not the lost value resulting from a regulation, but the net gain they would receive if the regulation were waived for them. These are two different concepts and likely, values.

Part 2 of the thesis will be an empirical analysis of Measure 37. It will test the economic arguments in Section V of Part 1 using data from three counties that comprise the Portland, Oregon metropolitan area. The Section VII will describe the data and display some of their summary statistics. Section VIII advances a thorough methodology behind the derivation of the data and hypothesizes their significance. Section IX will analyze the data using statistical techniques and draw inferences from output tables. In its basest form, Part 2 will examine how sales prices and land values are affected by changes in land regulations and apply this analysis to determine the true loss that Measure 37 claimants should be claiming. While this thesis recognizes that determining "fair" compensable amounts is difficult under any circumstance, it will surely indicate that Measure 37 uniquely creates incentives to submit speculative and inflated claims.

II. The Law of Land Regulation

The legal precedent behind the government's ability to regulate and enforce rules upon private property is laid out in the Fifth Amendment to the Constitution which states that "private land shall not be taken for public use without just compensation." The government is justified in seizing public land for a specific reason in so-called "takings cases" which determine monetary awards on a case by case basis. In fact, in many states, a precedent has been set whereby a court rules that a taking has occurred after determining "whether the ends and means of [the] legislation were appropriate and whether or not the legislation was 'unduly oppressive' to regulated parties."[9] Each state court decides at what point a regulation has become "unduly oppressive" and compensation is owed.

The point at which a regulation crosses the line and becomes "oppressive" has been greatly debated. Prior court rulings have used a number of inquiries to make this decision, including the estimated economic impact on the landowner, the extent that the claimant's future investment decisions have been interfered with and the specific character of the government regulation. The inquiry into the character of the action usually pertains to how much of the property is physically occupied by the public.[10] Oregon, on the other hand, has traditionally used another method known as the "economically viable use rule" to determine when a taking has occurred. This Fifth Amendment interpretation essentially states that if the regulation "allows a landowner

[9] Sullivan, Edward. "A Brief History of Takings Clause." Handout, August 2005.
[10] Gieseler, Lewallen, and Sandefur. Pg. 88.

some substantial beneficial use of his property, the landowner is not deprived of his property nor is his property 'taken.'"[11]

The compensation required when a land-use regulation devalues one's property as stipulated by Measure 37 is related to the issues present in classic takings cases, however there are significant differences. In a traditional takings case, it is ruled that a taking has occurred when the government takes one hundred percent ownership of the property. Once the government takes the land, it is constitutionally required to compensate the owner for the "fair market price" of the land as determined by an appraiser. Compensation under takings is prospective. Owners are reimbursed for any damages they occur the day of the taking as well as lost income that the land could have generated in the future.

Under Measure 37, Oregon is now required to compensate landowners not only if their land is taken due to a government seizure, but also if it is devalued by any amount through a zoning ordinance. Therefore, for the first time in Oregon, devaluation less than one hundred percent that occurred in the past or may occur in the future is grounds for compensation. Also, for the first time in the United States, the government is not granted ownership of property for which it must pay either partial or full "fair market value." Like takings cases, owners are given compensation for lost income that the land could have provided in the future. However, owners maintain ownership of this land as well as any future income it may generate. Therefore, claimants are being compensated doubly.

[11] Ibid. Pg. 90.

III. HISTORY

It is obvious why the issues regarding the implementation of Measure 37 have been such hotly debated topics in Oregon for the past year. No system has ever been created anywhere to consistently and fairly measure lost property value due to regulation. No one has figured out how to value land if it had always had full development potential. This would be the "fair market value" of the land had no regulation ever been enforced. Furthermore, there is no specific fund from which to pull money for compensation. Due to the lack of ability to pay compensation, people (especially farmers), are concerned that their neighbors will be granted permission to build a subdivision next door.

This begs the question: Was Oregon's former land use system so horrible that such an egregious overhaul was necessary? The answer to this question usually depends on how much right an individual believes the government has to restrict landowners' freedoms to use their property in any way they see fit. The former system, known as Senate Bill 100, began in 1973 when former Governor Tom McCall signed it into law. This plan established "urban growth boundaries" (UGB) which were supposed to protect Oregon from "sagebrush subdivisions, coastal condo-mania, and the ravenous rampage of suburbia in the Willamette Valley," in Governor McCall's words. Up until Measure 37 was passed, this system was considered the most rigid in the country. Property owners outside of urban growth boundaries could rarely use their land for development. Of course, these boundaries have expanded with an increasing population. Increasingly, critics argued that this system contributed to "increased congestion, higher housing costs, shrinking lot sizes, and too many restrictions."[12]

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[12] Oliver, Gordon. "Oregon on the Cusp." *Planning*. The American Planning Association, October 2004.

No matter the criticism, Senate Bill 100 remained almost entirely unchanged for thirty years. One commentator paints a backdrop of American history into its inception and longevity. The early Seventies were a time of political and social reform encapsulated by the "fight for open government against the Nixon administration [its Watergate scandal, abuse of power] and the Vietnam War and concern for the environment that made many political things new."[13] Sullivan further states that Senate Bill 100 was a manifestation of that reform. People were swept up in becoming part of the political process; new public records laws helped facilitate this. Just after the bill was passed, ten thousand people attended land-use planning workshops and another one hundred thousand were on the mailing list of the Land Conservation and Development Commission, an agency set up to administer Oregon's planning program.[14] Considering that the population of Oregon was two million at the time, there was great public input.

With the passage of Senate Bill 100, a number of statewide planning goals were adopted. Furthermore, individual pieces of land were zoned by local governments to conform to these goals. While numerous, the most important of these goals call for the conservation of natural resources, creation of an efficient transition from urban to rural land and the involvement of citizens in the planning process.

These goals defined where many people would stand in the debate over Measure 37 decades later. Many of those critical of the goals became outspoken supporters of the measure. The goals, notably those aimed at the preservation of open space and containing urbanization were the embodiment of anti-growth aspirations. All of the other

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[13] Sullivan. Pg. 136.
[14] Stacey, Bob. "Looking Large at Oregon's Future." Handout from the public interest group, 1000 Friends of Oregon.

goals were merely tools to realize those same aspirations.[15] Furthermore, they have led to "no growth, which in turn has led to a stifled economy, reduced tax revenues and skyrocketing housing costs," among other unnamed consequences.[16] The most egregious effect of the goals, however, is the deprivation of property rights to landowners in the name of preserving environmental attributes.[17]

Opponents of Measure 37 believe that these goals coincide with consistent and intelligent planning and the consequences have not been as grave as some believe. First of all, the goals do in fact advance Oregon's economy by protecting some of the land that the state is dependent on. For example, the economy was highly dependent on forestry when the goals were applied. It is estimated that 22 percent of Oregon's forests had been converted into developments when the system was put into place and since that time, the growth has been minimal.[18] Furthermore, the ability for farmers to earn a profit has been potentially heightened by the goals because of the separation of residential developments from agricultural areas which could cause many conflicts of interest. The consequence could be compromises or rules that limit the noise emanating from the farm as well as the amount of spray used. The waivers propagated by Measure 37 could have the impact of lost timber supply and an increased rift in urban-rural relations.[19]

Secondly, the goals represent a progressive knowledge of the effect developments have on air and water quality. Over time, there were revisions made to the zoning regulations so that land-uses continued to conform to the goals as population and demand

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[15] Gieseler, Lewallen, and Sandefur. Pg. 92.
[16] Ibid. Pg. 93.
[17] Ibid. Pg. 92.
[18] Martin, Shelia. "Documenting the Impact of Measure 37: Selected Case Studies." Institute of Portland Metropolitan Studies, Portland State University. January 2006. Pg. 5.
[19] Ibid. Pg. 5.

changed. These revisions were made in the best interest of society in order to maintain high levels of environmental quality. However, "by allowing claimants to use land-use laws in place decades ago, Measure 37 requires policy makers to ignore what we know today about how development affects these resources."[20]

Thirdly, opponents of the goals could make a case could be made that housing will not become cheaper for low income residents. However, most of the development proposed under Measure 37 is low density residential in rural areas which will not meet the needs of many citizens. Those with low incomes will not be able to afford the costs associated with a larger lot size and commuting distance.

Proponents of Measure 37 would counter that people of every income level have had to deal with higher housing prices and little business growth due a constrained supply of land afforded by the UGB. The UGB does essentially contain growth and public infrastructure within prescribed areas. According to Metro, the government agency that maintains the UGB, however, it creates incentives to continue to re-develop and "keep downtowns in business."[21] Furthermore, a twenty year supply of land is kept within the UGB at all times for all uses so that the supply remains high enough to prevent large price increases.[22]

Finally, the goals of Senate Bill 100 made up a planning framework which all policy decisions were based on. Measure 37 is not an amendment to this community-wide policy system since it completely invalidates the goals for legitimate claimants, nor is it a framework in its own right. Instead, the measure only gives consideration to an individual's whims whereby "decisions about development are no longer based on facts

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[20] Ibid. Pg. 6.
[21] See: http://www.metro-region.org/article.cfm?articleID=277
[22] For a more in-depth discussion of the UGB, see the Hypothesis section of this thesis.

regarding the potential [economic, environmental] impacts of alternative courses of action."[23] Unlike the goals, Measure 37 does not account for the varying economies and environmental attributes found across Oregon.

After three decades of existence, the goals of Senate Bill 100 were bound to become out-dated. Concerns that were addressed in other states remained unaddressed in Oregon. For instance, "[Oregon] never adopted a land use program which identifies the farm or forest resource land which truly merits 'conservation,' it simply mandated that almost every rural acre be 'preserved' regardless of productivity…"[24] This is a compelling argument; perhaps not all of Oregon's lands are being put to their greatest economic use. This is where both sides of the land-use divide could compromise. On a case-by-case basis, it rural zoning regulations could be amended to allow a more efficient use of land yet attempt to keep the original goals and local community land-use standards in place.

Senate Bill 100 was a unique planning system when it was first introduced. It was overwhelmingly supported by Oregonians for decades but eventually fell out of favor. Proponents of the system should have anticipated the need for revision. Opponents of the system have not solved any problems by introducing Measure 37, which eliminates the goals of the former scheme yet is not a stand-alone framework. Fortunately, a public study is being developed called the "Big Look" which will determine the effectiveness of the 1973 system and how the state's priorities have shifted since then. Hopefully, as many or more Oregonians will voice their opinion regarding the future of Oregon land-use as they did during the Nixon era.

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[23] Martin. Pg. 4.
[24] Gieseler, Lewallen, and Sandefur. Pg. 91.

IV. A UNIQUE INITIATIVE

Analyses of other states' land use and zoning laws are an important base for understanding Measure 37 property rights issues. In recent years, Florida has been a hotbed of controversy surrounding property rights and the regulation of land. Early in the 1990's Florida passed a law that is similar to that of Measure 37 in a number of ways. Similar to Measure 37, this act is open to numerous interpretations, one being that any regulation that limits the freedoms of an owner to use their property is grounds for compensation. Under this interpretation, the estimated transfer of wealth to land owners due to "inordinate burden" under these laws is 28 to 50 billion dollars.[25] Like Oregon, there are no state funds explicitly set aside for claims, so it is expected that much of the expense is passed onto taxpayers. Furthermore, one could tacitly assume that much of the funds in both states will be transferred to an already wealthy landowner group.[26]

This is an important area of interest because Oregon has yet to think of a "best" way to measure the reductions in land value in order to distribute compensation. In the case of Florida, land use entities—those who enforce the land use laws—must provide the claimant with a "ripeness decision" that details whether the claimant's proposed use of land is legal under the current laws, and what uses are allowable. If the claimant decides that the ruled allowable uses impinge upon his or her proposed use of the property, or its value, the case is taken to court to determine what the proper compensation amount should be. In theory, this method of filing claims should eliminate cases where no compensation is required and cut down on costly court time.

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[25] Vargas, Sylvia. "Florida's Property Rights Act: A Political Quick Fix Results in a Mixed Bag of Tricks." Florida State University Law Journal, 1996. Pg. 3.
[26] Ibid. Pg. 3.

Vargas asserts that Florida's land use law was enacted in order to give landowners compensation for the "fair" value of property values taken from property owners when their land is "inordinately burdened." The definition of "inordinately burdened" is somewhat arbitrary, but is based on a landowner's loss of use of part of their property, loss of the right to exclude others, and the loss of possible investment value the land may have had. Also, the law is intended to "signal to local governments to use greater caution and common sense when enacting new land use regulations," and among other things, "facilitate decentralized decision-making."[27]

Invoking an earlier image, many people believe that instead of telling the government to be more sensible, these laws create land regulation paralysis. It does not help that the government is at a disadvantage. Individual landowners hold asymmetric information about their property which the land use regulatory entity must spend time and money researching. Furthermore, these entities will become risk-adverse to the point that they settle early in the claims process for fear of having to pay lawyer fees and the requested compensation.[28] In Oregon, this same fear has led to the quick waiver of many regulations and will likely result in a failure by the government to enact future regulations that may provide benefits to the public.[29]

The Florida law was made without the intent of redistributing much income; however, there is nothing in the current scheme of the law to "satisfactorily mete out fairness." At a time when state funding is lacking, these land use laws cannot promise that compensation will not come from taxpayer's pockets. Therefore, the law does not protect the interests of the many against the one landowner. Compensating one

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[27] Ibid. Pg. 4.
[28] Ibid. Pg. 4.
[29] Martin. Pg. 4.

landowner will likely cost much more than the benefits it will bring to society as a whole. Like current problems in Oregon, Vargas finds fault with the lack of proper and full definitions of when land value has been taken from the owner.[30]

Florida Attorney David Powell says that proper compensation is decided on a case-by-case basis and is determined by a judge who is solely responsible for determining whether the property has been "inordinately burdened" and ultimately decides on compensation by measuring the difference in the fair market value before and after the regulation.[31] Appraisers on both sides of the argument decide on a land value. If the government is forced to pay compensation, it then owns the land, due to the logic that by placing a certain regulation on it, it was in effect taking the land. Oregon, on the other hand, allows property owners to retain rights to their land regardless of compensation.

Another stipulation of Florida's law is that a claimant can only receive compensation if they prove a given land-use regulation violates their "investment-backed expectations."[32] This restriction takes into account the fact that when people buy property, they buy that property with certain expectations of how it can be used in the present and the future. Furthermore, "such a right must exist at the time the land is purchased and be supported by some sort of government acknowledgement, such as a statute."[33] Therefore, if a regulation is enacted which prevents these expectations from being realized, the owner can make a claim for compensation. Similarly, if it is ruled that an owner could not have expected to use their property in a certain way, they cannot issue

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[30] Vargas. Pg. 3.
[31] Powell, David. "An Introduction to Florida's Landmark Law Protecting Private Property Rights." Hopping Green Sams & Smith, P.A. Tallahassee, Florida.
[32] Vargas. Pg. 12.
[33] Butts, Robert. "Private Property Rights in Florida: Is Legislation the Best Alternative?" Journal of Land Use and Environmental Law. Florida State University, 1997. Pg. 6.

a claim. For example, a rural landowner cannot make a claim because they are unable to build a subdivision or golf course. Without a developed infrastructure built, including things such as adequate roads and utilities, there is no way this owner reasonably expected to build such a subdivision when he acquired the land. The costs of developing such infrastructure would be too great for one landowner to overcome. Measure 37, on the other hand, does not include such a stipulation. This means that rural landowners could potentially claim for the ability to build a subdivision or receive the desired compensation, no matter the infrastructure available in their area. There is no safeguard from those who claim that they have been prevented from building a subdivision, yet have no intention to do so due to the overpowering capital costs it would take to implement.

Texas' law, however, is not quite as restrictive as Measure 37 in terms of how much land value can be reduced before compensation is owed. The statute only considers distributing compensation for regulations that take more than 25% of a property's value. Again, the value of the land is measured before and after a certain regulation was put in place. Currently, the Oregon legislature is proposing a bill that would adopt this policy. Presumably, it has resulted in fewer claims, and Oregon is looking for limitations on how many claims are brought into the courts.

Although Oregon's new law is similar to both Florida and Texas's policies, it goes above and beyond the other laws in ways that will surely increase the number of claims and compensable rulings. The laws in Florida and Texas act proactively, only affecting land use that is enacted after the law's passing. In Oregon, the law works both

proactively and retroactively.[34] This means that anyone who has owned a tract of land since the beginning of Oregon's land use laws can file a claim. Most likely, this signals a larger base of possible claims for Oregon than any other state. Also, there is a requirement in all other states that the claimant provide notification to neighbors that there may be a waiver of regulations in their area. This is sensible considering the fact that negative externalities may occur when a neighbor decides to develop his land. Oregon, however, has no requirements for public notification of possible waivers. This fact alone has created a lot of controversy since the measure was enacted. As we turn to the economic aspects of Measure 37, we find that many people's fears regarding the negative impact of Measure 37 claims in their area are quite sensible.

V. The Economics behind Measure 37

Measure 37 as written is vague, unfair to all landowners and taxpayers alike and does not adequately incorporate proven economic principles. By no means does this mean that Oregon's land-use system was not due for a change. Oregonians twice voted for systems to compensate aggrieved landowners (the first, Measure 7, was invalidated by the courts due to a legal technicality). However, the writing of the current initiative allows qualified landowners to act like monopolists, offering compensation as if developers would have desired only their land in a free market without regulation. This completely ignores the fact that had there been no regulation, these landowners would have been competing with their neighbor's land in order to attract a developer. In other words, it is possible that the regulation created the market for developable land in the

[34] Barringer, Felicity. "Property Rights Law May Alter Oregon Landscape." The New York Times, November 26, 2004.

claimant's area and not the forces of time and population growth. Also, the initiative does not take into consideration the effect that changing a claimant's zone designation has on neighboring properties.

Central to the latter argument is the assumption that land-use regulations result in both costs and benefits. The only necessary requirement for a land-use regulation to exist is whether it passes "potential Pareto improvement." This economic principle states that those who benefit from a land-use regulation benefit enough from it that they could, in principle, compensate those who lose land value. However, it is not a requirement that the "winners" compensate the "losers" because that would require a value judgment. This principle is just concerned with whether the benefits outweigh the costs in aggregate. Measure 37, on the other hand, incorporates the "Pareto" principle which states that "winners" must compensate the "losers." Unfortunately, Measure 37 does not provide a feasible method for fairly compensating the "losers" while protecting the "winners" due to the negative impacts a high density development could have on a residential community as a whole. It is possible that these negative impacts could outweigh the benefits provided the individual landowner. In this case, Measure 37 would not pass the "potential Pareto improvement" principle.

Interestingly, the land use system put in place by Senate Bill 100 has in some ways honored the "Pareto" principle. Many pieces of farm and forest land are given tax breaks and subsidies in order to keep their operations profitable. In fact, many of these same properties are now under Measure 37 claims. Unfortunately, Measure 37 does not take this fact into account; even where "winners" have been compensating "losers," claims are still allowable.

Usually, the community at large benefits from land-use regulations because individuals in residential areas can be assured that their neighbors will not build loud or polluting commercial and industrial enterprises. However, some landowners face costs because they cannot build, say, a convenience store or an apartment building in their neighborhood and reap profits from these enterprises. In some cases, however, regulations that keep amenities such as tree canopy and stream beds intact can cause a positive effect on the land value of all properties within a community. Nonetheless, there is a need for zoning regulations to protect amenities that positively benefit everyone. Occasionally, some landowners prefer to use their land as they see fit while they believe that their neighbors will keep positive amenities. Since the property of the owner who wants to exercise all freedoms to his land is close to positive amenities lying on surrounding properties, he still reaps the benefits. He has the incentive to strive for the best of both worlds: develop his land and hope his neighbors keep theirs undeveloped. Even in the case of positive amenities, there is a need for government regulation.

Therefore, when determining the validity of a claim, a regulation's benefit to the community could be determined. If the cost of removing a regulation is greater to a community than the benefit of that exemption is to the single landowner, then claims could be invalidated by invoking the "potential Pareto improvement" theory. This is a moral judgment. We cannot legitimately force a successful businessman to give away his fortune back to society unless these gains were made possible by illegal coercion or public harm. Similarly, only harmful uses of land should definitely be blocked under any circumstances, which Measure 37 does marginally take into consideration. Uses that interfere with "public health and safety" are excluded but uses that harm "public

welfare," a term that is usually linked with the other two in law, are not excluded. This may limit the definition of uses that distinctly work against the public interest.[35]

As one commentator puts it,

> The need to protect the public's interest in private land is particularly vital because it goes to the heart of private property's legitimacy…private property in land isn't morally legitimate when it allows owners to harm the public good. After all, why should we deploy our police and courts to support private action that harms the community?[36]

Society gives the power of property ownership to individuals in the name of personal freedom. Surely, the equality of personal freedom is a public good, meaning that it is beneficial to society. So, we must decide what types of land uses are against the public good just as we must decide what types of regulation limit personal freedom too much. Do zoning changes that result in excess noise, traffic and neighborly conflicts work against the community good sufficiently enough to invalidate claims? What about those changes that bring down the value of neighboring properties by reducing positive amenities when the owners have no means of recourse? Can't we legitimately contend that such zoning changes can and do limit the personal freedoms of claimants' neighbors? These rhetorical questions cannot be answered easily. It may be prudent to evaluate each claim on a case by case basis. There must be some point, however, when the wedge between societal costs and restoring a property's "fair market value" is so greatly skewed in the individual's favor that a Measure 37 claim should be invalidated.

Furthermore, what is meant by "fair market value" if we must value what a property with a hypothetical development is worth in the market? It is clear that the "fair market value" of any given piece of land with a regulation is the price that a

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[35] Sullivan. Pg. 144.
[36] Freyfogle, Eric. "Goodbye to the Public-Private Divide." *Environmental Law*. Lewis and Clark Law School, Volume 36, Issue 1. Pg 21.

knowledgeable buyer would pay a knowledgeable seller if neither were forcibly required to make the transaction. As Plantinga points out, most running definitions of "fair market value" emphasize that it is the price that results in a competitive market.[37] The real problem is deciding how much a buyer would pay a seller for a piece of land today if we pretend that land-use laws have been non-existent for the past thirty years. Unfortunately, Measure 37 wrongly assumes that only the claimant's land is excluded from the thirty years of regulation while neighboring properties are bought and sold with regulations intact. This is the monopolist argument alluded to above. Plantinga calls his paradigm the "partial-general equilibrium." It is under the partial equilibrium that the landowner is a monopolist; only a partial exemption of zoning from the individual's land is considered. The general equilibrium implies that there is a complete invalidation of the zoning regulation from all properties.

The approach currently undertaken by local governments to determine the fair market loss due to a regulation implicitly treats the claimant like a monopolist.[38] When a claim of market loss from a regulation is submitted, it considers the hypothetical value of a given property after its zoning is, for example, suddenly changed from agriculture to high density (developable) land. This value is computed by an appraiser who looks at similar properties where development is already allowed and estimates the value of the claimant's land if it could suddenly be sold to a developer. However, the appraisal will be flawed because it assumes that the "harmful" land-use regulation will be lifted for the claimant's property *and none of its neighbors* since it will be applied to an area where the

[37] This argument originates with Andrew Plantinga, professor of economics at Oregon State University, in the unpublished article, "Measuring Compensation under Measure 37: An Economist's Perspective," 12/9/04. Pg. 3.
[38] Ibid. Pg. 10.

regulation is fully enforced. "These methods implicitly assume that a property identical to other properties that sold for price X, will also be worth X, no matter how many such properties were to be put on the market."[39] Thus, the appraisal will act as though claimant has a monopolist's control of developable land in his immediate area. Simple supply and demand dictates that an exclusive piece of developable land will command a larger demand and price. Compensation must be measured as though the "harmful" regulation does not apply anywhere. If the regulation had never been passed, then the claimant would never have had a uniquely developable piece of land so their losses in land value occurred in a competitive rather than monopolist market. Competition drives down the demand and value of a given piece of developable land.

