EXTERNALITIES IN LAND USE: WITH CONSIDERATION OF THE EFFECT OF MOBILE HOME PARKS

by

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ABSTRACT

In this study of externalities in urban land use, a theory of externalities and property rights is outlined and related to urban land use problems. This theory is developed into a basic strategy for land use planning.

In the empirical section, the hypothesized negative external effect of mobile home parks was analyzed using multiple regression. The analysis is based upon the hypothesis that the real estate market will reflect external costs and benefits as variations in property values. Estimated regression parameters showed a positive relationship between property values and distance from a mobile home park. Property values decreased by $3,100 over a range of 4,000 feet as one moved toward a mobile home park, ceteris paribus. Other land quality characteristics shown as significant determinants of property value were mountain view, lot size, and distance from the university, central business district, commercial establishment, industrial zone, and grade school.

Introduction

The land use planning issue has been thrust into the forefront of national attention. Conflicts between land uses are occurring more frequently as many interrelated land uses become concentrated in the confines of urban areas. The interdependencies in urban land use, which may either lower or raise the economic value of surrounding land, are so complicated that it is difficult to identify or evaluate the multitude of tradeoffs involved. Public policy makers and planners are hampered in their efforts to contend with the complex issues both by the lack of a sound theoretical foundation and the lack of sound information on which to base decisions.

This study is an attempt to partially fill the void in information as indicated by the objectives delineated below. The justification outlines the background developments in land use which have created the impetus for the research to which this thesis is addressed. In the fourth section, Statement of the Problem, the economic theory of externalities and property rights is set forth as it applies to urban land use. It is followed by a section which outlines an important land use (mobile home parks) which generates conflicts[1] and then by a review of related literature. Since mobil

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[1]For example, see the article in Appendix C. Christene C. Myers, "County Commissions Split on Mobile Home Issue", Billings Gazette, May 4, 1976, p. 1.

home parks have become a significant urban land use and are suspected of creating externalities in residential areas, this study attempts to determine if, and to what extent, mobile home parks create externalities. Three mobile home parks located in residential areas of Bozeman, Montana were selected for analysis. A model of urban land markets is developed and applied to Bozeman in Chapter II by relating, via regression analysis, the sale price of single-family properties to their distance from mobile home parks and to other quality characteristics. It was hypothesized that variations in property values should reflect the presence and scope of the externality. The results of the empirical analysis are presented in Chapter III.

CHAPTER I

THE LAND USE PROBLEM

Justification

The public's interest in utilizing land use planning to upgrade the quality of life in urban areas and to guide private land use decisions to achieve the greatest public welfare is documented by the growing coverage this subject is accorded by Congress and state legislatures, the news media, and professional literature. This is evidenced by the two hundred land use measures introduced in the 92nd Congress,[2] the forty-two land use bills (five in Montana) considered in 1975 by the eight Rocky Mountain states,[3] and the fact that land use has been the focal point of many recent regional conferences.[4]

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[2] U.S. Congress, Senate, Committee on Interior and Insular Affairs, National Land Use Policy, 92nd Congress, 2nd Session, 1972, p. 1.

[3] A Summary of major bills introduced in each state is given in Appendix A.

[4] For example, see Larry R. Whiting, ed., Papers of the Land Use Planning Seminar: Focus on Iowa (Ames, Iowa: Center for Agricultural and Rural Development, August 1973); Maurice Baker, Everett E. Peterson, and John Muelbeirer, comp., Land Use Planning for the Great Plains (Lincoln, Nebraska: Nebraska Agricultural Experiment Station, June 1973); New Mexico State University, Proceedings of the 6th Annual Statewide Land-Use Symposium (Albuquerque, N.M.: Cooperative Extension Service, January 1975).

Reasons for the recent growth of interest in land use planning include a swelling population, sharpened competition for land by additional and alternative uses engendered by rapid material growth, and new environmental legislation. The United States population has increased from an estimated 150,697,361 in 1950 to 211,210,000 in 1974. Coupled with population growth there has been a continuing concentration of population in urban areas. In 1970, seventy-three percent of the United States population was urban and living on two percent of the land area.[5] The result has been greater demand for available urban land including residential, industrial and commercial development, and recreational property. Coterminously, there has been an increase in concern about possible negative impacts from development which together with environmental constraints and zoning has made it increasingly difficult to shift a parcel of land from one use to another.

Each of these factors has led to inevitable conflicts as many interrelated uses which are not complementary have become concentrated in the confines of urban areas. For instance, as urbanization occurs large amounts of land are passed over or held for speculative purposes. The patterns of development which emerge,

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[5]Marion Clawson, America's Land and Its Uses, Resources for the Future, Inc. (Baltimore: John Hopkins Press, 1972), p. 30.

known by such familiar terms as urban sprawl, leap frog development, and strip cities, increase the area over which municipal and county governments are expected to extend urban services, thus markedly increasing the cost incurred for the adequate provision of these services. These increased costs are typically paid for by all taxpayers and not just those responsible for the development. Similarly, development has oftentimes resulted in an agglomeration of residential, commercial, and industrial properties. In such cases, congestion, noise, lack of open space and privacy, and air pollution diminish the quality of life for everyone.

For planning purposes there is a need to look beyond superficial symptoms by illuminating the underlying economic causes. The benefits and costs derived from each alternative available form the structure of economic incentives facing urban residents and, therefore, may encourage the observed types of urban growth. Many of these incentives are the products, purposely or inadvertently, of governmental actions. It would be productive to examine these incentives.

First, federal income tax laws provide incentives which encourage home ownership as opposed to renting. Imputed rent from home ownership is not treated as taxable income and interest on home mortgages is deductible from taxable income while rent pay-

ment is not. Property taxes are also deductible from income tax liabilities.

The Federal Housing Administration provides easy access to credit for home purchase. Their standards (which the housing industry is inclined to follow) make detached single-family homes the most favorable type. These factors induce consumption of large areas of land for residences and lead to what is known as urban sprawl. The federal income tax laws further compound the sprawl incentive by giving capital gains from land sales special tax treatment. This encourages speculators to hold urban land vacant in hopes of making large profits, taxed at low rates.

Most of the discussions concerning solutions to land use problems are phrased in a manner which is not useful as a guide to policy. They are permeated with non-operational terms like "inefficient," "desirable," "unlovely," "unproductive," etc. Unqualified terms such as these require hard definition that would give economic meaning to the concepts they represent. Basically, these terms are recognizing that there is a problem but the contexts from which they are taken are not usually directed at the real cause of the problem. There is a tendency to pay heed to the effects and not analyze the cause. Application of the economic theory of externalities should help correct this problem.

Problems facing planners and policy makers also are compounded by a poor data base and the lack of reliable statistical information on which to base their decisions. "Imperative in planning and implementing land uses is sound planning founded on facts and analysis provided by applied research."[6]

Public officials are further hampered in making rational planning decisions by their inability to grasp the full significance of all the many relationships that must be considered and economists' inability to relate to the planner's perceptions. The problem would be considerably easier if the relationships involved and the streams of value they create were unidirectional and not so numerous. This is not the case, however, as two land uses may affect each other in any combination of positive and negative ways. Further complication is introduced when one considers that a given land use may have a concurrent negative and positive effect on land values. Workers, for example, may want to live close to an industrial employment center to enhance transportation savings but not so close that they are subjected to any negative externalities

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[6]John F. Timmons, "Issues in Land Use Planning and Control," in Papers of the Land Use Planning Seminar: Focus on Iowa, Larry R. Whiting, ed. (Ames, Iowa: Center for Agricultural and Rural Development, August 1973), p. 22.

associated with the industries located there. In brief, while an aversion to living near an industrial area may exist, there is still a desire to live fairly close. It is these types of tradeoffs public planners must attempt to weigh against one another. Identifying and understanding the tradeoffs will be facilitated by the application of the constructs of economic logic.[7]

Objectives

The purpose of this thesis is to help city managers, planning boards, zoning commissions, future researchers, and concerned local officials and citizens achieve a greater understanding of urban land use problems. It seeks also to help fill an informational void that has made urban decision-making so difficult. More specifically, the objectives of this thesis are (1) to apply the economic theory of externalities and property rights to an urban land use situation; (2) to test the null hypothesis that "mobile homes do not influence land values"; (3) to provide statistical information concerning the impact on land values of the externality associated with mobile

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[7] Robert D. Vlasin, "National Economic Considerations in Land Use," in National Land Use Policy: Objectives, Components, Implementation (Ankeny, Iowa: Soil Conservation Society of America, 1973), p. 53.

home parks located in urban residential areas; and (4) to provide information concerning the interdependencies or tradeoffs that exist between alternative land uses.

Statement of the Problem

The traditional approach to resource allocation in our economy has been to rely on the market. Ostensibly, market generated prices will signal shifts in resource use and allocate the resource between alternative uses. The market system invisibly guides each resource to its highest and best use and yields an "efficient" allocation of the resource if property rights in all resources are well defined.[8]

In the land market, however, we find that less faith is being placed in the price system and emphasis is being shifted to collective land use controls and regulations. The sovereign state's rights of eminent domain or condemnation and police power are being employed in conjunction with taxation, government expenditure programs, and an arsenal of lesser tools to influence land use. "Land

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[8]Neil E. Harl, "Economic and Legal Development and Analysis to Guide Land Use Planning and Control," in National Land Use Policy: Objectives, Components, Implementation (Ankeny, Iowa: Soil Conservation Society of America, 1973), p. 324.

use planning, by definition, involves efforts to modify patterns of land resource allocation or income distribution or both. The objective of planning is the further enhancement of man's welfare. To a considerable extent, such modifications are viewed as departures from the allocation and income distribution patterns that would otherwise exist under market or price determined forces."[9]

Although the market is impartial and logically consistent, complete reliance upon it may yield a misallocation of resources and a skewed distribution of wealth. The market will be efficient and its allocative and distributional formula optimal only under a very stringent set of conditions and assumptions.[10] Namely, the market must take into account all the costs and benefits of each market participant's actions and reflect those costs and benefits fully upon the initiator of the action. In other words, the market must "internalize" all costs (benefits) for decision purposes. Failure to internalize all costs (benefits) will lead to an understatement (overstatement) to the private decision maker of

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[9]Ibid., p. 323.

[10]For more detail see C.E. Ferguson, Microeconomic Theory (rev. ed.; Homewood, Ill.: Richard D. Irwin, Inc., 1969), Ch. XVI.

total or "social" cost (benefit). The result is that the decision making firm or individual perceives marginal conditions as being met at a point inconsistent with Pareto optimality.[11] Total costs relevant to the firm or person are lower than is consistent with Pareto optimality. Consequently, more land is allocated to that particular use than would be the case if all costs were internalized into the decision process.[12] Failure of the institutional structure to internalize the total social cost results in a technological externality.

An externality occurs when $U_A = F(X_{A1}, X_{A2},\ldots,X_{AN}, X_{B1},\ldots,X_{BN}, X_{N1},\ldots,X_{NN})$. The essence of this utility function is that the utility of person A depends not only on actions under his control $(X_{A1}\ldots.X_{AN})$, but also on the actions of other individuals $(X_{B1},\ldots\ldots,X_{NN})$ which are not under his control.[13] In relation to

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[11] Pareto optimal is the state in which no individual can improve his situation without making at least one other individual worse off.

[12] Harl, "Economic and Legal Development," p. 324.

[13] An externality is caused by the non-independence of individual preference (utility) or production functions. A consumption externality is demonstrated, although the analysis is basically symmetrical for production or preference functions. To change the analysis requires only the deletion and insertion of appropriate terms. For more detail, see F.J. Bator, "The Anatomy of Market Failure," Quarterly Journal of Economics, LXXII (August 1958), pp. 351-79; and Emery M. Castle, "The Market Mechanism, Externalities and Land Economics," Journal of Farm Economics, XLVII, No. 3, August 1965), pp. 542-56.

a single variable, X_{B1}, an externality exists when $\frac{\partial U_A}{\partial X_{B1}} \neq 0$. When $\frac{\partial U_A}{\partial X_{B1}} > 0$, an external economy exists. If $\frac{\partial U_A}{\partial X_{B1}} < 0$, then an external diseconomy prevails.[14]

This definition requires some clarification because it implies that any change in A's utility invoked by another individual including changes occurring within the market system is an externality. In an interdependent market system one individual's action alters the set of products and factor prices facing other individuals. The utility levels of the individuals not initiating the action are altered because the scope of their opportunity sets is changed by actions not under their control. However, in the case of perfect competition, the equilibrium solutions are all Pareto-optimal and cannot be ranked without a social welfare function. A distinction must, therefore, be made between cases where utility is affected indirectly as through relative prices and those where such effects are from direct influences upon the components of the utility function. Hence, these market generated (pecuniary) externalities are excluded from the consideration when "externality" is used

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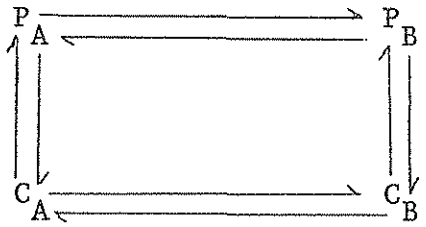
[14] James M. Buchanan and William Craig Stubblebine, "Externality," Economica, New Series, XXIX, no. 116 (November 1962), p.372.

in this thesis.[15]

Externalities can be caused by non-independence between both production and consumption functions. B's consumption may be a variable in A's consumption (utility) function and vice versa. Similarly, A's production may be a variable in B's consumption.[16] The term interdependencies will be used to represent this generalized concept of externalities and to connote a reciprocal relationship rather than a cause and effect characterization.

