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The presence of adverse selection in the Las Vegas resale housing market

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THE PRESENCE OF ADVERSE SELECTION IN THE LAS VEGAS RESALE HOUSING MARKET

by

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ABSTRACT

The Presence of Adverse Selection in the Las Vegas Resale Housing Market

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Adverse selection may affect the resale housing market. Sellers hold valuable information concerning the quality of their homes that is not directly available to buyers. If buyers are unable to identify quality, the relocation decision is different for owners of low and high-quality houses. Since information is asymmetric owners of low-quality houses are more likely to relocate than owners of high-quality houses, other things constant. Thus, I suggest that quality is decreasing in the number of times a house has been resold. The presence of a relationship between price and the number of times a house has been resold is consistent with the hypothesis that adverse selection influences the resale housing market. My hedonic pricing model results supports this hypothesis. Moreover, as a house's turnover rate increases, consumer's willingness to pay for that house decreases, other things constant.

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CHAPTER 1

INTRODUCTION

Asymmetric information between market participants may adversely affect market outcomes. When either buyer or seller possesses information about product quality that is not directly observable to both market participants, a reduction of mutually beneficial trades may occur. This reduction in trade can be attributed to adverse selection. According to Akerlof (1970), adverse selection results because "there is an incentive for sellers to market poor quality merchandise, since the returns for good quality accrue mainly to the entire group whose statistic is affected rather than the individual seller" (488 1970) Informational discrepancies compel less-informed market participants to value the commodity at the expected value of goods offered for sale. With varying quality within a commodity class, adverse selection potentially drives high-quality goods out of the market. This occurs when sellers of high-quality goods are unable to command their reservation price, since the presence of low-quality goods decreases the expected value of goods offered for sale. In contrast, sellers of low-quality goods are induced to sell their product since the market price exceeds their reservation prices. Therefore, other things equal, these low-quality goods are offered for sale more frequently than goods of higher quality.

The resale housing market has been analyzed extensively throughout the literature; however, potential adverse selection problems have not been addressed. An asymmetry of information is likely to exist in this market. Thus, I attempt to identify if adverse selection hinders the resale market for single-family residential homes. Owners possess superior information about their home quality relative to potential buyers. Through direct consumption of housing services, owners identify the quality of their house's amenities that are not revealed to prospective buyers. These amenities may include plumbing, wiring, foundation, environmental conditions, and neighborhood attributes. On the other hand, a prospective buyer would need to incur costs to get information. In many cases this information would be expensive.

Since information is asymmetric, buyers are willing to pay a price consistent with the expected value of homes offered for sale. As such, reasons must exist for owners of high-quality houses to sell their good for a market to exist at all (Genesove, 1993). If relocation is not optimal for owners of high-quality houses, then only low-quality houses are sold. In the resale housing market, some potential reasons for selling include occupational relocation, to change neighborhoods, the taking of house price appreciation, and the desire to increase or decrease housing consumption as income or family size changes. The effects of adverse selection diminish when there is an increase in the percentage of sellers of high-quality houses that find relocation optimal. This allows even more high-quality products to be sold. However, high-quality goods sell for less than they would with perfect information.

Asymmetric information induces owners of low-quality goods to sell their products, resulting in low-quality goods being sold more frequently. Conversely, the probability that a house is being sold of a low quality, given it is offered for sale increases with the frequency of resale. As the number of times a house is resold increases, consumers reduce their willingness to pay, other things constant. The presence of asymmetric information may result in adverse selection influencing market outcomes.

CHAPTER 2

ILLUSTRATIVE EXAMPLES OF ADVERSE SELECTION IN THE RESALE HOUSING MARKET

The following two examples identify potential housing market outcomes characterized by adverse selection. These cases rely heavily on restrictive assumptions, and they are presented for pedagogical purposes only rather than their realism or accurate portrayal of the housing market. First, "bad houses drive out good," is an outcome illustrative of Gresham's law. A second outcome is where mutually beneficial trades do not decrease, but the price received by sellers of high-quality houses in the market declines relative to the perfect information outcome. In the latter case, sellers of low and high-quality houses receive a premium and discount for their goods, respectively. This outcome occurs because consumers in markets characterized by asymmetric information value goods at the expected value of quality offered in the market. Both of these examples are analogous to an illustration developed in Kreps (1990).

In the first example, asymmetric information drives high-quality goods out of the market, resulting in the adverse selection of low quality goods. Assume for simplicity that there are exactly two types of houses in the market: high and low-quality. High-quality homes are valued at $300,000 by consumers, while owners value them at $250,000. Likewise, low-quality homes are valued at $200,000 and $100,000 by buyers

and sellers, respectively. Secondly, assume that two out of every three houses in the resale market are low-quality. In both examples, buyers are unable to identify quality; whereas, sellers are certain about the quality of their goods. This assumption results in adverse selection influencing this market. Since consumers cannot identify quality, they value each house at the expected value of resale homes in the market. In this case, if both high and low-quality homes come to market, buyers are willing to pay $233,333.33, realizing there is a 66 percent chance of receiving a low-quality house. However, sellers of high-quality homes value their goods at $250,000. Sellers of high-quality homes are not willing to sell their goods at the prevailing market price. Consequently, high-quality sellers remove their goods from the market. Considering this, buyers readjust their willingness to pay to $200,000, resulting in only low-quality houses being sold. In this example, low-quality houses drive out high-quality houses.

In the following case, both high and low-quality houses are sold. However, the presence of asymmetric information allows sellers of low-quality homes to receive a premium for their houses. The assumptions from the prior example apply, except in this illustration two out of every three houses in the resale market are high quality. In this case, as before, buyers are unable to identify quality. Again, consumer valuation is determined by the expected value of houses offered for sale. Consumers are willing to pay $266,666.66 for each house understanding there is a 33 percent chance they purchase a lemon. This market price exceeds high-quality sellers' reservation price. Consequently, both high and low-quality houses are sold in this market. Sellers of high-quality homes, however, are penalized by the presence of asymmetric information. With

perfect information, sellers of high-quality homes would receive $300,000 for their goods which exceeds the $266,666.66 that results with asymmetric information.

These illustrations identify the potential for counteracting institutions and market signals to improve market results. Counteracting institutions include warranties, advertising, appraisal, and reputation, generally referred to in this study as certification. Owners opt to certify their house if the benefits of certification exceed the costs. In the latter example, if the price of certification is less than $33,333.33, owners of high-quality housing stock opt to certify their good; whereas, owners of low-quality products do not. If this were the case, product certification would identify quality. Thus, certification identifies quality to consumers.

CHAPTER 3

LITERATURE REVIEW

Four areas of the literature germane to this research include: (1) the impacts of adverse selection and asymmetric information on market outcomes, (2) counteracting institutions that negate the adverse hindrances of informational discrepancies, (3) hedonic pricing models, and (4) housing and resale housing market literature. This chapter summarizes these four areas.

Impacts of Adverse Selection and Asymmetric Information on Market Outcomes

The impediments of asymmetric information on market outcomes are considered extensively in the literature, most notably by Akerlof (1970), Genesove (1993), and Greenwald (1986).[1] Akerlof (1970) pioneered the discussion of the hindrances of adverse selection and asymmetric information on market outcomes. In markets influenced by asymmetric information, sellers are more informed than buyers about the quality of the good. Sellers gain valuable information about quality through consumption. Accordingly, buyers pay a price equivalent to the expected value of all goods brought to

[1]Other articles that consider adverse selection include: Bond (1982), Chezum and Wimmer (1997 and 2000), Conlin (1999), Gibbons and Katz (1991), Greenwald and Glasspiegel (1983), Heal (1976), Hey and McKenna (1981), Kim (1985), Lacko (1986), Lehn (1984), Smallwood and Conslik (1979), Stiglitz (1987), and Wilson (1977) and (1979).

market. Sellers offer their goods for sale as long as market price exceeds the benefits they receive from retaining their goods. Since the quality of the marginal good taken to market exceeds that of the average quality offered, owners of high-quality goods may not find it optimal to take their goods to market. This removal of high-quality goods decreases the average quality of goods being sold, decreasing market price, potentially driving sellers of medium-quality goods out of the market. This pattern may persist until only low-quality products are sold. Consequently, in markets influenced by adverse selection, the quality of the good sold and the number of mutually beneficial trades tend to decrease.

Reduction in mutually beneficial trades is the result of an externality. Sellers of low-quality goods do not consider social welfare in their decision-making processes. Since sellers of low-quality goods take advantage of the market, the price that sellers of high-quality goods receive declines. Reduction in the prices received by sellers of high-quality goods drives some of these sellers out of the market. Externalities eliminate mutually beneficial trades that would occur with perfect information, resulting in inefficiencies.

Genesove (1993) suggests that asymmetric information does not necessarily result in market failure. Genesove argues that sellers may have reasons other than taking advantage of the market to sell their good. Genesove notes that even when asymmetric information exists, sellers may find it in their interest to offer a portion of their goods for sale. He suggests capacity constraints may provide such a reason.[2] If this is the case, both high and low-quality goods are brought to market. Also, if consumers are able to

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[2]Genesove considers the wholesale used car market in his analysis. In this example, the capacity constraint would be the size of the new or used car lot.

identify seller type by the value of the good they bring to market, consumers' willingness to pay will differ across seller types.