Amenity Effects

One professor definitively states that while many people believe land-use regulations unambiguously lower property values, there are two ways which regulations can increase values. First, there are "amenity effects," alluded to above, which were discussed in terms of protecting or enhancing environmental attributes. Perhaps a more tangible example is the property tax which helps fund many public services such as schools and in turn facilitates a prosperous community which raises property values through increased demand.[40]

The existence of an "amenity effect" was recognized by the Oregon Supreme Court in its February 21, 2006 ruling that Measure 37 is constitutional. The ruling states:

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[39] Jaeger, William. "The Effects of Land-Use Regulations on Property Values." *Environmental Law*. Lewis and Clark Law School, Volume 36, Issue 1. Pg 108.
[40] Ibid. Pg. 106.

> Plaintiffs allege that Adams will suffer the following concrete harms stemming from his neighbor's successful Measure 37 claim: (1) diminished water quantity and quality available to Adam's property; (2) increase traffic; (3) an increased tax burden due to increased enrollment in the local school system; and (4) increased pollution. We conclude that plaintiffs' allegations concerning Adams are sufficiently plausible and concrete to support standing.[41]

Many of these effects are due to the loosening of environmental standards that a development would create. This study agrees that such liberalization would lessen property values. It would be hard, however, to determine whether the direct increase in tax burden in this instance would outweigh the probable indirect property value increase that Jaeger contends.

From a rhetorical standpoint, we could ask if the exemption or loosening of environmental regulations due to Measure 37 is "fair" or socially moral. After all, the neighbors of claimants based their "investment decisions on the legal framework in place at the time they purchased their properties."[42] This is rather ironic: by claiming it was unjust to have regulations interfere with their investment decisions, claimants are inflicting the exact same injustice upon their neighbors. Again, rather than having a land use ordinance that effectively nullified the previous one for some owners, Oregonians needed to find an amended compromise to Senate Bill 100.

Scarcity Effects

Secondly, there are "scarcity effects" in which regulations restrict the quantity of developable land in certain areas and therefore increased prices and demand follow.[43]

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[41] Oregon Judicial Department Appellate Court Opinions. (CC No. 05C10444; SC S52875). Found at: http://www.publications.ojd.state.or.us/S52875.htm. Filed February 21, 2006.
[42] Martin. Pg. 7.
[43] Jaeger. Pg. 106.

This is why the compensation method that gives the claimant monopoly power is so problematic. The reason that an individual may find himself sole owner of developable land in a given region could be due to the intervention of a regulation. It is possible that the regulation has created a market for development on the claimant's property where none existed before. A supply shift due to regulation could also affect prices between regions. The market price for land in unregulated regions should be higher than the price for regulated and un-developable land. A wedge is created whereby the regulated and unregulated lands diverge in value when they once commanded the same price (considering all of their other attributes are similar).[44]

Inevitably, those people in the regulated region will look at land similar to theirs in unregulated areas and be envious, even furious, at the higher market values their neighbors are enjoying. If they think as many Oregonians have, they will believe that the devaluation their land has suffered due to regulation is equal to the differential between their market prices and those of their neighbors. This notion is incorrect due to supply shifts. The true devaluation that the regulation has caused is equal to market price that all land in both regions would be receiving if the regulation had never existed. By removing the ordinance from the regulated region, supply of developable land increases thereby decreasing prices in both regions.

Note that it is likely, although not guaranteed, that the regulated land was devalued in the first place. Regulations with "amenity effects" could increase all prices in the regulated region. However, market values could increase even more in unregulated regions. Some people may compare the two values and conclude that the regulation

[44] Ibid. Pg. 109.

devalued their land. In reality, the regulation increased all land values but some more than others.[45]

Now, consider the lone claimant who gets a regulation exemption through Measure 37. The market value of his land will skyrocket because it is uniquely developable in that region and the "scarcity effect" is taking place. The true devaluation of the claimant's property should be equal to the market price if no properties were regulated in the region. This argument conforms with Plantinga's rhetoric regarding the monopolistic treatment wrongly given to claimants.

The most important point is that it is always in the best interest of the individual landowner to get exempted from land-use regulations whether those regulations resulted in a real increase or decrease in the market value of their land. Either way, the "scarcity effect" will cause the exempted property values to rise above non-exempted counterparts no matter if the owner had been truly wronged in the first place. The direct consequence being, unfortunately, that many Oregonians believe that positive effects on land values due to regulation exemptions are proof that the regulation caused monetary harm.[46] The fundamental flaw with this paradigm is that it leads people to "measure not the *loss* in value resulting from a given regulation, but the windfall *gain* that an exemption would bring them."[47]

However, the premium claimants will receive from this exemption is dependent on the continuing conformity of their neighbors. This is sort of a "prisoner's dilemma."[48]

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[45] Ibid. Pg. 114.
[46] Ibid. Pg. 107.
[47] Sullivan. Pg. 142. Emphasis belongs to the author.
[48] The prisoners are better off as a community if no one "rats" on the others, but there could be significant gains to that one prisoner who decides to become a snitch. Therefore, everyone has an incentive to snitch on everyone else, thereby making the community worse off.

Pertaining to Measure 37, this means that claimants will receive a premium above their true losses because all of their neighbors are not eligible or willing to submit claims. This premium takes the form of a higher land value due to exemption, or possibly a higher amount than deserved paid by the local government. Conversely, as more and more people in a certain area become claimants and receive exemptions, the lower the increase in property values will be due to an increasingly supply of developable land. Therefore, it is greatly beneficial to be one of the first successful Measure 37 claimants. Future claimants should see lower gains and may possibly point to the gains that Measure 37 brought their neighbors and deem their windfall incorrect or unfair; it will just be proof of the "scarcity effect" in action.

Besides the overestimation in property value loss that the "scarcity effect" can lend itself to, an ardent desire to capture this effect can also lead to the diminished productivity and efficiency of lands just outside the UGB. Many of the Measure 37 claims call for development of rural lands to take advantage of the heightened market for developable land. However, compared with urban densities, these proposed developments are low-density, likely to attract those who want more space. This presents a problem: in the future, when the UGB increases to include these developed lands, their densities will be too low for true urban development.[49] Building infrastructure and adding public services will be too costly. Thus, the efficiency of adding these properties to the urban area will be reduced in terms of added tax revenue per dollar spent on infrastructure. Productivity is also reduced because these lands will not be easily redeveloped to alleviate population growth.

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[49] Martin. Pg. 7.

From the previous discussion, we can devise an unanswerable rhetorical question: if local governments must compensate landowners when a regulation devalues their property value, should there be any obligation for landowners to compensate local governments when regulations produce positive gains through amenity and scarcity effects?

When a developer lives in a reality with competition, he does not jump at buying the first piece of developable land that is offered for sale. The developer must decide among various pieces of property which ones suit him the best. Some properties may have positive attributes that make it more valuable such as a view, a stream or a forest. Other land may be worth more to the developer due to the location factor. Obviously, the right to develop close to a city is worth more than the right to develop far away in an area without water and electrical infrastructure (there is more demand for properties with the former characteristic than the latter). Therefore, in a free market, any given claimant's land may be worth less to a developer than neighboring properties due to a lack of these valuable features. Since the text of Measure 37 demands that the "fair market value" be determined under a system of no regulation, we are obligated to consider just this: which properties would a developer pay more for if they could develop *any* property. Again, we have no way of knowing exactly how much money a developer would have paid for a piece of land given a landscape of different regulations. However, it is important to take this into consideration because Measure 37 fundamentally fails at considering the possibility that a given piece of land may not be more valuable than surrounding land in a market where buyers and sellers freely make transactions as if regulations were at their pre-1973 levels.

PART 2: EMPIRICISM

The theoretical underpinnings introduced in the previous section will become integral to the empirical portion of this thesis. The externalities associated with the "amenity effect" and the market effects inherent in the "scarcity effect" will become the basis upon which all empirical estimation will lay. While many positive and negative amenities can be precisely estimated using economic techniques, the estimation of market effects will be largely theory based. Such estimation will allow this author to construct an analysis around the overarching belief that zoning changes, especially initiated through Measure 37, do have an effect on the sales prices of neighboring properties.

Section VI contains a detailed discussion of many amenities and their hypothesized effect on property sales prices; these are the amenities that will be estimated because the author believes that they will have the most significant effects on sales prices. The author's hypotheses regarding the "scarcity effect" will conform to the theories introduced in Section V, the Economics of Measure 37. Section VII discusses the data, while Section VIII contains the methodology behind obtaining the results. Section IX analyzes the empirical results of the thesis.

VI. HYPOTHESES

Zoning

Since the goal of this thesis is to determine what affects the sales price of residential properties, we must hypothesize what types of zoning may drive down

demand for nearby residences. For instance, any amount of industrial zoning within a mile radius of residential properties should reduce demand due to noise, traffic and pollution externalities.

Commercial properties should exert different effects on the different types of residential properties. For instance, only Neighborhood Commercial (CN) zones should have a positive effect on Single Family Residences (SFR) and Rural Residences (RRFU) because these properties and those who demand them lend themselves to low density, quite areas. The other types of commercial areas should exert negative effects on low density properties because they are higher volume operations. Most likely, however, while the effect should be highly negative within a quarter mile radius, perhaps the influence on properties in a "donut" area further than a quarter mile but less than a full mile will be positive because of a convenience factor.

The more intense commercial districts should have a positive effect on Mixed-Use Commercial and Residential (MUR) and Multi-Family Residences (MFR) because those who likely demand them wish to live in centralized areas with quick and easy access to a job and shopping area. This theory is discussed further as it also pertains to the "Distance to Downtown" variable.

Most importantly, the various residential types should exert different effects upon each other. SFR and RRFU properties should lose value as higher density residential properties move into the neighborhood (including the movement from SFR1 to SFR16). This situation is the most pertinent with regards to Measure 37 based upon many claimants' calls to subdivide and develop their property. These low density properties should lose value as a MUR or MFR property is developed nearby due to increased

density, noise and traffic. Furthermore, there should be a decrease in value with any increase in density. There will be an adverse affect on values if, for instance, many high density SFR16 properties sprang up around a low density SFR1 property.

On the other hand, the effect of density on MUR and MFR properties should be harder to predict. People could demand these properties because they are close to shopping, employment and cultural areas. Therefore, higher density would be a plus. But, people could put higher demand on these properties when they are located near open space and a low density neighborhood where there is less noise and pollution. Due to these potentially varying tastes, which could be a result of income, the effects of other residential properties on MUR and MFR lots will not be either largely positive or negative.

Distance to Downtown Portland

The distance from a given property to a major urban area likely has a distinct effect on land value. After all, one of the first rules of real estate is "location, location, location." For certain types of properties, notably high density residential complexes and commercial enterprises, the land value should be quite high near the city core. Elementary urban economics states that firms pay high land rents because demand is high for centralized land that is near the most consumers and is the most accessible by roads. Also, face-to-face contact is relied heavily upon by firms for the collection and distribution of information. These functions are preformed most efficiently in centralized areas.[50]

[50] O'Sullivan, Arthur. Urban Economics. McGraw-Hill: New York, 2003. Pg. 173.

As for the residential properties, high density complexes which house a high proportion of a city's low-income citizens occupy the most expensive land. This is due to the fact that for low-income citizens, commuting costs are prohibitive and there is a benefit being near the most jobs. For obvious reasons, each low-income household occupies little land area. However, as incomes rise, the demand for extra housing outweighs the commuting costs and people move to larger properties further from the city. These high-income citizens incur higher commuting costs as a trade-off for lower land rents and housing costs. These properties are likely zoned as low density single family residences. The exceptions to these rules are seen in areas with high amounts of "cultural amenities" such as parks, shopping areas, museums and restaurants which often draw high-income individuals back to the central city.[51]

The general point is that the distance to central urban areas is a likely determinant of land value. For commercially zoned properties, proximity to the city should correspond to higher land values. The same goes for high density residential properties. On the other hand, it is likely that there is an ambiguous effect on land value as low density residential properties get closer to the central urban areas. In one sense, the costs of transportation between work and commercial areas are lower. However, there are greater noise and pollution externalities. The overall effect here will depend on whether the demand for convenience outweighs the demand for a rural setting among those people leaving the central city to consume more land and housing.

Distance to Commercial Districts

[51] Ibid, pg. 183-190.

There are distinct externalities associated with living near commercial districts, most notably Neighborhood Commercial (CN) and General Commercial (CG) districts. These areas, along with Office Commercial (CO) zones have the highest probability of being near residential properties. Whether the estimated externality associated with commercial areas will be positive or negative remains to be seen. The reported distances will likely have a significant effect on land value if only because they can help describe the unique locations of properties. The demand for land can be affected by what is conveniently located near it.

I posit that living near a CN zone will have an opposite influence on land value than that of a CG zone. The types of firms present within the CN zone are inherently smaller than firms zoned otherwise and better suited to fulfill the needs of relatively low density residential areas. Small grocery stores and locally owned small businesses constitute firms zoned CN. I hypothesize that a close proximity to one of these properties will have a positive effect on land value. There should be a higher demand for properties near areas where essential provisions are located, especially if these areas act as community gathering places. CN firms must be small and therefore cause less traffic and noise externalities than larger firms, factors which would decrease values. Within the dataset, these firms are much less likely to occur in large groups. Most landowners should be happy to accommodate a couple of CN firms nearby that are not too overbearing.

CG firms, on the other hand, will likely cause negative effects on land value due to their greater potential for noise and traffic externalities. Individuals likely demand property removed from these “large format retailers” like Home Depot or Costco.

However, it would be wrong to assume that people do not want easy access to these types of retailers, especially ones that cater to the needs of the region. There may be a positive effect on land values due to these zones at a reasonable distance. I hypothesize that the net effect will be negative because the desire not to have a view of a strip mall or warehouse store will outweigh the desire for the casual convenience of shopping in such areas a few times a month. Furthermore, CG firms are usually spatially clustered together suggesting that their combined traffic and noise externalities are quite large.

Distance to Hospitals

Do hospitals exert an "amenity effect" upon housing sales prices? It seems logical to assume that the location of hospitals is not a significant source of demand in the housing market. Anyone who is living within any city boundary will be within a few miles of a hospital. Being very close to a hospital, however, should result in a negative effect due to extra noise and traffic. This amenity could play a role among those properties zoned rural residential (RRFU) as an exception. These properties are located outside of the city boundary and are usually not connected to urban infrastructure and services. A common concern, which the City of West Linn cited in response to a Measure 37 claim, is the fact that as more rural residential properties are developed, there will be an overwhelming strain on already limited emergency services.[52] Therefore, it could be lucrative if a rural residential property were also located near a hospital. However, this effect would also be correlated with the demand for low density rural areas combined with the conveniences of many urban services including sewers and electrical utilities.

[52] Martin. Pg. 25

Distance to Schools

The strength and sign of this amenity could very well differ depending on the type properties that are being analyzed. All properties within the urban growth boundary will, by necessity, be within a few miles of a school. For urban properties, at this point, it is rather ambiguous whether schools will have a positive or negative effect on values. In one sense, there may be a positive effect on properties near neighborhood primary schools with playgrounds and fields. However, there are negative attributes of schools such as increased noise and traffic, especially near secondary schools with older students of driving age.

It must be noted that the dataset used in this thesis does distinguish the school from the playground or field attached to it.[53] The open space owned by each school is designated as a Park zone and is considered a separate parks amenity. Therefore, it is very possible that the distance to schools amenity will have zero or negative influence on land value because of the noise and traffic effects. This is also why I have decided to not distinguish between the distance to a primary school or a secondary school.

There may be another story when considering only rural residential properties. Similar to hospitals, it is possible that a public service like education is quite rare outside of the city limits so those properties that have quick and convenient access to schools will be in high demand. This would cause a positive effect on values. Admittedly, this effect will be small because not all home buyers have children of school age so the location of schools does not cross every buyer's mind.

[53] See Section VII for a complete description of the database.

Distance to Freeways and Major Roads

There are many obvious reasons why there is a low demand for residences along major roadways including noise, pollution and not-so scenic views. For those residential properties along these roads, there will be a significant amount of negative effect on land values. However, it is rather evident from the dataset and personal observation that there are very few residences within easy view of any huge roadways in Oregon. Since there are so few residences near these roads in the dataset, the negative effect may not be present in aggregate terms. In fact, this variable will likely tell a different story. It will probably estimate how much value is attached to a quick and easy access to major roadways. For properties within the urban growth boundary, there may not be a huge effect because no matter where someone is located within this boundary, it is probable that their work commute is only a few miles and trips to shopping areas are even shorter.

On the other hand, ease of access to major roads may be a strong selling point for those moving into rural residential districts. Many of these households likely hold high-income workers who still need to commute into the city. Therefore, being close to but not literally next to a major roadway will have a positive effect on land values outside the urban growth boundary. Clackamas County has shown an understanding that this demand is real by requiring rural developers to help alleviate transportation issues caused by their developments. The problem of inadequate roads has been cited by county officials in response to a number Measure 37 claims. They recognize that if some claims are approved, roadways must be widened.[54] With the potential for increased congestion in rural residential areas, those properties that have the easiest access to the large roads leading into city will benefit from an increased demand.

[54] Ibid.

Distance to Parks

I hypothesize that parks and open space will exert an unambiguously positive effect on land values. Parks are a positive amenity because they can create a sense of the outdoors as well as provide recreation opportunities within the city. Parks can provide good views as well as the illusion (or reality) of low-density housing for individual residences. People would rather see a grassy field and some swings outside their window than the side of another house.

The same analysis applies to rural residential properties. In many cases, however, these homes are not provided with publicly-owned open spaces but rather privately-owned farmland. This farmland gives the same positive amenity effect as parks within cities although there is the potential for development. Therefore, possible loss of neighboring farmland due to Measure 37 has become a concern.

It must be noted that the effect of parks and open space on land value will not be as great for rural properties as urban ones. An urban residence near a low or zero density area is quite rare. Due to this uniqueness and the past constraints on development near the urban growth boundary in the Portland area, the demand for such properties should be high. Therefore urban properties will carry a higher value premium.

Distance to Rivers

This measure should show that rivers are a positive amenity due to the sense of wilderness they provide, not to mention the recreational opportunities. This natural setting, which lends itself to high concentration of trees also supplies homeowners with good views. The river amenity could be very lucrative if a given property were located

within the urban growth boundary as well as near a body of water. The convenience of urban life combined with the feeling of a rural area is highly valuable to many homeowners.

I hypothesize that the distance to the nearest river will have a positive effect on land values for both rural and urban residences as that distance decreases. However, the effect on urban properties will be greater. Rural residences appreciate rivers for likely the same reasons that urban residences do. The only difference is the fact that open spaces and rural attributes are rare in urban areas. Therefore, a higher premium is required to gain outright ownership or a view of this amenity.

UGB

According to Metro, a government land use agency, the UGB is a tool used "to protect farms and forests from urban sprawl and to promote the efficient use of land, public facilities and services inside the boundary." Other uses include an incentive to continue to re-develop the buildings and infrastructure within the urban core in order to keep "downtowns in business." The UGB also promotes certainty among businesses and local governments regarding present and future placement of infrastructure needed for development.[55] Essentially, the UGB works to constrain the supply of certain land uses and to control where they are located.

The UGB is flexible; Metro must provide a twenty year supply of land within the UGB for residential, commercial and industrial uses, with the supply adjusted every five years for added population and development.

[55] See: http://www.metro-region.org/article.cfm?articleID=277

Depending on the type of residential zoning in question, the UGB effect should produce different results. For those properties zoned "single family residential" or "multi-family residential," there should be a positive effect associated with being inside the UGB as opposed to being outside of it. If not already developed, these properties have development potential and are fair game to homebuyers, whose demand puts upward pressure on values. This pressure is present in great amounts for those properties either consisting of or neighboring positive amenities. Properties within the boundary are also valued higher because they come with guaranteed access to adequate road, sewer and electrical infrastructure as well as a school district.

For buyers looking for a single family residence, surely demand is lower in those areas where a well needs to be dug and a connection to the electrical grid built. There may be a lot of open space, but it will not come with positive urban amenities. Furthermore, it does not make sense to build a multi-family residence outside an urban area. Not only will the demand for that much housing be likely lacking, but according to urban economics, these residences are built to let consumers cheaply and efficiently occupy some of the most expensive land in a given urban area.

On the other hand, being within the UGB will have a negative effect on properties zoned "agriculture or forestry" or "rural residential." The uses associated with these zones legally require a lot of area. It is undesirable to locate farms near developed areas because of conflicting interests; this fact has been brought up in discussions concerning the impact of Measure 37. Conflicts include high volumes of dust, noise and spraying that coincide with farm operations.[56] Rural residential properties should see the same negative effect because the allowed development is so controlled that those people who

[56] Martin, pg. 31.

demand these large lots likely demand them because they want to be far from the city. Also, they may demand them because they believe they will someday be apart of the UGB. If these rural residential properties were included, their zoning would change and the value would increase. Measure 37 claimants state this fact and this is not disputed here. However, the fair and precise magnitude of this effect will be discovered in the analysis section of this thesis.

Distance to UGB

I hypothesize that those properties lying outside of the UGB will be worth more as they move closer to the boundary, everything else being equal. This will be true for properties of any zone classification. The properties outside of the boundary are subjected to more regulation that make many types of development illegal and prevent public construction of infrastructure. Since the UGB is subject to expansion, properties closest to the boundary have the most potential future for development. Investors may be willing to purchase a piece of farmland because they believe that sometime in the future it will be ripe for development. This demand will cause the value of this property to increase.

This increased value due to development potential is the main reason why Measure 37 claimants were so aggrieved with the old land-use system. However, it must be noted that the demand for potentially developable properties also depends largely on the unique positive amenities found near the property and the costs associated with building road and utility infrastructure.

Finally, we must not forget that the increased values that I empirically estimate in this thesis exist because the UGB exists. Higher value effects on properties nearest to the UGB occur because completely undeveloped lands within the UGB are scarce. Therefore, if the UGB did not exist, there would be no scarcity effect and those same properties would not be benefiting from a positive value effect. Simply, the large amounts of compensation demanded by many claimants stem directly from the scarcity effects caused by the same land-use regulations that many say are hurting their property values.

Distance to Railroads

Heavy rail should most certainly exert a negative influence on land values due to the many adverse externalities associated with rail activities. The most apparent externalities are noise, ground movement and pollution. These factors should cause the greatest negative effect on small residential properties. People generally expect to live in quiet areas and on a small lot, there are few places to go to escape the noise and calling the police certainly will not help. On the other hand, the effect on large pieces of farmland will likely not be so severe. The owner has the choice to build as far as he possibly can from the tracks.

Elevation

Elevation is an important variable to control for because it can greatly correlate with land value and sale price. This relationship, I contend, is due to the fact that elevation implies, but does not necessarily prove, the extent that a given property has

good views. A property with a higher elevation relative to another logically indicates that the potential to see further is greater with the former than the latter.

View is a positive amenity that is very difficult to estimate. It would be preferable if the data contained information regarding what landmarks can be seen from each property. Also, a land slope value would be helpful but RLIS Lite does not contain data adequate to measure this for every property. Therefore, I had to use a proxy, elevation, to help determine where views exist.

It is easy to conclude that elevation has a positive effect on all land values. It makes sense to believe that people uniformly place high demand on properties with views. Like parks, a view can place a sense of the outdoors within an urban setting. It can also have psychological effects by bringing about feelings of serenity or social superiority.