> Interdependencies between producers and consumers may exist as follows:



> where P_A and P_B represent the production functions of A and B respectively, and C_A and C_B represent the consumption functions of A and B, respectively. With [just the] four decision-making units outlined above, the probability of 12 external relationships exist.[17]

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[15] E.J. Mishan, "The Post War Literature on Externalities: An Interpretative Essay," Journal of Economic Literature, IX (March 1971), pp. 1-28.

[16] Castle, "Market Mechanism," p. 547.

[17] Ibid., p. 548.

So as more land uses, owners, and consumers become involved, the potential for externalities to be created becomes manifold.

In summary, "an externality in economic value arises when the actions of one person or group brings costs or values to another; costs which the person initiating the action does not have to bear or values which he is unable to capture."[18] The impact of the actions takes place through means other than the market and thus is not incorporated into the action-taker's decision process. The creation of these externalities can be directly related to a failure to completely define and control property rights. Property rights delineate what a person can and cannot do with respect to the use of any scarce resource. They specify the set of rules by which people must abide pertaining to the use of things and the penalties which must be borne for not observing these behavioral sanctions. Complete specification of property rights and control of their transfer and modification through the coercive powers of the state effectively internalizes the benefits and costs of any action and that is a necessary condition for efficient allocation of resources. Property rights exclude other people from free access to the good

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[18] Marion Clawson, Suburban Land Conversion in the United States: an Economic and Governmental Process, Resources for the Future, Inc. (Baltimore: John Hopkins Press, 1971), p. 166.

thus making the value of any good exchanged depend upon the content of the property rights bundle which is traded even though different persons may hold different components of that good. The market system can be thought of as a social mechanism whereby the exchange of property rights is accomplished. Inability or failure of the sovereign state to fully specify all property rights or to enforce those which are specified prevents the market from reflecting the total value of a good and leads to the existence of an externality. The problem to use an "Ellis-Fellner type explanation is 'the divorce of scarcity from effective ownership.'"[19]

An externality, then, is the result of a weak property rights structure and a solution is to establish a set of non-attenuated property rights.[20] Pareto-efficiency is ensured if competitive equilibrium conditions and zero transaction costs are supplemented by a non-attenuated property rights structure.[21] According to

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[19]Bator, "Anatomy of Market Failure," p. 361.

[20]Term used by Eirik G. Furubotn and Svetozar Pejovich, "Property Rights and Economic Theory: A Survey of Recent Literature," Journal of Economic Literature, X, no. 4 (December 1972), pp. 1137-57.

[21]Alan Randall, "Property Rights and Social Microeconomics," Natural Resources Journal, XV, no. 4 (October 1975), p. 733.

Professor Randall, a non-attenuated structure of rights has the following characteristics:

a) The set of rights is completely specified. Since rights provide, among other things, an information system, a completely specified set of rights will reduce both ignorance and uncertainty.
b) Exlcusive rights must be specified, so that all rewards and penalties accruing from an action accrue to the actor. In economic parlance, all benefits and costs are internalized and private and social costs are ipso facto equal.
c) The set of rights must be enforceable and enforced. The assurance of enforcement is essential for reducing uncertainty as to the outcome of decisions and actions.
d) Rights must be transferable so that rights like any other input may gravitate to their highest value use. Transferability is essential to ensure achievement of necessary marginal equalities.[22]

If transaction costs are sufficiently low to allow net gains from trade, Pareto efficient allocation of resources can be achieved despite the existence of externalities and without the assignment of legal responsibility. There must exist what is essentially a market for externalities. The party upon which costs are imposed will have incentive to pay the creator of the externality and the latter will have incentive to accept payment. As the dynamic process of trade goes on, all gains from trade will be exhausted and optimal resource allocation will be secured. However, this solution will have substantial effects on the distribution

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[22] Ibid.

of wealth.[23]

When externalities are involved, there are two aspects which must be evaluated. They are efficiency and equity. Efficiency has been partially discussed above and involves the use and allocation of resources to achieve maximum social welfare. Equity considerations involve the distribution of wealth. If transaction costs are zero, the resource allocation will be the same and optimal whether or not liability is assigned and will be independent of any assignment. But, where the liability is placed has definite implications for the distribution and transfer of wealth between the two parties.[24] Which party should be assigned liability for an externality is an equity question.

To use an example relevant to this thesis, consider an individual establishing a mobile home park in a residential area which we will assume, for explanatory purposes, creates an externality by

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[23]Ronald H. Coase, "The Problem of Social Cost," Journal of Law and Economics, III (October 1960), pp. 1-44.

[24]See Ibid.; James N. Buchanan and William Craig Stubblebine, "Externality," Economica, New Series, XXIX, no. 116 (November 1962), pp. 371-84; and Ralph Turvey, "On Divergences Between Social Costs and Private Costs," Economica, New Series, XXX, no. 119 (August 1963), pp. 309-13.

offending his neighbors' aesthetic sensitivities and which will reduce surrounding land values. Because property rights are not assigned, no one owns the amenities of the neighborhood. Therefore, preventing the individual from this action which inflicts injury on his neighbors would impose real costs on the individual in that he is barred from engaging in an activity which is optimal for him. On the other hand, he imposes some real costs on his neighbors. From a social welfare aspect the solution is to minimize the total harm or in other words, to maximize total welfare. Are the costs imposed on the neighbors (their reduced amenities and property values) more or less than the value that the mobile home residents and owners receive from the provision of this type of housing at this location? The equity question which must be decided is who should bear the costs or who should be allowed to injure whom. It is clear that this problem must be viewed in total as well as at the margin.[25]

The economic researcher can only particularize the alternatives and their implications. The choice between alternatives must be made through social institutions such as legislatures, courts, and citizen organizations because they involve social welfare judgments.

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[25]Coase, "Social Cost," p. 2.

The problem is aptly spelled out by Dolbear.

> It is not for an economist, qua economist to assess legal responsibility for an externality. For example, suppose my neighbor has a coal furnace and I find the smoke from his chimney noxious. Most people would hold my neighbor responsible. Now, suppose my neighbor paints his house gray and I find gray a depressing color. Here most people would hesitate to blame my neighbor. Determination of responsibility for externalities seems to have more to do with private property rights than with economics -- which makes it a matter for the courts or for a legislative body.[26]

As previously brought out, the distinguishing feature of externalities is that the actions of one decision-maker (making optimal decisions for himself but not necessarily for society) brings values or costs to another decision-maker; values which the former is unable to capture for himself or costs which he does not have to bear. The subsequent effect of cost avoidance or value loss is not a purposeful production, but rather is an incidental consequence of some otherwise legitimate action.

The basic strategy for urban land use planning (with due consideration for the equity problem) is to optimize positive and negative land use externalities. At present, the social and political techniques available to do this are weak or absent.[27]

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[26] F. Trenery Dolbear, Jr., "On the Theory of Optimum Externality," American Economic Review, LVII, no. 1 (March 1967), p. 90.

[27] Clawson, Suburban Land Conversion, pp. 166-87.

Zoning, for example, a prime tool for avoiding negative externalities, has not always been effective. Moreover, it is especially weak for promoting positive externalities.[28]

Both efficiency and equity problems can be solved simultaneously by internalization of the external effects. Internalization means reflecting the consequences of any action into the decision-making process of the action-taker. The initiator of any decision must be made to bear all the costs or capture all the values resulting from that decision. To accomplish this, Marion Clawson believes two things must happen. First, there must be legal measures devised to define property rights. "Before society can do much to maximize the as yet poorly defined external values from land uses in urban settings, it must find a way to define the property rights and to control their creation, transfer, increase or decrease, or modification in any way." Second, flows of values between alternative land uses must be more effectively measured. "Intuitively, as one observes the urban scene, one senses that complex flows of value do exist . . . . But just where do these value flows begin and end, and, above all, how large are they in quantitative terms? These are economic problems to which relatively little time and talent

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[28]Clawson, "A Look at the Past," p. 34.

have been devoted so far."[29]

The objective of this thesis as previously delineated is to partially fulfill the tasks outlined by Clawson's second requirements. The rationale for his first task have been set forth in this section.

Mobile Homes

A. The Problem

The major hypothesis to be tested is that the presence of mobile home parks in urban residential areas creates an external diseconomy which is reflected in decreased land values near such parks. "Despite the increased popularity of mobile home living, there remains considerable apparent hositility in many Eastern States, on the part of public and municipal officials toward mobile home parks and mobile homes on private lots."[30] Gibson's findings are collaborated by this statement by Bair:

> . . . the mobile home is often excluded from location on its own lot or as an accessory dwelling in more restricted residential districts primarily on the expressed grounds that its appearance would adversely affect the character of the

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[29]Clawson, "Suburban Land Conversion," pp. 361, 368 and 369.

[30]Constance B. Gibson, Policy Alternatives for Mobile Homes, Center for Urban Policy Research (New Brunswick, N.J.: Rutgers University, February 1972), p. 33.

> district and thus lower property values. As secondary considerations . . . , it may be barred because of its relatively low cost, and because its occupants may be of a different social or economic level.[31]

Planning commissions and governing bodies are seen to be about evenly divided on the favorable-unfavorable split, and the general public is judged to have a very low opinion of existing mobile home developments.[32] Apparently, the mobile home park imposes aesthetic and other costs upon nearby land owners which the park owner and its inhabitants do not bear. It is thus associated with an externality. However, an important caveat must be attached to this statement.

B. Economic Considerations

There are two alternative hypotheses concerning the specification of the theoretical and empirical models as it relates to mobile home parks. The argument arises in relation to causation. Do mobile home parks cause the decrease in property values indicated by the results presented later in this thesis or are mobile home

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[31]Frederick H. Bair, Jr., Regulation of Modular Housing with Special Emphasis on Mobile Homes (Chicago: ASPO Planning Advisory Service, August 1971), p. 62.

[32]Frederick H. Bair, Jr., Modular Housing Including Mobile Homes: A Survey of Regulatory Practices and Planner's Opinions (Chicago: ASPO Planning Advisory Service, January 1971), p. 39.

parks simply correlated with lower land values? The contemporary hypothesis as indicated by Bair and Gibson[33] is that mobile home parks and their alleged attendant externalities are the direct cause of lower property values. This is the premise upon which the inclusion of distance from a mobile home park as an independent variable in the regression equation is based. Alternatively, the hypothesis has been advanced that the presence of a mobile home park is only coincident to lower property values. The proposition is that a mobile home entrepreneur would rationally seek low valued land to build the park upon. It is conjectured that inhabitants of mobile homes are likely to have preference patterns which would discount the value of many neighborhood amenities. These persons would likely not be willing to pay premiums for mountain views, larger lots, and isolation from various industrial and commercial establishments which have non-trivial offensive characteristics. Therefore, mobile home park developers would supply (develop) the parks at locations which cater to these demands. In this case, the gradient in property value would exist regardless of the mobile home park. A final consideration along this line is that any specification error in the model presented in Chapter II would tend to bias up-

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[33]Bair, Regulation of Modular Housing; and Gibson, Alternatives in Mobile Homes.

ward the results indicating an externality. To any extent that the above hypothesis is correct and that the empirical model simultaneously contains specification error, the coincidental correlation of mobile home parks with low land values would be reflected in the mobile home park variables' regression estimate.

The contention presented in this thesis is that mobile home parks do create a negative externality. There are abundant court cases aimed at preventing the establishment of a mobile home park in a residential neighborhood. The citizens instigating these court suits are obviously devoting resources to their cause; resources which have alternative uses and thus opportunity cost. If these people are assumed rational, they must be incurring these costs in the expectation of gain. The "gain" which they apparently expect is the "prevention of loss" due to the mobile home park. This loss may be monetary (in the form of lower property values) or aesthetic. Therefore, it is contended that mobile home parks do impose costs upon nearby residential neighbors or the neighbors would not rationally expend resources to prevent their establishment.[34]

It must be pointed out that there are three arguments which can

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[34]Terry L. Anderson and P.J. Hill, "The Evolution of Property Rights: A Study of the American West," Journal of Law and Economics, April 1975; Gordon Tullock, "The Cost of Transfers," Kykos, Vol. XXIV (1971).

be presented to refute this contention and cast doubt upon its validity. The first is that urban residents are "rationally ignorant" and merely believe that the mobile home park creates an externality which indeed it does not. "Rationally ignorant" in this case implies that urban residents have rationally not determined the true impact of mobile home parks. The behavior is purported to be rational because the benefits from this additional information are less than the value of the resources required to obtain it.

A second argument is that urban residents who spend resources to prevent mobile home parks from being built do so to prevent a loss due to a pecuniary externality rather than a technological externality. If this is true then the market is working properly, its solution is Pareto optimal, and it can not be said whether the loss is good or bad without a social welfare criterion. According to the argument, the establishment of a mobile home park in a neighborhood increases the supply of housing. Since at a point in time the demand for housing is constant, the price a potential buyer is willing to pay is reduced for all houses in the neighborhood. It is this loss that the second argument contends park-site area residents are trying to prevent when they object to mobile home parks.

The third point is that even if the technological externality does exist, its abolute or relative magnitude can not be separated through this econometric technique from the relative supply repercussions

mentioned above. A technological externality would incline some affected residents to seek property in neighborhoods devoid of mobile home parks. Demand for the relative supplies of property would increase in the park-free areas and decrease in park-site areas. If the supply of property is less than perfectly elastic, the property price will increase and decrease in the respective areas. The magnitude of the price increase caused by the rising demand in the park-free areas will depend on the relative supply elasticity of property. Furthermore, increase in the housing supply in park-site areas could magnify an observed gradient in property values associated with mobile home parks since this supply shift would further lower prices in those areas.