Greenwald (1986) examines the influence of adverse selection on the labor market. He suggests employers discern the productivity of their employees through supervision. At the end of each contracting period, employers opt to continue relations with their most productive employees, thus driving up the wage of retained employees. The firm's desire to retain an employee signals high quality. This leads firms to offer wages that are sufficiently low to their least productive employees to force them to change occupations, results in a signal of low-quality in the secondhand labor market.

If this was the only reason individuals changed occupations, then only unproductive employees would migrate between jobs. Migration in this case would provide an accurate signal of quality to employers. Accordingly, future employers' willingness to pay would fully reflect quality. This is not the case, however, since individuals may change occupations for other reasons. Asymmetric information imposes a constraint on both employers who hire from the secondhand labor market and employees who desire to change occupations. Employers are unable to accurately identify the quality of migrating employees, so they value migrating employees at the expected productivity level of the entire group. Consequently, the presence of low-quality employees depresses high-quality employees' wages in this market. Employees migrating for reasons other than quality receive a lower wage than they would if information were perfect. Hence, asymmetric information limits the mobility of labor, because employers cannot discern the productivity of applicants in the secondhand labor market. This reduces high-quality

employees' wages in future positions, thereby placing an impediment on their mobility within the labor market.

An extensive literature review identified that prior consumption by one market participant creates an asymmetry of information.[3] Existing literature provides support for a similar model in the resale housing market. In short, homeowners obtain information about the quality of their houses through consumption, and this information is not available to prospective buyers. Consequently, market outcomes in the resale housing market should be hindered by adverse selection.

Counteracting Institutions

Akerlof (1970), Heal (1976), Shapiro (1982) and (1983), Spence (1973) and (1976), and Stigler (1961) discuss institutions that diminish the impacts of asymmetric information.[4] In markets where asymmetric information is an impediment, adverse selection can force owners of high-quality goods out of the market. To avoid this outcome, owners of high-quality goods attempt to signal quality. This signal may come in the form of advertising, warranties, producer's reputation, and/or certification or appraisal. If successful, the price that producers of high-quality goods command in the marketplace increases. Counteracting institutions potentially increase mutually beneficial transactions, thus decreasing welfare losses.

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[3]Bond (1982), Genesove (1993), and Lacko (1986) consider the resale automobile market. Greenwald and Glasspiegel (1983) consider the market for slaves in nineteenth century America. Lehn (1984) considers the market for free agent baseball players. Chezum and Wimmer (1997 and 2000) consider the market for thoroughbred yearlings.

[4]Other notable contributions to the literature include: Cooper and Ross (1984), Grossman (1981), Heal (1976), Kerton and Bodell (1995), Klein and Leffler (1981), Leland (1979), Nelson (1970) and (1974), Schmalensee (1978), and Smallwood and Conslik (1979).

Advertising improves market results when information about price, quality, and producers is not perfect. It helps identify buyers, sellers, price, and quality, thereby partially negating asymmetries in information that exist between buyers and sellers.

Stigler (1961) suggests advertising is effective at identifying buyers and sellers in a market. Search is costly if buyers and sellers cannot identify one another. Advertising reduces these costs by allowing buyers and sellers to identify themselves to one another. This identification reduces search costs and facilitates trade.

In the resale housing market, real estate agents advertise indirectly. By congregating buyers and sellers, real estate agents dramatically reduce the search costs of purchasing a home. This reduction in costs increases the number of mutually beneficial trades that take place in this market, supporting the assertion that advertising plays a prominent role in the resale housing market.

Also, advertising in the form of brochures and publications provides information concerning a house's directly observable attributes. Following Nelson (1974), advertising may be a signal of quality provided by sellers of high-quality goods. Nelson (1974) suggests a good's utility per dollar increases with advertising. Producers of high-quality goods find it advantageous to identify quality through advertising. This result is driven by consumers' uncertainty about quality. With perfect information, advertising increases production costs, impairing a firm's ability to compete. In contrast, when information is not perfect, producers of high quality products may find it in their best interest to identify superior quality through advertisement. Otherwise, consumers value quality at the expected value of goods offered for sale in the market. Producers of high quality do not

receive a price that is in accordance with their quality. Thus, advertising is one method for producers of high-quality goods to identify themselves.

In addition, warranties, if feasible, identify a product's quality. In most cases, however, complete warranties, which guarantee some level of quality, are not feasible because of adverse selection and moral hazard problems. Spence (1976) and Shapiro (1982) discuss the impacts that adverse selection and moral hazard have on the market for complete warranties. The theory of moral hazard suggests individuals who possess a complete warranty take actions that increase the probability of filing a claim. That is, the owner is careless with his or her product, taking risks he or she would not otherwise take without a warranty. This results in damages that would not occur without the complete warranty. Moral hazard makes complete warranties expensive and inefficient. Likewise, adverse selection hinders the market for complete warranties. Individuals who purchase complete warranties value them beyond their cost. These consumers have the highest expected claim costs. Thus, only the most careless individuals purchase complete warranties. This drives up the price of complete warranties until the price drives all but the most careless individuals out of the market.

Spence (1976) suggests that complete warranties are effective only if the sellers of warranties are certain about the quality of the product. If the seller is uncertain about quality, than complete warranties cannot eliminate buyer's risk of purchasing a lemon without placing substantial risk on the seller.

The presence of warranties in the resale housing market signals that asymmetric information may influence outcomes. However, a warranty's effectiveness in eliminating

asymmetric information is impeded by adverse selection, moral hazard, and seller identity.

A seller's reputation factors importantly into reducing the hindrances of adverse selection on the resale housing market. Heal (1976) disputes Akerlof's (1970) claim that bad products drive out good. Heal suggests that as long as sellers are partially concerned about future sales it is not in their best interest to deceive consumers by selling low-quality products. As long as current gains of selling an inferior good do not exceed the present discounted value of future gains from maintaining quality, high-quality goods are not driven out of the market. Thus, sellers consider their long-term relationships with their customers before selling low-quality products.

As suggested by Shapiro (1983), reputation is established over time. He suggests that in a competitive industry with imperfect information reputations allow price to exceed cost. If information is perfect, consumers value goods according to quality and they pay cost. When quality is uncertain, however, consumers are willing to pay a premium for products from sellers who have an established reputation for producing high-quality products. This premium represents a regular return for investment in reputation. Initially, high-quality goods sell for less than cost. This initial loss represents an investment in reputation. For producers to be willing to produce high quality, this investment in reputation makes a regular rate of return. Consequently, consumers pay a premium above cost for goods from firms with established reputations. Moreover, it would seem that reputation would not alter the market for resale homes. Sellers enter this market

infrequently, eliminating incentives to build and maintain reputations of selling high-quality products.

Despite this, reputation may indirectly affect the market for resale homes. Real estate agents may have incentives to build a reputation of selling high-quality resale homes. Agents who sell low-quality houses, exploiting transaction cost gains, may lose future customers. Consequently, agents may establish a reputation of selling high-quality housing. If this is the case, the real estate agents involved in a transaction may signal quality.

Appraisal and certification reduce the impacts of adverse selection in the resale housing market. Appraisal and certification occur when an expert assesses the quality of a house. The appraiser, through direct inspection, reduces some uncertainty about quality. This reduction in uncertainty reduces the asymmetry in information between buyers and sellers in the resale housing market. Thus, if certification and appraisal are effective, the market draws closer to the perfect information outcome.

Appraisal and certification do significantly impact the market for resale homes. It is commonplace in most resale housing markets for appraisal to be a necessary condition for a home to be sold. This activity identifies quality to both buyers and lenders.

Following Genesove (1993) and Akerlof (1970), the mere existence of counteracting institutions in the resale housing market indicates that asymmetric information probably exists. These institutions become profitable when there is a divergence in information between buyers and sellers. If these institutions are completely effective, the perfect information result will occur. However, it does not appear that these institutions will

effectively eliminate the asymmetry that exists between buyers and sellers in the resale housing market.

Hedonic Price Literature

Rosen (1974) provides the seminal work concerning hedonic prices in which goods can be defined by a set of "n" objectively defined characteristics. Following Rosen's notation, a product "z" with "n" objectively identifiable characteristics can be defined as $z = (z_1, z_2, \ldots, z_n)$ where z_i measures the amount of the *ith* characteristic contained in each good. Consequently, "z" offers consumers different packages of characteristics depending on their preferences, therefore, $p(z) = p(z_1, z_2, \ldots, z_n)$. The price of good "z" is determined explicitly by the combination of the objectively measured characteristics. The implicit prices (also known as hedonic prices) of these characteristics can be estimated with regression analysis as follows:

$$p(z) = B_0 + B_1 z_1 + B_2 z_2 + \ldots + B_n z_n + e$$

The coefficient B_i for each regressor identifies the implicit price consumers are willing to pay for one more unit of each objectively identified characteristic.

This method has been utilized extensively in the housing market literature to identify such things as the value of environmental amenities as well as the value of insulation and comfort. Also, Benson et al. (1998) identify the value of a view in Bellingham, Washington. Through hedonic price estimation, Benson et al. quantify the value consumers place on different types of views. Results indicate that an inverse relationship exists between distance and value of a view.

My study utilizes hedonic price estimation to determine whether or not an inverse relationship exists between price and the number of times a house has been resold. Also, interaction terms are utilized to determine if this relationship varies with housing size.

Housing Market Literature

Smith et al. (1988) and Blank and Winnick (1953) provide distinguished overviews of the housing market literature. These authors discuss several key housing market factors that contribute to this study. These include spatial fixity, housing stock heterogeneity, transaction costs and commuting costs, and housing stock durability.