VII. DATA

The data used in this project is derived solely from the Metro Data Resource Center. Metro is an elected government entity that serves the Clackamas, Multnomah and Washington counties in Oregon. This region covers the Portland, Oregon metropolitan area as well as twenty-five cities that lie in its suburban area. This organization undertakes the service of planning and policy making with the intent to "preserve and enhance the quality of life and the environment for ourselves and future generations."[57] Metro is funded by taxes, grants and voter-approved bonds as well as revenues from user fees charged to individuals and businesses for certain services. Its

[57] Preamble to the Metro Charter, November 1992. See http://www.metro-region.org/pssp.cfm?ProgServID=62.

tangible services include defining the urban growth boundary, setting land-use regulations, managing garbage disposal and data collection.

The Metro Data Resource Center compiles data from other government entities and agencies in the region including county tax assessors, the Portland Planning Bureau and the U.S. Census Bureau among others. It also creates and maintains its own data. Metro provides the service of collecting and updating this wide array of data which is pertinent to the Portland metropolitan area. The commercial form of this data available for consumer purchase is called the Regional Land Information System (RLIS Lite). Metro updates the data quarterly (November, February, May and August) and charges consumers a yearly subscription price for this access. This author purchased the data at a student rate which includes no updates. The dataset used for the empirical purposes of this thesis is updated through November 2005.

Due to the varying agencies that are involved in Metro's RLIS Lite project, there exists a rich assortment of data types that go beyond basic property characteristics. Foremost, this dataset includes detailed tax assessor data on every property in Clackamas, Multnomah and Washington counties. However, analysts solely using tax assessor data would only have information on the sale price, owner, land and building size of these properties and that is all. RLIS Lite, while embracing tax assessor data, includes data concerning the external environment that is not necessarily part of any given property yet unambiguously affects property values and appropriate uses. These types of external data include roads, rivers, parks and open spaces, school locations, tree canopy coverage, zoning and urban growth boundaries among other attributes.[58] The inclusion of roads and

[58] For a complete listing of the data contained in RLIS Lite (not all were pertinent to the goals of this thesis), see http://geode.metro-region.org/metadata/index.cfm?startpage=main.cfm?db_type=rlislite.

rivers in a dataset, along with their relation to given properties, can give an analyst a clearer picture regarding why a piece of land is valued at a certain price and why it is used in a certain way. This type of spatial data is known as Geographic Information Systems (GIS) data.[59]

The RLIS Lite data are very suitable for carrying out the goals of this thesis. Unfortunately, time and computational constraints made it necessary to choose only some of Oregon's counties to work with. Furthermore, most Oregon counties do not maintain adequate GIS data needed for an extensive analysis such as this. Fortunately, the three Portland Metropolitan counties are vast and encompass a wide range of land types and uses. The shear number of properties located within these three counties is vast as well—there are 556,102 observations in the dataset.

Multnomah County contains Oregon's largest city and urban area. Almost all of Portland's residences, commercial and industrial districts lie within the county's 464 square miles. Clackamas County, on the other hand, is roughly one-eighth urban. Most of its 1,879 square miles is rural farm and forest land. In fact, it encompasses Oregon's largest mountain and a national forest. Washington County is roughly 727 square miles and contains the western edge of the City of Portland. The county proudly boasts to host Oregon's largest companies including Nike and Intel while using "focused residential and industrial growth which has enabled the county to preserve 75% of its agriculture and forestlands."[60]

While it would optimal to include every county and property in Oregon, it would not be feasible due to the shear amount of computing required as well as the widely

[59] See Appendix 1 for a complete illustrated description of GIS data.
[60] See http://www.co.washington.or.us/deptmts/cao/geninfo/geninfo.htm

varying price effects present between regions. For instance, certain amenities such as distance to rivers may result in much different price effects on desert properties than urban properties. Nonetheless, the author believes that these three counties provide an adequate sample to measure the effect that Measure 37 claims will have on the value of most Oregon properties. These counties make up roughly 42% of Oregon's population and 34% of all Measure 37 claims. It is important to note that 85% of all claims originate in the Willamette Valley which includes Clackamas, Multnomah and Washington counties. The Willamette Valley is almost entirely made up of farm, forest and urban land very similar to that found in the tri-county sample. Only 15% of all claims originate in countries with arid, desert-like land unlike any land found in the RLIS Lite dataset.[61]

Based on these statistics, the author contends that the data sample used in the following analyses adequately incorporate property and environmental attributes inherent in the "average" Measure 37 claim. The results of this analysis will therefore be pertinent to present and future claims.

Most importantly, this author contends that the individual variables used in the empirical section of this thesis are quite adequate for describing price effects on land value and sales price. Again, this confidence is built upon the completeness of the dataset, especially its inclusion of external environmental factors that make the study of externalities possible. TABLE 1 displays all of the variables used to analyze the effects on land value and sales price.

TABLE 1: Description of Variables Used[62]

[61] These statistics were formulated by the Oregon Department of Land Conservation and Development. See http://www.oregon.gov/LCD/index.shtml.
[62] See Appendix 2 for a complete listing of the summary statistics for every variable.

VARIABLE NAME	DEFINITION
Area	Square footage of tax lot as calculated by the GIS
TLID	Tax lot account number, also known as state_id. This uniquely identifies every property.
Rno	Unique account or parcel number used by county assessor in Multnomah County.
Ownersort	First five letters of owner's name
Owner	Owner's name
Oweneraddr	Owner's address
Ownercity	Owner's city
Ownerzip	Owner's zip code
Sitestrno	Site street number
Siteaddr	Site address
Sitecity	Site city
Landval	Real Market Value of land
Bldgval	Real Market Value of building
Totalval	Total Real Market Value (Landval + Bldgval)
Bldgsqft	Square footage of residential living area
A_T_Acres	Acreage of tax lot as shown in the County Assessor's database
Yearbuilt	Year structure was built
Taxcode	County tax code
Saledate	Date of the most recent sale of the property with range 1885-2005
Saleprice	Price of the most recent sale of the property
County	County abbreviation
X-coordinate	Spatial coordinate from the X-axis that, along with the Y-coordinate, places each object (such as a school) in its own location on a plane. Units are in feet.
Y-coordinate	Spatial coordinate from the Y-axis that, along with the X-coordinate, maps objects to unique locations. Units are in feet.
Zone_Class	43 Regional classifications into which zoning is generalized. All properties in the dataset have one of these classifications.
(*)Zone1Count :::::::::::::::::::: Zone 43Count	The number of properties of each of the 43 types of zones which fall within a one mile radius of each property. (i.e. If the value were 2 for a given property under Zone21Count, there are 2 properties zoned 21 that fall within a mile radius of that

	property).
(*)Zone1Area ::::::::::::::::::: Zone43Area	The total area, in square feet, of each of the 43 zones which fall within a one mile radius of each property.
(*)Zone1QuarterArea ::::::::::::::::::: Zone43QuarterArea	The total area, in square feet, of each of the 43 zones which fall within a quarter mile radius of each property.
(*)DistanceDowntown	The distance to the Portland, Oregon city hall
(*)DistanceCN	The distance to the nearest property zoned "Neighborhood Commercial."
(*)DistanceCG	The distance to the nearest property zoned "General Commercial."
(*)DistanceHospital	The distance to the nearest hospital.
(*)DistanceSchools	The distance to the nearest school, not distinguishing the education level.
(*)DistanceFreeway-Art	The distance to the nearest road labeled "freeway" or "major arterial."
(*)DistanceParks	The distance to the nearest park or open space.
(*)DistanceRivers	The distance to the nearest river.
(*)UGB	A 1 if the property is in the Urban Growth Boundary, a 0 if not.
(*)DistanceUGB	If the property is outside the UGB, the distance to the UGB.
(*)DistanceRailroads	The distance to heavy rail lines.
(*)Elevation	The elevation of the center-most point of the property.
(*)Year1970 ::::::::::::::: Year2005	Dummy variables for each year a property has sold (1970-2005). Meant to be a regional price deflator which puts all sale prices in 2005 dollars.

All of these variables were derived from the RLIS Lite dataset. Some variables were already present in the dataset while others are the result of manipulation by GIS software on preexisting data. The variables marked with an asterisk (*) were derived by the author using such manipulation.[63] These variables help describe not only the property

[63] See Appendix 5 for a complete description of this methodology.

itself—how big it is, what it is used for and what is structures are built on it—but what makes it unique. They are largely environmental and infrastructural attributes which I hypothesize will have a distinct positive or negative effect on any given property if located in the immediate area. The magnitude of these effects remains to be seen.

Undoubtedly, the most important variable in this dataset is "Zone_Class." Measure 37 is an initiative that hinges on the controversy surrounding zoning laws and their application. The definition of "Zone_Class" states that there are 43 unique zoning classifications used in the dataset of which one corresponds to every property. Zoning describes what a given piece of property can be used for and to what extent; it does not necessarily tell us what it is currently being used for. For example, zoning tells us that a certain property can accommodate residential houses of a maximum of 3,000 square feet. This allows the local government to control where homes, businesses and industrial areas lie so as to minimize harmful interactions or competing interests. Zoning also helps control development and density, dictating where great numbers of people are allowed to move and live. The planning of local government is usually provoked by natural resource, current infrastructure (sewer and electric utilities), public safety or aesthetic concerns.

All 43 zones present in the dataset are listed in TABLE 2. These are local zones whose definitions are maintained by Multnomah, Clackamas and Washington Counties. I numbered each zone so they were easier to manipulate using GIS software without potentially confusing the symbols and acronyms (the "Zone Class") that originally identified them. Notice that as the number associated with the "Zone Class" label increases, the various types of residential zones allow for higher housing density.

TABLE 2: Description of Zoning Found in Data[64]

ZONE ID	ZONE CLASS	CLASSIFICATION
1	CC	Central Commercial - allows a full range of commercial typically associated with CBD's and downtowns. More restrictive than general commercial in the case of large lot and highway-oriented uses. Encourages higher FAR uses including multi-story development.
2	CG	General Commercial - larger scale commercial districts, often with a more regional orientation for providing goods and services. Businesses offering a wider variety of goods and services (including large format retailers) are permitted in this district and include mid-rise office buildings and highway and strip commercial zones.
3	CN	Neighborhood Commercial - small-scale commercial districts permitting retail and service activities such as grocery stores and neighborhood service establishments that support the local residential community. Floor space and/or lot sizes are usually limited to between 5,000 to 10,000 square feet.
4	CO	Office Commercial - districts accommodating a range of low-rise offices; supports various community business establishments, professional and medical offices; typically as a buffer between residential areas and more intensive commercial districts.
5	FF	Agriculture or Forestry - activities suited to commercial scale agricultural production or forestry, typically with lot sizes of 10, 20 or 30 acres or more.
6	IH	Heavy Industrial - districts permit light industrial and intensive industrial activity such as bottling, chemical processing, heavy manufacturing and similar uses with noxious externalities.
7	IL	Light Industrial - districts permit warehousing and distribution facilities, light manufacturing, processing, fabrication or assembly. May allow limited commercial activities such as retail and service functions that support the businesses and workers in the district.
8	MFR1	Multi-family - single family, townhouses, row houses permitted outright. Max density permitted is 15 units / net acre.
9	MFR2	Multi-family - single family, townhouses, row houses permitted outright. Max density permitted is 20 units / net acre.
10	MFR3	Multi-family - single family, townhouses, row houses permitted outright. Max density permitted is 25 units / net acre.
11	MFR4	Multi-family - single family, townhouses, row houses permitted outright. Max density permitted is 30 units / net acre.
12	MFR5	Multi-family - single family, townhouses, row houses permitted outright. Max density permitted is 35 units / net acre.
13	MFR6	Multi-family - single family, townhouses, row houses permitted outright. Max density permitted is 40 units / net acre.
14	MFR7	Multi-family - single family, townhouses, row houses permitted outright. Max density permitted is 60 units / net acre.
15	MUE	Multiple Use Employment - an employment district that accommodates a broad range of users including offices, retail stores, warehouse distribution, and light industrial including manufacturing, fabrication, and assembly.
16	MUR1	Mixed Use Commercial & Residential with FAR maximum of about 0.35[65]
17	MUR10	Mixed Use Commercial & Residential with FAR maximum of about 12.5
18	MUR2	Mixed Use Commercial & Residential with FAR maximum of about 0.5
19	MUR3	Mixed Use Commercial & Residential with FAR maximum of about 0.75
20	MUR4	Mixed Use Commercial & Residential with FAR maximum of about 1.25
21	MUR5	Mixed Use Commercial & Residential with FAR maximum of about 1.5
22	MUR6	Mixed Use Commercial & Residential with FAR maximum of about 1.75

[64] All zone classifications originate from the Multnomah, Clackamas and Washington County governments. They were copied from the RLIS Lite website. See http://geode.metro-region.org/metadata/index.cfm?startpage=main.cfm?db_type=rlislite.

[65] "FAR" is an acronym for floor area ratio. It is the ratio of square feet of commercial and residential space compared with total square footage of the property. Therefore, a FAR of 4 indicates a multi-storied building.

23	MUR7	Mixed Use Commercial & Residential with FAR maximum of about 2
24	MUR8	Mixed Use Commercial & Residential with FAR maximum of about 3
25	MUR9	Mixed Use Commercial & Residential with FAR maximum of about 4
26	PF	Public Facilities - allows government building, institutional and cultural uses such as museums.
27	POS	Parks and Open Space
28	RRFU	Rural Residential or Future Urban - residential uses permitted on rural lands (1 dwelling unit per lot) or areas designated for future urban development, typically lots are 10 or more acres
29	SFR1	Single family - detached housing with minimum lot size from 35,000 sq. ft.
30	SFR10	Single family - detached or attached housing with lot sizes around 3,500 sq. ft.
31	SFR11	Single family - detached or attached housing with lot sizes around 3,000 sq. ft.
32	SFR12	Single family - detached or attached housing with lot sizes around 2,900 sq. ft.
33	SFR14	Single family - detached or attached housing with lot sizes around 2,500 sq. ft.
34	SFR15	Single family - detached or attached housing with lot sizes around 2,300 sq. ft.
35	SFR16	Single family - detached or attached housing with lot sizes around 2,000 sq. ft.
36	SFR2	Single family - detached housing with minimum lot size from 15,000 sq. ft. to a net acre
37	SFR3	Single family - detached housing with lot sizes from about 10,000 sq. ft. to 15,000 sq. ft.
38	SFR4	Single family - detached housing with lot sizes around 9,000 sq. ft.
39	SFR5	Single family - detached housing with lot sizes around 7,000 sq. ft.
40	SFR6	Single family - detached housing with lot sizes around 6,000 sq. ft.
41	SFR7	Single family - detached housing with lot sizes around 5,000 sq. ft.
42	SFR8	Single family - detached housing with lot sizes around 4,500 sq. ft.
43	SFR9	Single family - detached housing with lot sizes around 4,000 sq. ft.

Please note that SFR13 is skipped in TABLE 2 because no properties in the data set were given this classification.

The Analysis section will demonstrate how important the zoning data is towards advancing the goals of this thesis. The zone is the most fundamental indicator of the greatest legal use of each property. Since every Measure 37 claim has been filed on behalf of a residential or agricultural property, the analysis preformed later will only take these various properties into consideration. In other words, only the effects of varying factors upon the sales prices of these properties will be considered. It will be assumed, of course, that any of these residential properties or farms could become a commercial or industrial property in the future due to Measure 37 claims.

The basic summary statistics are reported in TABLE 3. These statistics show how the descriptive variables vary among properties depending on type of residential or agricultural zone. For the purposes of this cursory analysis, the residential zones have been generalized into four main groups: SFR, MFR, MUR and RRFU. Agriculture lands are denoted by the group, FF. The reader will be able to discern the most conspicuous differences in size, value etc. between the four types of residences. Some large values are rounded because they were reported in scientific notation by the statistical software. This first set of statistics is not screened for outliers and erroneous observations.

TABLE 3: Summary Statistics, No Filters

AREA					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	362776	12095.19	49557.48	.005	6415158
MFR	49848	12669.12	135436.2	11.297	26500000
MUR	47358	13530.11	73872.44	0	7043847
RRFU	33810	116040.9	344839.2	8.56	49300000
FF	39345	1711981	22600000	49.906	1020000000
BUILDING SQUARE FEET					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	362776	1763.62	2432.64	0	479448
MFR	49848	2090.92	8932.73	0	748503
MUR	47358	3799.05	20123.9	0	907500
RRFU	33810	1508.98	1653.4	0	104812
FF	39345	1196.06	1928.31	0	200937
BUILDING VALUE					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	362776	152248.2	432227.3	0	129000000
MFR	49848	206385.3	1142867	0	151000000
MUR	47358	454258.7	4263573	0	439000000
RRFU	33810	136333.4	368944.6	0	46000000
FF	39345	105076.8	289078.4	0	31500000
LAND VALUE					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	362776	102146.2	108001.1	0	17000000

MFR	49848	86492.2	235258.6	0	21300000
MUR	47358	179784.8	693544.6	0	36400000
RRFU	33810	122154.3	117452.7	0	7064530
FF	39345	144785.1	274991.9	0	11900000
TOTAL VALUE					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	362776	254395.9	482609.7	0	134000000
MFR	49848	292878	1306018	0	158000000
MUR	47358	634046.9	4691316	0	467000000
RRFU	33810	258528.2	417856.7	0	48800000
FF	39345	253481.9	428916	0	31900000
SALES PRICE					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	362776	145428.4	401146	0	69000000
MFR	49848	197522	882321.6	0	51300000
MUR	47358	596340.2	18700000	0	2000000000
RRFU	33810	113221	240393.8	0	17100000
FF	39345	119654.5	445110.5	0	19100000

The statistics above were derived without using any filters to mete out outliers and observations containing incomplete or omitted data. They are displayed so that the reader can compare them with the filtered statistics and ascertain why filters are reasonable and necessary before any analytical inferences can be made. For the most part, filters will eliminate observations which could bias results such as incorrect or perplexing sales prices of $0.

The summary statistics for the various types of residential properties with filters are given in Table 4[66]. This is the data used in the analysis section of this thesis.

TABLE 4: Summary Statistics, Filters

AREA					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	149330	10307.67	24799.75	509.49	3084514

[66] See Appendix 3 for further discussion of the filters.

MFR	13209	9621.68	27549.1	663	1741655
MUR	8142	10120.9	48424.1	576.02	3196605
RRFU	6461	131932.9	139392.2	2426.7	3896564
FF	4526	227315.9	455804.9	4230.3	6299097
BUILDING SQUARE FEET					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	149330	1875.37	915.17	0	93907
MFR	13209	2173.82	7049.61	0	289168
MUR	8142	2313.54	5709.3	0	183344
RRFU	6461	2005.8	1515.83	0	12622
FF	4526	1882.2	1492.8	0	32570
BUILDING VALUE					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	149330	146883.4	134770.9	0	21100000
MFR	13209	150350.3	406830.7	0	22300000
MUR	8142	167655.7	461979	0	20500000
RRFU	6461	184309	606618.7	0	46000000
FF	4526	156628.5	156286.6	0	1925850
LAND VALUE					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	149330	102632	59163.45	10000	5079200
MFR	13209	91637.3	98536.9	10000	4433000
MUR	8142	115298.1	234275.7	12200	13200000
RRFU	6461	154529.4	140586.6	10000	7064530
FF	4526	151592.4	114727.8	10000	3573980
TOTAL VALUE					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	149330	249515.5	169244.5	10000	25700000
MFR	13209	241987.6	487936.5	10000	26700000
MUR	8142	282953.7	604888.7	12200	21800000
RRFU	6461	338848.6	663497.5	10000	48800000
FF	4526	308719.5	221162.2	10000	4102310
SALES PRICE					
	Observations	Mean	Std. Dev.	Minimum	Maximum
SFR	149330	193547.1	109165.4	2415	5050000
MFR	13209	187838.5	203152.3	8000	8058470
MUR	8142	208194.3	205778.1	10000	7300000
RRFU	6461	237716.3	178505	2200	2590057
FF	4526	316587.6	325272.1	10000	5021730

While some observations have been compromised, it is easy to see that many outliers are now excluded by glancing at the statistics. Notice that the standard deviations have fallen considerably. The statistics now make sense intuitively. The mean area is largest for rural residential and agriculture properties, whose lack of density, expansive land uses and location on cheap land relative to the city center demand more space. Building square feet is greatest for urban residential properties, especially highly dense multi-family residences and mixed use commercial and residential. It is obvious that each individual apartment is not counted, but the combined square footage that is developed on a given tax lot. This is fortunate; tenants do not own their apartments and therefore cannot issue claims. The analysis will only include properties that have legal owners. It is no matter that some values for building square feet and value are zero. Ownership of land is the only major necessity to filing a claim. Building value is highest for dense urban residences because they are larger compared to single family residences and rural structures.

The land value is much higher on average for rural rather than urban properties. This is simply because on average, each rural property has more square footage. Economic theory dictates that land is more valuable in urban areas due to a higher demand. The analysis portion of this thesis will control for this and other factors in order to determine the sole value of land. Statistics for the total value follow much the same argument.

Before the filters were put in place, the rural properties did not have the largest sales prices on average. Now, they do which corresponds to a higher land values and total values among these properties. Notice that the standard deviations are much lower,

the means now relate much more closely with the assessed total value means and formerly very high maximum values have fallen.

Now that the erroneous and unhelpful observations have been filtered, we can turn to the methodology and hypotheses behind the forthcoming analysis.

VIII. METHODOLOGY

This author will use regression analysis to determine how various property and housing characteristics (the explanatory variables) determine the land value (the dependent variable) of a given property.[67] Since sales prices are the revealed market values, they will be used as a proxy for changes in land value. The explanatory variables will include a multitude of housing and environmental attributes as well as zoning from the RLIS Lite dataset. The variables in my dataset should give me accurate estimates of the effect of various attributes, such as property square footage, will have on land value.

When economists use a certain explanatory variable, it is said that they are "controlling" for that variable. Suppose that there exist two properties that are the same in every way except for the fact that one is larger by one square foot. In this case, it would be easy to determine the value of one more square foot; it would be the difference in the land value of the two properties. However, reality never gives us properties that are the same. First of all, every property occupies a different location which alone is a big determinant of land value. Regressions allow the analyst to control for location and size (explanatory variables) and determine statistically by how much an additional square foot of land would add to the land value on two identical pieces of property. Of course, many other attributes can be controlled for.

[67] See Appendix 4 for a detailed discussion regarding the theoretical foundation of regression analysis.

Obviously, determining what affects land value will be quite complex due to the numerous factors that can affect its value. Nonetheless, I am making the bold assumption that the variables in the RLIS Lite dataset are the most important in determining land value. Due to the fact that the variables are spatially mapped, I can control for the one main thing that makes every property unique: location. This can be accomplished by determining each property's distance to roads and rivers as well as elevation, among other things. These are attributes that no two properties will have in common. Therefore, the regressions in the analysis portion of this thesis should be as complete and relevant as possible for measuring the affects on land value.

By corollary, any other property characteristics not included will have either insignificant effects or effects that cannot be easily measured from any data. For example, changing consumer preferences for different characteristics cannot be measured because this is a psychological phenomenon. Another example is air quality. Unfortunately, this is a realistic shortcoming in the dataset. It is very likely that people's demand for elevation and distance to urban areas, for example, have changed many times in the past three decades. This can cause a problem known as omitted variable bias. This type of biasness has a number of consequences, the most important being misleading conclusions about the effect of certain variables on land value. The incorrectly estimated variables will be those that are correlated with the omitted variable. If air quality were left out, it is possible that the effect of elevation on land value could be overestimated because this estimate would include not only consumers' demand for a better view but also a property further away from the city with a higher air quality. Therefore, it would

appear that the dollar effect of elevation is higher than it actually is because it is describing more than it should be due to omitted variables in the dataset.