An illustration of the idea discussed here can be provided by considering two hypothetical communities similar in all respects except the proportion of mobile home park-free neighborhoods. Tastes and preferences of households in the communities are assumed to be identical. In the first community there are a large number of locations not influenced by mobile home parks. If a regression equation were estimated for this community and compared with that of a second community having a very small proportion of non-affected locations, the estimated parameter for the second would be much larger than for the first community.

C. Industry Development

The mobile home had not been heard of until recent years. The industry had its start in the manufacture of travel trailers in the 1930s. According to the Mobile Home Manufacturer's Association, travel trailer sales amounted to approximately $1,300,000 throughout the 1930s. But today, the mobile home industry is the primary source of new low-price housing in the United States.[35] That mobile homes are currently an important factor in the housing supply in the nation cannot be denied as evidenced by the following figures which give an idea of the size and nature of the mobile home and mobile home park industry. Mobile homes are now being built at a rate in excess of 400,000 units per year[36] which is nearly one out of every five new housing units. At least two out of every five families who bought a new home in 1971 without federal assistance bought a mobile home.[37] In 1972 there were well over 2 million mobile homes in use and over 6 million people resided in them.[38]

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[35]The mobile home sales record for 1966-70 are given in Appendix B.

[36]Gibson, Policy Alternatives, preface.

[37]U.S. Department of Housing and Urban Development, HUD Challenge (Washington, D.C.: Government Printing Office, July 1971), p. 28.

[38]Robert Hovey Nulsen, The Mobile Home Manual (Beverly Hills, Cal.: Trailer-R-Club of America, 1972), p. 15.

The growth rate is paralleled by the mobile home park industry where approximately 26,000 mobile home parks existed in the U.S. in 1972 and expansion was taking place at a rate of about 3,000 parks per year.[39] For a further discussion of the mobile home industry and problems and constraints faced by owners and inhabitants, it is recommended that the reader consult Gibson.[40]

D. Snynopsis

The phenomenal growth in these two industries has made mobile homes a very pressing land use problem. An illustration is provided by a May 4, 1976 article in the Billings Gazette. A shortage of mobile home parking spaces, a string of protests, and a difference of opinions between the Zoning Commission and County Commission are erupting into a potential court battle. A zoning change to allow the building of a mobile home park in a residential neighborhood is being proposed. The County Commissioners approved the change because they felt that mobile homes are becoming increasingly important to the working class and are being crowded out of existence. More and more middle-income people are buying mobile homes and finding there is no place to put them. But, homeowners in the

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[39] Ibid., p. 5.

[40] Gibson, Policy Alternatives.

new park-site area feel that the mobile homes devalue property and bring population density that causes excess noise and traffic snarls. Consequently, they have contacted an attorney and plan to fight the zoning change in court.[41]

Problems similar to this are not likely to disappear with time. In the preface to her book, Constance Gibson states: "This type of shelter can no longer be viewed as a temporary aberrant, a transient response to a housing shortage, which will disappear as the latter becomes less rigorous. Some form of the mobile home is here to stay."[42]

Should housing policies accept and encourage the consumption of mobile homes in parks? Or should policy eliminate them through exclusionary zoning and building codes? Opinions and recommendations on these subjects are beyond the purview of economics and this thesis. However, consideration of policy options is necessary to determine the role mobile homes might occupy in increasing the housing supply in suburban as well as urban areas. Regional, county, city, and other planners need to know the full impact of mobile homes if they are to make enlightened decisions. The empirical

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[41]See Appendix C for entire article.

[42]Gibson, Policy Alternatives, preface.

analysis presented in Chapters II and III seeks to provide information to help answer these important questions.

Some earlier Studies

Economic literature of special relevance to this study includes work by Kitchen, Knetsch, Supalla, Jaksch, and Downing.[43] The approach followed in these property value studies was to regress market price of a property on a set of value-determinant characteristics related to both the land and improvements.

In his study, Kitchen isolated the effect of urban public parks on proximate residential land values. Using a linear regression model, he found that when improvement value (house, etc.) was separated from total property value the hypothesized positive regression coefficient relating land value to distance from the park was significant. Kitchen used local tax assessment as a proxy for the

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[43] J.W. Kitchen and W.S. Hendon, "Land Values Adjacent to an Urban Neighborhood Park," Land Economics, XLIII (August, 1967), pp. 357-60; Jack L. Knetsch, "The Influence of Reservoir Projects on Land Values," Journal of Farm Economics, XLVI (February 1964); John A. Jaksch and Herbert H. Stoevener, Effects of Air Pollution on Residential Property Values in Toledo, Oregon (Corvallis, Ore.: Agricultural Experiment Station, September 1970); Raymond T. Supalla, Impact of Location Factors on Residential Property Values (Las Cruces, N.M.: Agricultural Experiment Station, June 1975); Paul B. Downing, "Estimating Residential Land Values by Multivariate Analysis," in The Assessment of Land Value, ed. by Daniel Holland (Madison, Wis.: University of Wisconsin Press, 1970), pp. 101-24.

value of property improvements.

Knetsch studied the impact on land values of proposed TVA reservoir projects. Multiple regression techniques were the primary tools of analysis. A model which explained land values around three existing TVA reservoirs provided estimates of land values if a proposed reservoir was constructed. A similar model was used to predict land values if the project was not constructed. The difference between the two estimates could then be considered as the influence of the proposed reservoir project. Apparently, a positive externality created by the recreation benefits of the reservoir was capitalized into land value. Knetsch used actual market sales of land tracts as the dependent variable.

Multiple regression analysis was also used by Supalla to analyze the location factors which influence residential property values in Las Cruces, New Mexico. He determined that the values of single-family homes are substantially affected by their proximity to commercial and industrial property. The distance from industrial and commercial establishments entered the regression equations in an exponential form. His basic data source was the realtors' multiple listings in Las Cruces for 1967. The value of property improvements were controlled for by using property characteristics found on the multiple listing forms. Typical data were square feet of heated area, type of garage, lot size, and number of bathrooms and bedrooms.

Also of interest is the study by Jaksch and Stoevener which developed an economic model to measure the magnitude of the negative externality created by a pulp and paper mill in Toledo, Oregon. Actual sales price of single-family residential property was the dependent variable in a multiple regression analysis. Design characteristics were used to control for the value of improvements. With such control, Jaksch and Stoevener found that an externality such as air pollution will indeed be reflected by the real estate market.

Downing developed a theoretical and an empirical urban land value model to explore the theory of land value. He related sale prices of vacant lots to their accessibility to economic activities, its amenities, its topography, and its present use. Downing found that the distance from the central business district (CBD) was significant when entered in the regression equation in non-linear form (1/X). He conjectured that if less aggregated data were used, more of the location and amenity variables should have a non-linear specification.

CHAPTER II

URBAN LAND MARKET

A general theoretical model of an urban land market is developed in this chapter. Concurrently, the theoretical model is discussed in relation to the land market existing in the study area and an empirical model is constructed.

The determinants of urban property values can be thought of as a set of utility-bearing characteristics. Each single-family property (house and lot) can be described by a unique vector of these parcel characteristics. The empirical model consists of a multiple regression equation in which the sale price of residential property is the dependent variable and a set of quality characteristics which describe the sample properties are the independent variables. When the regression is estimated, the coefficients constitute a hedonic price equation. The estimated coefficients (hedonic price indicators) are interpreted as implicit prices attached by the urban land market to various quality characteristics specified in the regression model. The implicit prices are determined jointly by the structure of consumer demand and producer supply at a point in time. The supply and demand relationships which generate the implicit prices are hidden from view and the magnitude of their separate influences can not be

identified.[1]

Study Area

The study area chosen for an empirical test of the developed model is Bozeman, Montana. Bozeman is a community of 20,000 people located in the Gallatin Valley in southwestern Montana. The valley is a fertile farming and ranching area serviced by several smaller communities as well as Bozeman. Montana State University, located at Bozeman, currently enrolls about 8500 students. Associated with the University are the Extension Service, Agricultural Experiment Station, and numerous research facilities. It is a major employment and cultural center for the community, and in general is an important factor in the local economy. Other than the University, the major economic activity and employment is based in service facilities catering to the University, the farming community, and the tourist industry. There is no heavy industry in Bozeman and the small amount of light manufacturing taking place does not occupy a major position in the economy. As a result of the relatively undisturbed nature of

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[1]See Sherwin Rosen, "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition," Journal of Political Economy, LXXXII, No. 1 (January/February, 1974), pp. 34-55 and William T. Stull, "Community Environment, Zoning, and the Market Value of Single-Family Homes," Journal of Law and Economics, XVIII, No. 2 (October 1975), pp. 536-37, 551-52.

the nearby Gallatin Range and Spanish Peaks, and its location on a route between Glacier and Yellowstone National Parks, Bozeman enjoys a considerable tourist industry.

Land Value Determination

One problem encountered in an empirical land value study in urban areas is the determination of specific land values. When permanent improvements are erected upon urban land, they are, for all intents and purposes, immobile. Further, when urban consumers purchase residential sites they consider the land and improvements as an integral unit. It is, therefore, hypothesized that the effects of residential land value determinants will be capitalized into total property value just as they are into land value.

The sale price of an urban property represents a market capitalization of an expected future stream of values or utilities, including items which diminish the stream. Buyers bid for the land based upon what is perceived to be the present or discounted value[2] of the stream of net utilities they will receive from acquiring rights to a bundle of valuable characteristics, including locational

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[2]The present or capitalized value of land can be expressed by PV = R/i where PV is the present value of land, R is the constant annual net satisfactions received in perpetuity (in dollar terms) and i is the interest rate.

advantage, air quality, association with neighbors, landscape features, and schools, parks, playgrounds, and other public services.[3] The utility received depends on the satisfactions generated by the unique collection of these characteristics specific to a particular land parcel instead of from the land per se. The satisfactions derived from a given characteristic will differ when the characteristic is found separately or in combination with other characteristics.[4] It is in this way that the varied externalities, both positive and negative, are taken into account, perhaps subconsciously, by buyers of urban land.

Because separate values for land and improvements are not available, proxies must suffice even though market generated values would be desirable. The proxies are estimates of value as assigned according to standard procedure, but they have not been directly subjected to the forces of supply and demand nor the utility maximization criterion that takes place within the market. As a consequence, when this proxy for improvement value is included in the

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[3]Allan A. Schmid, Converting Land from Rural to Urban Uses, Resources for the Future, Inc. (Baltimore, Md.: The John Hopkins Press, 1968), p. 28.

[4]Kelvin J. Lancaster, "A New Approach to Consumer Theory," Journal of Political Economy, LXXIV, No. 2 (April 1966), pp. 132-56.

regression equation as an independent variable, the interpretation of the regression parameters in terms of land value is questionable. The best that can be done in this circumstance is to interpret results in terms of total residential property value. Since there will be no attempt in this thesis to separate the effects of various independent variables on total residential property value from their effect on residential land value, the results are to be interpreted in terms of the former.

The Model

The scope of the empirical study included in this thesis is limited to land used for single-family residences within the city limits of Bozeman. All property in the sample is supplied with city services. Land parcels supporting multi-family housing units such as duplexes and apartment houses were excluded from the sample. However, residences which were not designed for multiple-family occupancy, but had basements, second floors, or other portions of the residence rented to second parties were not excluded.

The empirical analysis is conducted under the assumptions of the classical normal linear regression model[5] with parameters of

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[5]Further discussion of the classical assumptions is delayed until later.

the regression equation being estimated by the method of least squares. The dependent variable in the model is defined as the final sales price of residential property. John Haynes, a licensed realtor and proprietor of Haynes Realty, supplied the sale price of 243 single-family residences. Information on term structure, mortgage rates, and other sales agreements which might influence final sales price was not available. Residences in the sample were all sold between January 1, 1973 and December 31, 1975. There is not an apparent reason to expect that a bias has been introduced into the analysis by the sample being composed solely of residences sold through real estate agents. But, this sampling procedure may incur a bias by underrepresenting the preferences of more permanent residents. It is expected that the relatively mobile segment of the population would actively participate in the real estate market more frequently. Their preference patterns would be proportionately overrepresented in the sale price of sample properties. If this is correct, then the mobile home park and other disamenity regression estimates are biased downward. The relatively permanent residents are believed to have preferences which would be more adversely affected by disamenities such as location near a mobile home park.

No endeavor was made to ensure that all sales were bona fide (i.e., an arms-length sale not engaged in by relatives, close friends, or business associates). Nevertheless, a problem was not envisioned

since it is reasonable to assume that non-bona fide sales would not have been closed through the services of a real estate agent. The low transaction costs associated with such sales usually eliminate the advantages derived from the agent's services.

The value of a given residential property is most affected by the value of the house and other improvements situated on the lot. Several studies have used design features of the house as independent variables in the statistical model.[6] This study employs a single variable which envelopes a comprehensive set of design and construction features such as number of rooms, exterior finish, plumbing, and type of heating into one composite value.[7] This technique added flexibility by accounting for the value of existing structures other than the house and by requiring fewer degrees of freedom. The composite value used in the statistical model developed is the depreciated replacement value (physical value) entered on appraisal forms on file in the state Classification and Appraisal Office. A brief

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[6]For example, see John A. Jaksch and Herbert H. Stoevener, Effects of Air Pollution on Residential Property Values in Toledo, Oregon (Corvallis, Oregon: Agricultural Experiment Station, September 1970); Raymond J. Supalla, Impact on Location Factors on Residential Property Values (Las Cruces, N.M.: Agricultural Experiment Station, June 1975); and Frank C. Emerson, "Valuation of Residential Amenities," The Appraisal Journal, XL, No. 2 (April 1972), pp. 268-78.

[7]See the standard appraisal form in Appendix D.

discussion of the determination of physical value is in order.