Spatial fixity concerns the permanence of housing location. Once built, relocation of housing stock becomes prohibitively inefficient. This establishes geographical resale housing markets. Homeowners who decide to relocate enter the resale housing market as both buyer and seller, purchasing housing stock in the housing market they are moving to and selling their current housing stock.

Commuting costs frequently make relocation optimal. These costs include time and transportation costs, both of which increase directly with commuting distance. Indeed, over relatively short distances commuting costs can become significant. Commuting costs necessitate relocation if a household decides to pursue occupational opportunities in a different geographic housing market. Thus, the housing stock consumption decision is centered upon occupation location.

Relocating costs manifest in transaction, search, moving, and psychic costs. Transaction costs include, but are not limited to, various closing, real estate agent, and

legal fees. Search costs comprise the monetary expenses including time necessary to purchase housing stock. Moving costs include fees paid to move furniture and household appliances. Psychic costs include those associated with breaking community ties and having to forge new relationships. According to Smith et al. (1988), relocating costs have been estimated to be significant, ranging from 8 to 10 percent of the house's sales price.

Housing stock is considered a unique durable good. Its useful life, if maintained properly, spans decades. Through proper maintenance, housing stock value can be maintained, and through rehabilitation existing housing stock can be increased. The importance of maintenance and rehabilitation ties directly to the issue of adverse selection in the resale housing market. Sellers are better aware of a house's maintenance record. Without proper maintenance a house's quality deteriorates. Since sellers are better informed about maintenance an asymmetry of information between buyers and sellers in the resale housing market exists.

Housing stock is heterogeneous. Houses comprised of different levels of amenities in different locations can be priced equally. This is best illustrated by Rosen's (1974) hedonic price model. Each objectively identified amenity of housing stock is valued by consumers.

Muth (1974) and Weinberg et al. (1981) consider the apparent immobility of households. They suggest the imposition of relocating costs is a significant deterrent to households' relocating decision. Significant increases in economic variables, such as income and wealth, induce only modest increases in housing stock consumption.

The asymmetric information costs suggested herein reinforce these authors' findings. Sellers of high-quality houses face an asymmetric information cost of relocating. These sellers receive a market price that does not reflect quality. Consequently, owners of high-quality houses may not find it optimal to increase housing stock consumption when faced with large increases in economic variables (e.g., income and wealth) resulting from the presence of asymmetric information in this market.

CHAPTER 4

THEORETICAL DISCUSSION

Akerlof (1970) pioneered the discussion of the hindrances of adverse selection and asymmetric information on market outcomes. In markets influenced by asymmetric information, sellers are more informed than buyers about the quality of the good. Sellers gain valuable information about quality through consumption. Accordingly, buyers pay a price equivalent to the expected value of all goods brought to market. Sellers offer their goods for sale as long as market price exceeds the benefits they receive from retaining their goods. Since the quality of the marginal good taken to market exceeds that of the average quality offered, owners of high-quality goods may not find it optimal to take their goods to market. This removal of high-quality goods decreases the average quality of goods being sold, decreasing market price, potentially driving sellers of medium-quality goods out of the market. This pattern may persist until only low-quality products are sold. Consequently, in markets influenced by adverse selection, the quality of the good sold and the number of mutually beneficial trades tend to decrease.

Genesove (1993) suggests that asymmetric information does not necessarily result in market failure. Genesove argues that sellers may have reasons other than taking advantage of the market to sell their good. Genesove notes that even when asymmetric information exists, sellers may find it in their interest to offer a portion of their goods for sale. He suggests capacity constraints may provide such a reason.[5] If this is the case,

[5]Genesove considers the wholesale used car market in his analysis. In this example, the capacity constraint would be the size of the new or used car lot.

both high and low-quality goods are brought to market. Also, if consumers are able to identify seller type by the value of the good they bring to market, consumers willingness to pay will differ across seller types.

The focus of this paper is to consider if asymmetric information influences the resale housing market. First, I examine a household's relocation decision under conditions of perfect information following Weinberg et al.(1981). These authors identify that households decide to relocate if the benefits of relocation exceed costs. The significant transaction costs that are associated with relocation influence households' housing stock consumption decisions; suggesting households may consume a suboptimal level of housing stock in equilibrium. The model's assumption of perfect information indicates expected quality in the resale housing market should be identical to the actual quality of the universe of housing stock.[6] Second, asymmetric information is introduced into households' relocation decisions. Assuming only two levels of quality exist in the market (high and low), owners of low-quality housing are more likely to relocate than in the case of perfect information, whereas owners of high-quality are less likely. As illustrated in Genesove (1993), as long as households have reasons to sell their house other than just to take advantage of the market, both high and low-quality houses are sold. If information is asymmetric, however, the average quality of homes in the resale market is lower than the average quality of the universe of housing stock.

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[6]With perfect information consumers are able to identify accurately the quality of a house. Thus, they are willing to pay for the quality they receive. The price sellers receive will be consistent with quality they are selling.

Weinberg et al. (1981) formally develop a model of the household's relocation decision. Central to the relocation decision is the idea of "compensating income variation- the maximum amount of money that a household could spend on transaction costs (given the prevailing prices and income) and be as well off after the move as before"(334 1981). In short, IC quantifies the amount of money a household is willing to pay to optimize housing stock consumption, holding utility constant.

The benefits of relocation are not without costs. According to Smith et al. (1988) households face significant relocating costs (RC). These costs manifest in transaction, moving, search, and psychic costs. The summation of these costs identifies the overall relocating costs faced by households. This can be shown as

$$RC = f(T, S, M, P, \alpha),$$

where RC is relocation costs, T is transaction costs, S is search costs, M is moving costs, P is psychic costs, and α corresponds to all other remaining relocating costs.

A household's relocation decision depends on both IC and RC. Generally, four potential other reasons households may decide to relocate are suggested herein. These include to change occupations, to take house price appreciation, to change neighborhoods, or to increase housing stock consumption as income or family size increases or decreases. Thus, if IC is greater than RC, the household should relocate, otherwise they should not.

I posit another factor affecting the household relocation decision is asymmetric information between buyers and sellers as to the amenities of a home. These information factors can be divided into two sets. The first set is considered observable, for example,

square footage, presence of a pool, and number of baths. The second set is factors not directly observable; or, if observable, one might be expected to value these factors only after frequent observations. These factors are referred to as latent and include plumbing, wiring, foundation, environmental amenities, neighborhood amenities, and insulation. Therefore, since some latent home amenities are almost always present, asymmetric information is a common feature in the resale market. Homeowners, other things equal, more readily observe the quality of their homes' latent amenities than potential buyers who are unable to observe the quality of these amenities without incurring search and information costs.

Accounting for asymmetric information, IC can be decomposed into two components: OC and LC. OC measures the gains households receive from altering their consumption of observable housing stock amenities. LC represents the gain or loss that households expect to receive from selling their home in a market influenced by asymmetric information. LC is the difference between the quality of a household's current consumption of latent amenities and the quality of latent amenities the household expects to receive when they relocate.[7]

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[7]If consumers are risk neutral, the value of LC is the difference between the quality of a household's current consumption of latent amenities and the quality of latent amenities the household expects to receive when they relocate. If consumers are risk averse LC is the difference between the quality of current consumption of a household's latent amenities and the certainty equivalent of the expected value of latent amenities brought to market. The certainty equivalent of the expected value of latent amenities is the value of latent amenities the consumer would have to receive to be indifferent between a certain level of latent amenities and the expected value of latent amenities brought to market. If consumers are risk averse the magnitude of LCs will change but the signs will not.

Households calculate their IC in each period and decide whether or not to relocate. I assume that OCs are randomly distributed among owners of low and high-quality housing stock. Furthermore, both buyers and sellers know the distribution of OCs, LCs, and the corresponding ICs. Households decide to relocate if benefits exceed the costs.

To develop a benchmark, the effects of quality on a household's relocation decision are considered when information is perfect. In this setting, LC goes to zero. The price sellers receive reflects the quality of their house exactly. Those households with OCs that exceed RC decide to relocate. OC* is defined as the minimum value of OC necessary for homeowners to find relocation optimal. Assuming OCs are randomly distributed across owners of high and low-quality houses, the average quality of goods offered for sale is identical to the average quality of houses in the overall market. Now consider when information is asymmetric. To simplify this discussion, I assume two levels of housing quality exist in the market: high and low quality. Also, potential buyers are aware of the distribution of high and low-quality houses, but they are unable to observe the particular LC of a home. If information is asymmetric, buyers pay according to the expected value of houses brought to market.[8] Consequently, sellers of low-quality houses receive a price that exceeds the value of their good; whereas, sellers of high-quality houses receive a price that is less than their home's true value. That is, the LC for sellers of high-quality houses is negative, and the LC for sellers of low-quality houses is positive.

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[8] I assume, following Genesove(1993), that ICs for some percentage of owners of high-quality housing stock are large enough for them to enter the resale housing market that is influenced by asymmetric information.

Households decide to relocate to maximize expected utility if IC exceeds RC or equivalently if the sum of OC and LC is greater than RC. Since LCs are positive for owners of low-quality houses and negative for owners of high-quality houses, a greater proportion of owners of low-quality housing stock find relocation optimal in each period compared to owners of high-quality housing stock. Since owners of low-quality housing are more likely to take their goods to market than owners of high-quality houses, the expected value of houses in the resale market is less than the average quality of the universe of housing stock. Moreover, as the number of times that a house is resold increases, the likelihood that a house is of low quality should increase.