Again, this author believes that the variables used in the empirical analyses of this thesis are quite adequate for describing price effects on land value. I created the variables listed in TABLE 1 that are marked with an asterisk (*) in order to avoid the problem of omitted variable bias. They help to tell the most important story regarding every property, which, in essence is its location. Furthermore, they represent the amenities that were described in the Hypothesis section. These amenity variables reveal consumers' demand for neighborhood and environmental amenities that otherwise cannot be determined from basic tax assessor data. Therefore, all the variables used in the regression analysis will be properly estimated with little overestimation due to biasness.

All of those variables marked with an asterisk (*) are spatial in nature. They were all created using a GIS software package called ArcMap. Notably, ArcMap allowed this author to find the distance from every property in the database to the amenities listed in the Hypothesis section. Using this data, this author was able to estimate the price effects of these various amenities. See Appendix 5 for a complete discussion behind the processes and tools used to create these variables.

It is important to note that all of the price effects described in the Analysis section refer to changes in property sales prices. In order to convert the sales data in the database to current dollars, this author created variables to control for yearly effects on sales prices. These year dummy variables are meant to work as regional price deflators for the years 1970 to 2005. The sales prices in RLIS Lite are not recorded in 2005 dollars but rather reflect the dollar amount paid when the property was last sold. For purposes of

this study, the most recent sale date for the observations range from 1970 to 2005 because prior to these dates almost all of the observations contain incomplete sales date or price data.

In order to convert all sales prices into today's dollars to adjust for inflation and changing demand, I could have multiplied them all by the Consumer Price Index which other researchers have used when studying housing prices over time.[68] However, this is a national index which takes every region's housing fluctuations into consideration. Housing supply and demand is not the same all over the country; it is tough to compare housing in New York City, Houston and Portland. Therefore, I created my own regional housing index that only incorporates only homes sold in the Portland metropolitan area since 1970.[69]

IX. Analysis

This section will apply empirical statistical analysis to the rhetorical and hypothetical discussions produced earlier in this thesis. Much of the analysis will focus on estimating the "amenity effects" mentioned by Jaeger and the Oregon Supreme Court as well as many Oregonians wary of the potential Measure 37 claims in their neighborhood. The goal of this section is to show that the sale price—and therefore the revealed market demand—of a given property is influenced by many factors including those that are environmental and those that are societal based. In every regression, sale price is the dependent variable. All of the hypotheses presented in the methodology

[68] Netusil,Noelwah. "The Effect of Environmental Zoning and Amenities on Property Values: Portland, OR. Forthcoming in *Land Economics*. Pg 13.
[69] See Appendix 6 for a graph of the housing price trends for urban and rural land in the Portland Metropolitan area.

section remain the same because the effect on sales price should be mostly attributable to changes in land value. Sales price is a much better measure, however, because it represents changes in market demand, not an assessed (estimated) market value.

The belief that a Measure 37 claim can and does affect sales prices of neighboring properties is the overarching hypothesis entering this section. Some of this influence is caused by the elimination of "positive" amenities such as rivers, open space and low density housing due to new development in areas where it had previously been illegal. The rest of the effect is caused by the addition of "negative" amenities that produce byproducts such as traffic, noise and pollution. By now, it should be clear which variables are predicted to be positive and which are supposed to be negative.

In every regression, the variables that control for a property's general size attributes are displayed first and then the characteristics that help describe location are subsequently given. It is unlikely, for the most part, that Measure 37 claims will affect these attributes because the acts of claimants can neither create nor destroy these; the exception being the distance to a major road arterial. It is possible that a large roadway may need to be built in order to serve a new development. In this case, a given property may become nearer to an arterial and its externalities.

Lastly, the zoning variables are displayed. Again, they represent the effect that a percentage change in a given type of zoning has on sales prices. These are the variables most likely affected by Measure 37 claims since claimants are effectively asking for a zoning change that would legally allow more development or density.

Please note that the year dummy variables have been suppressed for reasons of brevity. They are present in every regression, however, because they put all monetary

amounts into current dollars.[70] Appendix 8 contains the unabridged version of every regression. Furthermore, note that the value of each coefficient is listed with its standard error. The asterisks mark the level of statistical significance that each variable takes. In practically every instance that two asterisks (**) occur, the p-value is effectively zero, meaning that these variables are most certainly *not* equal to zero and have an effect on the dependent variable. Variables with one asterisk (*) are still considered significant while those that have none may not, for reasons of probability, have an effect on the dependent variable.

Regression Set 1 is a linear estimation of different property amenities and attributes for both urban and rural properties. This linear specification means that for each unit change in the variables, the coefficient shows the direct monetary effect on sales price. The urban and rural properties were separated by regressing land-uses that respectively belong to either category. Land-uses, not zones, were used as the regressed properties because Measure 37 claims originate from a small portion of land-uses, namely residential, with the sole purpose to request that the zone be changed (or compensation paid). We want to know what the land is currently being used for in order to determine whether it is a likely Measure 37 candidate and if it is truly urban or rural. The "Urban" regression includes properties being used for single and multiple family residences whereas the "Rural" regression includes those being used for rural residential and commercial farm and forestry purposes. While not technically residences, there have been many claims issued for farm and forest properties.

For simplicity, the regressions will be shown and discussed in a fractional form.

[70] The Year Dummies are consistent with the hypothesis; they monotonically decrease going into the past to indicate that housing prices have been consistently rising.

REGRESSION SET 1

COEFFICIENT	(1) URBAN	(2) RURAL
area	1.349**	1.036**
	[0.012]	[0.015]
areaSQ	-0.000000217**	-0.000000151**
	[6.15e-09]	[3.29e-09]
bldgsqft	43.55**	5.077
	[0.15]	[3.34]
bldgsqftSQ	-0.000158**	0.00352**
	[0.00000091]	[0.00055]

These variables control for the size of the property and the structures that lay on it. The squared terms are meant to control for the diminishing marginal returns from adding extra square footage of land or structure to a property. While such additions may add a lot of value at first, eventually it adds less and less because at some point too much space becomes very cumbersome or expensive to maintain.

The addition of area is similar for both land types; an acre of urban use land adds roughly $59,000 to the sales price while in rural areas it is $45,000, everything else being equal (ceteris paribus). This makes sense because land nearer to the city center is usually worth more. Notice that there is a major difference in the addition of building square footage. In the rural areas, more building space usually means less space to farm, which is what the land is likely best suited for.

The following variables control for the effects that the location of the property places upon the sales price; they measure the effect of the distance from certain amenities. Note that the distances to CN and CG zones as well as the distances to parks and railroads have been omitted due to collinearly with other variables. Unfortunately,

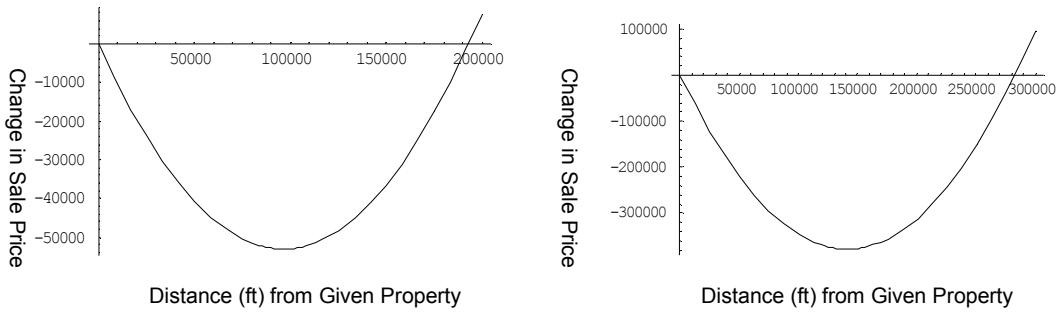
the RLIS Lite railroad data does not extend past the UGB, meaning that it was highly correlated with the distance to the UGB. This is a problem that results in coefficient misspecification. The effect exerted by parks can be seen in the POS variables while the effects of the commercial zones on sale price are present in variables CC through CO.

In every instance, those non-squared coefficients that have negative signs are actually "positive" amenities. As you move further away from these amenities, the sales price decreases. Conversely, those variables with positive signs are "negative" amenities.

The squared terms for each of these variables is added because in some cases, the effect of the amenity changes from positive to negative or vice versa at a certain distance. For instance, it may not be good to be located near a freeway, but being far away may be bad due to isolation from a high speed road network. This implies that there is an "optimal distance" from most amenities, especially if it is initially better to locate away from the amenity.

For every amenity, there is a graph which plots the dollar effect on the Y-axis, beginning at zero, as distance increases on the X-axis. At the point where the line crosses the X-axis is where the squared term has completely outweighed the linear term. Of course, the graph on the left represents the urban properties while the rural is on the right.

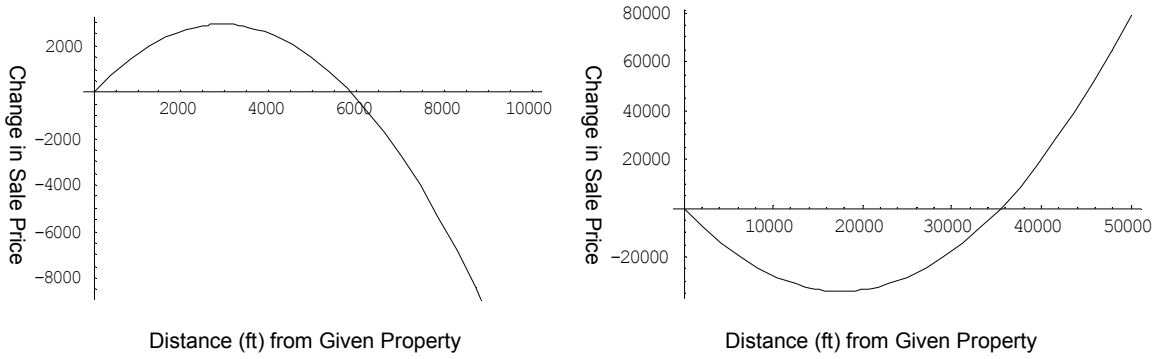
distdowntown	-1.101**	-5.344**
	[0.040]	[0.87]
disDTSQ	0.00000570**	0.0000189**
	[0.00000037]	[0.0000046]



In both cases, we see that being near a major downtown area is a "positive" amenity. It is likely, that the draw of shopping areas combined with employment creates a demand near the city. It is sort of curious that sales prices are higher for rural properties near the city. However, the effect of suburbanites desiring close access to employment probably outweighs those farmers wishing nothing to do with the city. For further proof of this, look at the freeway distance graph below.

Also, in both cases, there is a point (between 38 and 56 miles out) where being further from the city center is beneficial. At this point, the highest and best use for land is probably agriculture where the conflicting interests between urban and rural uses are non-existent. Furthermore, the people who live that far away probably want nothing to do with a large city.

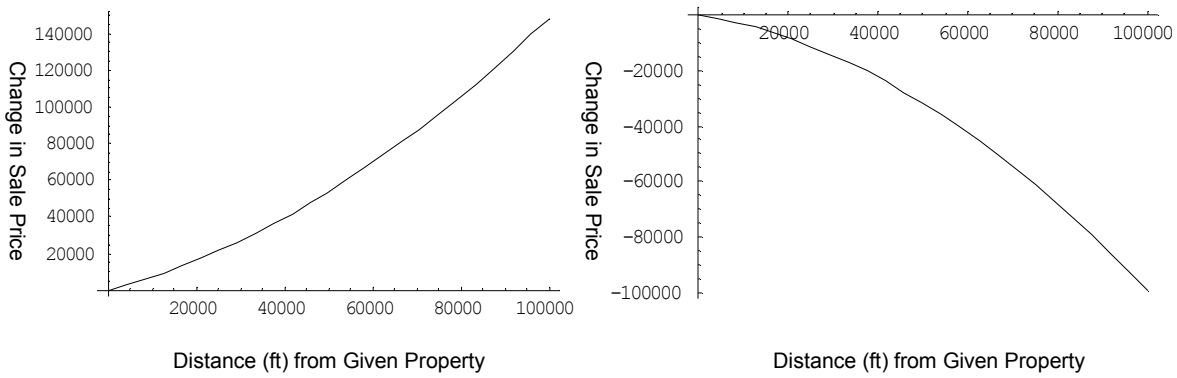
distfreeart	1.990** [0.20]	-3.861** [1.18]
disfreeartSQ	-0.000339** [0.000023]	0.000109* [0.000060]



Here, we notice that the distance to major roadways is a negative amenity for urban properties and a positive one for rural uses. In urban areas, there are many roads so it is easier to travel from place to place. Also, shopping and employment areas are more condensed. Therefore, being close to a major road is not in high demand; there is too much noise and pollution and it does not add much convenience. However, at about 1.13 miles the squared term takes over and it is no longer good to be further from a road due to isolation. In fact, the optimal estimated distance from a major roadway is about .60 miles where the amenity effect produces the largest positive influence on sale price.

On the other hand, it is best to be close to major roadways in rural areas. Again, this is probably because many people like moving to low density areas but desire a quick and convenient commute to urban areas. Otherwise, the benefits of living in a rural area may be lost. At about 6.6 miles, the squared term outweighs the linear and it becomes best to live further from major roads. At this point farmers, for instance, probably have little desire for quick road access and the externalities it creates.

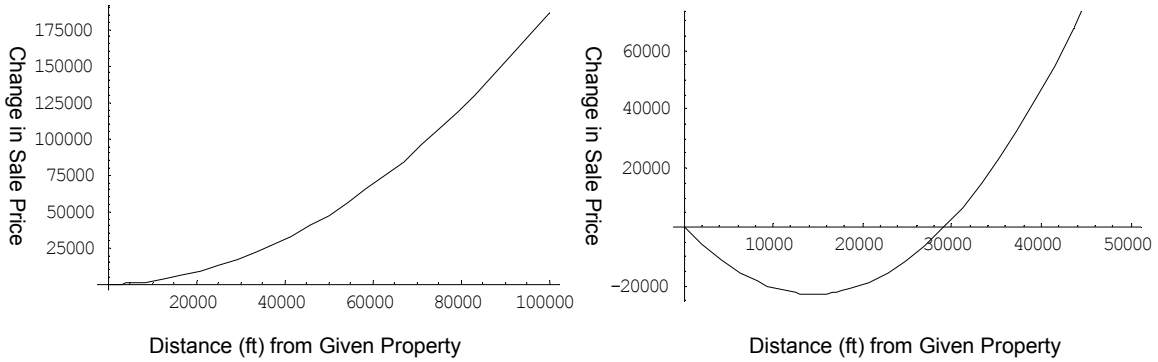
disthospital	0.659**	-0.278
	[0.074]	[0.68]
dishospitalSQ	0.00000825**	-0.00000716
	[0.0000020]	[0.0000089]



It appears that the distance to the nearest hospital produces different amenity effects for urban and rural properties. For urban properties, it is negative; it is best to live further away from hospitals. Like other negative amenities, this is probably a case of too much traffic and additionally, a reminder of illness. It is curious, however, why the squared term does not work in the opposite direction. Reasonably, one would expect that at a certain point, it would not be beneficial to live far from a hospital because response times would be slow and access limited. This fact works against my hypothesis where I stated that close access to limited emergency services on the city's fringe would be beneficial.

Conforming to my hypothesis is the positive effect hospitals have on rural properties. Again, I stated that there would be a demand for rural land near limited services, especially where road access may be poor. Unfortunately, these two variables are not statistically significant which indicates that there may be no effect at all. At the very least, it does not appear as if there are negative effects.

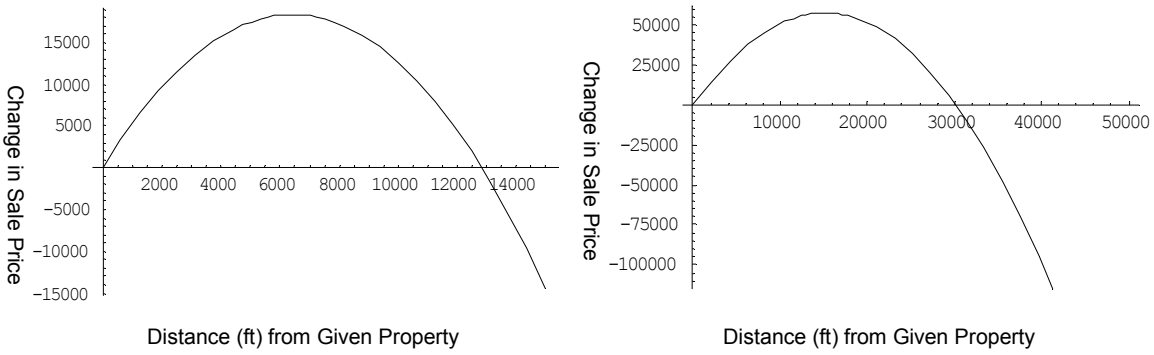
distrivers	0.0284 [0.091]	-3.123* [1.29]
disriversSQ	0.0000184** [0.0000033]	0.000107* [0.000059]



In the case of rural properties, the effect of river distances on sales price is positive and then eventually turns negative. It appears that it is best to either live right on the river or far away from it. In this case, there is a least optimal river distance (2.8 miles) for rural properties. It could be true that at this point, one does not receive river views yet has to deal with recreational traffic or noise from public areas. On the other hand, the river distance coefficient for urban properties in not significant meaning it probably does not affect sales price.

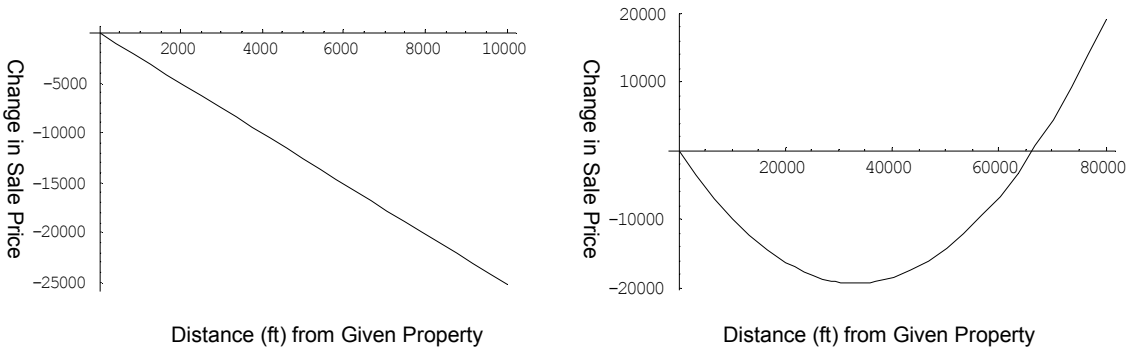
Therefore, I was correct in my hypothesis that there would be a positive effect. However, I was wrong about what types of properties would demand river access more. It appears that it is rural lands that derive the greatest benefits from rivers. Perhaps in urban areas, river pollution drives down some of the demand despite its relative rarity compared to rural areas.

distschools	5.719** [0.22]	7.589** [1.33]
disschoolsSQ	-0.000445** [0.000019]	-0.000251** [0.000048]



The effect of schools on sales prices is predictably negative to a point. Living close to a school is not good because of the extra noise and traffic. For urban properties, it is optimal to live about 1.2 miles from a school while it is roughly 3 miles for rural ones. I was wrong in assuming that rural areas would benefit more from schools; perhaps there is a higher premium placed on properties that are far away from any urban-type services that produce noise since this is what many people are trying to escape when they move away from the city.

distUGBdistance	-2.507**	-1.161*
	[0.16]	[0.55]
disUGBSQ	-0.00000137	0.0000175*
	[0.0000026]	[0.0000097]



For those properties that are of an urban nature, it is best to be located near the UGB if outside of it. These properties are closest to urban infrastructure and services yet enjoy the aspects of a rural area. Furthermore, land close to the UGB should be demanded by developers who may speculate that it will soon fall within the UGB and the realm of legal development. There is little chance that properties far away from the UGB, except via Measure 37 claims, will soon be developable.

While the same effect is initially true for rural lands, there is a positive squared effect that causes sales prices to begin increasing again at a certain distance. This suggests that there is a demand for urban services and potential development among rural properties. However, this demand dries up at a distance from the UGB because developers realize that there is little chance that this land will be given the same legal standing as urban land. At this point, the demand for a true rural setting away from potential urban-rural conflicts dominates.

elevation	107.1**	44.01**
	[1.35]	[7.95]
UGB	16610**	-48698**
	[2214]	[9396]

Here we see that elevation, which is a proxy for view, has a pretty high impact on the sales price. In the Portland urban area, elevated land around the city is rare and obviously commands a premium.[71] A 100 foot elevation increase adds $10,710 to the sales price, ceteris paribus. In rural areas, the premium is $4,400 per 100 feet. The effect is smaller here possibly because there is no city view.

[71] Note that elevation is not counted from the highest level in a multi-storied building; it is always a measure of feet above sea level from the ground.

The UGB variable measures the relative effect of being inside the UGB against the not being inside of it. Therefore, urban-type properties get a $16,600 premium from being within the boundary relative to being outside of it. This is due to the ability to develop these properties as well as partake in urban services not already controlled for such as utilities. In many cases it may not even be the sudden ability to develop but the sudden market demand for development. When a property is passes into the UGB, whether it was previously developable or not, demand increases because of its promised access to urban services. It is unclear how much of the UGB effect is attributable to the constriction of supply of developable land and how much is due to the access to urban amenities, however. Nonetheless, this is the effect that Measure 37 claimants hope to capture when they attempt to re-zone their property to a higher density and give it a designation that is usually reserved for the UGB.

Claimants of single family and multi family residences are correct to assume that their property value would be higher within the UGB. There is little doubt of that fact. While there may be a benefit for the individual landowner, however, there is a potentially larger cost on society of adding properties into the boundary due to the increased infrastructure and other costs of urban services.

Hypothetically, the UGB premium should decrease as more area is added into the boundary because the supply of developable land will increase. This is the "scarcity effect" discussed earlier. Unfortunately, this effect cannot be measured here because it would require the estimation of the intersection of many individual property supply and demand curves. It is economic theory on which we must rely for this belief.

The effect of the UGB on rural properties is much different. It is estimated that there is a $48,700 deduction when they move into the UGB. This is likely the effect of rural-urban conflicts that many farmers are worried Measure 37 will create. The highest and best uses of much of the farm and forest land outside of the UGB are probably agricultural ones. Before land use regulations were passed, the free market had already determined this. Therefore, by moving rural properties into the UGB, it may be hurting land value to place land that is better suited for agricultural uses under development or else land-use conflicts may result which will hurt farming efficiency and productivity.

Again, this measure does not take the "scarcity effect" into consideration. The effect of bringing rural land into the UGB will take away value due to reasons just discussed. However, if the zoning is changed from a rural designation to a higher density urban designation, the "scarcity effect" will likely overtake the $48,700 deduction and there will be a positive net effect. In fact, keeping everything else constant, if a rural property where moved into the UGB and its zone designation were changed to SFR or MFR, the net effect would be a sales price increase of about $65,000. This is a premium that many Measure 37 claimants wish to claim.