Each residence is inspected and appraised by trained personnel from the Classification and Appraisal Office. The house and other improvement[8] design features are identified, measured, and entered on the standard appraisal form. Notations are made as to quality when appropriate. The improvements are then assigned a value according to a state issued schedule which is designed to register full replacement value. However, due to time lags in the schedule issuance, this value may be low. This value was not used in the model because there is a large variation in the age of houses contained in the sample. Older houses suffer a substantial amount of physical and design obsolescence which would not be reflected in full replacement value. As a result, replacement value would not be as accurate a representative of market improvement value as would its depreciated counterpart, physical value. Physical value is just replacement value depreciated in compliance with a state schedule based on the age and condition of the improvements.[9] In addition, a normal value is assigned to those residences where substantial functional or economic obsolescence has occurred. It is usually applied to homes in commercial or industrial areas where the removal

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[8]Hereafter referred to as improvements.

[9]See the depreciation schedule in Appendix E.

of the home would constitute an expense to potential business developers. Functional depreciation also might be applied when a high priced house is located in a low-valued property area or when a house is inadequately wired. The per cent of functional depreciation applied is also predetermined by the state. Normal value was not used because the functional depreciation for which this value adjusts is controlled for by other independent variables included in the model. Normal value is then multiplied by an index to obtain sound value which was the basis of the property tax. The index was used to lower the effective tax base of all land in the county. It has not been used since 1974 by court order and was inappropriate for use in this study.

As discussed previously, the ideal value to assign to improvements would be their explicit sale price; but since this value is not available, it was necessary to choose a proxy for improvement sale price. Of the four values discussed above, physical value (depreciated replacement value) was considered the most appropriate for it most nearly represents the market value of the improvements.

One problem encountered in using the physical value (or any of the other three) is that any improvements appraised after January 1, 1973 are evaluated according to a newer schedule issued by the state at that time. The newer schedule resulted in equivalent improvements being appraised approximately 30 per cent higher

than under the previous schedule.[10] To compensate for this, a dummy variable was introduced into the model. The dummy took on a value of one if the improvements were appraised after January 1973 and a value of zero if it was appraised before that date.

The quality characteristics of a given unit of urban land can be expressed by three definitional categories, locational properties, intrinsic properties, and neighborhood properties. Location concerns the relation of an urban site to economic activities and transportation cost. Such properties have long been recognized as a determinant of land values.[11] Intrinsic properties like soil and topography are those which are inherent in the lands relation to environmental factors and its capacity for utilization in different functions. Neighborhood properties involve man-made features of surrounding property which influence the amenities of the community. The independent variables hypothesized to have a significant impact on residential property values and included in the linear regression model are given in Table 1, page 58. Column Two shows

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[10] Ted Kelly, State Appraisal Office, Bozeman, Montana, May 3, 1976.

[11] William Alonso, Location and Land Use: Toward a General Theory of Land Rent (Cambridge: Harvard University Press, 1964); Johann H. von Thünen, Der isolierte Staat in Beziehung auf Landwirtschaft and Nationalekonomie (1st vol, Hamburg, 1826; 3rd vol., and new ed., Hamburg, 1863).

the hypthesized sign of the effect of each variable on total property value.

A. Location Value

Location considerations are based on the implicit assumption that, ceteris paribus, land values will vary inversely with distance from desirable economic activities such as employment, goods and services, recreation, education, and governmental activities. As distance from economic activities increases, the cost of transportation increases. Consequently, site (land) value decreases as one moves toward the periphery of the city. The savings in transportation costs associated with more desirable sites near the city center will result in economic rents accruing to owners of such sites which will be capitalized into the value of the property.

Measures of location included in the empirical model are distance from the Central Business District (CBD), the university, shopping centers, grade schools, and high schools. Each house in the sample was located on a city zoning map (1" = 600') and the straight-line distance from each house to each of the location variables measured. The ideal measure would have been travel time or travel distance between house and location variable; but it was assumed that due to conditions specific to Bozeman the straight-line distance is highly correlated with either of those measurements.

These conditions are that Bozeman streets are almost all totally paved and that traffic congestion is minimal.

The CBD in Bozeman is a major employment center which contains many of the business and shopping activities as well as most of the government offices. Its relationship to land values and distance has long been noted.[12] Distance to the CBD was measured somewhat differently than other location variables. Rather than measuring the shortest distance from each sample site to the perimeter of the CBD, the straight-line distance was measured to a single point defined as the center of the CBD, in this case, the intersection of Willson Avenue and Main Street.[13]

Distance to the University was included because it is a major employment center. Not only is proximity to the University important

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[12]Lowden Wingo, Transportation and Urban Land (Washington, DC: Resources for the Future, Inc., 1961); W. B. Hansen, "An Approach to the Analysis of Metropolitan Residential Extension," Journal of Regional Science, Summer, 1961, pp. 37-55; Herbert Mohring, "Land Values and the Measurement of Highway Benefits," Journal of Political Economy, June, 1961, pp. 236-249; and William Alonso, "A Theory of the Urban Land Market," Papers and Proceedings of the Regional Science Association, VI, (1960), pp. 149-57.

[13]This method was also used by Downing, "Estimating Residential Land Values," p. 105.

to people who work there, but the large number of students living off-campus are especially interested in locations near it. Straight-line distance to the University was measured to the nearest of three main entries to the campus. To reach the buildings in which most activity takes place and to reach major parking lots, it is necessary (or at least most convenient) to approach the campus from one of the three entrances to which distance was measured. Any sample sites for which this would not be true were few in number and the value assigned such sites would not vary substantially from the value assigned if distance was measured to the nearest edge of the campus.

There are three main shopping centers in Bozeman other than the CBD. To classify as a shopping center, drugs, groceries, and other common consumer and household products had to be provided within a small radius. The three shopping centers to which the nearest distance was measured are West Park, Buttreys, and North Park.

Another location factor included in the statistical model, distance to schools, was divided into two variables. The shortest distance to the perimeter of the school grounds of both Bozeman Senior High School and an elementary school was measured for each site in the sample. Elementary grades K-4 attend one of four schools as specified and required by the Superintendent of Bozeman Elementary Schools (see map in Appendix F). Distance was measured to the appropriate elementary school designated.

The rationale for dividing the school location factor into two variables was the postulate that elementary schools would have a larger effect on the value of land than would the high school. It is postulated that due to greater concern for the safety and welfare of the younger children, location near an elementary school would be weighted more heavily in their parents' site-selection process than would location near a high school.

B. Intrinsic Value

Intrinsic value is derived from any physical characteristic of an urban residential site which may influence its desirability. A topographic feature such as a hill may provide the site with a superior view and materially increase its value for residential location. Conversely, a steep slope may cause construction problems and lower the value. Qualities of the soil and underlying layers for building purposes are also integral characteristics which influence land value. The size of the land parcel is important in value determination insofar as more utility is derived from a larger lot than from a smaller one.

View and lot size are the two intrinsic characteristics which are included in the statistical model. View enters the regression equation as a binary variable with a value of one assigned to the variable for any site having a view of any mountain range. Deter-

mination of whether a site had a view was made by subjective judgment at the time of a personal inspection of each property. Lot size of each property was gathered from city maps in the City Engineer's Office and expressed in square feet.

Soil characteristics of the site were not included in the model although suitability of the soil for building purposes does vary. Finger-like reaches of soil which have no limitations for building purposes are intertwined with similar reaches which have severe building characteristics. However, it is posited that this phenomenon is not taken into consideration by the purchasers of Bozeman residences. And, unless a condition that could potentially influence a land parcel's value is known to and considered by potential and actual purchasers, it would not be reflected in land price.

C. Neighborhood Value

Neighborhood properties are those man-made features and social factors which influence the amenities available to surrounding residential sites. In the words of Marion Clawson, "the use and value of any tract or parcel of land within a metropolis (city center and suburb) is affected more by the use and value of other tracts or parcels of land than it is by what takes place on the tract itself."[14]

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[14]Clawson, Suburban Land Conversion, p. 166.

These influences are both frequent and ubiquitous in urban areas. However, only the most important will be discussed here.

The measures of neighborhood amenities included in the statistical model include the presence of an adjacent multi-family unit and distance from four sites; industrial zone, commercial establishment, public park, and mobile home park. Each is discussed in turn.

When each property was inspected, a value was assigned to a binary variable representing the presence of an adjacent multi-family home. If the sample site was adjacent to a duplex or any larger housing unit designed for more than one family, then a value of one was assigned to the dummy variable. For all other sites, the variable received a zero value. The hypothesis that a multi-family housing unit would have a negative impact on site value is related to problems of congestion, noise, and parking.

Commercial and industrial developments are expected to have a negative effect on land value because they are associated with a noise and/or a congestion externality which diminishes the level of satisfaction for the urban land user. The shortest distance from each sample site to the boundary of the M-1 zoning classification and to the nearest commercial establishment was measured and assigned to the respective variables. The M-1 designation is the only zoning classification within the city limits which permits industrial

establishments. A commercial establishment is defined as a retail, service, or multi-family (four units or larger) establishment.[15] These include business permitted in R-O, B-1, B-2, and B-3 zoning classifications. These zoning classifications are described in Appendix G.

Proximity to a public park has had a positive influence on land values according to findings of several studies.[16] However, Supalla found that in Las Cruces, New Mexico, parks were not a significant determinant of land values. He conjectured that perhaps this was because areas designated as parks were really playgrounds and lacked environmental amenities. Based on this consideration and on the hypothesis that playgrounds would not have the same effect on land values as an aesthetically pleasing park, the Distance to Public Parks variable was limited to those parks that were not a baseball diamond or other type of playground. They are Lindley,

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[15] A multi-family housing unit which is located in a commercially zoned area was treated as a commercial establishment.

[16] Emerson, "Valuation of Residential Amenities"; Thomas R. Hammer, Robert E. Couglin, and Edward T. Horn IV, "The Effect of a Large Urban Park on Real Estate Value," Journal of American Institute of Planners, XL (July 1974), pp. 274-7; and Kitchen, "Urban Neighborhood Park."

Kirk, Bogart, Cooper, and Langhor.[17]

A major difference between this study and others reviewed is the inclusion of distance from mobile home parks as a component of the land market model. The analysis of the impact of mobile home parks was limited to the relationship between sales price of sample sites and the distance to three mobile home parks located in residential areas of Bozeman.[18] There are three other mobile home parks within the city limits of Bozeman but they are located in commercial areas.

The three mobile home parks selected for study are Nelson-Covered Wagon, North Wilson, and Eldridge. The Nelson-Covered Wagon Mobile Home Parks are separate parks but for purposes of this study were treated as one because they are closely located. Both are adjacent to a relatively new residential area. Covered Wagon Park was established in 1971 and Nelson in 1960. Within the two parks is a concentration of 168 mobile homes. North Wilson Mobile Home Park was established in a relatively old section of Bozeman before 1960. It has seventeen mobile homes. Eldridge Park, established in 1966 is located in a middle-aged neighborhood and currently has 10 mobile homes. The distances between each sample site and the

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[17] See map in Appendix F.

[18] See Appendix F.

edge of the nearest mobile home park were the values assigned the mobile home park variable.

It is hypothesized that all the location variables and the neighborhood variables expressed in distance terms have a non-linear relationship to land values for reasons described below. This is well documented for the CBD variable. Land values near the University are also expected to decrease at a decreasing rate as distance from it increases. Certain other land uses may have different effects on land values over different ranges since there are many trade-offs related to a given land use. An industrial area which is a major employment center may increase land values near it as savings in commuting costs are capitalized; concurrently, the land value may be decreased as a consequence of the attendant negative neighborhood effects. The relative strength of each effect is an empirical question. Further, land values will decrease with distance until eventually the effect is nil. Analogous reasoning can be applied to schools, parks, playgrounds, and commercial establishments. For example, Hammer, et al. found that a large urban park had a negative effect on the value of directly adjacent land and a positive effect within a relevant range thereafter.[19] The result is a parabolic relationship between land values and

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[19]Hammer, et al., "Effects of a Large Urban Park."

distance from land uses.

On that account the variables discussed above entered the statistical model as an expotential function, the functional form being that of a parabola. The resulting hypothesized relationship for each variable was $Y = B_1X_{i1} + B_2X_{i1}^2$ where Y is total sale price, X is distance, B_1 and B_2 are the relevant regression parameters, and the subscript i refers to the ith observation.

There are several neighborhood influences which are known or believed to affect urban land values but because of conditions specific to Bozeman they were not included in the model developed. Neighborhood appearance, social factors, public services, and micro-location factors are all discussed below.

The overall appearance of the neighborhood is a likely determinant of land values. Dilapidated nearby property, especially as a result of age and lack of maintenance, will have a detrimental effect on land value. Conversely, well-designed neighborhoods are a plus.

Social factors to consider are crime, crowding, racial or ethnic clusters, education, and income. None of the above variables have been included in the empirical model because they are not likely to vary spatially in Bozeman. Crime is not a paramount problem, but more importantly, there does not appear to be a detectable pattern of higher crime incidence in any one sector. Bozeman has no pockets

of residents with specific ethnic or racial character and it is presumed that the addition of neither an education nor an income index would increase the explanatory power of the model.

Variation in the quality of public services provided in neighborhoods could be exhibited in land values. In Bozeman, all houses are supplied with water and sewer systems, and garbage disposal. There is no reason to suspect that the quality of these services and those of police and fire protection are not uniform. Land value differences are also not assumed to be a function of street conditions since almost all are paved.

Bozeman is within one school district so one property tax applies to all sample land parcels. Therefore, it was not necessary to include a property tax index.