When information is asymmetric, the market will clear at a price where the expected quality of goods offered for sale is identical to the actual quality offered for sale. At this price, both owners of high and low-quality housing stock offer their goods for sale. Assuming RC is constant for owners of low and high-quality housing stock, the OC* for owners of high-quality housing stock will be greater than the OC* for owners of low-quality housing stock. OC* is defined as the minimum value of OC necessary for a household to relocate. Consequently, the resale housing market suffers from adverse selection, in that low-quality homes are more likely to be offered for sale than high-quality homes. The average quality of homes in the resale market, in the case of asymmetric information, is less than the average quality in the resale housing market when information is perfect.

This relationship can be illustrated with an example. Consider the case where one hundred houses come to market, fifty high-quality and fifty low-quality. Consumers

value low-quality houses at $180,000, and high-quality houses at $200,000. If asymmetric information exists, consumers are willing to pay $190,000, thus LC is $10,000 for owners of low-quality houses and -$10,000 for owners of high-quality houses. Consider the case when ten owners of low and high-quality housing stock have OCs of $40,000, twenty owners of low and high-quality housing stock have OCs of $20,000, and the remaining owners have OCs of $10,000, where relocating costs equal $12,000. In this example, every owner of low-quality housing stock finds relocation optimal, but only the ten owners of high-quality housing stock, with OCs of $40,000, do so. Since a portion of owners of high-quality housing stock exit the market, low-quality houses are adversely selected reducing the market price to $183,333. When participants leave the market LCs also change, potentially driving all but the lowest-quality houses out of the market. However, the price of $183,333 is an equilibrium in this example since actual quality brought to market equals expected quality. So, ten owners of high-quality housing stock and fifty owners of low-quality housing stock still decide to relocate. The following table illustrates the relocation decision of each market participant discussed in this section.

An Illustrative Example of the Influence of
Quality on a Household's Relocation Decision

Housing Stock Owner	No. of Homes	LC	OC	RC	OC + LC > RC	Relocate Decision
Low quality	10	-\$10,000	\$40,000	\$12,000	\$18,000	Yes
	20	-\$10,000	\$20,000	\$12,000	-\$2,000	No
	20	-\$10,000	\$10,000	\$12,000	-\$12,000	No
High quality	10	\$10,000	\$40,000	\$12,000	\$38,000	Yes
	20	\$10,000	\$20,000	\$12,000	\$18,000	Yes
	20	\$10,000	\$10,000	\$12,000	\$10,000	Yes

This analysis shows that the resale housing market can be divided into separate sub-markets where average quality differs based on a home's resale history. The price consumers are willing to pay for homes is different in each of these markets, holding other things constant. Thus, price should be decreasing in the number of times a house is resold.

I have shown that when asymmetric information influences the resale housing market, the average quality of homes offered for sale is lower than the average for the over all housing stock. This analysis could be replicated for houses that have been sold once, producing similar outcomes. In this case, houses sold twice would be of a lower average quality than those only sold once. Similarly, houses that have not been resold would be of a higher average quality than those sold once.

The challenge is to identify a way to measure whether or not adverse selection affects the market for resale homes. Genesove (1993) suggests if consumers are able to differentiate seller type by the level of quality they bring to market, we expect to see consumer's willingness to pay to be different across types of sellers. In the resale housing market, one measure that could identify type of seller is the number of a times a house has been resold. Turnover measures offer a test for the presence of adverse selection in the resale housing market. As a house's turnover rate increases, holding other things constant, consumer's willingness to pay should decrease.

This result, however, depends on the efficiency of counteracting institutions in relieving the asymmetry of information in this market. In markets affected by asymmetric information, incentives arise for third parties to provide counteracting institutions to improve market results. Counteracting institutions include warranties, advertising, appraisal, and reputation, generally referred to in this study as certification. Owners opt to certify their house if the benefits of certification exceed the costs. Owners of high-quality houses may find certification optimal since market price is not consistent with the value of their home. If only two levels of quality (high and low) exist, only owners of high-quality houses would consider certification. If only owners of high quality certify, the premium sellers of low-quality housing stock receive from selling their home would be eliminated. However, if the cost of certification is prohibitive, asymmetric information still affects outcomes in this market.

Risk aversion increases the demand for certification on the buyer's side. Risk averse consumers are willing to pay a premium to avoid an actuarially fair gamble. This

premium is commonly referred to as the risk premium. The purchase of latent amenities in the resale housing market can be considered a gamble since there is uncertainty in the quality that will be received. To simplify, I continue to examine the case when only two levels of quality exist in the market: high and low. If quality is uncertain consumers will purchase either high-quality latent amenities with a probability cf η and low-quality latent amenities with a probability of $1-\eta$. A risk averse consumer is willing to pay a premium to avoid the uncertainty that exists when quality is uncertain.

If the value of latent amenities is increasing in investment size, so is the risk premium consumers are willing to pay for certainty. The risk premium that consumers are willing to pay is directly related to the variance of the uncertain outcome. As the value of latent amenities increase so will the variance of the uncertain outcome. Thus, the risk premium that consumers are willing to pay to avoid this gamble should be increasing in investment size. Consumer's risk premium directly affects sellers' willingness to pay for certification. The value of certification is increasing in the size of the risk premium.

If the utilization of certification increases with investment size, I would expect the relationship between price and turnover rate to erode with investment size. That is to say:

$$\partial(\partial LNPrice / \partial Turnover\ Rate)/\partial Turnover\ Rate>0.$$

CHAPTER 5

DATA AND MODEL

A data set of 1,048 resale housing market transactions drawn from the Clark County Assessor's database was collected from the area of Clark County, Nevada for transactions occurring in October of 1999. This data set consists of information on sales price and housing characteristics for each transaction, including data on number of bedrooms, number of bathrooms, square footage, number of fireplaces, presence of pool, housing type, and year of first sale. These data also identify the address for each house being resold. In addition, data were also collected from the Clark County Assessor's Website (http://www.co.clark.nv.us/assessor). Each observation's resale history was also collected from this source.

The data set includes one dependent variable and three categories of independent variables. The dependent variable is *Price*, where *Price* is the sales price for resale homes transacted in Clark County, Nevada, during October of 1999. The categories of independent variables include *Observable Amenities*, *Community*, and *Latent Amenity Proxy* variables. A complete description of each of my variables and their expected signs is provided in Table 2 in Appendix I.

In order to hold constant for each observation's objectively identifiable manifest amenities a set of *Observable Amenity* variables are included. These variables include

Age, *Acreage*, *Average Room Size*, *Bath*, *Fire*, *Pool*, *One-story*, and *Square Footage*. *Age* is the difference between the year of transaction and the year of first sale. As with most durable goods a direct relationship between age and depreciation is expected. *Average Room Size* was calculated by taking the quotient of square footage and the number of bedrooms. *Bath* and *Fire* identify the number of bathrooms and fireplaces for each observation, respectively. Indicator variables include *Pool*, and *One-Story*, which are set equal to one if the house has the amenity, and zero otherwise. The variable *Square Footage* is the number of living square feet.

Community variables identify the importance of location in the valuation of housing stock. To capture location's importance, eight regional dummy variables of the Clark County area are introduced: *Downtown*, *East*, *Henderson*, *Northeast*, *Northwest*, *South*, *Southwest*, and *Summerlin*. These regions were developed by considering commercially available print publications from real estate agents in Clark County, Nevada.

Finally, the *Latent Amenity Proxy* variable identifies if asymmetric information influences the resale housing market. This variable is *Turnover Rate*. *Turnover Rate* equals the number of times each observation has been sold (not including initial sale) divided by its age.

Appendix I, Table 2 provides descriptive statistics for all variables. In aggregate, the sample's mean sales price is $149,891 with a standard deviation of $78,581. The mean square footage is 1,775.81 with a standard deviation of 696.61. Furthermore, the average turnover rate is 0.2756 per year with a standard deviation of 0.3042.

Box-Cox estimation was utilized to identify the appropriate transformation of the dependent variable. The Box-Cox transform identifies the logarithmic functional form to be the appropriate specification for this data set. Box-Cox is a maximum likelihood iterative estimation technique that permits identification of the transform that provides the best fit for the data set. The Box-Cox transform equation is:

$$y^{(\lambda)} = (y^{\lambda} - 1)/\lambda$$

Lambda equal to one, zero, and negative one identify linear, logarithmic, and reciprocal functional form specifications, respectively. The lambda calculated for this hedonic equation equaled -0.1734 with a 95% confidence interval ranging from -0.0988 to -0.2383. This suggests that the logarithmic transformation of the dependent variable is appropriate one among the three most frequently used transforms for this data set. Consequently, *LNPrice* is utilized as the dependent variable, where *LNPrice* is the natural log of sales price for homes transacted in Clark County, Nevada during October of 1999.[9]

The Ramsey Reset test (regression specification error test) is utilized to determine the appropriate transformation of variables. The Ramsey Reset test (*Reset*) is a general test that tests for omitted variables, incorrect functional form, and violations of the assumptions of ordinary least squares. The null hypothesis for this test is that the model is correctly specified. Conversely, the alternative hypothesis is that the model is incorrectly specified. *Reset* tests for omitted variables and functional form misspecification by re-estimating the model including the powers of the fitted values of

[9]The natural log transformation of price is consistent with *a priori* expectations. This transformation ensures that all predicted values will be positive. Since the model predicts values of price this constraint seems appropriate.

the dependent variable from the nested model. If the powers of the fitted values do not significantly improve the goodness of fit the null hypothesis should be accepted, identifying that the model is adequately specified. Two specifications of these data that allowed the null hypothesis to be accepted at conventional levels are utilized to test the hypothesis that price is decreasing in the number of times a house is resold. These specifications which are referred to as *Quadratic* include the following set of independent variables: *Latent Amenity Proxy*, *Age*, *Acreage*, *Average Room Size*, *Bath*, *Fire*, *Pool*, *One-story*, *Square Footage*, and *Square Footage*^{2}. One specification includes *Community* variables, the other does not.