The fact that the distance to and inclusion in the UGB has a significant effect on sales prices demonstrates that land use policies can and do affect property values. This is also an indirect indication that Senate Bill 100 did manipulate property values among Portland metropolitan properties when it was passed in 1973. Had the land and housing market been free for the past few decades, there is no doubt that these premiums would not exist. Many claimants would contend that policies such as this only decrease property values. However, the regression results above indicate that this belief may not

be true. On average, all properties have lower values the furthest they are from the UGB. Claimants would likely point to the properties closer to the boundary and state that because they are worth more, their property must have decreased in value. This statement would be wrong; without a land use policy, the UGB premium would not exist and the landowner whose land is far from the now non-existent boundary would notice that his property is just as valuable as anyone else's. The huge supply of developable land would drive the price down. In this case, the "scarcity effect" is at work. Unfortunately, with the current data, we can only logically notice this effect; it cannot be empirically estimated here.

The next set of variables control solely for the differences in sales price among the various types of land uses. In each of the regressions in the analysis section, land use is used to discern the types of properties regressed because I wish to find the effect on established properties that are being used for their highest legal use. In other words, I wish to eliminate those cases where the regressed properties are vacant although the zone allows a differing use. Therefore, the variables with "LU" indicate land use.

In the urban regression, the given value for the LUMFR dummy is relative to the LUSFR dummy and in the rural regression, the dummies are relative to rural residential properties. LUMFR properties are worth more than other urban land uses because these properties are allowed higher density development and they are also more likely located on centrally located land. LUAGR properties are worth more than LURUR properties; farmland should be worth more because the soil is rich and productive. Rural residential land is not worth much, as urban economics has taught us, because it is not centrally

located. LUFOR properties are worth less likely because there is no legal development potential and the soil and slope are not suitable for farming.

LUMFRdummy	29455** [2527]	
LUAGRdummy		16427** [5928]
LUFORdummy		-32087** [6373]

The following variables represent the effect of a percentage change in various types of zoning within a quarter mile radius of a given property. These are the variables that have the "QUART" suffix. The variables that contain "DN" are "donuts" that measure the effect of a percentage zoning change between a quarter mile and a full mile radius from a given property. Please refer to TABLE 2 in the Data section for complete definitions of the zones mentioned below. Note that the effects of some types of zoning with multiple ranks such as MFR have been merged together to prevent co-linearity and correlation among similar zones.

Percent**SFR**not123Quart	-487.1** [21.6]	1760** [404]
PercentDN**SFR**not123	-213.3** [35.2]	-1741* [844]
Percent**MFR**Quart	-528.1** [25.8]	-474.7 [511]
PercentDN**MFR**	-1570** [43.6]	-3802* [1723]
Percent**MUR**Quart	-628.8** [25.7]	2982** [1054]
PercentDN**MUR**	-336.4** [40.9]	12990** [2954]
Percent**INDUST**Quart	-740.5**	-1476

	[34.2]	[1027]
PercentDN**INDUST**	-20.55	1262
	[42.1]	[1220]
Percent**CC**Quart	-538.4**	204374
	[84.8]	[198906]
PercentDN**CC**	-616.4**	20013*
	[142]	[12055]
Percent**CG**Quart	-750.5**	1185
	[44.9]	[1466]
PercentDN**CG**	721.3**	5157*
	[73.4]	[2618]
Percent**CN**Quart	-943.5**	35864**
	[120]	[12395]
PercentDN**CN**	553.8**	6353
	[166]	[25700]
Percent**CO**Quart	-110.3	-48472*
	[128]	[23889]
PercentDN**CO**	2694**	-14398
	[260]	[9718]
Percent**FF**Quart	-1006**	-228.1
	[31.4]	[295]
PercentDN**FF**	95.64*	-1088
	[39.2]	[752]
Percent**MUE**Quart	-586.7**	858.7
	[39.8]	[2995]
PercentDN**MUE**	174.2**	-6057**
	[51.9]	[1950]
Percent**PF**Quart	-982.1**	-2599
	[46.7]	[1743]
PercentDN**PF**	-914.2**	1353
	[78.6]	[2133]
Percent**POS**Quart	-428.7**	2824**
	[36.1]	[827]
PercentDN**POS**	-543.5**	-4936**
	[49.4]	[1308]
Percent**RRFU**Quart	-1498**	-860.9**
	[28.5]	[281]
PercentDN**RRFU**	285.4**	-879.5

	[40.4]	[758]
Constant	223897**	688129**
	[3859]	[73137]
Observations	168123	6611
R-squared	0.67	0.65

These results conform quite well to stated hypotheses. It is important to note that for both regressions, these values represent the effect on sales price *relative* to one percentage of SFR1, SFR2 and SFR3 which are the lowest density of residential properties. This makes for a nice estimate; these variables are effectively describing the hypothetical situation in which a percentage of area within a quarter mile radius of a given property (about 54,700 square feet or 1.25 acres) is suddenly converted from low density residential zoning to each of the zoning types listed in the regressions. Furthermore, the donut variables describe the situation in which a percentage of the area between a quarter and a full mile radius has a zoning change. This represents approximately 820,000 square feet or 19 acres.

We must be careful when interpreting these results. Due to the difference in size between the quarter mile radius and the donut areas, similar coefficients do not have the same magnitude of effect on sales price. For example, assume that the coefficient for both the quarter mile and donut variable is $500 and the change in zoning is 40 acres. The effect on every property within the quarter mile would be $16,000 while it would only be $1,050 for every property in the donut. This difference will become clear in the case study below.

Economic theory would tell us that for the most part, a switch in zoning from SFR 1, 2 and 3 to most other types of zoning would constitute a decrease in value for neighboring properties. Denser allowable uses of land permit the possibility of more

development or commercial areas in one's own backyard or neighborhood. In other words, they have the potential to create many negative externalities which will cause neighboring sales prices to fall. In fact, this is the precise effect that these regressions are displaying.

Some greatest negative effects on urban properties are increased percentages of multi-family residential as well as mixed use commercial and residential districts. This is true for both the quarter mile and donut distances. These types of zones allow quite a lot of density in the form of many housing units per square acre and multiple storied buildings. It is not hard to imagine the types of externalities that are inherent with living near these types of properties. They could include loss of positive environmental amenities or increased noise and traffic. There could also be negative effects due to an aversion to lower socio-economic classes. Notice, for instance, that higher density single family residences have a lesser impact on sale prices.

Relative to SFR 1, 2, and 3 properties, higher density single family residences command a negative effect. Notice that the effect on properties within a quarter mile of the zoning change is much higher than the effect on lands further away. This is quite expected; the negative externalities associated with higher density zoning should have a larger tangible impact on those properties closest to zone change. The effect of multi-family residential properties on urban land is also quite largely negative due to the high density externalities. While it might seem that the effect is larger for properties in the donut area than the quarter mile area, this is not the case. A ten acre increase in MFR zoning in the quarter mile area decreases every sales price by $4,200 while the same increase only deducts $826 in the donut area. This estimate confirms perfectly to the

stated hypothesis; not only does high density zoning cause decreases in value, but the effects are much larger for the closest properties.

Industrial districts (here light and heavy industries are combined) have distinctly negative effects on urban properties. The negative effect is very large in the quarter mile area; no one wants a noisy and possibly polluting industry to suddenly appear next door. On the other hand, the effect on donut properties is quite miniscule although negative nonetheless. This relative indifference to living within a near but not too near an industrial area could be due in part to the new belief that it is trendy to live near industrial warehouse districts. Consider the Pearl District in Northeast Portland.

The effect of commercial districts on urban properties is very interesting. Any type of commercial district within a quarter mile of urban land commands a negative effect on sales price. This is very reasonable; no one wants a commercial district nearby due to excess amounts of traffic and noise. Relatively speaking, the commercial district that provides the lowest negative externalities compared to low density residential zoning is the Office Commercial zone. This is intuitive; the CO zone is described as a buffer between residential and heavy commercial districts that contains many community business establishments. These types of properties could provide many convenient, low impact services with lower externalities. Other commercial zones have greater negative effects within the quarter mile area; surprisingly, the General Commercial zone has a smaller negative effect than the Neighborhood Commercial zone which is contradictory to my hypothesis.

The results become exciting when the effect of commercial districts within the donut area is considered. For every commercial zone, the effect becomes systematically

positive when the zoning change occurs further away than a quarter mile. The largest positive effect is a $2,694 premium attached to Office Commercial properties. Again, this makes sense; it could be quite valuable to have community business establishments nearby for the convenience.

Due to the coefficients on the commercial properties, we can see that there exists an optimal distance that one should live from such districts. This distance lies somewhere beyond a quarter mile, where noise and traffic are likely not going to reach. Empirically speaking, suppose that a ten acre shopping area zoned General Commercial (CG) made up of "large format retailers" (such as Costco or Office Depot) moved near a neighborhood. Those residential properties with an quarter mile would lose $6,000 each while those properties in the donut area would gain $380 each. Again, this makes perfect intuitive sense.

See Table 5 for a complete estimation of the effects that the various zones have on urban land. Every value listed in the table is the direct cost or benefit that every property within the given area receives.

TABLE 5: Monetary Influence of Selected Zones on Urban Properties

Effect ($) of Ten Acre Increase of Zoning on Urban Land		
Zone	Quarter Mile	Quarter to Full Mile Donut
High Density Residential	-3,825*	-112*
Multi-Family Residential	-4,225*	-826*
Central Commercial	-4,307*	-324*
General Commercial	-6,004*	380*
Neighborhood Commercial	-7,548*	291*
Office Commercial	-882	1,418*
Agriculture	-8,049*	50*

*-Statistically Significant

Rural residential and agriculture properties (RRFU and FF, respectively) have negative effects relative to low density residential when they are located within a quarter mile. This could be because they are a signal that the given property may be out of the UGB and urban services are far away. Consider that commercial properties take less off of the sales price. It seems convincing that proximity to urban services is a significant positive amenity. This logic is further verified when we consider that there are positive effects on properties when rural land is in the donut area. People obviously value open, low density spaces. However, if these spaces are in the donut area, it is a sign that a given property is getting the best of both worlds: urban services and seldom developed open space.

Finally, we see that public spaces and land have negative effects. Public Facilities (PF) exert an effect that is quite large, and understandably so; it includes properties such as prisons. Properties designated Parks and Open Space (POS) are also negative. For both PF and POS zones, the effect is resoundingly negative both in the quarter mile and donut areas. While I hypothesized that parks would be a positive influence, it appears that I was wrong. The effect of the traffic as well as the likely homeless appears to not prove beneficial. In a city such as Portland, with many parks, one will never live very far from one anyway.

The effect of zoning on rural properties is a little different. While all of the urban coefficients are statistically significant, many of the rural coefficients are not. There could be two reasons for this phenomenon: first, rural landowners on average could be less picky regarding the types of land uses surrounding them. This is entirely reasonable to believe since rural properties are much larger and the externalities associated with

zoning changes may be less pronounced. However, based on the uproar that some claims have caused among farming communities, this explanation cannot be the only one. Second, it could be due to a lack of rural observations containing zoning data on high density properties. Due to Senate Bill 100, high density and commercial zones are hard to find outside of urban growth boundaries. Also, since these properties are so large, neighboring properties may not have been counted in the zoning data because their geographic center is greater than a mile away. Therefore, many of the true effects of zoning changes on rural properties may not be seen until more Measure 37 claims are validated.

Relative to low density SFR properties, higher density SFR properties within a quarter mile produce positive effects but the influence turns negative when we move into the donut area. This arrangement seems confusing: why would a 10 acre increase in high density SFR land produce a $14,000 premium if located nearby and subsequently decrease values by $916 if further away? This effect is possibly driven by the effect the UGB has on sales prices. Rural lands with a lot of high density zones nearby are more likely located near the UGB, a positive amenity for surrounding properties. Rural residential properties, which are bound to have the lowest rural-urban conflicts and are the best candidates for future high density development, are probably driving these results.

MFR zoned properties produce an understandable effect. For both distances, the effect is negative although it is not significant for the quarter mile distance. However, the MUR properties are estimated to have a curious positive influence. The fact that a

commercial and residential complex near a rural area would produce a positive effect does not seem to follow intuition.

The effect that commercial zones place on rural properties varies among the types of zone. Central Commercial (CC) zones add a very large premium to rural properties. Again, this is probably due to having the best of both worlds: low density housing near employment and business districts. For every ten acres increase in CC zoning in the donut area, there is a premium of $10,500. An increase in the quarter mile area would command a premium of hundreds of thousands of dollars, but it is not statistically significant. These properties are likely owned by only the richest Portland suburbanites. Similarly, the Neighborhood Commercial (CN) zones add a huge positive premium on rural property. A ten acre increase of this zoning in the quarter mile area adds $287,000. The magnitude of this effect is doubtful, however, and is probably driven by outliers although it indicates the positive effect of having a commercial district that is normally rare in rural areas nearby.

Conversely, the effect of Office Commercial (CO) properties is quite negative and significant for the quarter mile area. A ten acre increase in CO zoning relative to low density SFR zoning results in a $388,000 deduction for every property. This result is curious; it is probably driven by outliers and a small number of observations.

See Table 6 for a complete estimation of the effects that the various zones have on urban land. Every value listed in the table is the direct cost or benefit that every property within the given area receives.

TABLE 6: Monetary Influence of Selected Zones on Rural Properties

Effect ($) of Ten Acre Increase of Zoning on Rural Land		
Zone	Quarter Mile	Quarter to Full Mile Donut
High Density Residential	14,081*	-916*
Multi-Family Residential	-3,797	-2,001*
Central Commercial	1,634,984	10,533*
General Commercial	9,472	2,714*
Neighborhood Commercial	286,904*	3,343
Office Commercial	-387,768*	-7,577
Agriculture	-1,824	-572

*-Statistically Significant

When I hypothesized that high density zones would have a significant effect on rural property values, I wrongly assumed that the data would contain a lot of instances where there are high density properties near rural areas. However, with only 8,026 observations in this regression and the simple fact that this type of arrangement is not likely to happen often due to previous limits on rural development, these results are probably driven by a few remaining outliers. Perhaps having these properties within a one mile radius, which could be a signal for nearby urban services, is rare in rural areas and does provide a positive effect. Since a mile radius accounts for a lot of area, these benefits could be coming by way of little externality. It is very likely that if the size of the radius were reduced, the positive effects would diminish and even turn negative as the true effect on bordering properties is estimated.

Parks and Open Space (POS) zoning produces an opposite effects depending on the distance. Having parks nearby produces a positive influence on sales prices. Unlike urban land, parks are recreational areas are much sparser in rural areas. On the other hand, this type of zoning becomes a negative amenity when placed further than a quarter mile away. In fact, a ten acre increase at this distance results in a $2,600 decrease in

sales price. It is possible that at this distance, properties receive negative externalities such as excess traffic yet are too far away to enjoy the scenery.

Another curious result lies in the negative or statistically insignificant estimation of increased forest and rural residential (FF and RRFU) zoned lands near rural areas. It might seem intuitive that it would be best if rural properties were near each other. Again, this effect is relative to low density residential zoning. Similar to the increased amount of high density SFR and MUR zones within the mile radius, fewer rural zones could be a proxy to indicate a given property is near the UGB. At this location, the sale price should jump relative to similar properties because of the potential for development. Remember that the effect of moving inside the UGB is very negative only when the rural zoning remains attached to the property. While urban services would be available, development remain illegal. Only when a given rural property is given an urban zone designation and moved within the UGB does its value significantly increase. This logic points to the fact there are lucrative benefits from being near the UGB and this is likely the effect that is being measured in the rural regression.

When empiricists believe that there are significant outliers remaining in the data or that it is not normally distributed, they sometimes produce regressions using a log-linear specification. Due to the nature of the rural results, Regression Set 2 was produced with this specification. The same regressions shown above, except with the dependent variable taken to the natural log, are given in Appendix 9. Unfortunately, after running tests for skew-ness due to outliers in the data, this specification did not seem to eliminate the problem.

The log-linear specification reports the coefficients as partial elasticities. This means that we are shown the percentage growth effect that a unit change in the explanatory variables has on the dependent variable. Therefore, if you multiply the coefficients by 100 you find the percentage change in sales price.[72]

These regressions do not vary significantly from the earlier linear model. For the most part, the signs stay the same, especially in the urban regression. The magnitude of the effects also appears reasonably similar.

X. Case Study

The regression results discussed above can be utilized in many useful ways. It has been shown that the "amenity effect" exists and in some instances is quite largely positive or negative depending on the amenity in question. This analysis should have particular consequences for anyone interested in those factors that affect housing prices in aggregate. However, the following case study should give readers, especially Oregonians, an illustrative view of the estimated effects a single Measure 37 claim will have on the surrounding community.

The property used for this case study is located just outside of Portland's UGB in Clackamas County. It is currently zoned for farm use (FF) so it is not developable and has no guaranteed connection to urban infrastructure such as roads. The owner wishes to divide this property, which is 53 total acres, into many one or two acre low density residential lots. Since this subdivision is illegal under current zoning laws and the owner acquired the land in 1977 before many land use regulations were implemented, the owner

[72] The dummy variables are interpreted in a slightly different way; you must take the antilog (to base e) of the coefficient, subtract 1 from it and then multiply it by 100 to find the partial-elasticity. The result does not vary greatly from the displayed coefficient.

has decided to submit a claim for $11.6 million with the State of Oregon. The only basis for this monetary request lies in the fact that a developer recently offered the owner roughly the same amount of money to purchase the property.[73]

FIGURE 1 displays the property in question. The dot at the center of the smallest blue circle represents the center-most point of the property. The boundary of the smallest blue circle is a quarter mile from this point, while the boundary of the larger circle is a full mile from the point. The red line is the UGB which noticeably separates the rural land from the urban. Noting the number of points representing properties on the right-side of the line, it is obvious that this area is quite dense and thereby urban.

FIGURE 1: Case Study

Using the same results from the regressions above, we can estimate the total effect a zoning change will have on those properties within the two circles. TABLE 7 displays

[73] Martin. Pg. 9.

the aggregate effect that this claim, as well as other possible land uses, will have on the neighboring community.

TABLE 7: Aggregate Effect ($) Selected Zoning Changes will Exert on Community

Zoning Change	Total Effect on Quarter Mile Area	Total Effect on Donut Area	Total Community Effect
Low Density Residential	1,109,014	-440,012	669,002
High Density Residential	358,619	-1,538,871	-1,180,252
Multi-Family Residential	-823,594	-8,266,862	-9,090,456
General Commercial	-827,351	4,729,640	3,902,289

The table indicates that the proposed claim, which changes the zoning from farm to low density Single Family Residential, actually has a positive effect on the community. This is not entirely unexpected; the neighboring properties will not be subjected to a large increase in noise and traffic. Furthermore, much of the positive effect is attributable to increases in rural sales prices because it now appears as if they are closer to the UGB.

If the claimant were to request the ability to change the zoning to higher density residential, which is entirely possible because of the long span of ownership, the total spillover on the community would be negative. This is expected because of the increased noise and traffic that these developments would bring. While this claimant is not threatening to develop high density lots, the threat of other claimants doing it is real and the effect would be a multi-million dollar loss for the community.

Finally, it appears that a commercial site in this area would provide a beneficial effect. This is due to the convenience that many people would gain due to such a

development being further than a quarter mile away. For those properties next to such a zone change, the sale price will decrease by $31,800.

Many readers may wonder why the claim should not be immediately allowed because the largest negative effects estimated here do not match the estimated damages that regulations had on the property in the first place. However, note the "scarcity effect" argument whereby it was mentioned that developers would not have asked this claimant for his property for such a high price if no regulations had been in effect for the past thirty years. Due to current regulation, the claimant's land is scarce which is artificially driving up its price.

Furthermore, note that there are un-estimated "amenity effects" that also accrue because there is a zoning change. The estimates in TABLE 7 do not take into consideration the monetary effect that adding more people to the school district, increasing emergency services, building a larger road and extending sewage and electrical lines will have on the community. All of these factors would result in a further deduction from sales prices which would make any claim validation even worse for the community than estimated.

XI. Empirical Conclusion

The results of the previous section strongly suggest that there is a distinct "amenity effect" associated with housing in the Portland Metropolitan area. As hypothesized, such amenities as roads, schools and zoning have large influences upon sales prices. Furthermore, there is a dichotomy in many cases between those amenities that are valuable to urban land and those that are valuable to rural land.

Oregonians must understand that some measurable amenities such as the urban growth boundary and the distance to certain types of zoning have positive effects on sales prices. Other types of amenities such as the distance to freeways and certain high density zoning have negative effects on sales prices. Many of the positive amenities are promoted by land use regulations while many of the negative ones are abated by regulation; land use regulations do not have an unambiguous negative effect on sales prices.

The previous analysis strongly indicates that changing the land use structure in Oregon causes many unintended or hidden externalities. A successful claim that simply changes the development potential of a piece of land can cause a loss of tens of thousands of dollars to neighboring properties. This does not even consider the further loss associated with the actual development of the land and the roads near it.

The empirical and theoretical conclusions of this thesis point to the fact that suddenly allowing some Oregonians to strip away the past thirty years of regulations will have unintended monetary effects on their neighbors and cause market effects upon themselves. In many cases, these monetary effects are negative while the market effects are positive. If the market effects could be reliably estimated here, we would likely find that the community loses more than the individual gains from Measure 37 in many cases.

Therefore, those who advocate Measure 37 are advocating for a redistribution of property values without public input. This same argument was used to criticize Senate Bill 100. Senate Bill 100, however, was a complete land use framework that provided subsidies and community-wide regulations that mitigated much of the negative effects

that some legally un-developable lands faced. Measure 37 is neither a framework, nor does it fairly relieve landowners from decades of perceived losses from regulation.

PART 3: THE FUTURE OF MEASURE 37

XII. CONTINUING CONFUSION

Proponents have interpreted the passage of Measure 37 as a call to end virtually all land-use planning in Oregon. However, opponents have cited recent polls which state that 60 to 70 percent of Oregonians want to keep community and land protections or make them even stronger.[74] How can such contradictory beliefs of Oregonians be reconciled? Perhaps this indicates that Oregonians are ready for a change in planning systems, yet Measure 37 is not quite the change they anticipated. This could explain the constant legal and neighborly battles surrounding Measure 37 claims today.

Currently, there are hundreds of Measure 37 claims in almost every county in Oregon. Demands for compensation range from a couple of thousand dollars to 60 million dollars. Claims range from the lost benefit from cutting down some trees to the lost revenue a golf resort could potentially make if it were built. Recently, Measure 37 was deemed unconstitutional in the Marion County Circuit Court. Among other reasons, the judge ruled that the measure creates a "special class of citizens." Namely, those families owned pieces of land both before and after most land-use regulations were enacted in 1973 are effectively entitled to compensation or completely unregulated use of their land while newer landowners are not. Also at stake was the issue of whether a land-use regulation could ever be enacted in Oregon ever again given the fact that everyone it

[74] Stacey, Bob. "Transferable Development credits should be used as Compensation under Measure 37." *The Oregonian*, February, 20 2005.

affects will be eligible for a claim. In other words, Measure 37 requires the government to pay to govern.

As of February 21, 2006 the Oregon Supreme Court overturned the trial court's ruling and deemed Measure 37 constitutional. After months of suspension due to the lower court's ruling, the claim process was allowed to continue once again. The Oregon Supreme Court ruled, in part, that precedent has been set in earlier cases where certain citizens cannot bring themselves within certain legally favored closed classes such as Vietnam veterans. More importantly, it was ruled that "In Oregon, the Legislative Assembly and the people, acting through initiative or referendum processes, share in exercising legislative power."[75] This highlights the fact that Oregon voters, through a simple majority, can vote a law into the state constitution which must be obeyed as long as it does not violate any other piece of the constitution.