The final condition related to public services that is assumed to be of no consequence in the price of Bozeman land is variation in quality between elementary schools. Facilities at the five elementary schools are good and uniform in quality. The presence of the University provides an abundant supply of teachers from which to select. Hence, the Bozeman school teaching staff is assumed to be uniform among schools. If variations were present, it would be expected that land values would be lower in those neighborhoods with relatively lower educational opportunities.

There is a whole array of micro-location factors which are thought to affect land values in isolated cases. For example, location on a busy street is considered a negative factor.[20] Location on a corner lot rather than in the center of the block is a positive element in urban land value determination.[21] It is impossible to include all such variables in a model. However, it is assumed that these factors have both negative and positive effects which will on the average cancel each other out leaving the final results unbiased.

Dynamic Considerations

Changes in the overall tone of the land market in Bozeman during the study period (1973-1975) were standardized through the use of a time related variable. Time was introduced into the model by setting the time variable equal to zero if the sales occurred in January 1973 and increasing the value by one for each month thereafter. It is conjectured that this variable captures the total effect of dynamic influences such as inflation, interest rates, credit availability, and other time related factors. The

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[20] Supalla, Impact of Location Factors, p. 3.

[21] Hammer, et al., "Effects of a Large Urban Park," p. 277.

specific contribution of each factor to the overall time trend is not known. Only the net effect will be registered. Implicit in this model is the assumption that time related factors as well as other relationships embodied in the model were constant throughout the period.

This type of variable was used in preference to a price deflator. No deflator could be found which adequately reflected changing prices in the study area. Prices on a local level are likely to change quite differently from those on a regional or national level. Short run supply and demand factors as well as a possible lag between national and local price trends are expected to contribute to the difference.

CHAPTER III

RESULTS AND CONCLUSIONS

This chapter presents the results of the estimation of the model developed in Chapter II. All the basic assumptions of the classical normal linear regression model are assumed to hold in this study. Given these assumptions, the least squares estimator of each regression parameter has all the desirable properties. Hence, the appropriate Student's t-tests and F tests are applicable. The multiple regression equation is defined as

$$Y_i = B_1 + B_2Y_{2i} + B_3X_{3i} + \ldots\ldots + B_{13}X_{13i} + \epsilon_i \text{ where}$$

ϵ_i is a random disturbance. The basic assumptions which are taken to apply to all observations are as follows: normality, zero mean, homoskedasticity; nonautoregression, and nonstochastic X.[1] When the sale prices of single-family residences were regressed on the independent variables, it was found that seven of the variables had insignificant t-values at the 5% level (see Appendix H). Statistical analysis indicated that five of the insignificant variables should be removed from the final model whose estimation results

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[1] Jan Kementa, Elements of Econometrics (New York: The Macmillan Company, 1971), p. 202.

are summarized in Table 1 below. Those variables eliminated from the final model were distance from a commercial establishment, public park, shopping center, and high school and the presence of an adjacent multi-family housing unit. Following Table 1, each of the statistically significant variables is discussed and interpreted in relation to the price of single-family residences. In the following section, the statistical procedures that were the basis for the elimination of the five variables are described.

Mobile Home Parks

Both the linear mobile home park variable and the squared mobile home park variable were significantly different from zero at the one percent level. The linear portion of the quadratic function was positive while the squared term was negative, thus yielding a downward opening parabola as shown in Figure 1. Mobile home parks in the model exhibited a negative influence on property values over a range of 4000 feet. As hypothesized, the influence is much stronger the closer the property is located to the mobile home park. The difference in property value attributable to mobile home parks between a property located 4000 feet away from it and a property located only 100 feet from it is $2,935. Beyond 4000 feet property values again begin to decrease indicating that other land

TABLE 1

Independent Variables	Hypothesized Signs	Regression Coefficient (absolute t-values in parenthesis)	t-value	Significance Level
Date of Sale (months) (January 1973 = 1)	+	183.9 (27.35)	6.724	.01
Lot Size (square feet)	+	.1224 (.5765 E-01)	2.123	.05
Physical Value (dollars)	+	1.261 (.4872E-01)	25.89	.01
Distance from mobile home park (feet)	+	1.516 (.4751)	3.190	.01
Distance from mobile home park, to 2.0 power (feet)	-	-.1848E-03 (.5450E-04)	-3.391	.01
Distance from industrial zone (feet)	+	.8621 (.4892)	1.762	.10*
Distance from industrial zone, to the 2.0 power (feet)	-	-.8929E-04 (.5917E-04)	-1.509	.10*
Distance from the University (feet)	-	-1.646 (.6750)	-2.439	.01
Distance from the University, to the 2.0 power (feet)	+	.1462E-03 (.9264E-04)	1.578	.10*
Distance from CBD (feet)	-	.2010	.1435	---**

TABLE 1 (continued)

Independent Variables	Hypothesized Signs	Regression Coefficient (absolute t-values in parenthesis)	t-value	Significance Level
Distance from CBS, to the 2.0 power (feet)	+	-.1679E-03 (1968E-03)	-.8530	---**
Distance from grade school (feet)	+	-1.437 (.8516)	-1.687	.05**
Distance from grade school, to the 2.0 power (feet)	-	.4973E-03 (.2158E-03)	2.304	.01**
View of mountains	+	2475.0 (891.9)	2.776	.01
New Appraisal Book (dummy)	-	-6488 (1039)	-6.246	.01
Constant		10,100		

R^2 = .8485; number of observations = 243; standard error of estimated Y = 4024; property value mean = 32,240 (dollars); property value standard deviation = 10,010.

*These variables appear insignificant at the 5% level. However, when the linear and squared term of each are tested together with the F-test, both are statistically significant influences at the 1% level.

**These four highly colinear variables are significant at the 1% level when tested as a group.

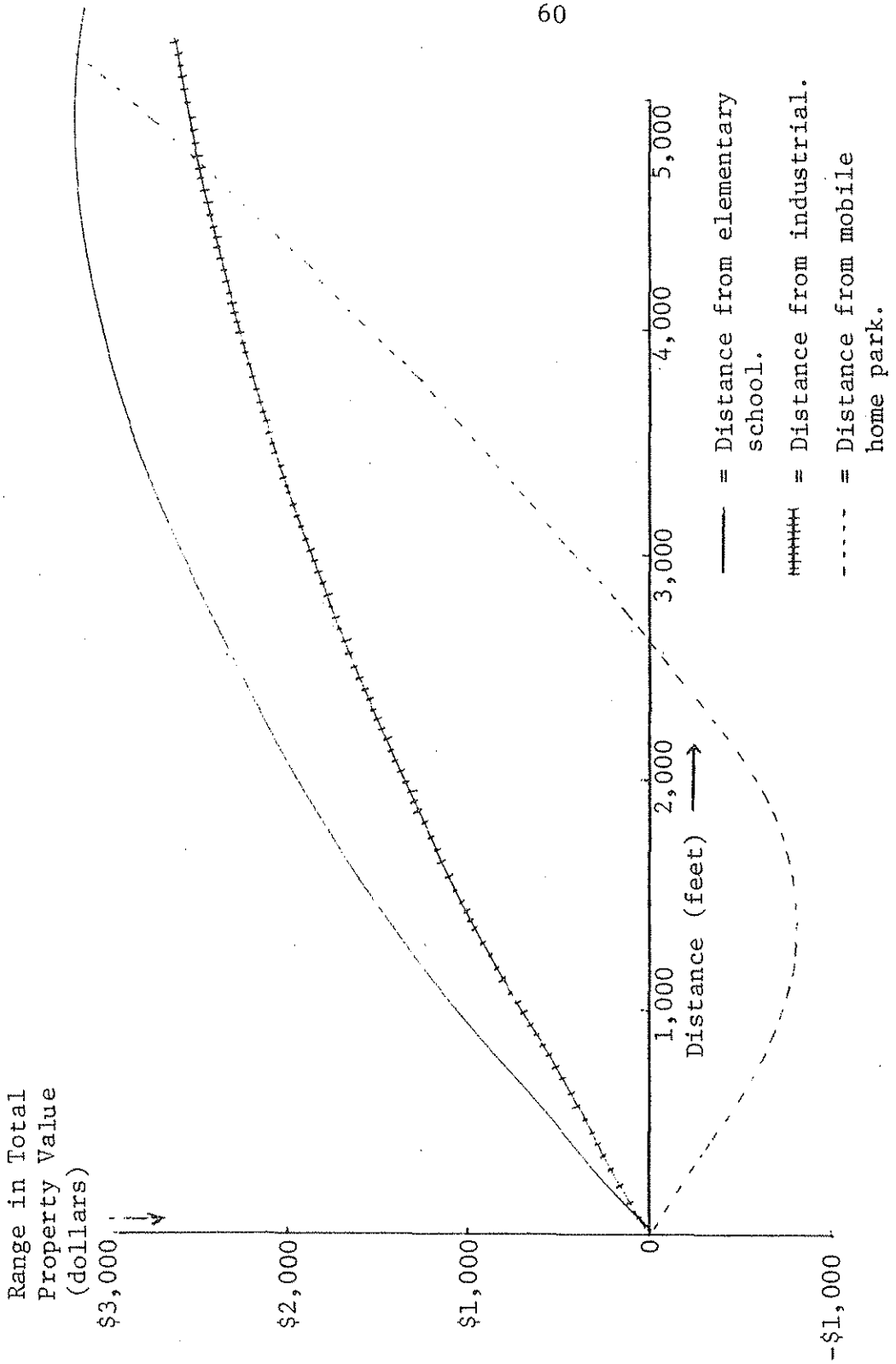

Figure 1. Impact of Schools, Industrial Sites and Mobile Home Parks on Property Values.

use influences are outweighing any existing negative influence from the mobile home park.

Location

The three measures of location which were significant in the model are distance from the CBD, grade school, and university. The CBD coefficient does appear to substantiate the traditionally accepted viewpoint that property values decrease as one moves away from the city center (see Figure 2). The indication is that property values near grade schools are negatively affected and that implies that there may be more of an amenity influence than a location impact (see Figure 1). But since the CBD and grade school variables are highly correlated in the sample, little importance can be attached to the estimated coefficients. The multicollinearity between the two variables causes their variances to be so large that the estimates of the regression parameters are highly unreliable.

The university has the largest influence on property values in Bozeman as indicated on Figure 2. Property values increase by $3,850 as one moves from a site 4500 feet away to a site adjacent to the universty.

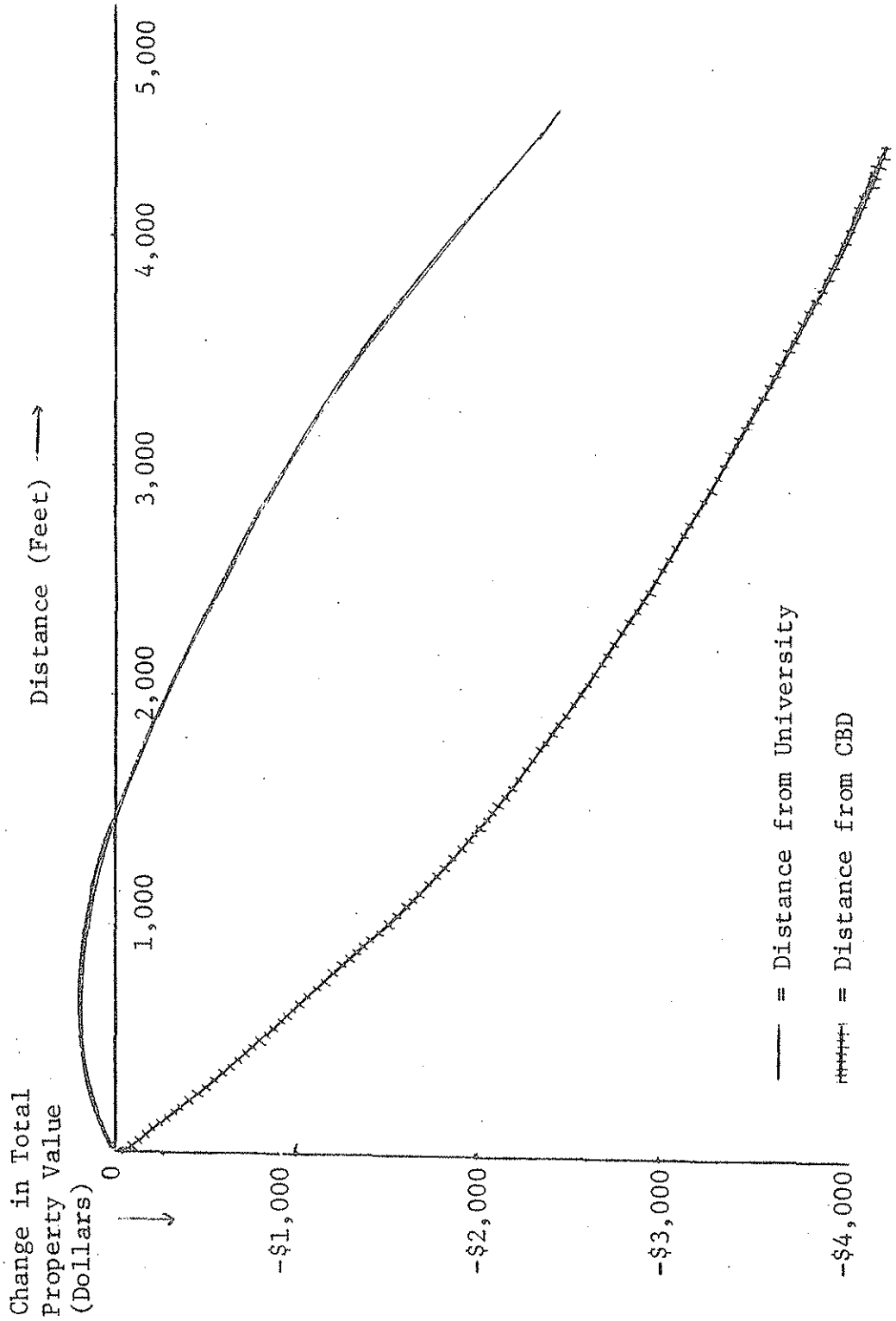

Figure 2. Impact of University and CBD on Property Values

Neighborhood

The only neighborhood variable other than mobile home parks significantly affecting property values was distance from the industrial zone. The positive linear term and negative squared term indicated a downward opening parabola. Its influence extended for 5000 feet and showed a property value decrease of $2,000 as one moves toward the zone (see Figure 1). It is probable that this variable is picking up the correlation of more than just the industrial establishments since the industrial zone contains the original townsite. Hence, the influence of other neighborhood factors such as age of buildings and condition of surrounding property may be embedded in the estimated coefficient.