To determine if the relationship between price and the number of times a house is resold is robust, several other specifications were tested. These include specifications for which *Square Footage* is included linearly and logarithmically (*double-log*).[10] The *double-log* is reported in addition to *quadratic* specification and includes *Age*, *Bath*, *Fire*, *LNAcreage*, *LNAverage Room Size*, *LNSquare Footage*, *Pool*, and *One-story* as the set of *Observable Amenity* variables, where *LNAcreage*, *LNAverage Room Size*, and *LNSquare Footage* are the natural logs of *Acreage*, *Average Room Size*, *Square Footage*, respectively.

Utilizing these data, two hedonic price models are estimated to determine if asymmetric information influences the resale housing market. The hedonic pricing model equation is,

[10]The *Reset* tests' null hypothesis was rejected in both of these specifications.

Above, I have argued that sellers may employ certification to address problems of asymmetric information. The most direct way to test such an hypothesis is to obtain information on whether or not such a mechanism is employed. These data unfortunately could not be collected to include these variables directly. However, I expect the value of certification to be increasing in the size of the home. An indirect test for the utilization of certification is to examine whether the relationship between price and turnover rates varies with housing size. Thus, from Equation 1,

$$B_3 \textit{Latent Amenity Proxy} = f\,(\textit{Square Footage})$$

To test this hypothesis, a second Latent Amenity Proxy variable that interacts *Turnover Rate* with *LNSquare Footage* is included in the *double-log* specification to consider the relationship between price and the number of times a house has been resold as square footage changes.[11] Expanded from Equation 1:

$$\begin{aligned} LNPrice = B_0 + B_1 \textit{Observable Amenities} + B_2 \textit{Community} + \\ (B_3 + B_4 \textit{LNSquare Footage})\ \textit{Turnover Rate} + e \end{aligned} \qquad (Eq.\ 2)$$

Further,

$$\begin{aligned} LNPrice = B_0 + B_1 \textit{Observable Amenities} + B_2 \textit{Community} + \\ B_3 \textit{Latent Amenity Proxy} + e \end{aligned} \qquad (Eq.\ 1)$$

[11]The double-log transform was utilized to model the relationship between price and turnover as square footage changes since it is a parsimonious model, consistent with economic theory, that takes into account the nonlinearities between price and square footage present in the data.

$$LNPrice = B_0 + B_1 Observable\ Amenities + B_2 Community + B_3 Turnover\ Rate + B_4 LNSquareFootage * Turnover\ Rate + e \quad (Eq.\ 3)$$

The partial derivative of *LNPrice* with respect to *Turnover Rate* identifies the relationship between price and turnover rate for different sizes of housing stock, which is:

$$\partial LNPrice / \partial Turnover\ Rate = B3 + B4LNSquare\ Footage \quad (Eq.\ 4)$$

I expect that an increase in a house's turnover rate should decrease consumer's willingness to pay for that house, holding other things constant, and this relationship may erode as the size of investment increases if the value of certification is increasing in size of investment or mathematically $\partial(\partial LNPrice / \partial Turnover\ Rate)/\partial Turnover\ Rate$ is positive.

CHAPTER 6

EMPIRICAL RESULTS

Tables 3, 4, and 5 in Appendix I include empirical results. Table 3 shows the findings for two regression equations that correspond to the *quadratic* specification in which *Turnover Rate* is the only *Latent Amenity Proxy* variable introduced. Table 4 illustrates the results of two regression equations that correspond to the *double-log* specification in which *Turnover Rate* is the only *Latent Amenity Proxy* variable introduced. Table 5 includes two regression equations that correspond to the *double-log* specification for which both *Turnover Rate* and *Turnover Rate *LNSquare Footage* are included as *Latent Amenity Proxy* variables. Column 1, in each table, does not include *Community* variables, whereas column 2 does.[12]

Empirical results reinforce expectations for *Observable Amenities* and *Community* variables. That is, manifest amenities and location appear to influence housing price. The variables *Age, Average Room Size, Fire, LNAcreage, LNAverage Room Size, LNSquare Footage, Pool, One-Story, Square Footage, Square Footage*^{2} are statistically significant in each regression equation for which they are included. Also, *Northwest, Northeast, Central, East*, and *Southwest* are statistically significant in each equation for

[12]Results of regression equations for which *Square Footage* was entered linearly were provided results similar to that of the *quadratic* and *double-log* models.

which they are included. *Northwest, Northeast, Central, East* each have a negative coefficient, whereas *Southwest* has a positive coefficient. *Acreage, South, and Summerlin* are not statistically different from zero in any regression equation in which they enter.

The *Latent Amenity Proxy* variables are of interest to my model. In the *quadratic* regression equation that does not include *Community* variables, the *Turnover Rate* coefficient is negative and significant at the 5 percent level. In the *double-log* regression equation that does not include *Community* variables, the *Turnover Rate* coefficient is negative and has a p-value of .112, indicating an inverse relationship exists between turnover rates and price. However, this variable, while remaining negative, becomes insignificant when *Community* variables are included. The p-value for *Turnover Rate* drops to 0.246 and 0.686 for the *quadratic* and *double-log* specifications respectively.

Although these results are consistent with expectations that a relationship exists between price and turnover rates, I believe that this form of the model does not capture fully this relationship. Variables that should be included to fully capture these data include differences in demographics across regions, the uncertainties about quality that may decrease in established neighborhoods, and the presence of counteracting institutions.[13] Although data were not collected for these variables, below I test indirectly

[13]Central to my argument is that consumers are uncertain about quality in the resale housing market. To test if perceptions of turnover rates are different in more established parts of towns or in regions with larger concentrations of minority households, the two oldest regions in the data set were omitted. These regions are also relatively concentrated with minority households. When these regions are omitted, the coefficient on *Turnover Rate*, when *Community* variables are included, becomes statistically significant.

for the influences of counteracting institutions on the resale housing market.

Also of interest are the regression results that include *Turnover Rate *LNSquare Footage* as a second *Latent Amenity Proxy* variable. The coefficients for each *Latent Amenity Proxy* variable in these equations is statistically significant. This regression indicates the relationship between price and turnover rate varies with housing size. The partial derivative of *LNPrice* with respect to *Turnover Rate* is negative up to 2,050 square feet and positive thereafter in the regression that does not include *Community* variables, spanning over approximately 80 percent of the data set. This partial derivative is negative up to 1,820 square feet and positive there after in the regression that includes *Community* variables. A 95 percent confidence interval was estimated for this partial derivative. This confidence interval identified that this partial derivative is statistically less than zero for houses less than 1700 square feet, not statistically different from zero for houses ranging from 1700 to 2900 square feet, and positive for houses greater than 2900 square feet in the regression equation that does not include community variables. Further, this confidence interval identified that this partial derivative is statistically less than zero for houses less than 1500 square feet, not statistically different from zero for houses ranging from 1500 to 2300 square feet, and positive for houses greater than 2300 square feet in the regression equation that does include community variables. Figures 2 and 3 in Appendix I plot the relationship between price and turnover as square footage changes for each regression equation.

In general, my results are consistent with the hypothesis that asymmetric information influences the resale housing market. An increase in a house's turnover rate decreases consumer's willingness to pay for that house, other thing constant. Further, it has been shown that this relationship depends on housing size. Depending on the value of certification, owners of high-quality housing stock may certify their goods in order to signal quality. As investment increases, consumers may be willing to pay a premium for housing stock that is identified to be of high quality. Thus, the relationship between turnover rates and price is increasing in housing size.

CHAPTER 7

CONCLUSION

The presence of asymmetric information in the resale housing market appears to influence market outcomes. Owners acquire information through consumption that buyers do not, creating an asymmetry in information. Since owners of low-quality houses gain more from relocation than owners of high-quality houses; the expected quality of houses on the market is lower than the expected quality of the aggregate stock of houses. Moreover, as the number of times that a house is put on the market increases, the likelihood that a house is of low-quality increases. Thus, the expected quality of houses offered for sale is decreasing in the number of times they are resold. My results suggest an inverse relationship exists between price and the number of times houses are resold, which is consistent with the hypothesis that asymmetric information influences outcomes in the resale housing market. This result provides several valuable insights into the housing market literature.

My results may provide another explanation for the household immobility presented by Weinberg et al. (1981). Transaction costs impede the relocation decision of households. As transaction costs increase, fewer households relocate. In addition, the presence of asymmetric information also assesses a cost to relocating households. When asymmetric information exists between market participants, the less-informed market

participant pays a price consistent with expected value of houses offered for sale. Thus, the price that owners of high-quality housing stock receive is depressed. This externality reduces mutually beneficial trades in the resale housing market, thus reducing the number of households that find relocation optimal. Although transaction costs are the primary explanation for household immobility, the presence of asymmetric information appears to be a valid extension.