The legality of whether Measure 37 can remain on the books has been cleared up yet the debate over its functionality and fairness rages on. The justices wrote, "Whether Measure 37 as a policy choice is wise or foolish, farsighted or blind, is beyond this court's purview,"[76] obviously alluding their understanding of the controversy that surrounds the initiative. Further debate will likely center upon the arguments laid out in this thesis. An added point of contention surrounds the ability of claimants to pass along development rights when they sell their land, thereby allowing someone else to benefit from the earnings potential of the land. The landowner is compensated through a higher selling price of his land. However, when a land-use regulation is waived by way of a Measure 37 claim, it is waived for the current landowner only because it is he who

[75] Oregon Judicial Department Appellate Court Opinions. (CC No. 05C10444; SC S52875). Found at: http://www.publications.ojd.state.or.us/S52875.htm. Filed February 21, 2006.
[76] Ibid.

claimed that his right to use the land has been compromised, not the developer. Currently, it is claimant who must also pose as the developer.

Measure 37 is a policy issue that will be relevant to every Oregonian who has a stake in the state's future. Some people will welcome the freedom to use their property as they see fit. Others will be dismayed by the outcropping of new development. Oregon will no longer be nationally-renowned for its meticulous city planning. Some citizen's land will gain value while others will lose out. Nevertheless, it is likely that Oregon voters will see a modification to or elimination of parts of Measure 37 on the November 2006 ballot. Even voters in other states, such as Washington, have been promised to see similar initiatives in the future by property rights lobbyists. The only point that cannot be debated is the fact that the effects of Measure 37 will be felt long into the future.

PART 4: APPENDICES

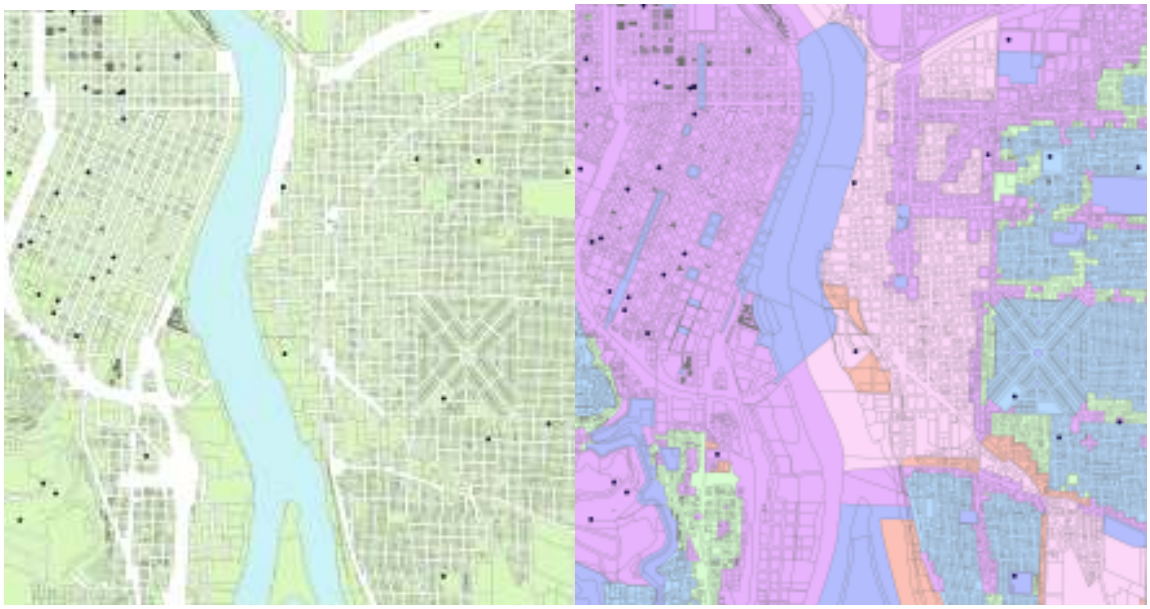
XIII. APPENDIX 1

RLIS Lite data take the form of Geographic Information Systems (GIS) data. Unlike spreadsheet data that take on purely numerical properties, GIS data contain spatial properties which allow it to be viewed as if on a map. By utilizing common desktop mapping software, the user can see how the various data elements fit together by layering them on top of each other. For instance, the user can take the data for roads and layer it on top of the data for rivers thereby producing their own map which displays Portland's roads in relation to its rivers. Therefore, instead of having one database listing roads and one database listing rivers without a noticeable relationship between the two, the user can visually see where the roads and rivers intersect. Each of the attributes listed above contain this sort of spatial information. Figures 2 and 3 display examples of various RLIS Lite data mapped onto the same portion of Portland using software called ArcMap. This program is very versatile; it allows users to add or subtract data from the map in order to see only what they are interested in, while also selecting the order in which these data files are mapped (or layered) upon each other. ArcMap facilitates the creation of user-defined and manipulated virtual maps.

FIGURE 2: Property Layer[77] **FIGURE 3: Zoning Layer**[78]

[77] Figure 2 displays parts of east and west Portland, which are separated by the Willamette River in blue. Every green polygon represents a property. The white areas are roads while the dark points are schools. This is an example of the visual and spatial properties of the RLIS Lite dataset.

[78] Figure 3 displays the same area of Portland as Figure 2. This time, zoning is the focus of this map. Properties are represented by the grey polygons. The light blue area represents single family residences, pink is industrial, purple is a commercial and residential mixture and dark blue is parks and open space.



Having data in a spatial form is very powerful for analytical purposes. Mapping software contains many mathematical algorithms which allow the user to find the distance between points or calculate areas, for example. Users can also use the software to merge various data, which lie on top of one another, together into a single dataset. Property data can be merged with zoning data as well as elevation data to produce a database suitable for the user's goals. The usefulness of this procedure is obvious; the user can quickly generate a database of properties with their corresponding zoning and elevation attributes. Furthermore, relationships are readily apparent. The user can quickly see where all of the "heavy industrial" properties in the dataset are located in relation to rivers, roads and single family residences. One can quickly infer how many professionals including economists, city planners and environmentalists among others find these data invaluable.

XIV. APPENDIX 2[79]

```
. sum if saledate>=197001 & landval>=10000 & saleprice>0 & area>=500 &
accountedarea>=61307803 & accountedarea<=113857350 & sphatFinalR
> ESRatio>=.13 & sphatFinalRESRatio<=2.26

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
  fid_export |    243549    56885.01    34542.03         0     156473
        area |    243549    27862.41    137261.3   509.489    6397417
        tlid |         0
         rno |         0
   ownersort |         0
-------------+--------------------------------------------------------
      owner1 |         0
      owner2 |         0
      owner3 |         0
   owneraddr |         0
   ownercity |         0
-------------+--------------------------------------------------------
    ownerzip |         0
   sitestrno |    243549    8827.169    8377.012         0      90184
    siteaddr |         0
    sitecity |         0
     landval |    243549    108707.7    98402.46     10000   1.32e+07
-------------+--------------------------------------------------------
     bldgval |    243549    157587.6    268271.2         0   5.04e+07
    totalval |    243549    266322.8    327926.3     10000   5.19e+07
    bldgsqft |    243549    1949.495    2905.372         0     289168
   a_t_acres |    243549     .470286    5.941891         0       2500
   yearbuilt |    243549    1865.829     446.328         0       2030
-------------+--------------------------------------------------------
   prop_code |         0
     landuse |         0
     taxcode |         0
    saledate |    243540    199906.5     547.659    197009     202509
   saleprice |    243549    201059.1    177364.1       390   1.15e+07
-------------+--------------------------------------------------------
      county |         0
     x_coord |    243549     7643747    45798.32   7480152    7881360
     y_coord |    243549    662042.4    29179.18    479032     776799
           x |    243549     7643747    45798.43   7480154    7881361
           y |    243549    108962.8    251488.1         0   776985.2
-------------+--------------------------------------------------------
  fid_zoning |    243549    10571.46    5283.752         1      18859
      area_1 |    243549    2.31e+08    2.58e+09   1975.051   3.77e+10
     city_no |    243549    556.6111     410.556         5       1245
        city |         0
        zone |         0
-------------+--------------------------------------------------------
  zone_class |         0
  zonegen_cl |         0
    describe |         0
           X |    243549     7643747    45798.32   7480152    7881360
```

[79] Those variables that are coded in text format are displayed as a single zero.

Y	243549	662042.4	29179.18	479032	776799
resdummy	234684	1	0	1	1
zone1count~l	243549	7.463857	30.79248	0	226
zone1newar~n	243549	227570.1	828904.5	0	7813642
zone2count~l	243549	26.75145	54.6434	0	368
zone2newar~n	243549	1058345	1985438	0	1.39e+07
zone3count~l	243549	2.737334	6.848936	0	47
zone3newar~n	243549	142517.8	720515.4	0	1.14e+07
zone4count~l	243549	3.71329	10.38144	0	90
zone4newar~n	243549	160730.1	497534	0	8622538
zone5count~l	243549	18.46732	41.62763	0	495
zone5newar~n	243549	8720456	1.81e+07	0	1.13e+08
zone6count~l	243549	4.889977	20.23693	0	323
zone6newar~n	243549	716768.2	2392868	0	3.13e+07
zone7count~l	243549	28.85511	56.51019	0	475
zone7newar~n	243549	2594351	4755724	0	7.20e+07
zone8count~l	243549	23.58349	80.71974	0	631
zone8newar~n	243549	436721.2	1279403	0	8715404
zone9count~l	243549	120.6776	269.6661	0	1976
zone9newar~n	243549	1249013	2495901	0	3.23e+07
zone10coun~l	243549	73.93641	142.193	0	831
zone10newa~n	243549	1130941	1912331	0	1.14e+07
zone11coun~l	243549	144.1703	286.2856	0	1689
zone11newa~n	243549	1536735	2890062	0	1.99e+07
zone12coun~l	243549	4.788449	29.17704	0	422
zone12newa~n	243549	187538.2	1137362	0	1.54e+07
zone13coun~l	243549	.1023121	1.132581	0	17
zone13newa~n	243549	2672.034	26825.19	0	393054.8
zone14coun~l	243549	66.83528	150.9801	0	1167
zone14newa~n	243549	622516.7	1265623	0	7273134
zone15coun~l	243549	17.16552	33.55596	0	289
zone15newa~n	243549	1660616	3723012	0	5.09e+07
zone16coun~l	243549	1.667894	14.31759	0	216
zone16newa~n	243549	84729.28	622255.7	0	7090447
zone17coun~l	243549	27.95566	240.8846	0	8416
zone17newa~n	243549	278492.3	1298543	0	2.21e+07
zone18coun~l	243549	81.06785	196.9272	0	1107
zone18newa~n	243549	856591.9	2028264	0	1.38e+07
zone19coun~l	243549	3.319681	16.36024	0	156
zone19newa~n	243549	78735.83	334238	0	2647435
zone20coun~l	243549	34.80341	102.639	0	895
zone20newa~n	243549	664009.7	1656677	0	1.41e+07
zone21coun~l	243549	51.15259	105.6757	0	666
zone21newa~n	243549	882250.7	1585941	0	1.71e+07
zone22coun~l	243549	3.589931	15.95573	0	161
zone22newa~n	243549	197213.4	797342.1	0	9930635
zone23coun~l	243549	31.40146	93.21279	0	581

zone23newa~n	243549	662122.2	1848216	0	1.14e+07
zone24coun~l	243549	37.31871	127.6472	0	1523
zone24newa~n	243549	774621.6	1809900	0	1.69e+07
zone25coun~l	243549	33.54281	84.531	0	725
zone25newa~n	243549	358132.6	997361.2	0	1.42e+07
zone26coun~l	243549	3.49278	8.590918	0	81
zone26newa~n	243549	786053.2	1910493	0	1.52e+07
zone27coun~l	243549	12.8661	27.92395	0	295
zone27newa~n	243549	2596951	4809339	0	5.49e+07
zone28coun~l	243549	49.98727	122.3736	0	1266
zone28newa~n	243549	4992637	1.05e+07	0	8.21e+07
zone29coun~l	243549	6.520905	42.06011	0	518
zone29newa~n	243549	213102.9	1394911	0	2.35e+07
zone30coun~l	243549	26.33167	92.54264	0	837
zone30newa~n	243549	273445	841003.5	0	7094959
zone31coun~l	243549	6.496167	46.03036	0	491
zone31newa~n	243549	107503.4	756388.5	0	9567984
zone32coun~l	243549	34.41991	122.7899	0	1292
zone32newa~n	243549	450339.5	1468233	0	1.42e+07
zone33coun~l	243549	177.2126	512.3896	0	3682
zone33newa~n	243549	1024203	2849035	0	2.11e+07
zone34coun~l	243549	24.50969	99.56983	0	796
zone34newa~n	243549	241843.7	1002799	0	8295679
zone35coun~l	243549	1.745817	24.24052	0	382
zone35newa~n	243549	32103.33	438866.4	0	7766547
zone36coun~l	243549	43.5292	133.0325	0	1388
zone36newa~n	243549	1325194	3930478	0	3.26e+07
zone37coun~l	243549	5.762372	31.569	0	300
zone37newa~n	243549	126405.7	661151.1	0	7143650
zone38coun~l	243549	419.82	689.4599	0	3853
zone38newa~n	243549	7113849	1.14e+07	0	6.06e+07
zone39coun~l	243549	1080.119	1198.365	0	5106
zone39newa~n	243549	1.23e+07	1.38e+07	0	5.78e+07
zone40coun~l	243549	538.2093	927.7871	0	4468
zone40newa~n	243549	7203762	1.26e+07	0	7.78e+07
zone41coun~l	243549	960.6798	1751.63	0	9023
zone41newa~n	243549	6929648	1.11e+07	0	5.07e+07
zone42coun~l	243549	29.58908	139.4538	0	1172
zone42newa~n	243549	304344.6	1349390	0	1.17e+07
zone43coun~l	243549	99.57645	250.099	0	1619
zone43newa~n	243549	1288466	2889177	0	1.77e+07
ffdummy	243549	.0363992	.1872818	0	1
mergezoning	243549	3	0	3	3
distdowntown	243549	50502.87	27802.11	3637.083	251819.3
mergedownt~n	243549	3	0	3	3
distancecn	243549	11989.1	12121.17	35.01216	129959.9
mergecn	243549	3	0	3	3
distancecg	243549	8352.038	8110.835	38.12783	58724.84

mergecg	243549	3	0	3	3
distfreeart	243549	2360.807	2140.419	10.10832	58805.21
mergefreeart	243549	3	0	3	3
disthospital	243549	17811.61	15659.89	204.7304	186877.3
mergehospi~l	243549	3	0	3	3
distparks	243549	1331.924	2719.65	1.817504	52921.5
mergeparks	243549	3	0	3	3
distrivers	243549	9510.69	7073.683	6.783214	32943.23
mergerivers	243549	3	0	3	3
distschools	243549	2485.373	2541.185	.586172	43214.51
mergeschools	243549	3	0	3	3
distUGBdis~e	243549	2936.287	12776.6	0	171421.3
mergeugbdi~e	243549	3	0	3	3
UGB	243549	.9069386	.290519	0	1
mergeugb10	243549	3	0	3	3
distrailro~s	243549	9500.428	12367.62	21.7613	156547.7
mergerailr~s	243549	3	0	3	3
accounteda~a	243549	7.26e+07	5901356	6.13e+07	1.13e+08
disDTSQ	243549	3.32e+09	4.42e+09	1.32e+07	6.34e+10
discnSQ	243549	2.91e+08	7.43e+08	1225.851	1.69e+10
discgSQ	243549	1.36e+08	2.81e+08	1453.731	3.45e+09
disfreeartSQ	243549	1.02e+07	3.02e+07	102.1781	3.46e+09
dishospita~Q	243549	5.62e+08	1.66e+09	41914.55	3.49e+10
disparksSQ	243549	9170491	8.45e+07	3.30332	2.80e+09
disriversSQ	243549	1.40e+08	1.88e+08	46.01199	1.09e+09
disschoolsSQ	243549	1.26e+07	4.77e+07	.3435976	1.87e+09
disUGBSQ	243549	1.72e+08	1.21e+09	0	2.94e+10
disrailroa~Q	243549	2.43e+08	1.08e+09	473.5543	2.45e+10
Y1970	243549	.0000123	.0035097	0	1
Y1971	243549	.0000164	.0040526	0	1
Y1972	243549	.000037	.0060788	0	1
Y1973	243549	.0000164	.0040526	0	1
Y1974	243549	.0000287	.0053611	0	1
Y1975	243549	.0000164	.0040526	0	1
Y1976	243549	.0000328	.0057312	0	1
Y1977	243549	.0000164	.0040526	0	1
Y1978	243549	.0018559	.0430401	0	1
Y1979	243549	.0023691	.0486161	0	1
Y1980	243549	.0017656	.0419815	0	1
Y1981	243549	.0015479	.0393135	0	1
Y1982	243549	.0011456	.0338268	0	1
Y1983	243549	.002944	.0541785	0	1
Y1984	243549	.0034942	.0590082	0	1
Y1985	243549	.005502	.0739711	0	1
Y1986	243549	.0100062	.0995295	0	1
Y1987	243549	.0099857	.0994284	0	1
Y1988	243549	.0136851	.1161805	0	1

Y1989	243549	.019376	.1378428	0	1
Y1990	243549	.0196059	.138642	0	1
Y1991	243549	.0186698	.1353561	0	1
Y1992	243549	.0240362	.153162	0	1
Y1993	243549	.0314187	.1744469	0	1
Y1994	243549	.0345228	.1825682	0	1
Y1995	243549	.0346008	.182767	0	1
Y1996	243549	.0426074	.2019708	0	1
Y1997	243549	.0465902	.2107599	0	1
Y1998	243549	.054486	.2269746	0	1
Y1999	243549	.0575695	.2329281	0	1
Y2000	243549	.0580212	.233784	0	1
Y2001	243549	.0721415	.2587227	0	1
Y2002	243549	.0824434	.2750396	0	1
Y2003	243549	.1037943	.3049942	0	1
Y2004	243549	.1276909	.333746	0	1
Y2005	243549	.1179065	.322498	0	1
Percent1	243549	.0031216	.0114594	0	.1202416
Percent2	243549	.0146439	.0276954	0	.2070365
Percent3	243549	.001963	.0098395	0	.1607802
Percent4	243549	.0022463	.0069198	0	.1198988
Percent5	243549	.1093008	.2211505	0	1
Percent6	243549	.0099657	.0333077	0	.4502914
Percent7	243549	.0364282	.0669016	0	.7358325
Percent8	243549	.0060722	.0178718	0	.1385102
Percent9	243549	.0173736	.0345717	0	.3591626
Percent10	243549	.0154097	.0260008	0	.1542803
Percent11	243549	.0226232	.0424584	0	.2741987
Percent12	243549	.0025724	.0152208	0	.2077377
Percent13	243549	.0000398	.0004061	0	.0064075
Percent14	243549	.009238	.0187667	0	.1008227
Percent15	243549	.022982	.0498378	0	.6546307
Percent16	243549	.0011293	.0081416	0	.0958564
Percent17	243549	.0041916	.0198343	0	.3599313
Percent18	243549	.0117831	.0281717	0	.2007914
Percent19	243549	.0011111	.004796	0	.0431639
Percent20	243549	.009117	.0227193	0	.1920538
Percent21	243549	.0128556	.0232923	0	.2552862
Percent22	243549	.0027611	.0112125	0	.1441226
Percent23	243549	.0091114	.0254716	0	.1630658
Percent24	243549	.0109626	.0248884	0	.2308946
Percent25	243549	.0053922	.0150498	0	.2316258
Percent26	243549	.0106076	.0255075	0	.1977729
Percent27	243549	.0371416	.0677431	0	.713482
Percent28	243549	.0637276	.1314749	0	.9924515
Percent29	243549	.0028241	.0183232	0	.3404168
Percent30	243549	.0037971	.0117191	0	.102167
Percent31	243549	.0013945	.0098679	0	.1334902

Percent32	243549	.0061494	.0200045	0	.1973806
Percent33	243549	.0157361	.0442131	0	.3248344
Percent34	243549	.0032836	.0136586	0	.1127999
Percent35	243549	.0004087	.0056171	0	.1072034
Percent36	243549	.0179826	.0526046	0	.4354658
Percent37	243549	.0016763	.0087242	0	.0928112
Percent38	243549	.0979863	.1570429	0	.8778071
Percent39	243549	.1731967	.1936279	0	.7897637
Percent40	243549	.0968661	.1680775	0	.9914147
Percent41	243549	.1032269	.1698832	0	.8227973
Percent42	243549	.0041072	.018234	0	.1634976
Percent43	243549	.0174925	.039375	0	.2512791
SFRdummy	243549	.8032552	.3975386	0	1
MFRdummy	243549	.0743752	.262381	0	1
MURdummy	243549	.04542	.208224	0	1
RRFUdummy	243549	.0405504	.1972465	0	1
FFdummy	243549	.0363992	.1872818	0	1
areaSQ	243549	1.96e+10	4.63e+11	259579	4.09e+13
bldgsqftSQ	243549	1.22e+07	4.50e+08	0	8.36e+10
elevation	243549	307.8912	211.9364	0	4035
mergeeleva~n	243549	3	0	3	3
PercentSFR	243549	.5461281	.2353905	0	1
PercentMFR	243549	.0733289	.0701039	0	.3629605
PercentMUR	243549	.0684148	.0827876	0	.5310754
sphatFinal~S	243549	259898.8	228005.9	1465.515	6210495
sphatFinal~o	243549	.8656326	.4038525	.1300145	2.259957
PercentIDUST	243549	.0463939	.0808569	0	.7358325
SFRareawit~n	243549	3.90e+07	1.67e+07	0	7.78e+07
MFRareawit~n	243549	5166138	4932958	0	3.23e+07
MURareawit~n	243549	4836899	5919342	0	4.08e+07
INDUSTarea~n	243549	3311119	5742806	0	7.20e+07
PercentCCCO	243549	.0053679	.015267	0	.1898668
PercentCOMM	243549	.0219748	.035263	0	.2955199
Percent~R123	243549	.0224831	.0657621	0	.5922169
Percent~t123	243549	.523645	.2319968	0	.9914147

XV. APPENDIX 3

The complete set of filters used in the analysis section is as follow:

```
Saledate>=197001 & saleprice~=0 & landval>=10000 & area>=500 &
sphatYearRESRatio>=.28 & sphatYearRESRatio<=1.57 &
AccountedArea>=61307804 & AccountedArea<=113857350 &
AccountedAreaQuarter>=3831737 & AccountedAreaQuarter<=7116084
```

In the end, these filters will make the data analysis much more significant and less biased. The first filter, `Saledate>=197001`, allows only those properties that have been sold since the first month of 1970. Many of the properties that have sold before this time and never been resold have very incomplete data likely due to less meticulous data collection. Furthermore, this takes care of properties that have no sale date whatsoever which would be of no use to me. Next, `saleprice~=0`, maintains that only those properties with recorded sales prices will be allowed in the analysis because this data is crucial for determining the effect zoning changes have on market prices. `landval>=10000` and `area>=500` exclude observations with recorded land values of less than $10,000 and areas of less than 500 square feet. It is highly likely that properties with such low values and areas are developable due to the size or undesirability of the land. Or, these filters could be excluding data errors. Notably, condominiums with individual owners have a recorded land value of zero so that they will be excluded. This is good; these types of owners, in contrast to the principle owners of the entire building, have never been Measure 37 claimants. The owners of entire apartments, on the other hand, are listed along with adequate land values and areas under the MFR zoning. `sphatYearRESRatio>=.28 & sphatYearRESRatio<=1.57 r`epresent a proxy that eliminates observations where the given sales price differs greatly from an estimated, expected sales price. This was accomplished in two steps. First, a regression was completed whereby the average sales price was estimated for residential properties based upon various factors that make each of these pieces of land unique.[80] Then, a ratio was created where the given sales price was divided by the estimated sales price so that a value of 1 indicates the property sold for exactly what it was expected to sell for. The

[80] See Appendix 4 for a complete discussion of regression analysis.

most extreme ratio values, those less than the 5th and greater than the 95th percentiles are excluded by this filter. Consequently, this should exclude observations with sales prices that are not market driven, such as sales between friends or inheritances. Therefore, only "arms-length" transactions between traditional buyers and sellers are included. The last exclusion, `AccountedArea>=61307804 & AccountedArea<=113857350`, is based upon the Zone Area variables.[81] In a circle of radius one mile, there are roughly 87 million square feet. These variables count the square footage of zoning surrounding every property; during the data collection, the precise number of square feet was not calculated for every property, the reason being discussed in Appendix 5. This filter only allows those observations where the "accounted area" is between 70 and 130 percent of the perfect amount. `AccountedAreaQuarter>=3831737 & AccountedAreaQuarter<=7116084` have the same meaning, except that they eliminate the outliers accrued after finding the Zone Area variables using a circle of a quarter mile radius.