Intrinsic

The two intrinsic properties--lot size and view--included in the model were positive and significant at the 5% level or better. The positive lot size coefficient means that an additional square foot of lot will increase property value by 12 1/4 cents. Apparently, urban residents do place some value upon and pay a premium for a larger lot. A view of a mountain range added $2,475 to the property value of property in the sample.

Insignificant Variables

As stated before, when the original model was estimated, seven variables had insignificant t-values at the 5% level.[2] The problem presented, then, was to determine if these variables were unimportant factors in the Bozeman land market or if they were insignificant because of problems inherent in the sample data. If the variables were unimportant factors in Bozeman, then the model would be misspecified due to the inclusion of irrelevant explanatory variables and the least squares estimates of the regression coefficients would not be efficient. On the other hand, if the variables were relevant but data limitations obscured this and resulted in their exclusion from the model, a specification error would be committed that would lead to biased and inconsistent[3] least squares estimators.

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[2] Supra, p. 56.

[3] $\hat{\theta}$, an estimator of a statistical parameter θ, is an unbiased estimator of θ is the $E(\hat{\theta}) = \theta$. An efficient estimator of θ must be unbiased and its sampling distribution must have a smaller variance than any other unbiased estimator. Consistency is a large sample property and refers to the form of the sampling distribution of θ as the sample size approached infinity. To be consistent, an estimator $\hat{\theta}$ must equal the true parameter θ as sample size increases to infinity. In mathematical notation, $\hat{\theta}$ is a consistent estimator of θ if Plim $\hat{\theta} = \theta$. It should also be noted that a biased estimator implies that the estimator is also inefficient. For greater detail, see Kmenta, Elements of Econometrics, Chapter 6.

The F-test was applied as the appropriate test for specification errors concerning the inclusion of irrelevant explanatory variables. Distance from a commercial establishment, public park, shopping center, and high school and the presence of an adjacent multi-family housing unit were not significant at the 5% level when tested as a group. The indication is that they are statistically irrelevant and consequently they were dropped from the model.

The insignificance of the distance to a shopping center and distance from a commercial establishment may be attributable to Bozeman's small size. Savings in transportation costs may not outweigh the benefits derived from shopping at more than one place, especially since some goods and services are not available at the shopping centers and are available along the two arterial streets which connect them. If this is the case, then not much advantage would be offered by living close to any one shopping center. For similar reasons, it is not so surprising that distance from a commercial establishment is insignificant. Apparently, since the availability of many goods and services is distributed mainly along two interconnecting streets, the convenience of easy access to these streets offsets any disamenity considerations associated with living near a commercial establishment. The plausibility of this explanation is increased when it is considered that in Bozeman the distance

to a commercial establishment is essentially a proxy for accessibility to the two streets, particularly over the range which Supalla found commercial establishments to have an influence. The effect of such a measure of accessibility to economic activity is hypothesized to be opposite that for distance to a commercial establishment, thus accounting for the off-setting influences and resulting insignificance of the variable.

Some studies have indicated that distance from a public park has a significant influence on residential property values.[4] This is contrary to results contained herein perhaps because the accessibility of public lands outside the city and the proliferation of vegetation in most yards makes the amenities offered by aesthetically pleasing parks less important in land purchasers' decisions.

Emerson[5] found that high schools were not a significant determinant of land values unless they were associated with an aesthetically pleasing park. This study is consistent with that research; since parks do not exert an important effect upon land values it is not expected that high schools would either.

The effect of the presence of an adjacent multi-family housing unit may not have been adequately represented in the regression

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[4] Supra, note 16, p. 49.

[5] Emerson, "Valuation of Residential Amenities."

equation. A considerable amount of the expected negative effect from a multi-family unit possibly was not captured due to the limitation that the dummy variable represented only adjacent property. It is also possible that multi-family housing is much more ubiquitous than is indicated by the sample. In some sections of Bozeman there are many large, older houses which have been converted to apartments. It may be that when this type of housing is included, multi-family housing is so prevalent that land purchasers do not consider it a significant variable in their utility functions.

Application of the F-test to the distance from the CBD and grade schools revealed that the two were significant in the model even though each had insignificant t-values. An explanation for this is the high degree of multicollinearity between these two variables as indicated by a correlation coefficient of .9470.[6] The mean square error test indicated that if bias and efficiency are equally weighted, the best model contains the two variables. A similar conclusion is reached by Farrar and Glauber. They conclude that "multicollinearity, then, constitutes a problem only if it undermines that portion of the independent variable set that is

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[6]See correlation chart in Appendix I.

crucial to the analysis in question."[7] Since the estimated coefficients for the CBD and grade schools are not of primary interest in this research, it was decided that both variables should remain in the model.

Summary

Externalities are a major source of conflicts in land use. Their prevalence can be linked to an attenuated set of property rights. A principal objective of this thesis was to set forth the economic theory of externalities and property rights and relate it to land use planning analysis.

It was hypothesized that externalities in land use are capitalized into the total value of residential properties. To test this hypothesis, a major land use which may create externalities (mobile home parks) was chosen for analysis. A theoretical urban land market was developed and three mobile home parks in residential areas of Bozeman, Montana were selected for the empirical test.

A multiple linear regression model was set up to explain variation in residential property values due to locational, neighborhood,

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[7] Donald E. Farrar and Robert R. Glauber, "Multicollinearity in Regression Analysis: The Problem Revisited," Review of Economics and Statistics, XLIX, no. 1 (February 1967), pp. 92-107.

and intrinsic demand factors. The specific econometric results are summarized in Table 1 on pages 58 and 59.

It was found that distance from mobile home parks was significant at the 1% level and thus apparently associated with an externality which is capitalized into property values. Property values near mobile home parks declined by $3,100 within 4000 feet.

Other results indicate that the university increased property values by $3,850 over its influence range of 4500 feet; the industrial zone had a negative influence of $2,000 within 5000 feet; an additional square foot of lot size added 12 1/4 cents; and a view of the mountains was worth $2,475. The distance from the CBD and grade schools were significant but the magnitude of the effects could not be determined because the two variables were highly collinear.

Conclusions

A limitation in applying the results of the study is that the estimated hedonic price indicators are the product of a particular set of supply and demand vectors at a specific time and geographic area. Care must be used in generalizing the results found here to other residential markets and to other time periods. The values of the coefficients are determined, at least in part, by factors specific to the study area which may or may not operate in other resi-

dential markets. Also, the same factors may not be important in the study area at a later date.

In a more general sense, however, the research reported here substantiates location theory and other studies which indicate that centers of economic activity and employment such as the CBD and a university are important determinates of land value. The significance of the industrial, grade school, and mobile home park variables lends credence to the hypothesis that external effects are capitalized into land values.

The results of the study lead one to conclude that the reduction in total property values associated with the mobile home park variable may be caused by the presence of the park. But the analysis presented here cannot determine whether the reduction in property values is due to a pecuniary externality, a technological externality, a model misspecification, or any combination of these. It is not possible to delineate what portion of the differential is caused by an externality and what portion is simply correlated with the location decisions of mobile home park owners. Evidence presented above does support a casual relationship, but to the extent that any prior differential existed and to the extent there is a simultaneous model misspecification (which is quite possible). The estimates herein are upper bound measures of the externality. Furthermore, the magnitude of the technological externality could not be precisely measured

without independent data even if there were no model misspecification. The pecuniary externality involved (i.e. supply influences) is operating in such a manner that it increases any property differential existing due to the technological externality. The result is that the effects of the technological and pecuniary externalities on the regression estimates can not be separated. For this reason, also, the regression coefficients are upper bound estimates of the technological externality. Whatever part of the reduction in property values is due to a pecuniary externality or supply influences is a product of the market system and is Pareto optimal. However, whether the negative property-value gratient near mobile home parks found by this research is Pareto optimal or not, the research does suggest that opening single-family residential areas to mobile home parks may impose a capital loss upon established park-site area homeowners.

Policy Implications

With the limitations discussed above in mind, this research can be useful in evaluating the impact of mobile home parks on residential property values. The models and results presented herein have implications for land use zoning pertaining to mobile home park location near or in residential neighborhoods.

With the recognition that land use patterns and conflicts vary substantially from one time and location to another, the most useful

aspect of this research is the applicability of the developed model to each individual situation. Given the required data, this model, with necessary refinements to adjust for specific geographic conditions, can be adapted to analyze different urban areas.

The research presented herein has identified several significant land use externalities. Hopefully, this information will be used in comprehensive land use plans to aid in arranging proposed land uses in a manner which optimizes positive and negative external effects.

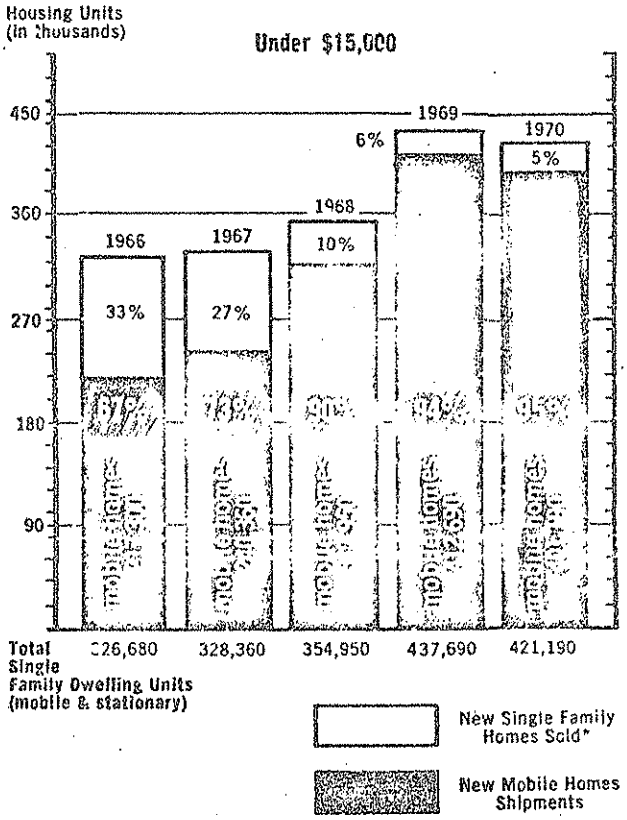
APPENDICES

MAJOR BILLS INTRODUCED IN EACH STATE

	Mineral Taxes	Impact Taxes	Plant Siting	Conservation	Environment	Reclamation	Water	Land Use	Manpower	Research Units	Other
ARIZONA	5	5	2	6	13		5	4		2	
COLORADO	3	8		9	8	3	3	9		4	
IDAHO			1	2		1	1	7			
MONTANA	1	3	1	1	1	4		5	1	1	1
NEVADA	2	3		5	4		2	8		3	
NEW MEXICO		4		1	3		4	4		5	
UTAH	5	11	4	7	2		7	1			
WYOMING	1	6	1		1		1	4			
TOTALS	17	40	9	31	32	8	23	42	1	15	1

APPENDIX B

5-Year Housing Sales Record
Mobile Homes and One-Family Homes*



1970 Sales Comparison
Mobile Homes and Site-Built Homes*

	Under $15,000	Under $20,000	Under $25,000	All Prices
Site-Built Homes*	20,000	158,000	259,000	487,000
Mobile Homes	401,190	401,190	401,190	401,190
Total	421,190	559,190	660,190	888,190
Mobile Home Share	95%	72%	61%	45%

*U. S. Dept. of Commerce, Bureau of Census Data
Conventional Homes—Construction Reports
(C-25-70-Q4), issued 3/71

Source: Mobile Home Manual

APPENDIX B

Mobile Home Shipments to Dealers in U.S. and Estimated Retail Sales, 1949-1973

Year	Mobile home shipments	Retail sales (estimated $000)
1949	46,200	$ 122,000
1950	63,100	216,000
1951	67,300	248,000
1952	83,000	320,000
1953	76,900	322,000
1954	76.000	325,000
1955	111,900	462,000
1956	124,330	622,000
1957	119,300	596,000
1958	102,000	510,000
1959	120,500	602,000
1960	103,700	518,000
1961	90,200	505,000
1962	118,000	661,000
1963	150,840	862,064
1964	191,320	1,071,392
1965	216,470	1,212,232
1966	217,300	1,238,610
1967	240,360	1,370,052
1968	317,950	1,907,700
1969	412,690	2,496,775
1970	401,190	2,451,271
1971	496,570	3,297,225
1972	575,940	4,153,103
1973	566,920	4,406,382

Notes: Prior to 1949, production varied from 1,300 in 1930 upward to 46,200 in 1949.

10 foot wide homes came into mass production in 1955.
12 foot wide homes came into mass production in 1962.

Source: Mobile Homes Manufacturers Association.