Future research should attempt to identify both the importance of counteracting institutions in the resale housing market and the primary reason sellers relocate. Data on individuals and why they move or where they move to would be helpful. This information may be available to consumers at the time of purchase, thereby altering their willingness to pay. Further, data from another geographical housing market should be collected and a similar test be constructed. In addition, Clark County's dynamic housing market may not be descriptive of less robust markets. This hypothesis may be better supported by data collected in a more established geographical housing market. These data could possibly be collected via Metroscan and local county assessors' offices. Also, variables more capable of identifying the intricacies of neighborhood characteristics should be included.

Another extension to this theory would include the number of days a house is on the market as the dependent variable while maintaining the same independent variables. One potentially credible signal is to forego the benefits of moving by refusing offers that are not consistent with value. Since sellers of low-quality homes are expected to receive a premium for selling their homes; such a signal is likely to be prohibitively costly for

them. Thus, owners of high-quality housing stock can signal quality to the market by leaving their house on the market until the price they receive more closely reflects quality. So, an inverse relationship between days on the market and turnover rates should exist, other things constant. Since owners of low-quality housing stock are receiving a price that exceeds value, if asymmetric information exists they are more likely to accept offers than are owners of high-quality housing. This hypothesis could be tested with a hazard rate model.

In any case, the presence of asymmetric information in the resale housing market appears to affect outcomes. As a house's turnover rate increases, consumers reduce their willingness to pay for that home, other things constant. This relationship also varies with investment size. Risk averse consumers willingness to pay for certification increases with investment size. My empirics are consistent with this hypothesis.

APPENDIX I

TABLES AND FIGURES

Table 1. Variable Descriptions and Coefficient Expectations

Variable Name	Description	Expected Sign
Dependent Variable		
Price	The sales price of a subset of houses transacted in Clark County, Nevada during October of 1999.	N/A
LNPrice	Natural log of *Price*.	N/A
Latent Amenity Proxy	Variables that attempt to identify if a relationship exists between price and the number of times a house has been resold.	N/A
Turnover Rate	Equals the number of times sold, not including initial sale, divided by age.	Positive/ Negative
*Turnover Rate * LNSquare Footage*	*Turnover Rate* multiplied by *LNSquare Footage*.	Positive/ Negative
Observable Amenities	Includes all independent variables consumers are able to identify and accurately value during their search process.	N/A
Acreage	Size, in acres, on which the house resides.	Positive
Age	Difference between 1999 (transaction year) and the year of first sale.	Negative
Average Room Size	Produced by dividing living square feet by number of bedrooms.	Positive
Bath	Number of bathrooms in the house.	Positive
Fire	Number of fireplaces the house possesses.	Positive
LNAcreage	The natural log of size, in acres, on which the house resides.	Positive
LNAverage Room Size	The natural log of the quotient of square feet and number of bedrooms.	Positive
LNSquare Footage	Number of total living square feet for each house.	Positive
One-Story	Dummy variable that identifies if a house is one or two stories. This variable takes the value of one if the house is one story and 0 is the house is two stories.	Positive
Pool	Dummy variable that identifies the presence of a pool. This variable takes on the value of 1 if a pool is present and 0 if a pool is not present.	Positive
Square Footage	Number of total living square feet.	Positive
Square Footage^2	Number of total living square feet squared.	Negative
Community	Regional dummy variables that attempt to quantify the value of location in the price of housing stock.	N/A

Table 1 (continued)

Downtown	This variable takes on the value of 1 if the house resides in zip codes 89101, 89102, 89104, 89106, 89107 and 0 otherwise.	Positive/ Negative
East	This variable takes on the value of 1 if the house resides in zip codes 89121, 89120, 89109, 89122 and 0 otherwise.	Positive/ Negative
Henderson	This variable takes on the value of 1 if the house resides in zip codes 89012, 89014, 89015 and 0 otherwise.	Positive/ Negative
Northeast	This variable takes on the value of 1 if the house resides in zip codes 89115, 89110, 89030, 89031 and 0 otherwise.	Positive/ Negative
Northwest	This variable takes on the value of 1 if the house resides in zip codes 89130, 89131, 89108 and 0 otherwise.	Positive/ Negative
South	This variable takes on the value of 1 if the house resides in zip codes 89119 and 89123 and 0 otherwise.	Positive/ Negative
Southwest	This variable takes on the value of 1 if the house resides in zip codes 89103, 89113, 89117, 89118 and 0 otherwise.	Positive/ Negative
Summerlin	This variable takes on the value of 1 if the house resides in zip codes 89128, 89129, 89134 and 0 otherwise.	Positive/ Negative

Table 2. Descriptive Statistics*

Variable Name	Mean	Standard Deviation
LNPrice	11.83	0.393
Turnover Rate	0.276	0.304
*Turnover Rate * LNSquare Footage*	2.0612	2.2967
Acreage	0.188	0.545
Age	14.810	13.062
Average Room	534.69	153.43
Bath	1.9519	.5387
Fire	0.801	0.642
LNAcreage	-1.887	0.4711
LNAverage Room Size	6.2461	0.2608
LNSquare Footage	7.418	0.346
One-Story	0.679	0.467
Pool	0.2145	0.411
Square Footage	1.775.815	696.616
Square Footage^2	3.638.335	3.492.630
Downtown	0.138	0.345
East	0.089	0.2859
Henderson	0.168	0.374
Northeast	0.155	0.362
Northwest	0.108	0.310
South	0.063	0.243
Southwest	0.099	0.299
Summerlin	0.179	0.384

*Number of observations used was 1,048.

Table 3. Two Regression Equations That Include *Turnover Rate* as the Only *Latent Amenity Proxy* Variable (*quadratic* specification). T-statistics using white standard errors in parentheses.

Variable	*LNPrice*	*LNPrice* (*Community*)
Constant	10.863*** (210.021)	10.9278*** (206.622)
Turnover Rate	-0.030** (-2.279)	-0.0149 (-1.160)
Age	-0.0083*** (-15.089)	-0.0071*** (-10.920)
Acreage	0.0158 (1.167)	0.0149 (1.041)
Average Room	0.0005*** (6.504)	0.0004*** (5.619)
Bath	0.0044 (0.299)	0.0097 (0.673)
Fire	0.0287*** (2.609)	0.0107** (2.102)
One-Story	0.0635*** (4.978)	0.0726*** (5.923)
Pool	0.0899*** (6.289)	0.0901*** (6.351)
Square Footage	0.00047*** (15.230)	0.0004*** (14.366)
Square Footage^2	-2.70E-08*** (-4.919)	-2.19E-08*** (-3.820)
Downtown		-0.615*** (-2.975)
East		-0.0631*** (-2.828)
Northeast		-0.1311*** (-7.729)
Northwest		-0.0412** (-2.429)
South		0.0057 (0.318)
Southwest		0.0447** (2.222)

Table 3 (continued)

Summerlin		0.0195 (1.227)
Number of Observations	1048	1048
R-squared	0.8353	0.8510
F-statistic	343.07	225.82

Note: Henderson excluded regional dummy variable.
* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.

Table 4: Two Regression Equations That Include *Turnover Rate* as the Only *Latent Amenity Proxy* Variable (*double-log* specification). T-statistics using white standard errors in parentheses.

Variable	*LNPrice*	*LNPrice (Community)*
Constant	5.8813*** (18.902)	6.397*** (20.296)
Turnover Rate	-0.0176 (-1.190)	-0.00047 (-0.032)
Age	-0.0081*** (-13.899)	-0.0071*** (-10.513)
Bath	0.0241 (1.562)	0.0318** (2.094)
LNAcreage	0.1038*** (4.022)	0.1129*** (4.255)
LNAverage Room	0.2821*** (7.629)	.2389*** (6.583)
Fire	0.03519*** (3.196)	0.0324*** (2.961)
LNSquare Footage	0.5908*** (16.532)	0.5682*** (16.10)
One-Story	0.0434*** (2.795)	0.0513*** (3.386)
Pool	0.0922*** (6.362)	0.0931*** (6.397)
Downtown		-0.052*** (-2.437)
East		-0.0643*** (-2.913)
Northeast		-0.1285*** (-7.451)
Northwest		-0.0539*** (-3.104)
South		-0.0192 (-1.114)
Southwest		0.0478** (2.261)
Summerlin		0.0224 (1.401)

Table 4 (continued)

Number of Observations	1048	1048
R-squared	0.8287	0.8442
F-statistic	335.83	211.52

Note: Henderson excluded regional dummy variable.
* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.

Table 5. Two Regression Equations Including Both *Turnover Rate* and *Turnover Rate *LNSquareFootage* as *Latent Amenity Proxy* Variables (*double-log* specification). T-statistics using white standard errors in parentheses.

Variable	*LNPrice*	*LNPrice (Community)*
Constant	6.145*** (19.302)	6.601*** (20.876)
Turnover Rate	-1.113*** (-3.211)	-1.110*** (-3.423)
*Turnover Rate * LNSquare Footage*	0.1460*** (3.151)	0.148*** (3.393)
LNAcreage	0.0982*** (3.824)	0.107*** (4.065)
Age	-0.0082*** (-14.241)	-0.0073*** (-10.873)
LNAverage Room	0.2809*** (7.964)	0.2381*** (6.590)
Bath	0.0213 (1.401)	0.02900** (1.942)
Fire	0.0346*** (3.074)	0.0311*** (2.837)
LNSquare Footage	0.5559*** (14.944)	0.5323*** (14.449)
One-Story	0.0436*** (2.843)	0.0514*** (3.433)
Pool	0.0942*** (6.459)	0.0951*** (6.514)
Downtown		-0.053*** (-2.479)
East		-.0651*** (-2.992)
Northeast		-0.1302*** (-7.520)
Northwest		-0.0555*** (-3.182)
South		-0.0211 (-1.231)
Southwest		0.0471** (2.226)

Table 5 (continued)

Summerlin		0.0196 (1.215)
Number of Observations	1048	1048
R-squared	0.8301	0.8457
F-Statistic	320.86	213.85

Note: Henderson excluded regional dummy variable.
* Significant at 10% level.
** Significant at 5% level.
*** Significant at 1% level.