XVI. Appendix 4

Regression analysis, a statistical tool used by economists, will allow me to effectively analyze the data in order to achieve the objectives of this thesis. Sometimes regression analysis is referred to as econometrics. Simply put, the fundamental purpose of this tool

> is concerned with the study of the dependence of one variable, the *dependent variable*, on one or more other variables, the *explanatory variables*, with a view to estimating and/or predicting the (population)

[81] See Appendix 5 for a detailed discussion of these variables.

> mean or value of the former in terms of the known or fixed (in repeated sampling) values of the latter.[82]

In other words, econometrics is a way to statistically measure how much certain factors affect or influence that value in which your interest lies. For example, one could attempt to predict the population mean of adult male heights (the dependent variable) based upon a number of explanatory factors. These explanatory factors could include the father's height and the mother's height. Obviously, it would be nearly impossible to estimate the adult height of a newborn just using one set of parental heights. Therefore, a large sample of parental heights and the associated height of adult male offspring is created. A sample is needed because it would be nearly impossible to measure the height of every parent-son combination in the world.

Regression analysis could then be used to tell us how the average height of sons increase (or decrease) with the parent's height. Then, we could take the measurement of one set of parents and predict the adult height of the son based upon the affect of parental height. The son's estimated adult height is based upon the average height of adult males given a set of parents with the same height as the son. Therefore, the explanatory variables (parental heights) are assumed fixed or known while the dependent variable (the son's adult height) is assumed random and statistical; it is uncertain how tall the son will actually be. If he is average, then he will be very close to the predicted height.

The beauty of regression analysis lies in the ability to determine by what value (positive or negative) the explanatory variables will affect the dependent variable. By

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[82] Gujarati, Damodar. *Basic Econometrics.* McGraw Hill, New York: 2003. The italics are the author's.

corollary, one could determine if an explanatory variable has no affect at all. It is also important to remember that a statistical relationship does not imply causation. Just because a relationship exists does not mean that two variables are affecting each other. Much of this problem can be solved using a priori common sense considerations as well as economic theory. The process of econometrics will become apparent in the analysis section of this thesis.

In this narrative, the heights of the parents are being controlled for. Thus, given two identical children, regression analysis gives the researcher a measurement of how much taller one child is likely to be given that his father is one inch taller than the other child's father.

XVII. Appendix 5

Zone Count and Zone Area: Quarter and Full Mile Radius

When each file in the RLIS Lite dataset is opened in ArcMap, the user can access both a spatial layout of the data and an "attribute table" which is the spreadsheet format of the same data. The spreadsheet form of the data is important because a single, organized spreadsheet is a necessary condition for regression estimation. Unfortunately, the zoning data for each property is not included in the same file as the general tax lot property data (non-asterisk variables). Under this condition, it is possible to visually ascertain the zoning belonging to any given property although this relationship does not appear in a common spreadsheet.

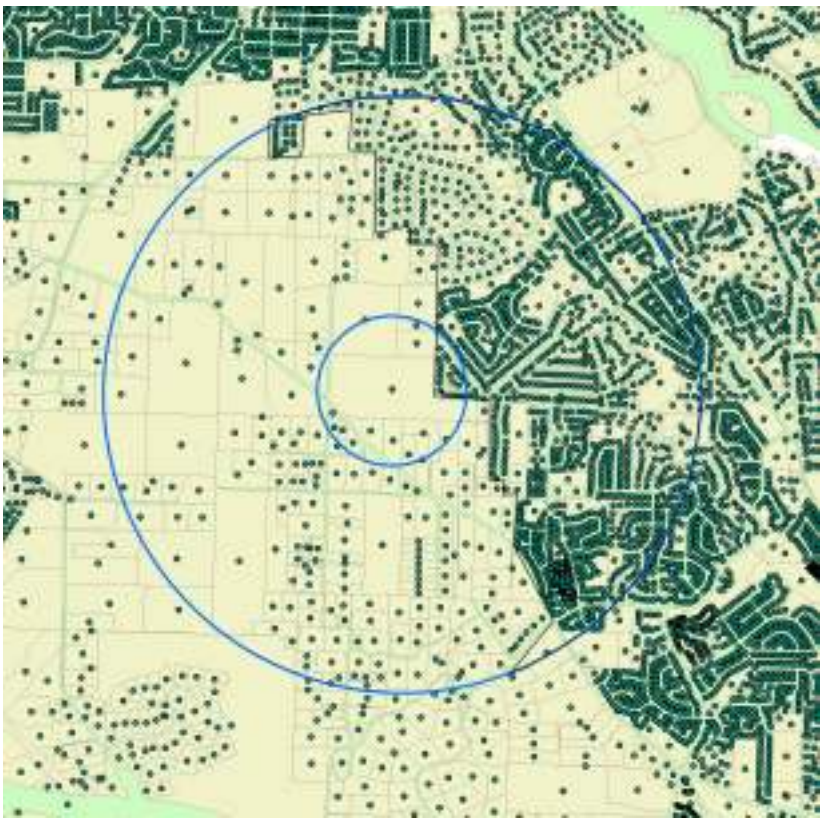
The tools of ArcMap were used to solve this problem. First of all, I converted every property into a single point on the map using a tool called "Feature to Point." The

software calculated the center-most point within each property and displayed it on a map. Then, I overlaid the RLIS Lite zoning file and asked the software to tell me the zone classification that fell over each point using the "Identity" tool. After making the calculations, ArcMap created an output spreadsheet and spatial file with the property data and the zoning data combined. This output could be easily verified as correct by looking at the two original data layers stacked upon each other. It must be noted that there are some properties that are legally split by two zones. Therefore, the method used here would only produce one zone for these properties (whichever zone is located where the point is). Fortunately, a visual survey of the spatial data confirmed that this occurrence is rare.

Before working any further with the zoning data, I gave each of the 43 zone classifications a numerical identification in order to eliminate confusion. Each of the zone types along with their corresponding ID were defined in TABLE 2 of the data section.

Once the various zones were defined numerically, I created the Zone Count and Zone Area variables with the help of a colleague, Ryan Sullivan. The creation of these two variables was crucial to the analysis presented in this thesis; a detailed description of the methodology used to derive these variables is below. Zone Count gives me the total number properties of each zoning classification within a one mile radius of very property within the dataset. Zone Area takes each of the properties in Zone Count and adds up the areas, in square feet, found in the variable Area. See FIGURE 4**.**

FIGURE 4: Quarter and Full Mile Radii[83]



The importance of this data will become apparent in the analysis section of the thesis. Using regression analysis and while controlling for environmental and structural attributes, I can find the change in land value from a one square foot increase in commercial land within a mile radius of any given property, for example. Or, I could put everything in percentage terms and find the effect of a one percent increase in a certain zone classification. This will allow me to make an argument whether changing the zoning make-up surrounding a given piece of property from low density residential to high density or commercial property has a negative effect on the land value of that

[83] This is a visual representation of the Zone Count and Zone Area variables for one property (the dots represent the center-most point of each property). The blue circles have a measured quarter mile and full mile radius. Zone Count gives us the number of properties of each type of zone classification within the blue lines and Zone Area gives us the areas of each type of zone.

property. This is analogous to the situation if one of your neighbors won a Measure 37 lawsuit and was suddenly allowed to develop their land. Consequently, the state would have to change the zoning of the disputed property from low density to high density, commercial or industrial.

These variables will tell me whether your neighbor's use of their property has a negative or positive effect on your land value, depending on the circumstance. A quarter mile radius was used because this is the distance at which the author believes some of the greatest amenity effects lay. A one mile radius, although arbitrarily determined, was used as the outer bound because that is the likely furthest distance that most land uses will have any effect on your own property value. Noise, traffic, pollution or the lack thereof are likely going to have the greatest effects on land value. These effects will be largest within the quarter mile radius and less so in the "donut" area comprising of the area further than a quarter mile and less than a full mile. This author contends that the effects these factors could pose will be miniscule when occurring one mile or more from your property.

Zone Count and Zone Area were derived using a program written by Ryan in Stata, a statistical software package.[84] Recall that the intent of the program was to find the zoning make-up in the immediate vicinity of every property in the dataset. The program would run in a loop. It took the first property in the database and then calculated the distance to every other property in the entire database. The distances were calculated using a well-known geometric formula which makes use of the X and Y coordinates

[84] See Appendix 7 for the complete script of this program.

found in the RLIS Lite dataset.[85] Then, the program would make note of those properties whose distance is less than or equal to 5,280 feet. Of those properties, it would then tally how many are of each type of zone (1 through 43). The program would record this number, as well as the areas of these properties in a column corresponding to the original property in question. Finally, it would move on to the second property in the database.

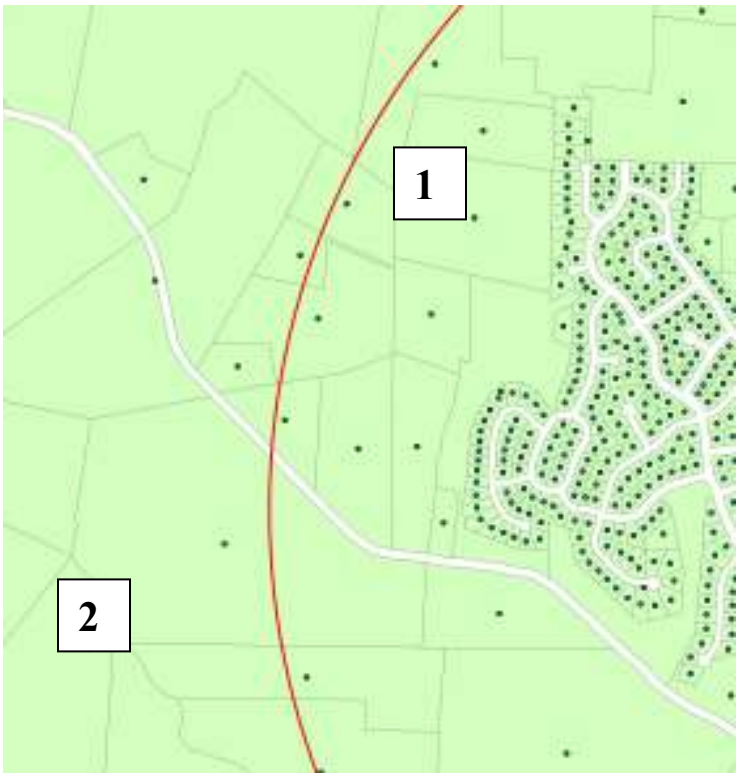
The amount of calculation involved in this entire process should be evident, especially considering that it was repeated 556,102 times for every property in the database. Therefore, the database was divided into three sections to improve efficiency. This was accomplished by splitting it vertically into fragments containing roughly equal numbers of properties using the X coordinates. A "buffer" of one mile was placed on the sides of the fragments where more properties were present. Those properties on the fringes would, therefore, contain data for all the zoning within the one mile radius. Fortunately, this process was completed in roughly two weeks using one of the fastest computers at the University of Oregon.

Unfortunately, this methodology does produce a problem with the accounted area. The area of a given property is counted within a mile radius of a certain other property if the centermost-point (created by "Feature to Point") is within a mile. However, there are cases in which the point is within a mile but much of the area of the property is not. Conversely, this is balanced by the fact that sometimes part of the property is within a mile but the point is not. See FIGURE 5**.** Admittedly, this is not an exact science. Also, properties on the edge of the dataset lie next to emptiness as far as the data is concerned so a lot of area is not accounted for. This is corrected by using a filter that throws out

[85] Given two points (X1, Y1) and (X2, Y2), the distance between these two points is: $d= \sqrt{\{(X2-X1)^2 + (Y2-Y1)^2\}}$

those properties whose accounted area is far greater or less than the 87,582,600 square feet found in a circle of a mile radius. It should be of no alarm if the accounted area does not add to this figure exactly; there is a lot of area, such as streets and rivers that is not counted because it is neither zoned nor does it occur within any property.

FIGURE 5: Zone Count Inclusions and Exclusions[86]



Distance to Downtown Portland

The process behind calculating the distance to downtown Portland was rather simple using the ArcMap software. First of all, I decided it would be easiest to calculate the distances using points so that I could use the same formula that was used in finding

[86] Figure 5 displays a portion of the circle of radius one mile represented by the red line. The property that lies slightly below and to the left of marker "1" is an example of a property that will be fully counted in the Zone Count and Zone Area data yet is not completely contained within the circle's perimeter. The property that marker "2" lies above is an example of a property that will not be counted in the Zone Count and Zone Area data yet is partially contained within the circle's perimeter.

the Zone Count variables. In RLIS Lite, Portland City Hall (on Second Avenue, in the midst of downtown) is labeled as a single point. For the property data, I used the point output file that I found earlier using the "Feature to Point" tool. Therefore, I was left with finding the distance between the one city hall point and every property point that were lying spatially on top of one another but were located in two different files. There is no straightforward tool in ArcMap for finding the distance between points from different files. Fortunately, there is a freeware program called Hawth's Tools which does.[87]

Hawth's Tools is an assortment of useful programs designed for ArcMap. I used a specific tool called "Distance between Points between Layers." This tool gave me an Excel file of all the distances along with the unique TLID variable so properties in the original RLIS Lite dataset could be appropriately matched up with this distance calculation.

It must be noted that this tool calculates distances "as the crow flies" (the shortest distance between two points) meaning it does not consider the driving distance to downtown Portland, for example. This can cause some problems, but it is likely that they will be small. The distance to the city should be relative. For the most part, a property that is further from the city hall relative to another will have a longer drive. Only access to high speed roadways could change this but this factor will be controlled for in the regressions due to a separate calculation for distance to freeways and highways. Lastly, noise and pollution travel "as the crow flies" as well and do not meander along roadways.

Distance to CN and CG

[87] Beyer, H. L. 2004. Hawth's Analysis Tools for ArcGIS. Available at http://www.spatialecology.com/htools.

Collecting the distances to the CN and CG zones was almost identical to the process of collecting the city hall distances discussed above. In this instance, the CN and CG zones were not apart of their own RLIS Lite file but were combined with every other type of zone in the dataset. I solved this problem by using the "Select by Attributes" function in ArcMap which allowed me to select and then export the proper commercial zones into a custom created layer.

Then, using all the tax lots in the dataset as points once again, I used the Hawth's Tools function "Distance between Points between Layers" which gave me the distance to the nearest CN property and CG property. TLID was used to match the distance output file with the original data. Again, this estimate only considers the absolute shortest distance between the two points. The concerns and the justifications behind using this method remain consistent with those expressed in the distance to downtown methodology.

Distance to Hospitals

I calculated the distances to the nearest hospital with the same process utilized for finding the downtown distances. The hospitals were originally represented as isolated points in RLIS Lite. Again, I used the Hawth's Tools function, "Distance between Points between Layers" which gave me the distance to the nearest hospital for every property in the dataset. TLID was used to match the distance output file with the original data. The concerns and the justifications behind using this method remain consistent with those expressed in the distance to downtown methodology.

Distances to Schools

The distances to schools were calculated using the same method as the distance to downtown Portland. Schools were originally represented as points in RLIS Lite so I layered the property point data that I created over the school data and used the Hawth's Tools function, "Distance between Points between Layers." TLID was used to match the original data to the calculated distances. The concerns and the justifications behind using the "as the crow flies" methodology remain consistent with those expressed in the distance to downtown methodology.

Distance Free-Art

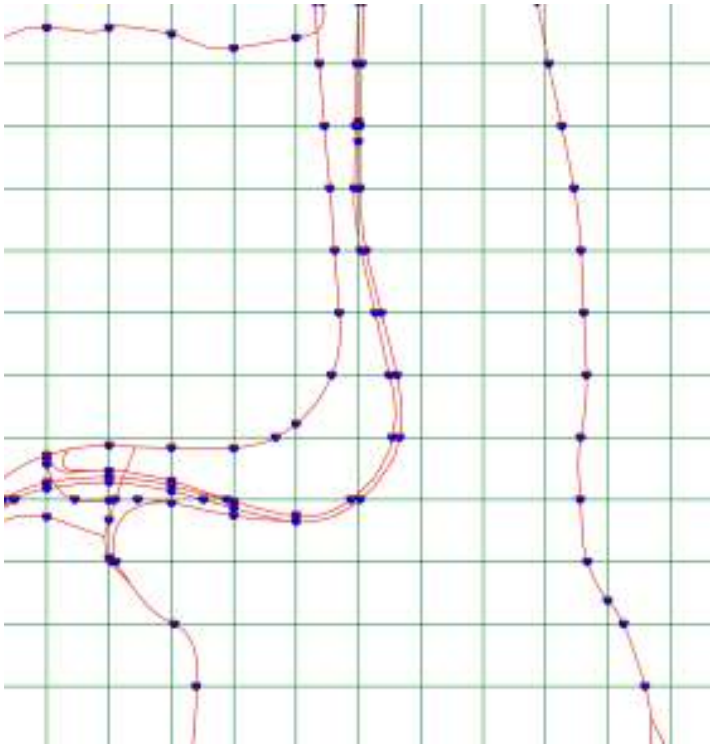
This variable measures the effect that a freeway or major road arterial can have on a given piece of property. In the dataset, freeways are defined as interstate highways including Interstate 5, 205, and 84. Major arterials include intrastate highways including Oregon Highways 99, 26, 30, and 8. The freeways can be included in the same variable as the arterials because in this instance they are all multi-lane roads used heavily by commuters throughout the city. Since Interstate 5 is only four lanes wide throughout the Portland area, all the roads are roughly the same size.

Calculating the distance to the nearest freeway or arterial was harder than any of the prior computations. The roadways are represented as lines in RLISLite that unfortunately do not contain data on entrance points. I wished to find the distance from every property to the nearest point on a road. I debated placing points along the lines which were dispersed according to the average number of feet between an on-ramp or road entrance. This would have given me the story behind road access, but I would have missed the externalities because some properties would appear much further from a road, depending on where they lie in relation to an on-ramp. Therefore, I decided to place

points (which would allow me to use Hawth's Tools) as close as possible along each road in order to get a true measurement of how far a property is from these roads. It is further reasonable to assume that, for the most part, properties closest to major roads will be nearest to entrances relative to those properties further away. It is also reasonable to assume that properties nearest to these roads will receive more externalities relative to those that are not.

Unfortunately, I did not have the expertise or time to calculate the distance to continuous points along the road data layers. I created a grid with squares of 500 feet by 500 feet and placed it on top of the road data. I used 500 feet because this was the smallest grid size that the computer could computationally handle given the dataset. Then, I found the points where the gridlines and the road lines cross using the "Intersect" tool in ArcMap. Since the roads are not perfectly straight, points were created at various intervals but no more than 500 feet apart. Those properties lying next to a road, while they may not be estimated perfectly, will not show a distance greater than 500 feet. **See** FIGURE 6. Again, since there are few residential properties located on the shoulders of these roadways, this fact should not cause a big problem.

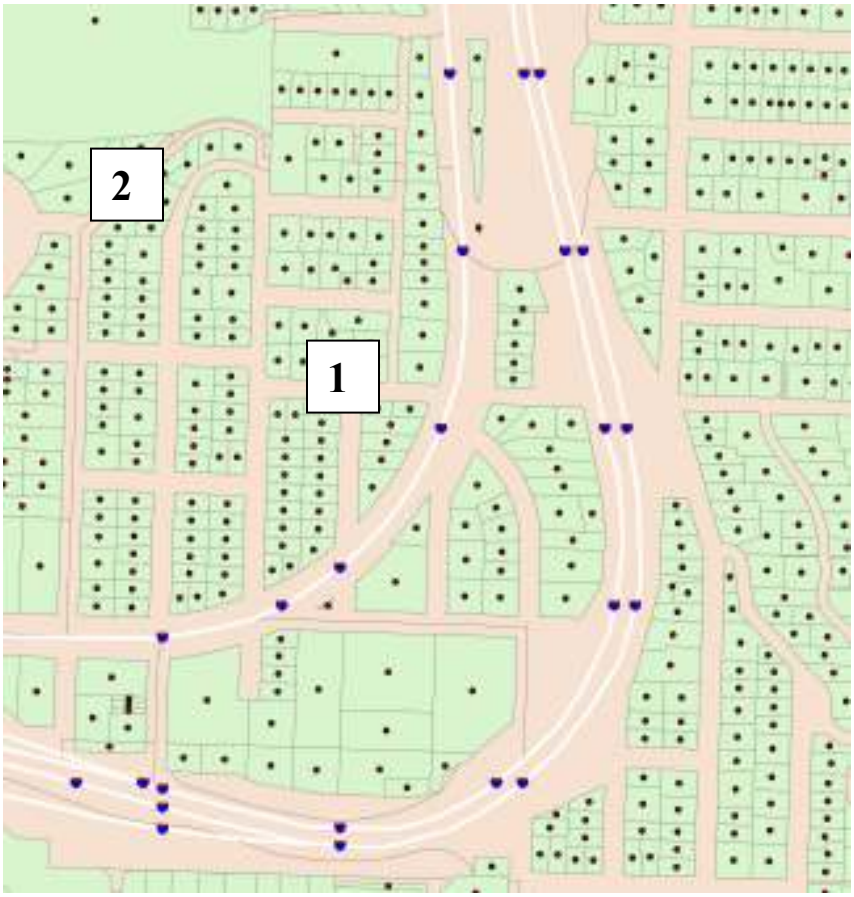
FIGURE 6: Freeway Grid[88]



Finally, I used the Hawth's Tools function, "Distance between Points between Layers." TLID was used to match the distance output file with the original data. Please see FIGURE 7 and its footnote for a further justification of the combined usage of the grid and "as the crow flies" methodologies.

[88] In Figure 6, the green squares are the 500 foot grid. It is easy to see that due to the curvature of the road, the blue points, which will be used to estimate the distance, are not placed in a consistent manner. However, none of the points are further apart than the side of one of the green boxes.

FIGURE 7: Distance to Freeways[89]



Distance to Parks

This variable measures the effect that the distance to a park or open space has on land values. This variable includes parks, golf courses, biking/hiking trails, community gardens and pools, cemeteries, school fields and fairgrounds. In RLIS Lite, these areas are represented as geometric polygons much like the original property data. The distance to these areas is quite important due to their potentially significant effect on land value.