APPENDIX C

COUNTY COMMISSIONS SPLIT ON MOBILE HOME ISSUE*

by Christene C. Meyers
of the Gazette Staff

A critical shortage of mobile home parking spaces, a string of protests and a difference of opinion between the Zoning Commission and County Commission are erupting into a potential court battle.

Commissioners Duane Christensen and chairman Leo Kamp recently overruled the Zoning commission in granting a zone change to Donald Dalke and Dan Juhl.

The two men propose to build a mobile home park at 2,000 Mary Street in Billings Height.

Mobile homes, the commissioners say, are becoming increasingly important to the working class and are being crowded right out of existence in Yellowstone County.

But the protestors of the zone change have contacted attorney Paul Olsen and say they plan to fight the development.

Olsen said Tuesday that he and the protestors are scheduling meetings for later in the week.

The county commissioners are ready for a court battle.

The problem is a simple one: more and more middle-income people are buying mobile homes and finding there is no place to put them.

County commissioners are succumbing to the pressure for more mobile home parks, much to the displeasure of homeowners in the new park-site areas who feel the mobile homes devalue property, and bring population density that causes excess noise and traffic snarls.

The Mobile Home Dealers Association says that its members have numerous mobile homes on their lot marked "sold" but waiting to be parked.

But protestors - who believe the mobile homes should be parked in "someone else's neighborhood" - are headed for district court.

They don't want mobile homes parked near their private residences and say the 10-acre Dalke-Juhl development will be a source of noise and congestion.

"I think we were headed for court one way or the other," Commissioner Christensen said Monday. "If we hadn't granted the zone change request, the Mobile Home Dealers Association would have taken us to court. They swear there must be more mobile home spaces made available

*NOTE: Taken from May 4, 1976 issue of the Billings Gazette.

for public use."

Christensen, who recently voted for a mobile home zone change near the Ramada Inn but was overruled by the two other commissioners, said he made an undercover survey to prove his point.

"Without identifying myself, I called all the trailer courts in town and said I had a 14-foot wide mobile home to park and needed a space."

"There wasn't a single slot available. One said there might be an opening in two weeks.

"This convinced me to fight to grant the zone change."

The area, formerly classified R-7200 (for residential one and two-family dwellings) is now classified Residential Mobile Home.

After the zone change application was filed, the planning office staff recommended the change be made.

But the Zoning Commission recommended it be denied.

The Zoning Commission felt that there are other tracts of land in the county, already zoned mobile home, that could be used for more mobile home parks.

"But now can you force a landowner to do a particular thing with his land?" Christensen asked. "The only way to do that would be to come up with the money on a county level and that just doesn't seem reasonable."

The decision of the county commission is one of only a few which overrules the zoning commission. Often, the county commission reinforces the zoning commission's recommendation. Always, the county commission has final say.

"Actually, we did override the Zoning Commission in granting the change," Kamp said. "But we went along with the first official recommendation, that of the planning office."

The Zoning Commission was angry that county commissioners overruled them before considering the Zoning Commission's formal report.

"But we heard the protests." said Christensen, "and we felt we had to make a decision to approve more mobile home housing."

Commissioner M. E. "Mike" McClintock was absent and so did not vote.

The necessary two-person majority vote makes a commission decision official, and both Christensen and Kamp voted in favor of the zone change.

Depending on Department of Health surveys, Dalke and Juhl could put as many as 50 to 90 mobile home slots on their property.

APPENDIX D

FORM AB 6

RESIDENTIAL IMPROVEMENTS AND LOT APPRAISAL FORM

OCCUPANCY	CONSTRUCTION	GRADE	YEAR CONST.	REMOD-ELED	CONDI-TION	EFFEC-TIVE AGE	REPLACE. VALUE	PHY. DEP.	PHYSICAL VALUE	FUNC. DEP.	NORMAL VALUE	LOCAL INDEX	SOUND VALUE
DWLG.													
1													
2													

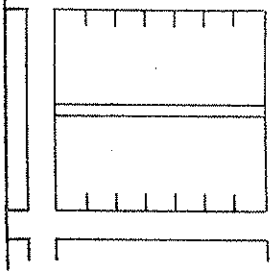
IMPROVEMENTS								LAND COMPUTATION						TOTAL
SIDE-WALKS	CURB-ING	DT. PAVED	DT. OILED	DT. DIRT	SEWER OR SEPTIC	WATER	GAS	ELEC-TRICITY	FRONTAGE FIGURED	AVERAGE DEPTH	UNIT PRICE	DEPTH FACTOR	FRONT FT. PRICE	TOTAL	ADJUSTMENT	VALUE

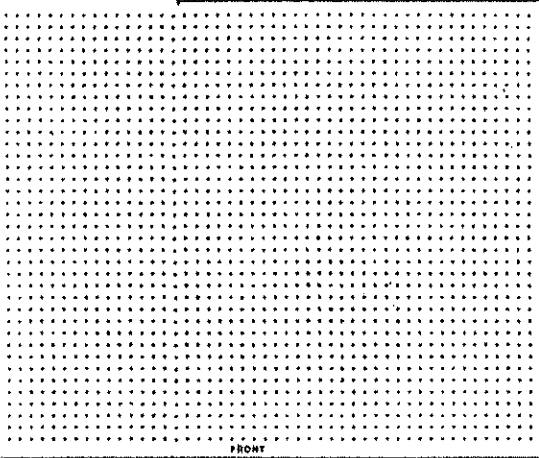
NO. SQ. FT.	PER SQ. FT.	
QUALITY FACTOR	%	

ADJUSTMENTS SQ. FT	PER SQ. FT.	ADD OR SUBTRACT
BSMT. AREA	X	
BSMT. FINISH	X	
INSULATION	X	
HEATING	X	
PLUMBING	FLAT	
FIREPLACES	FLAT	
VENEER	X	
BUILT INS	FLAT	
CURRENT MULTIPLIER		
REPLACEMENT VALUE		

TOTAL SOUND VAL. IMPS.	
TOTAL SOUND VAL. LAND	
ASSESSED VALUE IMPS.	
ASSESSED VALUE LAND	

LOCATION OF IMPS. IN BLOCK





DWELLING: 1s	1½s	2s
FOUNDATION		
CONCRETE BLOCK		
FORMED CONCRETE		
STONE		
WALL CONSTRUCTION		
FRAME		
CONCRETE BLOCK		
BRICK		
EXTERIOR FINISH		
STUCCO		
WOOD OR COMP. SHINGLE		
ASBESTOS SIDING		
MASONITE		
SINGLE SIDING		
VENEER		
ROOF TYPE		
HIP		
GABLE		
FLAT		
ROOFING MATERIAL		
WOOD OR COMP. SHINGLE		
BUILT UP		
SHAKES		

BASEMENT AREA	SQ. FT.
FINISHED AREA	SQ. FT.
CONCRETE FLOOR	
NO. ROOMS	
ROOMS MAIN FLOOR	
KIT. L.R.	D.R.
D.D. BATH	
ATTIC	SQ. FT.
DORMER	L. FT.
INSULATION	
WALLS	
ROOF	
FLOOR	
FLOORS	
CONCRETE	
SOFTWOOD	
HARDWOOD	
PLYWOOD	
CARPETED	
SINGLE FLOORING	
FL. JOISTS SPAN	FT.
FL. JOISTS X X	O.C.

INTERIOR FINISH	1ST	2ND
PAPERED		
DRYWALL		
LATH AND PLASTER		
WALLBOARD		
PANELING		
TRIM		
PINE OR FIR		
HARDWOOD		
PLUMBING		
BATHTUBS		
LAVATORIES		
TOILETS		
KITCHEN SINKS		
HOT WATER HEATERS		
SHOWER STALLS (METAL)		
SHOWER STALLS (TILED)		
BATH ROUGH IN		
ELECTRICAL		
SUITABLE FOR GRADE		

FIREPLACES	
1s STACK	
1½s STACK	
2s STACK	
FIREPLACES	
BSMT. FIREPLACES	
HEATING	
OIL GAS STOKER	
GRAVITY HOT AIR	
FORCED HOT AIR	
HOT WATER	
ELECTRIC	
FLOOR OR WALL	
COMBINED A.C. AND HEAT	
AIR CONDITIONING	

OUTBUILDINGS	1	2
FOUNDATION		
FOUNDATION		
FLOOR		
FLOOR		
FRAME CONST.		
MASONRY CONST.		
SIDING		
ROOFING		
INTERIOR FINISH		
O.H. DOOR		
ELECTRICITY		
HEATED		

TILING	SQ. FT.
PLASTIC OR METAL	
CERAMIC	
WINDOWS	
REGULAR	
THERMOPANE	
DAYLIGHT BSMT.	
BUILT IN	
RANGE	
COUNTER TOP RANGE	
OVENS	
DISHWASHER	
GARBAGE DISPOSAL	

DATE OF APPRAISAL	
MEASURED BY	
LISTED BY	
PRICED BY	
REVIEWED BY-DATE	
POSTED BY-DATE	

ADDRESS OF IMPS.

ADDITION	BLOCK	TRACT OR LOT	PARCEL NUMBER

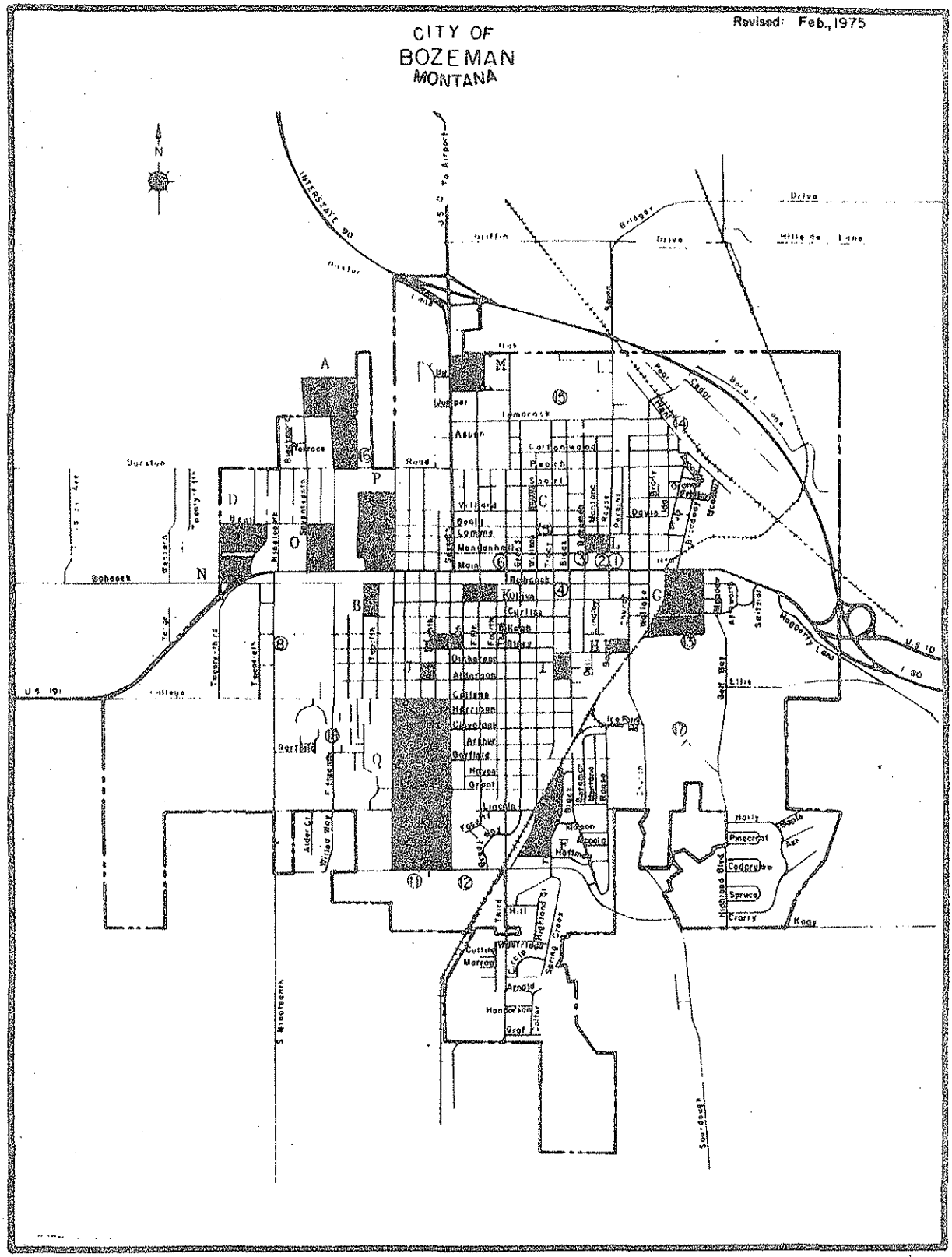
APPENDIX E

NORMAL PHYSICAL DEPRECIATION FOR DWELLINGS

AGE	1F-1	1F-2 & 1F-3	1F-4, 1F-5 & 1F-6	1F-7 & 1F-8
1	3%	3%	3%	3%
2	5	4	3	3
3	7	6	5	4
4	10	8	7	5
5	12	10	8	7
6	15	12	10	8
7	18	14	12	9
8	20	16	13	11
9	22	18	14	12
10	25	20	15	13
11	26	21	16	15
12	26	21	17	15
13	27	22	18	16
14	29	23	19	17
15	30	24	21	19
16	32	25	22	20
17	33	26	23	21
18	34	28	24	22
19	35	29	25	22
20	36	30	26	23
21	36	32	28	25
22	38	33	29	26
23	39	34	30	27
24	40	36	31	28
26	43	38	33	30
28	44	39	34	31
30	45	40	35	32
32	47	41	36	32
34	49	44	38	34
36	52	46	40	36
38	53	47	41	37
40	56	49	43	40
42	57	51	44	40
44	58	52	45	42
46	61	54	47	42
48	64	56	49	44
50	65	58	50	45
52	66	59	51	46
54	68	60	52	47
56	69	61	53	48
58	70	62	54	49
60	75	63	55	50
65		70	60	55
70			65	60
75				65
80				70

On dwellings that have exceeded 60 years effective age use extreme caution. These tables are to be used as a guide only under normal conditions. The suggested depreciations may be increased if the structure is in poor condition and decreased if it is in good condition for the age.