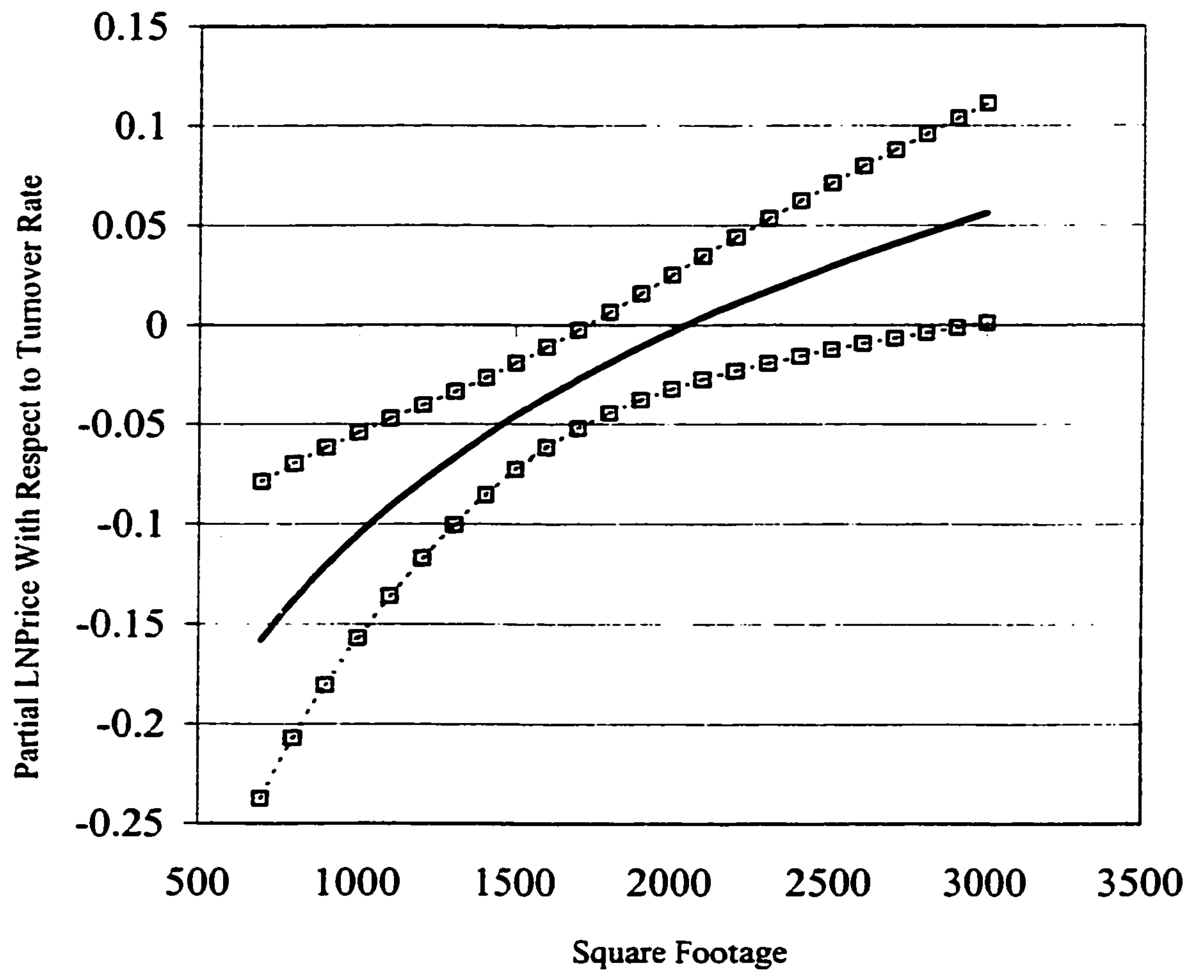

Figure 1. Relationship Between *LNPrice* and *Turnover Rate* Over the Relevant Range of Square Footage (no *Community* variables).

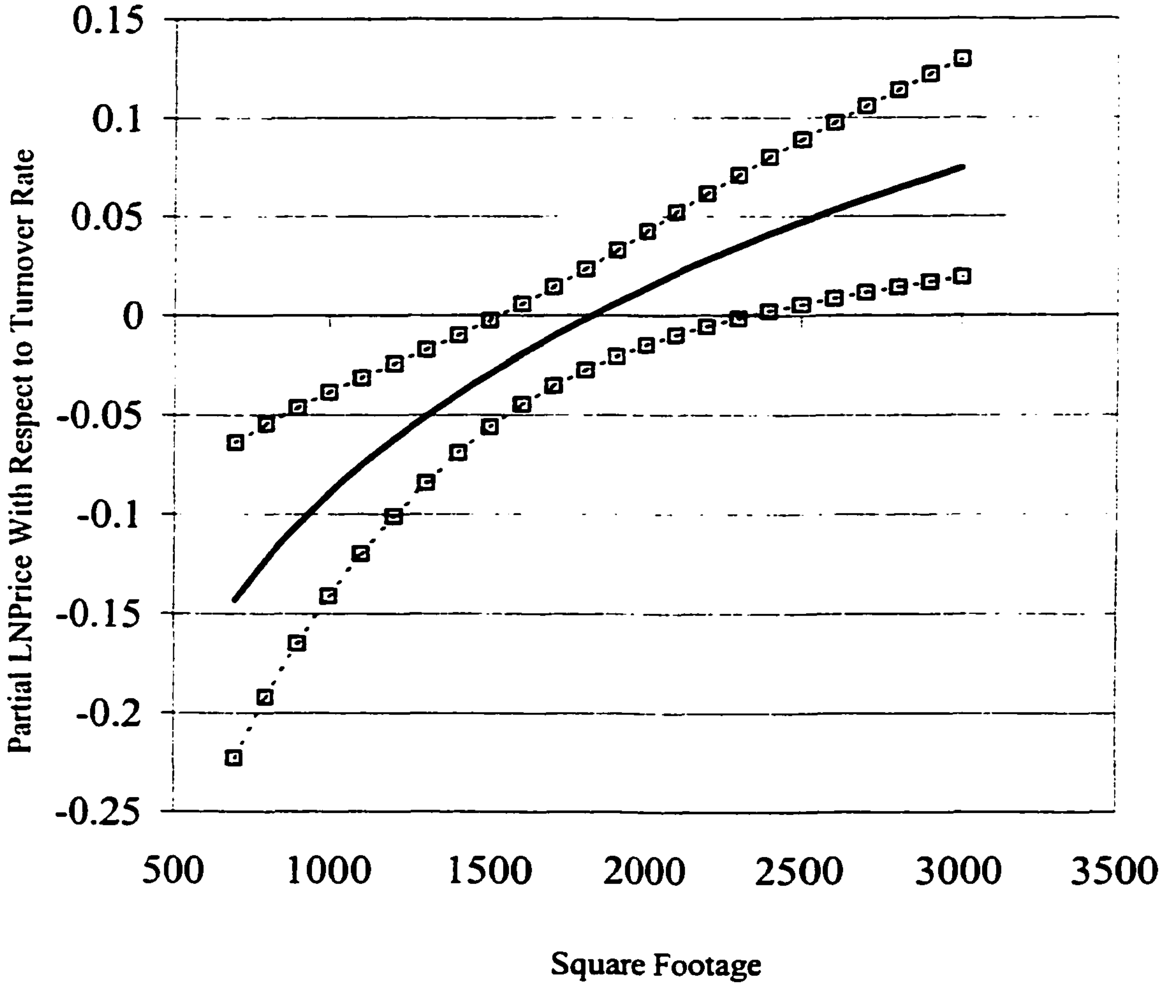

Figure 2. Relationship Between *LNPrice* and *Turnover Rate* Over the Relevant Range of Square Footage (with *Community* variables).

BIBLIOGRAPHY

Akerlof, George. "The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanism." Quarterly Journal of Economics. Volume 89 (August 1970): 488-500.

Arnott, Richard, Russell Davidson, and David Pines. "Housing Quality, Maintenance and Rehabilitation." Review of Economic Studies. Volume 50 (July 1983): 467-494.

Benson, Earl, Julia Hansen, Arthur Schwartz Jr., and Greg Smersh. "Pricing Residential Amenities: A Value of a View." Journal of Real Estate Finance and Economics. Volume 16 (1998): 55-73.

Blank, David, and Louis Winnick. "The Structure of the Housing Market." Quarterly Journal of Economics. Volume 67 (May 1953): 181-208.

Bond, Eric. "A Direct Test of the 'Lemons' Model: the Market for Pickup Trucks." American Economic Review. Volume 72 (September 1982): 836-840.

Bond, Eric, and Edward Coulson. "Externalities, Filtering, and Neighborhood Change." Journal of Uban Economics. Volume 26 (1989): 231-249.