[89] In Figure 6, the major roadway is represented by the white lines while the properties are represented by the green polygons. Their center-most point is also displayed. A property located next to the 1 will not be estimated correctly because it will really be the distance to the blue interstate logo. However, this property will show up as much closer relative to a property near the 2. At 1 there are definitely more externalities. However, it is conceivable that 2 is closer to an on-ramp than 1. This should not be a major problem because such a small percentage of properties lie right on a major roadway in this dataset.

I used a methodology very similar to that used in calculating freeway distance in order to find the distance to parks and open space. Finding the centermost points of the parks and calculating the distance to these would not have been adequate due to the large discrepancies in the size of parks in Portland. Some parks, such as Forest Park, are thousands of feet wide while others are just a couple of hundred. Therefore, it would appear that some properties were closer to parks in relation to others when that is not the case. To solve this problem, I found the distance to the boundary of the parks.

Once again, I placed a grid of 500 feet over the park boundaries for the same reasons discussed with the freeways. Then, I used the "Intersect" tool in ArcMap to find all the points where the grid and the park boundaries cross. This gave me a good, but not perfect, representation of where the park boundaries are located. I believe that the same relative distance justification applies here as it does to the freeway variable.

Finally, I used the Hawth's Tools function, "Distance between Points between Layers," to find the distance to the nearest park boundary for every property. TLID was used to match the distance output file with the original data.

Distance to Rivers

The variable "Distance to Rivers" measures the effect that proximity to a river can have on land values. Rivers are defined here as major bodies including the Columbia, Willamette, Sandy and Clackamas Rivers as well as Smith, Bybee, Vancouver and Sturgeon Lakes and Lake Oswego. It also includes smaller bodies including the Tualatin and Molalla Rivers and Johnson Creek. Only large rivers and streams were used in this

study because they are most likely to provide a habitat for plants and animals and amiable views for humans. The rivers are represented as lines in RLIS Lite, akin to the road data.

The methodology used to find the distance to rivers was exactly the same as that used to find the distance to freeways. First, I created a grid consisting of squares with sides of 500 feet and layered it on top of the rivers data. Utilizing the "Intersect" tool in ArcMap, I found every point where the grid and the rivers intersect. Since these points did not fall continuously along the river lines, this was not a perfect representation of where the rivers are located. However, none of the points were further apart than 500 feet. Furthermore, I believe that the same relative distance justification applies here as it does to the freeway variable.

Finally, I used the Hawth's Tools function, "Distance between Points between Layers," to find the distance from every property to the nearest river. TLID was used to match the distance output file with the original data.

UGB

This variable describes whether a given property lies within the urban growth boundary (UGB) or not. Descriptive variables such as this are called "dummy variables" which only take the value of 1 or 0. In this case, the value is 1 if the property is within the UGB and 0 if it does not. The coefficient on this regressed variable will tell us the positive or negative effect exerted upon a property if it is included in the UGB. By corollary, the coefficient is the entire estimated value difference between a property that is in the UGB and one that is not, holding all other factors constant.

This variable was derived quite easily. The UGB is defined as a border in RLIS Lite. In ArcMap, I gave a value of 1 to those areas inside the border and a value of 0 outside. Then, I used the "Identity" tool which told me whether each property point should be identified with a 0 or 1.

Distance to UGB

This variable measures the distance from each property to the Portland metropolitan urban growth boundary. For those properties inside the boundary, the distance is recorded as zero. It is clear from the discussion above that the UGB regulates where urban development is allowed and gives both homeowners and developers a sense of certainty regarding the present and future location of infrastructure. It is also important to remember that the boundary is changed every five years in order to incorporate more land. Therefore, it may be worthwhile to measure how proximity to the boundary affects land value.

The "Distance to UGB" variable was derived using the same process as the "Distance to Parks" variable. RLIS Lite represents the UGB as a single line boundary. Once again, I placed a grid of 500 feet over this boundary for the same reasons discussed earlier. Then, I used the "Intersect" tool in ArcMap to find all the points where the grid and the UGB boundaries cross. This gave me a good, but not perfect, representation of where the boundaries are located. I believe that the same relative distance justification applies here as it does to the freeway variable.

Finally, I used the Hawth's Tools function, "Distance between Points between Layers," to find the shortest distance to the UGB boundary for every property. TLID was used to match the distance output file with the original data.

Distance to Railroads

This variable measures the nearest distance from each property to a heavy rail line. The data in RLIS Lite only includes heavy commercial lines and does not count light rail lines used for public transportation. Railroads are represented exactly the same as freeways in the dataset.

The methodology used to find the distance to railroads was exactly the same as that used to find the distance to freeways. First, I created a grid consisting of squares with sides of 500 feet and layered it on top of the railroad data. Utilizing the "Intersect" tool in ArcMap, I found every point where the grid and the railroads intersect. Since these points did not fall continuously along the railroad lines, this was not a perfect representation of where the railroads are located. However, none of the points were further apart than 500 feet due to the nature of the grid. Furthermore, I believe that the same relative distance justification applies here as it does to the freeway variable.

Finally, I used the Hawth's Tools function, "Distance between Points between Layers," to find the distance from every property to the nearest railroad. TLID was used to match the distance output file with the original data.

Elevation

This variable measures the elevation, in feet above sea level, of the centermost point of each property. Elevation data is not present in RLIS Lite but I was able to obtain it from a GIS specialist at the University of Oregon, through the U.S. Geological Survey.[90] It is represented by topographic satellite image which breaks the State of Oregon into a grid composed of 100 square foot areas. The map is so precise that every one of these areas in Oregon is assigned an elevation value.

Calculating the elevation of each property was a two stage process. First of all, I needed to project the topographic elevation map in the same coordinate system as the properties so that they would line up perfectly on top of each other. I accomplished this by using the "Project" tool in ArcMap. I was able to determine that the data lined up because the rivers data was located where there were "trenches" of low-lying area surrounded by higher elevations. Then, I used a freeware program called "GridSpot" to find the elevation.[91] This program works by giving each property point an elevation value from the underlying topographic map. Only the elevation of the centermost point in the property is reported. This may be a problem for the largest of properties that have a large variance in elevation, but this occurrence appears rare. Finally, the elevation data was merged with the original RLIS Lite dataset using TLID.

Year Dummies

Technically, the Year Dummies were created through regression analysis. I used the variable "sales price" as the dependent variable and the 35 years of sale dates as the explanatory variables. In the dataset, I used a 1 to indicate that the residence was sold in

[90] U.S. Geological Survey, EROS Data Center. "Oregon 10m DEM." Raster digital data, created in Sioux Falls, South Dakota, 1999.
[91] Rathert, Dan. 2004. "GridSpot." Available at http://arcscripts.esri.com/details.asp?dbid=12773.

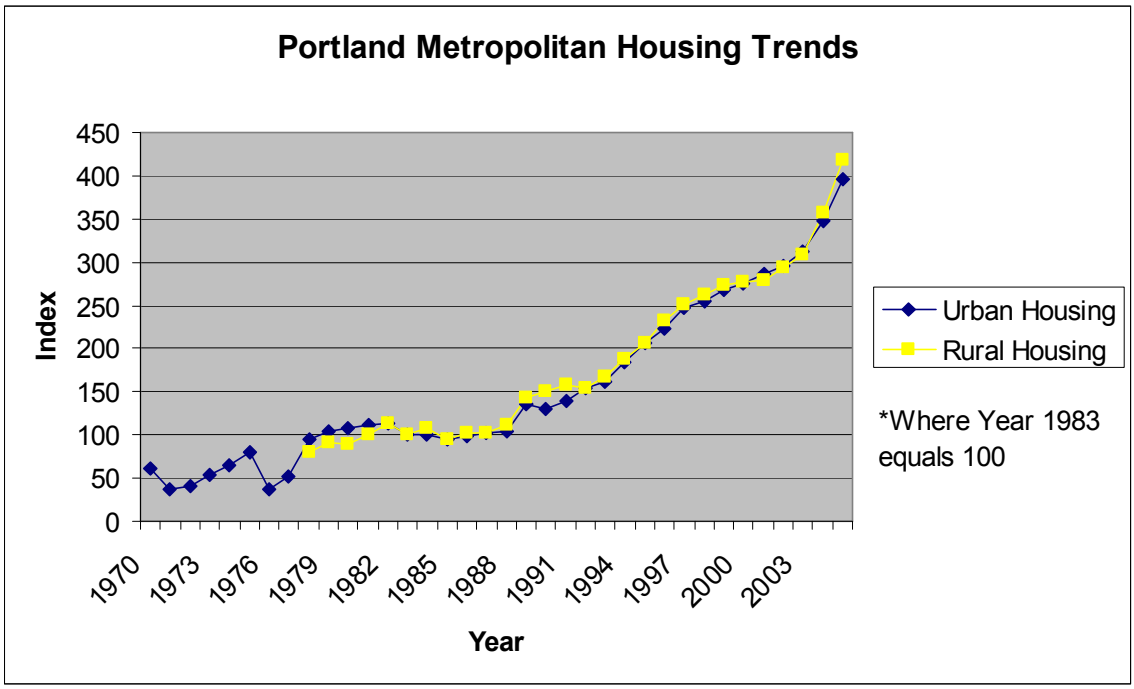
a given year and a 0 if it was not. When creating numerous dummy variables, one must be careful to leave one of them out so that a perfect but misleading linear relationship does not occur among these variables. The omitted dummy variable also becomes the variable to which all the other dummies are compared.

I have chosen to omit the 2005 dummy whenever the "Year Dummies" are used in the analysis section. This means that the coefficients for all the other years should reflect their relationship to the sales price in 2005. Therefore, I would expect all the coefficients to be negative and decreasing in a monotonic fashion into the past. The year 2005 should represent the highest sales prices due to inflation and increased demand so compared to its prices, the prices of prior years should be lower. Coefficients are negative because we must subtract a dollar amount from today's dollars to realize how much money would have bought a comparable residence in the past.

Simply, using a regression to control for changing purchasing power in the home market allows me to statistically estimate how sales prices fluctuate from year to year, everything else being equal. It must be noted that the "Year Dummies" are not used in regressions estimating land value as the dependent variable because land value is an assessed value that is consistently updated for every property.

XVIII. APPENDIX 6

FIGURE 8: Portland Housing Trends



XIX. APPENDIX 7

```
/* Property Group Middle */

/* Setup */
clear
set mem 200m
use /home/harbaugh/Desktop/M37/replacedzoneswpriceanddate.dta

set more off

rename x_coord X
rename y_coord Y
drop zone
rename zone_class zone


drop if X <= 7622291
drop if X >= 7668131
```

```
gsort -resdummy

quietly {

set more off

/* Generate the needed variables */

local zones = 44

gen float distance = 0
gen int withinboundary = 0

local n = 1

while `n'  < `zones' {

gen int zone`n'countlocal = 0
gen zone`n'newareawithin = 0

local n = `n' + 1

}

/* The While Loop */

local i = 1

while `i'  < 151289 {

/* Check to see which properties are within specified radius */

replace withinboundary = ((sqrt((X - X[`i'])^2 + (Y - Y[`i'])^2)) <
5281)

/* Determine which zone types are within radius */
local m = 1
while `m' < `zones' {

summ area if (withinboundary ==1 & zone ==`m'), meanonly
replace zone`m'countlocal = r(N) in `i'
replace zone`m'newareawithin = r(sum) in `i'

/* Next m */

local m = `m' + 1

}

/* Next i */

local i = `i' + 1

}

/* Drop uneeded variables */
```

```
drop distance withinboundary

}

save "/home/harbaugh/Desktop/M37/middle.dta"
```

XX. APPENDIX 8

REGRESSION SET 1

COEFFICIENT	(1) URBAN	(2) RURAL
area	1.349**	1.036**
	[0.012]	[0.015]
areaSQ	-0.000000217**	-0.000000151**
	[6.15e-09]	[3.29e-09]
bldgsqft	43.55**	5.077
	[0.15]	[3.34]
bldgsqftSQ	-0.000158**	0.00352**
	[0.00000091]	[0.00055]
distdowntown	-1.101**	-5.344**
	[0.040]	[0.87]
disDTSQ	0.00000570**	0.0000189**
	[0.00000037]	[0.0000046]
distfreeart	1.990**	-3.861**
	[0.20]	[1.18]
disfreeartSQ	-0.000339**	0.000109*
	[0.000023]	[0.000060]
disthospital	0.659**	-0.278
	[0.074]	[0.68]
dishospitalSQ	0.00000825**	-0.00000716
	[0.0000020]	[0.0000089]
distrivers	0.0284	-3.123*
	[0.091]	[1.29]
disriversSQ	0.0000184**	0.000107*
	[0.0000033]	[0.000059]
distschools	5.719**	7.589**
	[0.22]	[1.33]
disschoolsSQ	-0.000445**	-0.000251**
	[0.000019]	[0.000048]

distUGBdistance	-2.507**	-1.161*
	[0.16]	[0.55]
disUGBSQ	-0.00000137	0.0000175*
	[0.0000026]	[0.0000097]
elevation	107.1**	44.01**
	[1.35]	[7.95]
UGB	16610**	-48698**
	[2214]	[9396]
Y1970	-515510**	-
	[64295]	-
Y1971	-210818**	-
	[45446]	-
Y1972	-229336**	-
	[24296]	-
Y1973	-232819**	-
	[37110]	-
Y1974	-193413**	-
	[45448]	-
Y1975	-187888**	-
	[64272]	-
Y1976	-246232**	-
	[32137]	-
Y1977	-245193**	-
	[32141]	-
Y1978	-214981**	-294251**
	[3611]	[57226]
Y1979	-206935**	-291320**
	[3198]	[64486]
Y1980	-204624**	-273974**
	[3653]	[76151]
Y1981	-199053**	-274544**
	[4081]	[47860]
Y1982	-207498**	-243773**
	[4765]	[64692]
Y1983	-218167**	-322647**
	[3030]	[39485]
Y1984	-217349**	-300266**
	[2713]	[30751]

Y1985	-226067**	-319266**
	[2250]	[32248]
Y1986	-221216**	-285841**
	[1686]	[23074]
Y1987	-216752**	-297402**
	[1714]	[21491]
Y1988	-213273**	-271093**
	[1473]	[20367]
Y1989	-186383**	-253679**
	[1368]	[21122]
Y1990	-189535**	-263963**
	[1278]	[14849]
Y1991	-180110**	-244941**
	[1303]	[15433]
Y1992	-167817**	-256031**
	[1158]	[15469]
Y1993	-163619**	-255795**
	[1050]	[13423]
Y1994	-144026**	-216628**
	[997]	[12999]
Y1995	-130567**	-223156**
	[989]	[12197]
Y1996	-120458**	-188968**
	[895]	[11749]
Y1997	-103641**	-175218**
	[860]	[11464]
Y1998	-98507**	-161808**
	[813]	[10502]
Y1999	-90196**	-150422**
	[791]	[10622]
Y2000	-86208**	-138340**
	[793]	[10712]
Y2001	-78252**	-137180**
	[732]	[10285]
Y2002	-72332**	-123364**
	[705]	[9861]
Y2003	-60098**	-126785**
	[659]	[9276]

Y2004	-33806** [626]	-64910** [8720]
LUMFRdummy	29455** [2527]	
LUAGRdummy		16427** [5928]
LUFORdummy		-32087** [6373]
PercentSFRnot123Quart	-487.1** [21.6]	1760** [404]
PercentDNSFRnot123	-213.3** [35.2]	-1741* [844]
PercentMFRQuart	-528.1** [25.8]	-474.7 [511]
PercentDNMFR	-1570** [43.6]	-3802* [1723]
PercentMURQuart	-628.8** [25.7]	2982** [1054]
PercentDNMUR	-336.4** [40.9]	12990** [2954]
PercentINDUSTQuart	-740.5** [34.2]	-1476 [1027]
PercentDNINDUST	-20.55 [42.1]	1262 [1220]
PercentCCQuart	-538.4** [84.8]	204374 [198906]
PercentDNCC	-616.4** [142]	20013* [12055]
PercentCGQuart	-750.5** [44.9]	1185 [1466]
PercentDNCG	721.3** [73.4]	5157* [2618]
PercentCNQuart	-943.5** [120]	35864** [12395]
PercentDNCN	553.8** [166]	6353 [25700]
PercentCOQuart	-110.3 [128]	-48472* [23889]

PercentDNCO	2694**	-14398
	[260]	[9718]
PercentFFQuart	-1006**	-228.1
	[31.4]	[295]
PercentDNFF	95.64*	-1088
	[39.2]	[752]
PercentMUEQuart	-586.7**	858.7
	[39.8]	[2995]
PercentDNMUE	174.2**	-6057**
	[51.9]	[1950]
PercentPFQuart	-982.1**	-2599
	[46.7]	[1743]
PercentDNPF	-914.2**	1353
	[78.6]	[2133]
PercentPOSQuart	-428.7**	2824**
	[36.1]	[827]
PercentDNPOS	-543.5**	-4936**
	[49.4]	[1308]
PercentRRFUQuart	-1498**	-860.9**
	[28.5]	[281]
PercentDNRRFU	285.4**	-879.5
	[40.4]	[758]
Constant	223897**	688129**
	[3859]	[73137]
Observations	168123	6611
R-squared	0.67	0.65

XXI. APPENDIX 9

REGRESSION SET 2

COEFFICIENT	(1) URBAN	(2) RURAL
area	0.00000299**	0.00000181**
	[0.000000058]	[0.000000032]
areaSQ	-0**	-0**
	[0]	[0]
bldgsqft	0.000148**	0.000119**
	[0.00000072]	[0.0000074]
bldgsqftSQ	-6.89e-10**	-3.56e-09**

	[0]	[1.23e-09]
distdowntown	-0.00000289** [0.00000019]	-0.0000142** [0.0000019]
disDTSQ	0** [0]	0** [0]
distfreeart	0.00000616** [0.00000096]	-0.00000209 [0.0000026]
disfreeartSQ	-1.95e-09** [1.07e-10]	0 [1.33e-10]
disthospital	0.00000484** [0.00000035]	0.000000908 [0.0000015]
dishospitalSQ	0* [0]	-0 [0]
distrivers	0.000000979* [0.00000043]	-0.00000268 [0.0000029]
disriversSQ	1.47e-10** [0]	1.17e-10 [1.32e-10]
distschools	0.0000297** [0.0000010]	0.0000265** [0.0000030]
disschoolsSQ	-1.78e-09** [8.93e-11]	-8.64e-10** [1.06e-10]
distUGBdistance	-0.0000184** [0.00000074]	-0.000000550 [0.0000012]
disUGBSQ	7.28e-11** [0]	0 [0]
elevation	0.000536** [0.0000064]	0.000127** [0.000018]
UGB	-0.0106 [0.010]	-0.133** [0.021]
Y1970	-1.858** [0.30]	- -
Y1971	-2.365** [0.21]	- -
Y1972	-2.290** [0.11]	- -
Y1973	-2.004** [0.17]	- -
Y1974	-1.816**	-

	[0.21]	-
Y1975	-1.606**	-
	[0.30]	-
Y1976	-2.384**	-
	[0.15]	-
Y1977	-2.030**	-
	[0.15]	-
Y1978	-1.429**	-1.645**
	[0.017]	[0.13]
Y1979	-1.330**	-1.526**
	[0.015]	[0.14]
Y1980	-1.308**	-1.556**
	[0.017]	[0.17]
Y1981	-1.266**	-1.423**
	[0.019]	[0.11]
Y1982	-1.253**	-1.305**
	[0.022]	[0.14]
Y1983	-1.375**	-1.432**
	[0.014]	[0.088]
Y1984	-1.372**	-1.359**
	[0.013]	[0.068]
Y1985	-1.420**	-1.479**
	[0.011]	[0.072]
Y1986	-1.399**	-1.402**
	[0.0079]	[0.051]
Y1987	-1.358**	-1.402**
	[0.0081]	[0.048]
Y1988	-1.340**	-1.321**
	[0.0069]	[0.045]
Y1989	-1.073**	-1.072**
	[0.0064]	[0.047]
Y1990	-1.112**	-1.020**
	[0.0060]	[0.033]
Y1991	-1.043**	-0.979**
	[0.0061]	[0.034]
Y1992	-0.936**	-0.999**
	[0.0054]	[0.034]
Y1993	-0.895**	-0.918**
	[0.0049]	[0.030]
Y1994	-0.760**	-0.806**
	[0.0047]	[0.029]
Y1995	-0.647**	-0.711**
	[0.0047]	[0.027]
Y1996	-0.574**	-0.591**
	[0.0042]	[0.026]
Y1997	-0.467**	-0.511**
	[0.0040]	[0.025]
Y1998	-0.440**	-0.465**
	[0.0038]	[0.023]
Y1999	-0.390**	-0.428**
	[0.0037]	[0.024]
Y2000	-0.364**	-0.415**
	[0.0037]	[0.024]

Y2001	-0.325**	-0.406**
	[0.0034]	[0.023]
Y2002	-0.293**	-0.355**
	[0.0033]	[0.022]
Y2003	-0.234**	-0.304**
	[0.0031]	[0.021]
Y2004	-0.129**	-0.157**
	[0.0029]	[0.019]
LUMFRdummy	-0.0941**	
	[0.012]	
PercentSFRnot123Quart	-0.00169**	0.00138
	[0.00010]	[0.00090]
PercentDNSFRnot123	-0.00338**	-0.00137
	[0.00017]	[0.0019]
PercentMFRQuart	-0.00210**	-0.00224*
	[0.00012]	[0.0011]
PercentDNMFR	-0.0127**	0.0113**
	[0.00021]	[0.0038]
PercentMURQuart	-0.00289**	0.00418*
	[0.00012]	[0.0023]
PercentDNMUR	-0.00478**	0.00958
	[0.00019]	[0.0066]
PercentINDUSTQuart	-0.00373**	-0.00571*
	[0.00016]	[0.0023]
PercentDNINDUST	-0.00314**	0.00578*
	[0.00020]	[0.0027]
PercentCCQuart	-0.00272**	0.804*
	[0.00040]	[0.44]
PercentDNCC	-0.00391**	0.0359
	[0.00067]	[0.027]
PercentCGQuart	-0.00345**	-0.00871**
	[0.00021]	[0.0033]
PercentDNCG	0.000987**	0.0145*
	[0.00035]	[0.0058]
PercentCNQuart	-0.00464**	0.0351
	[0.00057]	[0.028]
PercentDNCN	-0.00151*	0.115*
	[0.00078]	[0.057]
PercentCOQuart	-0.000332	-0.0505
	[0.00060]	[0.053]
PercentDNCO	0.0151**	-0.0346

	[0.0012]	[0.022]
PercentFFQuart	-0.00294**	-0.00167*
	[0.00015]	[0.00066]
PercentDNFF	-0.00270**	0.000292
	[0.00018]	[0.0017]
PercentMUEQuart	-0.00251**	-0.00403
	[0.00019]	[0.0067]
PercentDNMUE	-0.00105**	-0.00643
	[0.00024]	[0.0043]
PercentPFQuart	-0.00446**	-0.0103**
	[0.00022]	[0.0039]
PercentDNPF	-0.00755**	0.00733
	[0.00037]	[0.0047]
PercentPOSQuart	-0.00129**	0.00660**
	[0.00017]	[0.0018]
PercentDNPOS	-0.00539**	-0.0110**
	[0.00023]	[0.0029]
PercentRRFUQuart	-0.00569**	-0.00365**
	[0.00013]	[0.00062]
PercentDNRRFU	-0.00144**	0.00216
	[0.00019]	[0.0017]
LUAGRdummy		0.118**
		[0.013]
LUFORdummy		0.0117
		[0.014]
Constant	12.53**	13.21**
	[0.018]	[0.16]
Observations	168123	6611
R-squared	0.67	0.70

Standard errors in brackets
** p<0.01, * p<0.10

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