APPENDIX F


CITY OF
BOZEMAN
MONTANA
Revised: Feb., 1975
N
INTERSTATE 90
U.S. 10 To Airport
Bridger Drive
Hillcrest Lane
Babcock
Main
Kagy
Ellis
College
Garfield
Lincoln
Grant
Haynes
Arthur
Cleveland
Harrison
Atlanson
Dickerson
Curtiss
Kollins
Aspen
Peach
Cedar
Holly
Pinecrest
Cedarview
Spruce
Cherry
Highland Blvd.
Third
Hill
Cutting
Morrow
Arnold
Hannon
Graf
Spring Creek
Ice Pond Rd.
Hoffman
Apgold
Kirkson
Bridger
Norwood
Rose
Alder Ct.
Willow Way
Tamarack
Aspen
Beech
Sherri
Valgard
Opell
Lamme
Mandonna
Grant
Wilson
Black
Orchard
Ogwin
Montana
Rose
Orchard
Broadway
Hoffman
Cedar
Bridger
Drive
Terrace
Road
Burton
Babcock
Western
Tamarack
Tamarack
Tamarack
Main
Babcock
Kollins
Curtiss
Dickerson
Atlanson
Cellens
Harrison
Cleveland
Arthur
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Ice Pond Rd.
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Tamarack

APPENDIX F

LEGEND

1. Mobile Home Parks
   - A. Nelson - Covered Wagon
   - B. Eldridge
   - C. North Wilson
2. Public Parks
   - D. Kirk
   - E. Cooper
   - F. Langhor
   - G. Lindley
   - H. Bogart
3. Elementary Schools
   - I. Longfellow
   - J. Emerson
   - K. Willson
   - L. Hawthorne
4. Shopping Centers
   - M. K-Mart
   - N. Gibsons
   - O. Buttreys
5. High School
   - Senior High School
6. University
   - Q. Montana State

APPENDIX C
CHART 1

ZONE REQUIREMENT CHART

COLUMN 1 DISTRICT	COLUMN 2 Permitted Uses	COLUMN 3 Classifications & Limitations on Permitted Uses	COLUMN 4 Conditional Uses
R-1	Accessory Uses Home Occupations Newly Constructed One-Family Dwellings Temporary Buildings - (1.)	(1.) For & during construction only.	Churches, Schools, Libraries, Public & Private Parks & Playgrounds, Golf Courses & Country Clubs & P.U.D.'s.
R-2	Same as R-1 Above		Same as R-1 above
R-3	Same as R-1 Above Plus: Churches Fraternity & Sorority Houses Multi-Family Dwelling Rooming & Boarding Houses - (1.)	(1.) Maximum of five rooming unites plus family quarters.	Same as R-1 & R-2 above when not a permitted use plus: Mobile Home Parks, Efficiency Units & Medical Offices.
R-4	Same as R-1, R-2, R-3 Above Plus: Apartments & Efficiency Units Clinics, Hospitals & Nursing Homes		Same as R-3 above
R-5	Same as R-1, R-2, R-3 & R-4		Same as R-4 above.
R-O	Same as R-5 Above Plus: Barber Shops & Beauty Shops Buildings with Dwellings and Offices Establishments Dealing in Prosthetic Appliances, Eye Glasses, Hearing Aids; (1.) Florists News & Tobacco Stands or Stores Private Clubs & Fraternal Lodges (2.) Professional (Business) Offices Restaurants Signs	(1.) Including production for on-premise sale, fitting, repair & sale of such products or their parts. (2.) Excluding bars except as a conditional use.	Same as R-4 above plus: Other types of Medical Facilities or Personal Services not listed as a permitted use. Motel, Gasoline Service Stations, Clubs, Bars, Taverns, Parking Lots, Public & private Parks & Playgrounds.
B-1	Accessory Uses for Parking Dry Cleaning & Laundry Establishments (1.) Food Stores, Such as Grocery Stores, Bakeries, etc. Restaurants (2.) Self-Service, Automatic Laundries Signs (3.) Temporary Buildings (4.) Variety Stores	(1.) Processing not to be done on premises. (2.) Exclusive of Drive-Ins. (3.) Only one Facade sign per business, plus one directory sign per district. (4.) For & during construction only.	Retail uses in addition to those permitted uses listed but limited to those serving the Consumer directly, Gasoline Service Stations.
B-2	Antiques Art & Music Supply Stores Barber & Beauty Shops Bars, Taverns & Cocktail Lounges Bowling Alleys Equipment Sales & Service Food & Drug Stores Frozen Food Storage & Locker Rental Furniture Stores Gasoline Service Stations Hotels & Motels Laundries & Dry Cleaning Establishments Liquor Stores Mortuaries Post Offices Professional & Business Offices Research & Development Institutions Restaurants (1.) Shopping Centers Signs Sporting Goods Stores Temporary Buildings (2.) Theaters (3.) Uses Customarily Accessory to Those Listed Vehicles & Boat Sales (4.) Veterinary Clinics (5.)	(1.) Including Cafes & Drive-In eating establishments. (2.) For & during construction only. (3.) Except Drive-In Theaters. (4.) Including Showrooms & Service Areas. (5.) Limited to small Animal Hospitals only. (6.)	Retail uses in addition to those permitted uses listed, Wholesale Distributors with on premise retail outlets provided warehousing is limited to comodities which are sold on the premises, Amusement & Recreational Activities, Travel Trailer Parks & P.U.D.'s.
B-3	Bakeries Bars, Cocktail Lounges Dressmaking Financial Institutions Hotels & Motels Laundry & Dry Cleaners Meeting & Lodge Halls Museums, Libraries & Galleries Parking Lots Printing Offices Private Schools (1.) Professional & Business Offices (2.) Public Offices Repair Services (3.) Restaurants & Cafes Retail Sales (4.) Signs Temporary Buildings (5.) Theaters (6.) Uses Customarily Accessory to Those Listed Wholesale Establishments (7.)	(1.) Such as Dance, Business, Secretorial & Technical—but not Private or Public Elementary or Secondary Schools. (2.) For Personal Services. (3.) For Clothes, Dolls, Small Appliances, Watches, Glasses & such other items. (4.) Such as Clothing, Candy, Furniture & Jewelry—but excluding Heavy Machinery. (5.) For & during construction only. (6.) Except Drive-In Theaters. (7.) That use samples, but do not store stock in premises.	Amusement & Recreation Activities, Auction Rooms, Transportation & Utility Stations, Apartments & Drive-In Banks.
M-1	Building Material Sales Building Contractors Establishments Cabinet Shops Enclosed Warehousing Flour & Feed Mills Food Processing Plants Gasoline Service Stations Grain Elevators Greenhouses Machine Shops Manufacturing of Light Consumer Goods (1.) Outside Storage (2.) Paint Shops Repair & Service Establishments (3.) Signs Sign Shops Temporary Buildings (4.) Truck & Rail Terminal Facilities Uses Customarily Accessory to Those Listed Vehicle & Boat Sales	(1.) Such as: Electronic Equipment, Appliances, Furniture & Beverages. (2.) If accessory to permitted use & if screened from street, & surrounding properties by solid fence 6 ft high or dense planting. (3.) For light consumer goods, such as Automobiles, Appliances & Furniture. (4.) For & during construction only.	Open Storage (if screened), Retail Establishments, Residence for owner or caretaker & P.U.D.'s.

ORIGINAL REGRESSION RESULTS

VAR. NO.	MEAN	PARTIAL CORR.	REGRESSION COEF.	STD. ERROR REGR. COEF.	COMPUTED T VALUE
2	21.63	1.000	171.6	28.21	6.084
3	8579.	1.000	.1593	.6153E-01	2.589
5	.1999E 05	1.000	1.277	.5087E-01	25.11
6	3521.	1.000	2.532	.8687	2.915
7	5049.	.9999	.2219	.9300	.2386
8	1956.	-1.000	-.3715	.9607	-.3867
9	1967.	1.000	1.074	.9107	1.179
10	3912.	-1.000	-1.880	.9046	-2.079
11	4286.	-1.000	-1.148	1.495	-.7678
12	.16-0E 08	.9971	.3733E-01	.7680	.4861E-01
13	4412.	.9999	.4100	1.814	.2260
14	2489.	-1.000	-.9712	.9664	-1.005
15	.2922	1.000	1761.	926.1	1.902
16	.8230E-01	1.000	1094.	991.2	1.104
18	.1070	-1.000	-5796.	1138.	-5.094
26	.2186E 08	-1.000	-.2945E-03	.9472E-04	-3.109
27	.3240E 08	-.9999	-.3889E-04	.1137E-03	-.3357
28	.7828E 07	1.000	.1277E-03	.1441E-03	.8859
29	.8736E 07	-1.000	-.1469E-03	.2306E-03	-.6370
30	.1978E 08	1.000	.1223E-03	.1256E-03	.9734
31	.3406E 08	1.000	.9054E-04	.1115E-03	.8121
32	.6535E 17	-.9971	-.9368E-11	.1927E-09	-.4861E-01
33	.2508E 08	-1.000	-.2437E-03	.2693E-03	-.9049
34	.1038E 08	1.000	.5013E-03	.2625E-03	1.910
DEPENDENT 1	.3224E 05				

INTERCEPT = .1197E 05
R SQUARED = .8566
STD.ERROR(SY.X) = 3994.

ANALYSIS OF VARIANCE FOR THIS REGRESSION

SOURCE	D.F.	S.S.	M.S.	F VALUE
DUE TO REGRESSION	24	.207819E 11	.865911E 09	54.2714
RESIDUAL	218	.347823E 10	.159552E 08	
TOTAL (N = 243)	242	.242601E 11		

SIMPLE CORRELATIONS

	1	2	3	5	6	7	8	9	10	11	12	13	14	15	16	18	26	27	28	29	30	31	32	33	34
1	1.0	.13	.20	.86	.26	.48	.24	-.06	-.12	.19	.07	.43	.34	.34	.08	.25	.22	.44	.16	-.03	-.12	.21	.07	.36	.29
2		1.0	-.07	-.01	-.02	*	*	.03	.03	.03	-.12	.03	.05	.07	.05	.15	.01	.05	-	.01	.10	.35	-.12	.04	.06
3	Lot size		1.0	.18	-	.15	.08	.03	.10	.03	.07	.19	.16	.16	.02	.03	-	.16	.02	-	.10	.03	.01	.16	.12
5	Physical value			1.0	.31	.56	.33	-.01	.02	.22	.03	.56	.49	.42	.05	.45	.31	.54	.24	.01	-	.27	.03	.49	.42
6	Dist. mobile home park				1.0	.41	.90	.31	.14	.95	-	.68	.66	.53	-.13	.20	.96	.43	.85	.44	.19	.94	-	.74	.73
7	Dist. Industrial Zone					1.0	.44	.03	-.14	.31	-.40	.81	.72	.52	.03	.37	.45	.96	.41	.09	-.11	.41	-.04	.75	.67
8	Dist. Commerical Establishment						1.0	.49	.32	-.89	-.02	.72	.76	.61	-.93	.23	.94	.45	.95	.61	.39	.95	-.02	.81	.79
9	Distance public park							1.0	.60	.32	-.01	.35	.42	.36	-.03	.02	.46	.10	.58	.95	.67	.47	-.01	.44	.50
10	Distance to University								1.0	.15	-.04	.29	.45	.34	-.01	.12	.28	-	.41	.62	.97	.30	-.04	.36	.46
11	Distance to nearest shopping center									1.0	.01	.61	.60	.47	-.17	.18	.90	.33	.84	.44	.21	.96	.01	.69	.68
12	Distance to high school										1.0	-.06	-.06	-.04	-.01	-.02	-.01	-.05	-.02	-.02	-.04	-	-.04	-.05	-.04
13	Distance to CBD											1.0	.94	.72	-	.40	.74	.86	.73	.43	.35	.73	-.06	.97	.91
14	Distance to elementary school												1.0	.73	-.01	.02	.75	.80	.75	.50	.48	.74	-.06	.96	.96
15	View of mountains													1.0	.10	.36	.60	.58	.59	.41	.34	.58	-.04	.73	.71
16	Multifamily housing unit (adjacent)														1.0	.09	-.13	.33	.84	.44	.21	.96	.01	-.03	.68
18	New appraisal manual															1.0	.21	.42	.15	-	.07	.19	-.02	.39	.91
26	Mobile home park, distance squared																1.0	.48	.93	.59	.34	.96	-.01	.82	.83
27	Industrial zone, distance squared																	1.0	.43	.14	.02	.44	-.05	.83	.77
28	Commercial, distance squared																		1.0	.70	.48	.93	-.02	.80	.81
29	Public park, distance squared																			1.0	.70	.59	-.02	.52	.58
30	University, distance squared																				1.0	.35	-.04	.41	.49
31	Shopping center, distance squared																					1.0	-	.80	.81
32	High School, distance squared																						1.0	-.05	-.04
33	CBD, distance squared																							1.0	.97
34	Elementary School, distance squared																								1.0

(1) = sale price

(2) = date of sale

** correlations less than .01 are not shown.

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