Brucato, Peter, James Murdoch, and Mark Thayer. "Urban Air Quality Improvements: a Comparison of Aggregate Health Benefits to Hedonic Price Differentials." Journal of Environmental Management. Volume 30 (1990): 265-279.

Case, Bradford, and John Quigley. "The Dynamics of Real Estate Prices." Review of Economics and Statistics. Volume 73 (February 1991): 50-58.

Case, Karl, and Robert Shiller. "The Efficiency of the Market for Single-Family Homes." American Economic Review. Volume 79 (March 1989): 125-137.

Chattapadhyay, Sudip. "Estimating the Demand for Air Quality: New Evidence Based on the Chicago Housing Market." Land Economics. Volume 75 (February 1999): 22-38.

Chezum, Brian, and Bradley Wimmer. "Roses or Lemons: Adverse Selection in the Market for Thoroughbred Yearlings." *Review of Economics and Statistics*. Volume 79: 521-526.

_____. "Evidence of Adverse Selection from Thoroughbred Wagering." Southern Economic Journal. Volume 66(3), 700-714.

Chinloy, Peter. "An Empirical Model of the Market for Resale Homes." Journal of Urban Economics. Volume 7 (1980): 279-292.

Conlin, Michael. "Empirical test of a Seperating Equilibrium in National Football League Contract Negotiations." Rand Journal of Economics. Volume 30 (Summer 1999): 289-304.

Cooper, Russell, and Thomas Ross. "Prices, Product Qualities and Asymmetric Information: the Competitive Case." Review of Economic Studies. (1984): 197-207

Coulson, Edward, and Eric Bond. "A Hedonic Approach to Residential Succession." Review of Economics and Statistics. Volume 72 (August 1990): 433-444.

Doughertry, Ann, and Robert Van Order. "Inflation, Housing Costs, and the Consumer Price Index." American Economic Review. Volume 72 (March 1982): 154-164.

Genesove, David. "Adverse Selection in the Wholesale Used Car Market." Journal of Political Economy. Volume 101 (August 1993): 644-665.

Gibbons, Robert, and Lawrence Katz. "Layoffs and Lemons." Journal of Labor Economics. Volume 9 (1991): 351-380.

Graves, Phil, James Murdoch, Mark Thayer, and Don Waldman. "The Robustness of Hedonic Price Estimation: Urban Air Quality." Land Economics. Volume 64 (August 1988): 220-233.

Greenwald, Bruce. "Adverse Selection in the Labour Market." Review of Economic Studies. Volume 53 (July 1986): 325-347.

Greenwald, Bruce,and Robert Glasspiegel. "Adverse Selection in the Market for Slaves: New Orleans, 1830-1860." Quarterly Journal of Economics. Volume 98 (August 1983): 479-499.

Grossman, Sanford. "The Informational Role of Warranties and Private Disclosure About Product Quality." Journal of Law and Economics. Volume 24 (December 1981): 461-483.

Grossman, Sanford, and Joseph Stiglitz. "Information and the Competitive Price Systems." American Economic Review. Volume 66 (May 1976): 246-253.

Heal, Geoffrey. "Do Bad Products Drive Out Good?" Quarterly Journal of Economics. Volume 90 (August 1976): 499-502.

____. "Guarantees and Risk-sharing." Review of Economic Studies. Volume 44 (October 1977): 549-560.

Hey, John, and Chris McKenna. "Consumer Search with Uncertain Product Quality." Journal of Political Economy. Volume 89 (February 1981): 54-66.

Katz, Michael and Harvey Rosen. Microeconomics. Irwin: Boston, 1981.

Kearl, J.R. "Inflation, Mortgage, and Housing." Journal of Political Economy. Volume 87 (October 1979): 1115-1138.

Kerton, Robert, and Richard Bodell. "Quality, Choice, and the Economics of Concealment: the Marketing of Lemons." Journal of Consumer Affairs. Volume 29 (Summer 1995): 1-28.

Kim, Jae-Cheol. "The Markets for 'Lemons' Reconsidered: a Model of the Used Car Market with Asymmetric Information." American Economic Review. Volume 75 (September 1985): 836-843.

Kim, Sunwoong. "Search, Hedonic Prices and Housing Demand." Review of Economics and Statistics. Volume 74 (August 1992): 503-508.

Klein, Benjamin, and Keith Leffler. "The Role of Market Forces in Assuring Contractual Performance." Journal of Political Economy. Volume 89 (August 1981): 615-641.

Kreps, David. A Course in Microeconomic Theory. Princeton: 1990, 625-660.

Lacko, James. "Product Quality and Information in the Used Car Market." Bureau of Economics Staff Report to the Federal Trade Commission.

Lehn, Kenneth. "Information Asymmetries in Baseball's Free Agent Market." Economic Inquiry. Volume 22 (January 1984): 37-44.

Leland, Hayne. "Quacks, Lemons, and Licensing: A Theory of Minimum Quality Standards." Journal of Political Economy. Volume 87 (December 1979): 1328-1346.

Linneman, Peter. "An Empirical Test of the Efficiency of the Housing Market." Journal of Urban Economics. Volume 20 (1986): 140-154.

Margolis, Stephen. "Depreciation and Maintenance of Houses." Land Economics. Volume 57 (February 1981): 91-105.

Meese, Richard, and Nancy Wallace. "Testing the Present Value Relation for Housing Prices: Should I Leave My House in San Francisco?" Journal of Urban Economics. Volume 35 (1994): 245-266.

Milon, J. Walter, Jonathan Gressel, and David Mulkey. "Hedonic Valuation and Functional Form Specification." Land Economics. Volume 60 (November 1984): 378-387.

Miyao, Takahiro. "Dynamic Instability of a Mixed City in the Presence of Neighborhood Externalities." American Economic Review. Volume 68 (June 1978): 454-463.

Muth, R. "Moving Costs and Housing Expenditures." Journal of Urban Economics. Volume 1 (1974): 108-125.

Nelson, Jon. "Residential Choice, Hedonic Prices, and the Demand for Urban Air Quality." Journal of Urban Economics. Volume 5 (1978): 357-369.

Nelson, Phillip. "Information and Consumer Behavior." Journal of Political Economy. Volume 78 (March-April 1970): 311-329.

______. " Advertising as Information." Journal of Political Economy. Volume 82 (July-August 1974): 729-754.

Palmquist, Raymond. "Estimating the Demand for the Characteristics of Housing." Review of Economics and Statistics. Volume 66 (August 1984): 394-404.

Pindyck, Robert, and Daniel Rubinfeld. Microeconomics. Prentice-Hall: New Jersey, 1998.

Quigley, John, and Daniel Rubinfeld. "Unobservables in Consumer Choice: Residential Energy and the Demand for Comfort." Review of Economics and Statistics. Volume 71 (August 1989): 416-425.

Rosen, Sherwin. "Hedonic Prices and Implicit Markets: Product Differentiaition in Pure Competition." Journal of Political Economy. Volume 82 (January –February 1974): 34-55.

Schmalensee, Richard. "A Model of Advertising and Product Quality." Journal of Political Economy. Volume 86(June 1978): 485-503.

Shapiro, Carl. "Consumer Information, Product Quality, and Seller Reputation." Bell Journal of Economics. Volume 13 (Spring 1982): 20-35.

______. "Premiums for High-quality Products as Returns to Reputations." Quarterly Journal of Economics. Volume 98 (November 1983): 659-680.

Silberberg, Eugene. The Structure of Economics: A Mathematical Analysis. McGraw-Hill: New York, 1990.

Smallwood, Dennis, and John Conslik. "Product Quality in Markets Where Consumers are Imperfectly Informed." Quarterly Journal of Economics. Volume 93 (February 1979): 1-23.

Smith, Lawrence, Kenneth Rosen, and George Fallis. "Recent Developments in Economic Models of Housing Markets." Journal of Economic Literature. Volume 26 (March 1988): 29-64.

Spence, Michael. "Job Market Signaling." Quarterly Journal of Economics. Volume 87 (August 1973): 355-374.

______. "Informational Aspects of Market Structure: An Introduction." Quarterly Journal of Economics. Volume 90 (November 1976): 591-597.

Spitzer, John. "A Primer on Box-Cox Estimation." Review of Economics and Statistics. Volume 64 (May 1982): 307-313.

Stigler, George. "The Economics of Information." Journal of Political Economy. Volume 69 (June 1961): 213-225.

Stiglitz, Joseph. "The Causes and Consequences of the Dependence of Quality on Price." Journal of Economic Literature. Volume 25 (March 1987): 1-48.

Weinberg, Daniel, Joseph Friedman, and Stephen Mayo. "Interurban Residential Mobility: the Role of Transaction Costs, Market Imperfections, and Household Disequilibrium." Journal of Urban Economics. Volume 9 (1981): 332-348.

Weisberg, Sanford. Applied Linear Regression. Wiley & Sons: New York, 1980.

Wilde, Louis, and Alan Scwartz. "Equilibrium Comparison Shopping." Review of Economic Studies. Volume 46 (July 1979): 543-553.

Wilson, Charles. "The Nature of Equilibrium in Markets with Adverse Selection." Bell Journal of Economics. Volume 11 (1977): 108-130.

_____. "Equilibrium with Adverse Selection." American Economic Review. Volume 69 (May 1979): 313-317.

Wooldridge, Jeffrey. Introductory Economics: A Modern Approach. South-Western College Publishing: 2000.

Zuehlke, Thomas, and David Rasmussen. "A Search Model of Housing Transactions." Bell Journal of Economics. Volume 54 (January 1988): 623-629.

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